Title
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Permalink
https://escholarship.org/uc/item/8gz5b9xf

Journal

ISSN
1069-7977

Authors
Frozza, Rejane
Mainieri, Alessandra Ghinato
Molz, Kurt
et al.

Publication Date
2005

Peer reviewed
Educational System based on Cognitive styles and/or Learning styles?

Alessandra Ghinato Mainieri (aless@unisc.br)
Department of Psychology, 2293 – BL 35. Independência Street
Santa Cruz do Sul, 96815-900 Brazil

Rejane Frozza (frozza@unisc.br)
Department of Informatics, 2293 – BL 17. Independência Street
Santa Cruz do Sul, 96815-900 Brazil

Jacques Schreiber (jacques@unisc.br)
Department of Informatics, 2293 – BL 17. Independência Street
Santa Cruz do Sul, 96815-900 Brazil

Kurt Molz (kurt@unisc.br)
Department of Informatics, 2293 – BL 17. Independência Street
Santa Cruz do Sul, 96815-900 Brazil

Abstract

The concept of cognitive styles is frequently applied in the field of educational systems research (Chou, Chan & Lin, 2003). Roberts and Newton (2001) suggested that although the concept of cognitive styles is a useful starting point, it is unable to account for many finds in the literature, and that any model of strategy usage that is reduced itself to mechanisms governing strategy selection is incomplete. It is necessary to consider which strategies people have available and how they discover new ones. Therefore, the aim of the present study was to investigate the learning strategies of undergraduate students of Psychology and Computing Sciences courses in order to explore possible variables to implement in a Intelligent Tutorial System. Thus, to evaluate learning strategies, the Ross Test of Cognitive Process, which evaluates the student individual performance of thinking process and strategies, was used. The results suggests that each group have different learning strategies choices. According to this, it is discussed the use of learning strategies to implement educational systems.

Educational systems

Educational systems are a kind of system which act as tutor and it is known as Intelligent Tutor System (ITS). The ITS are systems which help in learning process and permit the devolpment of a cooperative enviroment between system and student. The objective of these systems is to improve learning process, promote cognitive flexibility and guide the students through learning process. This objective is made through identification of students interests and needs. So, these systems work with the individual differences of students, including cognitive/learning styles (Carver et al, 1996; Papanikolau et el, 2001; Triantafillou, 2003).

The Educational Systema is compound by three modules: Dominium Module (set of dominium content); Student Module (student features); Adaptative Module (according student’s cognitive/learning style and information, the dominium content is adapted). The modules work integrated with different aspects of learning process, adapting the content according student’s knowledge, combining presentation midias of the content, adapting learning strategies (tactics) and modifying examples and links.

There are two principal systems: Intelligent Tutor System (ITS) and Companion System. The main focus of ITS is manage with students individual necessities and give an adaptative feedback of the system to the student. The ITS must comprehend student’s need and offer interactive strategies to the student. In general, these systems have four modules (Wenger, 1987): Dominium Module (Knowledge which represents learning objectives); Student Module (detects student’s beliefs, actions and mistakes. It is used to give adaptative feedback to the student); Pedagogical Module (it is the pedagogical strategies used to guide student’s interaction with the system); Interface (comunication module with student). The other system, Companion System, uses educational agent in its structure and this agent has two plays: intelligent tutor and learning companion (Chou et al, 2003). A leaning companion acts like a student’s companion during interaction and offer activities within the enviroment, it can colaborate or compete like a human student. The human student can observe campanion’s actions while solving problems or explaing the solutions as a part of programmed actions of the companion. The purpose of the enviroment is to use several companion’s agent in order to identify student’s features such introversion, extroversion, among others. This agents are a kind of educational agents with human caracteristics (showed by text, graphs, icons, voice, animation, and others) which facilitates social learning.

The pedagogical and didatic propousals of software products with ITS caracteristics are extenses (Corredor, 1993), because it confirms the importance of student’s individual features, recognizing that instruction could be individualize in order to facilitate the development of student’s conceptual and methodological structures.
Aim of the study

The aim of the present study was to investigate the learning strategies of undergraduate students of Psychology and Computing Sciences courses in order to explore possible variables to implement in a Intelligent Tutorial System.

Method

Participants: 135 undergraduate students (79 from Computing Science and 56 from Psychology), with age between 18 to 40, was invited to participate in the study.

Instruments and Material: The Ross Test of Cognitive Process was used to measure cognitive strategies. The main objective of the test is to evaluate student’s individual performance in thinking processes (Ross & Ross, 1976). The test was conceived to measure 3 general abilities, analyses, syntheses and evaluation, and in each of the 8 subtests (Analogy, Deductive Reasoning, Missing Sentences, Abstract Relations, Sequential Syntheses, Questioning Strategies, Relevant and Irrelevant Information, and Attribute Analyses) specific abilities are defined (table 1).

Table 1 – Abilities tested in Ross Test - Bloom (1976)

<table>
<thead>
<tr>
<th>Abilities tested in Ross Test</th>
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<tbody>
<tr>
<td>Analyses</td>
<td>Sintheses</td>
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<td>- Analogies (AN)</td>
<td>- Abstract Relations (AB)</td>
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<td>- Missing Sentences (PA)</td>
<td>- Sequential Syntheses (SE)</td>
</tr>
<tr>
<td>- Relevant and Irrelevant Information (IN)</td>
<td>- Attribute Analyses (AT)</td>
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</table>

Procedures: The test session took place in a classroom and those students who did not want to take part of the study could leave the room freely.

Results and Discussion

To a better analyses of the results, the sample was divided into 2 groups: Group 1 (Psychology students) and Group 2 (Computing Science students). Through the analyses of the test, there is a small difference about reasoning strategies used in both groups (Tabelas 2 and 3). Although, the variance within the students was very large. In group 1, subtests with bigger means were Deductive Reasoning (RD), Attribute Analyses (AT) and Missing Sentences (PA), respectively, 58,286; 57,143 e 56,929. On the other group, the subtests with bigger means were Relevant and Irrelevant Information (IN), Attribute Analyses (AT) and Deductive Reasoning (RD), respectively 74,114; 72,608 e 69,481.
According to Bloom (1976), all teaching plans should be flexible and consider learning strategies as a teaching plan. An adaptive module with tactics, knowledge, and links to the student's learning style implies building a representation of the external world. Thus, aggregating style refers to a cognitive control between inner state and learning style. This makes it possible to identify student's correlations to these. This makes the system more capable of adapting to the learning needs of the student, not just to a fixed group of learning strategies. However, the test gives some interesting variables to build an educational system based on preferred strategies, opening a possibility to have a system that can be adaptable not just to students' preferences but also to make possible the development of metacognitive abilities.

**Acknowledgment**

The authors are grateful to Santa Cruz do Sul University to provide the funds for carrying out this research.

**References**


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<th>AN</th>
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Ross, John D.; Ross, Catherine M.. Teste Ross De Processos Cognitivos. Instituto Pieron De Psicologia Aplicada.


