

"READERS" AND "SCANNERS" EVALUATE E-LEARNING: SAME OVERALL GRADING DESPITE LARGE DIFFERENCES IN USER BEHAVIORS AND EXPERIENCES

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HowtEx (How to Experiment) is an interactive e-learning module in a course about Experimental Design (Reips and Wilkening, 2000) in the Mesosworld project of the Swiss Virtual Campus (SVC). With the evaluation of HowtEx we could replicate the results of a previous study: The four factors that correlate highest with users' overall grading of the e-learning module are (1) structure of the module, (2) design, (3) presentation of the material, and (4) ease of navigation. Additionally, giving small incentives to participants seems to influence intrinsic motivation: Extrinsically on them. motivated participants viewed the same amount of pages but spent considerably less time

INTRODUCTION

In the evaluated e-learning module *HowtEx* one learns in ten steps how to design a scientifically sound experiment. Even though this e-learning submodule is part of a course in experimental design, most parts are also usable for other kinds of empirical studies found in the social sciences, e.g. for surveys. We attribute *HowtEx's* wide applicability in the real world to its constructivist instructional design and an emphasis on usability. Every step is written as short as possible in order not to bore the experienced reader, whereas for the novice there are always continuative links to in-depth articles, external resources, or other learning modules.



Image 1: *HowtEx* starting page

The present study was conducted around two central questions: First we wanted to know which factors account for the overall grading of an e-learning module like *HowtEx*. We also wanted to replicate the findings by Nagi (2002) who evaluated another submodule of the experimental design course that is part of the Mesosworld project (Methodological Education for the Social Sciences). Her research had shown that only few factors correlate with overall grading. Furthermore we wanted to know if other psychological factors like attitude and competence correspond to overall grading. For this purpose we used parts of the questionnaire used by Nagi (2002) and included items from a questionnaire by Kersten et al. (2001). Second we wanted to see if monetary and non-monetary incentives might affect learning behavior and experience. Incentives are suspected to produce the crowding-out effect by which original (intrinsic) motivation is replaced by extrinsic motivation (motivation that originates in factors outside of the individual). Unlike learning modules following a behaviorist instructional design (as for example often implemented in statistics) it is difficult with constructivist designs to check a learner's progress with tests and exercises. Because setting measurable external goals is difficult in constructivist learning environments, it is crucial for such environments that students are driven by high intrinsic motivation. Nagi (2002: 38) reported that people recruited from undergraduate psychology classes tend to evaluate such a module superficially: Most of her students stayed between 11 and 20 seconds on one page of her module. We call these people "scanners" because during such a short period it is not possible to read much more than the headlines of a web page. With different ways of recruiting participants we intended to test the hypothesis, how (monetary and non-monetary) incentives affect intrinsic motivation. Intrinsically motivated people should stay on a page for a longer period, but shouldn't differ significantly from the extrinsically motivated students in the total number of visited pages.

METHOD

The whole module was connected to a database where participants' actions on the web pages were recorded. As the questionnaire is part of *HowtEx*, every submitted form could be linked to a specific user trail.

In total 25 students completed the online questionnaire. Of those, seven were recruited from an undergraduate statistics course and two from a course in psychological methodology. These participants were asked to participate for the sake of learning something useful for their studies. Eight were asked to participate as part of their homework in a graduate psychology course about evaluation. The remaining eight were recruited from a different graduate course about evaluation but were told they could also participate in a sweepstake, where 3 x 50 CHF could be won. Due to the incentives, participants in these last two groups were assumed to develop a rather extrinsic motivation for studying the materials in *HowtEx*.

The questionnaire contained 27 items and was administered in German, as the materials. Twelve items centered on evaluating the module itself (e.g. "the length of the pages is too short / too long"). Ten items centered on the attitude towards the material (e.g. "experimental design is uninteresting / interesting"), learner specific behaviors (e.g. "in questions concerning my studies, I gladly accept help from colleagues") and competencies (e.g. "I could build a homepage if I were asked to"). In four questions participants could express suggestions on how to improve the module. In the last question participants were asked to give an overall rating of the e-learning module based on school marks.

