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A VIDEODISC PROGRAM FOR THE ACQUISITION OF DIAGNOSTIC SKILLS IN HEALTH EDUCATION

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Introduction

In health education the main goal is to answer the question what kind of a disease does a patient have. The abilities which are prerequisite for answering this question are referred to as diagnostic skills. The central issue which will be discussed here is the design of a multi-media learning environment which will enhance the acquisition of these diagnostic skills. The assumption is that the design of such learning environment can be derived from prescriptions based on the *prototype* view of concept learning. This view will be elaborated firstly.

To provide a diagnosis is conceived as a type of categorisation. The process of categorisation refers to the subsumption of objects, processes and events in a category (Bourne, 1970; Bruner, Goodnow & Austin, 1956; Hunt, 1962). A category can have clear-cut boundaries or fuzzy boundaries. Most concepts in the medical domain can be characterized as *fuzzy* concepts (Zadeh, 1965). This can be illustrated by concepts as heart disease, low-back pain and headache. The question is what concept model is the most appropriate to represent the fuzziness of most medical concepts. Currently the two main concept models are the *classical model* (Bourne, 1965) and the *prototype model* (Rosch, 1973; Rosch & Mervis, 1975; Rosch, 1978). The prototype model seems the most appropriate for it takes into account explicitly the fuzziness of conceptual boundaries.

Tennyson & Cocchiarella (1986) have provided an instructional design model for learning concepts based on the prototype view of concept learning. They hypothesized that the learning of concepts consists of two phases:

- the formation of conceptual knowledge and
- the development of procedural knowledge.

From that background the instructional design guide-lines contain the following elements:

- a concept definition,
- a typical example,
- a set of expository instances,
- a set of interrogatory instances and
- a classification test.

Based on attribute characteristics (constant and variable dimensions) and the relational structure (successive and coordinate). Tennyson and Cocchiarella (1986) distinguished four strategies:

- constant plus successive,
- constant plus coordinate,
- variable plus successive and
- variable plus coordinate.

The videodisc program, presented in this paper, has been derived from the last strategy. It addresses learning coordinate concepts with variable dimensions. Especially it attends to the effect on learning outcomes of variation of instances and sequence of presentation of instances as well as the effect of contrast in variable attributes of instances.

One of the main characteristics of the instructional program is the difference between expository and interrogatory instances. The expository instances contain a linear video presentation with spoken comment. These instances refer to *typical* diseases.

The interrogatory instances encompass

- an initial video presentation where the patient is linear presented without the possibility for interaction,
- a secondary presentation encompasses the different aspects of the human body (E.g. face, hand, foot) as well as the monitor data (E.g. heart frequency, blood pressure, respiration, etc.).

In this phase the student can choose one aspect about which he will receive a question. Before answering this question he can optionally view the relevant video sequence.

Method

The reasons for choosing a videodisc program are:

- the possibility to use different information channels (text, speech and images),
- random access,
- branching,
- instant jump (Handbook Interactive Video, 1988).

The program*) contains three modules. In the first and second condition of the first module a best instance of the concept *shock* is presented followed by randomly presented interrogatory instances. Note that the first condition contains defining symptoms as well as irrelevant symptoms whereas the second condition contains only defining symptoms. In the third and fourth condition interrogatory instances are presented randomly without exposition of a typical instance. In the fourth condition the irrelevant symptoms are omitted. The hypothesis is that the presentation of a best example facilitates the formation of a mental image and that the enumeration of irrelevant symptoms will strengthen this effect. So condition one is expected to be superior.

The second module contains four conditions. In the first condition problems from one subcategory are practiced until no more errors are made. In the second condition a problem of each of the subcategories is presented followed by a problem of the next subcategory until all subcategories have been addressed to. The third and fourth condition are similar to respectively condition one and two

except for the fact that a relevant area of a variable is contrasted with a non-relevant area.

The third module attends to the problem of how new knowledge is related to existing knowledge. Relating new knowledge to existing knowledge enhances the retention of new knowledge. The assumption is that relating new knowledge can be accomplished by organizing a knowledge structure which can be presented before (first condition) and during practice (second condition) and at the moment that errors are made (third condition). The hypothesis is that the last condition is superior.

The videodisc program contains 30 patients ranging from typical to less typical instances of the three types of shock: cardiac shock, distributive shock and hypovolemic shock. Each patient fragment is presented in a standardized way and contains an anamnesis, a list of more or less salient symptoms and monitor data.

Results

A formative evaluation has been completed and has led to various improvements as to screen design, content and presentation form of the content. A group of 10 experts in the field of educational technology and with experience regarded to interactive video have completed a questionnaire of 42 questions. The questions were subdivided in seven categories: information channels, sequencing of the instruction, questions, screen design, user interface, informational accuracy and attractivity. Among the most important improvements which were made are the reduction of the number of buttons, enhancing the interaction possibilities and tuning the information channels voice, image and written text.

Conclusion and discussion

It seems that a videodisc is a suitable tool for the development of the conceptual and procedural knowledge which are of crucial importance in the identification of diseases. Especially the interactive character of the videodisc as well as the possibility to confront subjects with clusters of symptoms seems promising for the health education as well as for instructional design for learning (medical) concepts.

*) The program was developed using the authoring language "Course of Action".

References

- Bourne, L.E., Jr. (1965). Human conceptual behaviour. Boston: Allyn & Bacon.
- Bourne, L.E., Jr. (1970). Knowing and using concepts. Psychological Review, 77, 546-556.
- Bruner, J.S., Goodnow, J.J., & Austin, G.A. (1956). A study of thinking. New York: Science Editions.
- Hunt, E.B. (1962). Concept learning: An information processing problem. New York: Wiley.
- Interactive video: Introduction and handbook. (1988). London: The national interactive video centre.
- Rosch, E. (1973). On the internal structure of perceptual and semantic categories. In: T.E. Moore (Ed.): Cognitive development and the acquisition of language. New York: Academic Press.

- Rosch, E., & Mervis, C.B. (1975). Family resemblances: Studies in the internal structure of categories. Cognitive psychology, 7, 573-605.
- Rosch, E. (1978). Principles of categorisation. In: E. Rosch & B.B. Lloyd (Eds.), Cognition and categorisation. Hillsdale, NJ: Laurence Erlbaum Associates.
- Tennyson, R.D., & Cocchiarella, M. (1986). An empirically based instructional design theory for teaching concepts. Review of Educational Research, 56, 40-71.
- Zadeh, L.A. (1965). Fuzzy sets. Information and Control, 8, 338-353.