Scaffolds for users of interactive learning media

Cecilia Katzeff and Elin Lundborg[1]
Learning matters
Framkom,
Box 1243
S-164 28 Kista
cecilia.katzeff@framkom.se
SWEDEN

ABSTRACT

In this paper, we report an experiment addressing the problem of designing scaffolds, i.e. learning support, for interactive media for learning. The paper focuses learning and memorization of facts, rather than complex problem solving. When subjects were provided with a scaffold prompting them to actively engage in their own learning process, they tended to perform better on a retention test than subjects who were not presented with the scaffold.

Keywords

Interactive learning media, constructivism, scaffolding

1 INTRODUCTION

Interactive media provide favorable conditions for learners to actively engage in the learning process. Unfortunately, designers of commercial interactive learning media do not fully seem to recognize this new opportunity to design for active engagement. Especially, the unique needs of learners in a corporate setting do not attract the attention they deserve.

The purpose of this paper is to shed light on the use of scaffolds in educational media directed towards adult users in a corporate setting. Current theories of learning advocate the role of active engagement in learning. It is argued that by actively *constructing* meaning, the learner interprets and acts upon the material being learnt and thereby produces a better understanding (Lave et al., 1993). Implications for design of educational media include inviting the learner to actively engage in her own learning. Invitations for learners to summarize learning materials may constitute examples triggering such activities.

Presently, there seems to be a gap between theoretical models of learning and the design of interactive media for learning. A fruitful approach to bridging this gap may be the learner-centered design (LCD) approach (Soloway et al., 1996; Quintana et al., 1999). The central claim of LCD is that interactive media may embody learning supports that can address the learner's growth, diversity, and motivation. This support is usually referred to as *scaffolding*, denoting the provision of support to learners while they engage in the learning process. The Soloway team has brought the idea of scaffolding into the design of interactive educational media in the development of the tools Theorybuilder and Symphony (Quintana et al., 1999). Both are directed towards supporting the science inquiry process for high-school students. Our research, on the other hand, addresses the problem of adult learners in a corporate setting. The

[1] The co-author carried out part of the research at WM-data.

focus is on the learning of a great amount of factual information, rather than on problem solving.

2 THE EXPERIMENT

The multimedia application used in the experiment was a CD-ROM based education, commercially developed by a consultancy firm for a transportation and shipping agency. The aim of the education was to provide new staff with an overview of how the agency operates. The education contains a great deal of new information and explains many concepts and relations specific to the agency.

This particular multimedia education was chosen because it was aimed at an adult audience in a work context and because the information contains a lot of details. It also showed a potential for improvement, mainly because of its didactic way of presenting information.

2.1 EXPERIMENTAL DESIGN

In order to test the hypothesis that people learn more effectively when prompted to use learning techniques involving interpretation processes rather than merely repeating the material to be learnt, subjects were divided into two groups, receiving two different types of instructions: The *scaffold* group and the *repetition* group.

2.1.1 Instructions

The instructions to the scaffold group provided scaffolds by prompting the subjects to summarize the contents of the CD-ROM as they went along. They were asked to write summaries in a format of their choice from mind maps, keywords, or drawings. Subjects were told to use paper and pencil for their summaries. The instructions to the repetition group asked subjects simply to run the educational CD-ROM one extra time. Subjects were not allowed to use any tools, such as paper and pencil while going through the education.

2.1.2 Retention test

There were a total of 11 questions. The first question was a warming up question, six were about direct facts presented in the education, and four were questions requiring reasoning and drawing of inferences from the presented material.

2.2 SUBJECTS AND PROCEDURE

25 students from the University of Skövde, Sweden, were used as experimental subjects. Thirteen subjects were placed in the scaffold group and twelve subjects in the repetition group.

Two subjects were tested at the same time, but using individual PCs. They were not allowed to cooperate. Each subject went through the following steps:

1. Description of experimental procedure given by test leader.
2. Instructions on how to start the interactive education, how to use it, which parts to go through, and how to go through them. The scaffold group was told to summarize the material, as the repetition group was to repeat it.
3. Running the interactive education. The scaffolding group were given notepaper for their summaries and used these continuously throughout the session. All subjects were told that they were to receive a written test on the contents of the education afterwards.
4. Completion of retention test. This was done without access to the educational material.

3 RESULTS AND DISCUSSION

Two independent judges, following a template containing correct answers corrected the retention test. The correlation between scores obtained by the judges was 0.97. Thus, the judgement of test responses was considered reliable.

3.1 Over all scores

The maximum score possible for the 11 questions was 43. The mean score for the scaffold group was 22.5 and for the repetition group 20.1. The difference between the groups was not statistically significant. There was, however, a tendency for the scaffold group to produce higher scores on a majority of the questions: The scaffold group produced a higher score on 8/11 questions. On 2/11 questions, the repetition group produced a higher score, and on one question the groups produced the same score.

3.2 Scores on factual vs. reasoning questions

The proportion of correct responses to factual questions (6 questions) and reasoning questions (4 questions) were calculated. Results are presented in Table 1. The warming up question is not included in the calculation of means.

Type of question	Scaffold group	Repetition group
Factual	76%	63%
Reasoning	47%	43%

Table 1. Proportion of correct responses

As for the over all scores, differences between the groups' performance on the different type of questions were not

significant. However, also here there was a tendency for the reasoning group to perform better on both types of questions.

4 CONCLUDING REMARKS

The results present tendencies towards differences between the scaffold and repetition groups, pointing to interesting future directions. It was hypothesized that the scaffold group would perform better on the retention test because they had been prompted to use learning strategies considered to be more effective. Being prompted to engage in an interpretation process while summarizing the material was thought to cause the scaffold group to process it on a cognitively deeper level resulting in better learning.

The lack of significant differences between the two groups might be explained by the fact that the repetition group also used effective learning strategies. Although repetition in itself is usually not considered an effective technique for learning other than on a superficial level, the experiment did not control for what cognitive technique repetition group subjects in reality used. As all the subjects were students, they were used to studying and might have developed their own effective strategies for retaining material to be learnt. A future study will be designed to control for this factor. Future research will also be conducted to refine the scaffolding technique prompting the use of mind-maps and mnemonics. Studies integrating these techniques with the design of the user interface will be carried out.

5 REFERENCES

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