RESULTS

It turned out that we had replicated the findings by Nagi (2002). The same four factors correlated highly with overall rating of the e-learning module. Interestingly they also correlated in the same magnitude as the ones reported by Nagi (see Table 1).

Item	Present study	Nagi (2002)
I like the structure of the module	0.82	0.72
Overall the screen design appeals to me	0.72	0.66
Clear / messy presentation of the material	0.51	0.52
The symbols on the navigation bar are confusing	-0.36	-0.36

Table 1: Correlations of itmes with overall grading in two different e-learning submodules within the Mesosworld module on experimental design (Reips and Wilkening, 2000). *Note: all correlations are significant on at least the $p=0.05$ level*

For further analysis we split the sample in two groups: Those who stayed for a longer period than 15 minutes ($n=12$, average 24 minutes, 1:52/page) we call “readers”, those who stayed for a shorter period ($n=13$, average 8:50 minutes, 0:44/page) we call “scanners”. As predicted, participants who participated for wholly intrinsic goals studied the material more thoroughly and were in the “reader” group. Additionally, there were three students from the graduate psychology course who evaluated the web site as homework but none of those who were told they could participate in the sweepstake. The two groups did not differ significantly in the average number of pages visited (12.1 vs. 12.9).

Interestingly, “readers” and “scanners” did not differ much in the main items that correlate highly with overall grading. Significant differences between the two groups were found in areas related to users’ competencies and their subjective experiences with the material. For example, the reader group indicated that the page length was just perfect, whereas the „scanners“ experienced them as being too long. We found another interesting significant difference in the attitude towards the material: The “readers” experienced themselves as being more inquisitive while working through the material than “scanners”. Potentially due to this reason we also found the largest difference between the two groups in the ratings of one key feature of this module: The helpfulness of an interactively generated checklist.

The distinction between “readers” and “scanners” produces some new factors that correlate highly with *overall grading* (cf. Table 2). Competence with Internet and computers, ease of clicking through (scanners), curiosity (readers), being able to concentrate on one thing at a time (readers) are important for the overall learning experience in the respective subgroups.

Item	readers	scanners
The module inspired me, to intensively involve with the material.	0.74	0.05
Working through the material I felt being curious / inquisitive	0.56	-0.36
If disturbing thoughts appear, I cannot easily put them away	-0.44	0.33
I use email rarely / often	0.14	0.65
With technical computer problems, most of the times I know how to solve them myself	0.59	0.30

The length of the pages is too short / long	0.02	-0.74

Table 2. Note: Correlations in **bold** are at least significant on a 0.05 level

DISCUSSION

With the present study we were able to replicate previous findings showing that (1) structure, (2) design, (3) presentation of the material, and (4) navigation experience correlate with overall grading of e-learning modules. Remarkably, these factors' importance (as indicated by order) remained constant between studies, even the same pattern in magnitudes of correlations could be replicated.

Additionally, e-learning enjoyed high correspondence of overall ratings with other factors, such as familiarity with computers and the Internet, if time spent per web page was taken into account. Two seemingly motivation-dependent subgroups of users were identified: "readers" stayed longer on the web pages and mostly came from groups that were recruited without promising incentives; "scanners" stayed shorter on the web pages and mostly came from groups with additional incentives. The differences between groups in reading time were identifiable very early during user sessions. It remains unclear, whether the obvious motivational and behavioral differences between these subgroups can be attributed to the incentive manipulation. The effect may also be due to confoundings of our incentive manipulation with education and/or age. Most students of the non-incentives group were undergraduates, whereas most of the participants in the incentives group were graduates. Also, there was a trend for age to differ between groups. The non-incentives group (interestingly undergraduates) showed a mean of 27.7 years, the incentives group showed a mean of 24.9 years. If the alternative explanations can be ruled out in future studies, then we may well conclude: giving participants small incentives produces the crowding-out effect where intrinsic motivation is replaced by extrinsic motivation. If one wants to stimulate in-depth studying of materials in e-learning, it is advisable to rely on intrinsic motivation. The determinants of overall grading of e-learning modules remain unchanged by incentives, however, despite noticeable differences in user behavior.

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