Online Learning and Cognitive Engagement

In their study “The role of students’ cognitive engagement in online learning,” Richardson and Newby (2006) attempted to identify the extent to which students cognitively engage with online courses and the degree to which such factors as gender, age, program focus, prior online experience, and employment status affect students’ cognitive engagement. The study found that students engage cognitively with online learning, that is, they use deep motivation and learning strategies in their learning, in direct proportion to the amount of their prior experience with online classes. Experienced students make more connections across the content and other online courses and utilize more self-regulatory learning strategies. These findings have important implications for the design and facilitation of future online courses, particularly, on how detailed scaffolding of students' interactions in online environments should be: the less experience, the more scaffolding. Also, the analysis of students' profiles prior to online courses can determine which of these students will likely be more successful in those classes.

Theoretical Perspective

Author's conceptual framework

The main concept of this study is cognitive engagement, which the authors define as “the integration and utilization of students' motivations and strategies in the course of their learning” (Richardson & Newby, 2006, p. 25). This is a robust operational definition that comes from the literature. Corno and Mandinach (1983) were the first to coin the term “cognitive engagement” understood as students' ability to cognitively interpret their environments and themselves. For them, one form of cognitive engagement is self-regulation—the ability to regulate one’s own learning. They stated that cognitive engagement affects the amount of effort that students dedicate to a task; hence, effort was used as a measure of cognitive engagement (Corno & Mandinach, 1983). Guthrie et al. (1996) referred to engagement as “the integration of motivations and strategies in literacy activities” (p. 306). This definition most closely resembles the one that the authors of the study under the
critical evaluation use. Combing the views of Corno and Mandinach (1983) and Guthrie et al. (1996), Richardson and Newby (2006) look at cognitive engagement as an assemblage of cognitive abilities, experiences, and motivations of a student. These indicators of cognitive engagement are generally in line with the scholarship on the topic that had been done in the field prior to their study, the authors claimed. Therefore, the use of the conceptual framework is well-justified.

The general shortages of the conceptual framework, however, are two-fold. First, its all three indicators—student’s cognitive abilities, experiences, and motivations—are complex constructs in themselves and are not easy to measure. It means that using constructs to describe a construct may not elucidate the phenomenon of cognitive engagement and, in fact, make it even more puzzling. Second, the framework does not address students’ perceptions and beliefs (self-efficacy) about their own learning; however, the authors indicated that there was some scholarship that addressed this questions in the past (Stoney & Oliver, 1999). To overcome these two pitfalls, the authors used a special instrument that measures students’ motivations and learning strategies by surface, deep, and achieving levels—Study Process Questionnaire (SPQ) developed by Biggs in 1987.

The need for this study and its importance

The study fills the lacuna in research regarding cognitive engagement in online settings. According to the authors, before their study the research had focused on learning effectiveness, learning strategies, social aspects of online settings and not on “how students engage with their online courses” (Richardson & Newby, 2006, p. 23). The citations to previous research are in their due place, which is done effectively. Also, the authors highlight the importance of learners’ unique needs in online settings, because these are directly related to their cognitive engagement, but this link had not been studied previously either. I found this claim compelling and well-put at the introduction to the study. However, I think one more claim and evidence would have made the need for the study even stronger—the focus on behavioral interactions among students in the previous studies as opposed to the cognitive aspects of learning in online environments. While it is true that the only
way to know whether there is cognition involved is by looking at the behavior, but it is not uncommon to ask the students how they conceptualize their cognitive engagement when no one can observe their direct behavior.

*How effectively does the author tie the study to relevant theory and prior research?*

The authors do an excellent job at presenting the prior research in a cohesive narrative. They start by saying that the increase in online learning ushered in the need for research on how students involve in it as compared to face-to-face instruction. Then they proceed by saying that the research has been focused on many things (e.g., learning effectiveness) but not on cognitive engagement, even though it is crucial to investigate cognitive engagement in online settings, because of what literature suggests on the benefits of cognitive engagement for learners. The authors follow by describing what cognitive engagement in using combing two frameworks into one. So, the relevant theory on cognitive engagement also weaves seamlessly into the study. What seems like a big drawback is the mention of only fourteen studies on which the narrative is based. It is a small number of studies, by no means is it all-encompassing on the topic. Plus, the authors do not justify why the choose the definition of cognitive engagement that they choose. Those missing pieces of information leave a reader somewhat skeptical as to the reliability of the construct of cognitive engagement.

