Effects of an On-Site Training on Picture-Reading

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Abstract. Pictures come across us every day. But only few people have developed a strategy to "read" pictures and therefore are able to understand the picture and comprehend the conclusion. In an experimental study we analyzed whether a training fostered learners understanding of pictures and if training effects are dependent from learners' style of organizing information (serialist versus holist). Half of the learners, which took part in the study, where given an on-site training on picture-reading, in addition they trained the given strategy over one week. After this week, all learners had to work with diagrams and realistic pictures, which they were supposed to look at closely so that they could answer questions afterwards. Results indicate that the type of learners' organization of information is crucial for the effectiveness of the training. Holists showed better comprehension for diagrams and reported less cognitive load, whereas serialists remained unaffected by the training.

Keywords: picture-reading; learning.

Introduction and Theoretical Background

Learning materials, like books or digital learning environments, usually contain pictures. But many learners aren't able to "read" these pictures in an adequate way. This may be due to the fact that learners often find pictures in learning material with a mere decorative function. However, as we know from research on multimedia learning, pictures can help to foster understanding (e.g. Mayer, 2005). Hence, when pictures have explanative functions within a text, learners should be able to collect and organize the given information adequately. It is crucial not only to look on details but to find the overall relationships between them in order to understand the global message of the picture.

In the present study we tested whether training on picture-reading can help to achieve better results in understanding pictures. Moreover, we are interested in Aptitude-treatement-interactions (ATI), as we know that effects of support often depend on learners prerequisites (e.g. Kalyuga, Chandler & Sweller, 1998). For learning from pictures it may be important that learners organize information in different ways and therefore can be categorized as serialist or holist learners (Pask, 1976). Serialists focus on details and work sequentially whereas holists focus on overall relations between details. Thus, we assume an ATI-effect, i.e serialists and holists will profit from training in a different way. Holists may benefit more from training as serialists because learning to read pictures means to learn how to focus on relevant details (in order to integrate them in a second step).

Method

In the experimental study 26 psychology-students took part and where randomly assigned to the training or the control group. The training group got an on-site training on picture-reading, whereas the control group had an alternative treatment without any reference to picture reading or other learning strategies. The training effects were quantified in 4 different picture-reading tasks (diagrams or realistic pictures). We calculated comprehension scores for diagrams (Cronbachs Alpha = .80) as well as for realistic pictures (Cronbachs Alpha = .70). In addition for each task the subjectively rated cognitive load has been assessed on a 7-point likert-scale that ranges from very low to very high mental effort (adapted from Paas, 1992).

In a first session learners characteristics, like age, sex, spatial abilities, use of learning strategies and working memory capacity have been measured. Learner's style of organizing information has been assessed and categorized with the Study Preference Questionnaire (SPQ; Ford, 1985). To ensure that learners do not know the pictures presented in the post-test they had to rate their familiarity with them before. The training on picture-reading took about one hour and showed different strategies for reading diagrams and realistic pictures in three steps: In a first step, the training shows, how to differentiate between diagrams and realistic pictures. The second step is to read out all details and to organize them, depending on the type of picture. In the last step, the message of the picture has to be found – again depending of the type of picture: while in realistic pictures information only has to be integrated with prior knowledge, the detection of information in diagrams is more complex and can be differentiated on three levels (1. Looking closely at one item of information 2. Compare two items of information 3. Compare two bulks of information). There were also given examples of using the strategy and examples for exercising in a booklet. Afterwards they were instructed to train the given strategy during the next week, which was monitored by handing in some edited pictures.

After one week all learners had to solve 4 tasks. In two tasks questions about given diagrams had to be answered by reading the picture correctly. In the two other tasks realistic pictures had to be processed the same way. The questions reflected the three steps of the training and assessed the ability of detecting details as well as organizing information and comprehension of the overall message. After every task the learners had to rate their cognitive load.

Results

First of all, we found no difference between the groups for the assessed control variables.

