The Interaction of the Need for Cognitive Closure With Implicit and Explicit Guidance in Wiki-Based Learning

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Abstract: One purpose of wikis is the collaborative generation of content. During generation processes, controversies about content can emerge that authors might elaborate on the article's talk page. Research suggests that controversies based on opposing points of view and contradictory evidence can be fruitful to trigger individual elaboration processes. However, research also showed that many wikis are not necessarily suited to highlight relevant discussion contents and thus users could need guidance as support. In an experimental study ($N = 181$) on wiki talk pages, we investigated two scaffolding measures in conjunction with the Need for Cognitive Closure: (1) visual markers to highlight controversy status (implicit) and (2) a collaboration script that directs users towards discussions (explicit). The results show that both guidance types in interaction with the Need for Cognitive Closure can affect learning outcomes.

Introduction

Regarding the effects of modified wikis for learning activities, studies on implicit and explicit guidance measures have shown that they can trigger intended behaviours. Implicit guidance with controversy awareness highlights can lead to a more focused selection of relevant content-related topics and explicit guidance with a discussion-centric collaboration script can lead to more meaningful a-priori discussion of proposed article changes (Heimbuch & Bodemer, 2017). Such cognitive group awareness tools as implicit guidance are focused on gathering and visualising knowledge-related contextual cues and have been successfully implemented as helpful aids to structure collaborative learning processes (Bodemer & Dehler, 2011). Research has also proposed alternative measures such as explicit guidance to incorporate in wiki-based learning environments to improve the overall quality of knowledge artefacts and for better coordination processes of students. The implementation of one possible measure for explicit guidance are collaboration scripts where the activities of writers and editors within a social system are coordinated and optimised. A collaboration script is essentially a set of instructions that specifies the group formation, modes of interaction and task management between collaboration partners (Dillenbourg, 2002). Research has also shown that individual differences can have an impact on learning-related processes and outcomes. There are indications that the effort a learner is willing to invest in searching for solutions to a problem can be influenced by the individual's Need for Cognitive Closure (NCC) (Webster & Kruglanski, 1994). This cognitive construct is a motivational continuum between the need to get a clear answer in an ambiguous situation and the avoidance of quick and unambiguous answers. Various empirical results and discussions illustrate that it can be regarded as a relevant construct in knowledge creation processes. Although there are close ties between the Need for Cognitive Closure and inter-individual differences in learning and knowledge construction, there are only few studies in technology-enhanced learning addressing this construct. To further support and extend on earlier findings, we wanted to compare the effects of one implicit and one explicit guidance measure for wiki environments in interaction with the individual NCC of learners.

Methods

We used an experimentally controlled laboratory setting with individual participants ($N = 181$) in a between-subjects design to investigate the interplay between different guidance types and NCC in wiki-based learning. The first independent factor was the type of talk page guidance (implicit vs. explicit). The second factor of interest was the individual NCC, which we factorised in two levels (low vs. high). According to the original literature on the scale 16-NCCS that we used in this study, post-hoc median splits were applied for classifying low NCC and high NCC participants (Schlink & Walther, 2007). As main dependent variables, we measured individual learning outcome, metrics of article and discussion contributions, and process log data. Participants performed the experiment's stages individually in their own wiki instance. We surveyed their interest in and prior knowledge of the study's subject matter (forms of energy). Both groups had the same task of contributing to a Wikipedia-like base article about different forms of energy and taking part in up to three of the corresponding discussions. Participants received the information that the discussions hold enough arguments and evidence to enrich the original article, since we did not give any other added material about the subject matter elsewhere. We gave no further instructions on how to start their wiki task (e.g., reading the article or any discussion first) or what kind of

reply they should make to a self-selected discussion. After the wiki contribution phase, participants were asked to fill out several questionnaires to some of the study's dependant variables.

Results

In the knowledge test, participants in the implicit controversy highlight group achieved an average score of $M = 15.84$ ($SD = 3.43$) in comparison to $M = 15.47$ ($SD = 3.60$) in the explicit scripting group. A mean test score difference between both guidance groups of 0.37 points is equivalent to zero in a 90% CI [-0.50, 1.23] and not significantly different from zero in a 95% CI [-0.66, 1.40]. This result gives evidence that no group outperforms the other per se. In the knowledge test, low Need for Cognitive Closure participants scored on average $M = 16.05$ ($SD = 3.29$) in comparison to an average score of $M = 15.24$ ($SD = 3.70$) of high Need for Cognitive Closure participants. A mean test score difference between both guidance groups of 0.82 points is equivalent to zero in a 90% CI [-0.04, 1.68] and not significantly different from zero in a 95% CI [-0.21, 1.85]. This result gives further evidence for equivalence in learning outcomes when only one factor is analysed in isolation. Regarding the potential effects of the guidance type and the NCC on the learning outcome, with a 2x2 ANCOVA a small to moderate effect was found, $F(2, 175) = 5.30$, $p = .023$, $\eta^2_p = .03$. Using the full Need for Cognitive Closure data spectrum with a hierarchical linear regression model, the effect of the interaction itself was weakened, $b = -0.03$ ($SE = 0.05$), $t(176) = -0.67$, $p = .502$ within a moderate total effect model, $F(4, 176) = 3.20$, $p = .014$, $R^2 = .07$.

Discussion

In earlier wiki-related research individual cognitive differences of learning-related variables were often measured only as secondary variables (Notari, Reynolds, Chu, & Honegger, 2016). Therefore, we wanted to focus on one of these constructs that had been previously found as potentially relevant for learning scenarios with ambiguous information, namely the Need for Cognitive Closure. At first, we analysed the equivalence of implicit and explicit guidance in the overall sample, since we had no reason to believe that one measure alone should outperform the other. The results show that participants do not differ between the kinds of guidance in the test scores. Additionally, there were no meaningful differences between participants in the two categorised levels of their Need for Cognitive Closure on any of the measured process variables or in the learning outcome. When analysing the learning outcome, the interaction of guidance type and Need for Cognitive Closure was following an expected pattern. Participants with a high Need for Cognitive Closure scored higher in the knowledge test when working in a wiki enriched with implicit guidance rather than explicit guidance. The pattern reversed for low Need for Cognitive Closure participants. As persons with a high Need for Cognitive Closure have the desire to resolve ambiguity as quickly as possible and care less for the best possible solution they tend to rely on simpler heuristics to select and process information (Webster & Kruglanski, 1994). Implicit guidance with our visual highlights for controversy awareness gives them exactly this, a quick possibility to assess and to decide how to proceed further. In contrast to that, persons with a low Need for Cognitive Closure prefer to elaborate in discussions and resolve ambiguity by finding better solutions than just the quickest (Dreu, Koole, & Oldersma, 1999). Thus, a more explicit guidance like the used discussion-centric script that tries to motivate the participation in discussion is better suited for these persons.

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