*The clarity and appropriateness of the research questions or hypotheses*

The study poses two clear and concise research questions: “What strategies and motivations are students utilizing (Deep, Surface, or Achieving) in their online courses?” and “Is cognitive engagement affected by factors such as program focus (engineering or education), gender, race, age, prior online experience, and employment status” (Richardson & Newby, 2006, p. 24). The questions are appropriate and relevant for three reasons. First, they are answerable within one study. Second, they are in harmony with the conceptual framework that the authors use in the study. Third, they align with the scholarship gap the authors identified in the study. Also, the authors went further and explained that the answers to the questions may inform better design of online instruction.
Research Design and Analysis

The appropriateness and adequacy of the study’s design in relation to the research questions

The study is a causal-comparative design (ex post facto research), because it compares two groups on a set of pre-determined dependent variables. Had there been just one group of subjects with which the authors worked, it could have been a correlational design. In the present study, the authors are interested to establish the effect of five factors (independent variables) on students’ cognitive engagement (dependent variable), as is stated in research question two (Richardson & Newby, 2006, p. 24), which is a perfect condition for using either a true experiment or a causal-comparative design. But because the present study did not and could not manipulate the independent variables, a true experiment was impossible. Neither was a true experiment possible because the sampling was not random. Therefore, the authors chose a causal-comparative design, which was adequate and justified for the circumstances in which they were and for research question two. Causal-comparative designs do not allow to establish causality between independent and dependent variables; however, they are stronger designs than correlational designs and are also faster and less expensive to conduct than true experiments. The fact that the authors used this design between the two alternatives is laudable. It should be noted here that research question of the study one is descriptive by nature and is not influenced by the design of the study.

The adequacy of the study’s sampling methods and their implications for generalizability

The sampling methods in the study are weak. In general, a causal-comparative design does not include random assignment of subjects into groups; hence, serious limitations to the generalizability of the results. The authors of the study in question used convenience sampling—“the selection of a sample of participants from a population based on how convenient and readily available that group of participants is” (Salkind, 2010, p. 254). The subjects were chosen from two universities on the basis of taking particular online courses. While it is easy to obtain subjects and relatively cheap to conduct a study using convenience sampling, the disadvantages of convenience sampling are such
that the generalizability of the results is narrow.

Another critical flaw of the sampling methods of this study is the use of volunteer participants. This even further limits the generalizability of the findings to broader settings and to other non-volunteers from the population (volunteer bias). Volunteers may be representative of other volunteers in the population, but not the general population. In general, volunteers “are more educated, come from a higher social class, are more intelligent, are more approval-motivated, and are more sociable” (Boughner, 2010, p. 1608) than non-volunteers.

Finally, relatively small sample size \( N = 121 \) chosen from only two large universities is a threat to external validity. The study has several parameters in focus and its goal is to describe a population and establish influences between independent variables and dependent variables. Due to this and the lack of random assignment and volunteers bias described above, sample size should have been as large as possible. I do not think that \( N = 121 \) can adequately address all those limitations for the generalizability of the results. However, it should be noted, that in 2003 when the actual data collection was conducted the research on online learning was still in its early stage, so probably for the context of 2003 that sample size may well have been more than large.

*The adequacy of the study's procedures and materials (e.g., interventions, data collection procedures)*

The study in question used adequate data collection procedures that corresponded to its purpose and research questions—describe students’ strategies and motivations as well as establish influences between independent and dependent variables. The authors collected demographics information from the participants, which became the basis of the independent variables such as gender, age, prior experience in online learning, program focus, and employment status. Then they administered a Study Process Questionnaire (SPQ) which became the basis of the dependent variable—cognitive engagement in online environments. Both data collection procedures were done using an online survey system. This was justified by the fact that the two groups were located in two geographically different locations as well as the nature of the study was online courses, which assumes that
participants have sufficient compute literacy skills to do surveys online. Also, using online surveys can eliminate human encoding error, if the same surveys had been administered by paper and pencil—computers collect the exact responses and may be copied and pasted in a data analysis software unchanged and free from researcher's mistakes. No other procedures, interventions, or materials were used in the study.

The appropriateness and quality of the measures used (e.g., reliability, validity)

The study used two survey instruments to measure the sample—a students' demographic and background survey and Student Process Questionnaire (SPQ). The validity of the former survey can reasonably assume a high level of internal validity—it measured exactly the information it was supposed to measure: age, gender, program focus, prior online experience, and employment status. By the same token, its reliability is assumed to be very high—no matter how many times students could answer the survey questions, they most probably would consistently get the same answers within the duration of the online course they were taking.