To analyze training effects on *comprehension of diagrams* we conducted an ANOVA. No main effect of the strategy-training and also no main effect of the type of organizing information could be revealed (Fs < 1, ns.). But we found by trend the expected ATI-effect ($F(1,24)= 3.51$, $p=.08$, $\eta^2=.16$): in the training group learners categorized as holists had better scores in solving tasks about diagrams than learners categorized as serialists (see figure 1, left side). The ATI-effect was especially strong in tasks on reading pictures at a first level, which means looking closely on one item of information ($F(1,24)= 4.62$, $p<.05$, $\eta^2=.20$; no main effects).

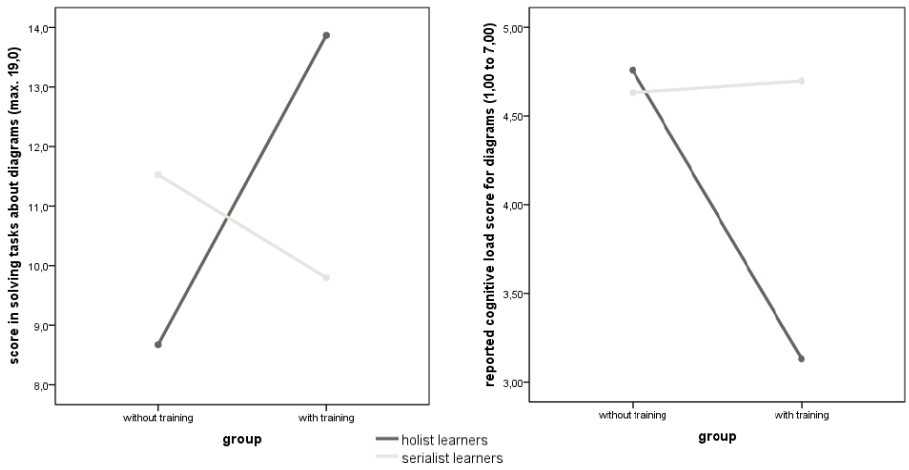

Figure 1. Scores of holists and serialists for reading diagrams and their reported cognitive load scores.

Moreover, we also found the ATI-effect for *cognitive load while learning from diagrams* (see figure 1, right side): the holists of the trained group reported lower cognitive load scores for learning from diagrams than serialists of the trained group ($F(1,24)= 4.62$, $p<.05$, $\eta^2=.20$; no main effects). Regarding *comprehension of realistic pictures* we found no main effects ($Fs < 1$, ns.) and also no ATI-effect ($F(1,24)= 1.94$, $p=.18$, $\eta^2=.09$). Nevertheless, the pattern is the same as for diagrams: holists improve their comprehension scores, whereas serialists even showed decreased scores in the training group. For *cognitive load while reading realistic pictures* we found no significant effects at all.

Summary and Discussion

We analyzed the effects of a training program on reading diagrams and realistic pictures. The first result is that the effects depend on learners' type of organizing information in that way that only the holists are able to benefit from the given strategy. After training they are able, in addition on gaining an overview of the topic, to take a closer look at pieces of information and therefore become more accurate in learning. The low load scores indicate that they may profit from the routine the strategy gives, especially the three steps of analyzing pictures. For serialists we assume that they are already accurate enough, so the training cannot show them anything inside the pictures which they wouldn't see without it. Nevertheless their comprehension scores remain on a middle level, so for this group of learners it may be helpful not only to improve their detail-view but also to teach them integration skills on a global level.

The second result is that the training is especially effective for learning to read diagrams, not for realistic pictures. This is perhaps due to the fact, that the part of the training for reading diagrams is more accurate. Due to the fact, that there is a large variety of realistic pictures, this part of the training cannot be as in-depth as the other. Therefore practical implications of our study could be to elaborate on the training, especially on the part on realistic pictures and on integration (as mentioned above). Nevertheless, there are some positive effects of the training for reading diagrams that could be implemented in school training when students have to learn complex diagrams, e.g. in natural science.

From a methodological point of view we have to state that the sample is very small. However, we found remarkable effect sizes which encourage us to collect additional data in order to prove and to differentiate our findings.

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