The validity and reliability of SPQ needs a more detailed look, because it may contain threats to internal validity and reliability. SPQ is a 42-item survey that was designed in 1987 by John Biggs to measure students’ learning strategies and motivations. The authors mention only two studies from the 1980s that confirmed the reliability of the instrument and produced relatively high coefficients for all six components being measured (between 0.61 and 0.77; Richardson & Newby, 2006, p. 27). This is evidence of a good quality instrument which consistently measures what it is supposed to measure. Even though it may seem that almost twenty years between the establishment of reliability and the actual conduct of the study is a long time, it should not be considered outdated, because it measures learning strategies and motives—something that has not been shown to drastically change over time.

The internal validity of SPQ has been shown throughout years. The authors mention that it was used in higher education for a multitude of purposes: to identify at-risk students, measure study
skills program intervention, examine how study skills change over time, etc. (Richardson & Newby, 2006, p. 26). However, all previous studies applied the SPQ for face-to-face settings. This study was the first in applying the SPQ for online settings. While it may seem to threaten the internal validity of the instrument (that is, an instrument can be valid in one context and invalid in the other), I want to emphasize that the context of its application was not changed—higher education. The only change was the delivery system of education, but scholarship has not shown differences in students’ utilizing their learning strategies because of the mode of instruction. One robust threat to external validity is test subjects themselves—they were all volunteers in this study and provided self-reports of their learning strategies. There is no guarantee that the volunteers did not provide socially desirable responses in the SPQ.

The adequacy of the study’s data analyses

The study’s data analyses are carefully done and reported in minute details. The authors used multiple independent samples t tests and multiple one-way ANOVAs. Each of the five independent variables was tested using a statistical technique. Each administered statistical test assumed normality, even though this piece of information was not included in the description of the results. The causal-comparative design of the study as well as the data collected justify the use of t tests and ANOVAs. Equality of variance among the two sample groups was also assumed in the study. All this does not deviate from a regular way of analyzing statistical data.

There are, however, potential oversights in the way the data were analyzed in this study. The authors did not employ statistical techniques to assess a cumulative effect several, or perhaps all, independent variables on cognitive engagement. For example, it is reasonable to assume that age, gender, employment status, and prior online experiences result in higher cognitive engagement than age and gender alone, or age alone and gender alone. Also, the study did not mention or analyze any confounding variables that can influence the relationship between independent and dependent variables. For instance, socioeconomic status or access to technology may have been such variables.
Interpretation and Implications of Results

Author’s discussion of the methodological and/or conceptual limitations of the results

The authors do not discuss methodological or conceptual limitations of the results except once in methods part the study: “A limitation of this study is that the participants were all volunteers, and therefore data relating to students who elected not to volunteer may not be represented” (Richardson & Newby, 2006, p. 27). While this is, indeed, a significant limitation to external validity and the authors are candid about it, they fail to recognize some other limitations.

First, all the collected data came from self-reports. Even though the SPQ is valid and reliable, participants’ own answers are not always reliable per se. Researchers cannot assume that participants in their studies are accurate in self-judgements, nor can they assume that participants are entirely honest. Participants may provide underestimate or overestimate their abilities and provide answers that they think researchers want and need. Self-reports are great tools in measuring participants perceptions, feelings, and beliefs; therefore, self-report data should be taken with skepticism in true experiments or ex post facto research. To compensate for that, the authors could have used other instruments such as observational data or achievement scores.

Second, the study’s conceptual framework is limited in that it defines cognitive engagement as a combination of learning strategies and motivations. Cognitive engagement is more subtle and complex. While the authors’ use of the cognitive engagement notion is rooted is some literature, they did not acknowledge that it is only one framework that, in fact, excludes unobservable cognitive processes from the equation (e.g., attention to, interest in, focus on assignments in online courses). Constraining a complex construct to deliberate efforts (learning strategies) and internal factors that drive students to persist in online classes (motivations) reduces the breadth of the construct to a few learned characteristics. Cognitive engagement may be affected by extrinsic motivations (e.g., the role of instructor, family issues), person’s attitudes and/or anxieties, environment (e.g., lack of computer skills). This, of course, is impossible to include in one study, but could have been acknowledged.
How consistent and comprehensive are the author’s conclusions with the reported results?

The results of the study are very detailed—all t tests and ANOVA findings were reported and assessed in terms of significance. The explanations that the authors provide are detailed and do not go beyond reasonable conclusions that the statistical tests allow. The conclusions for each of the given independent variables are comprehensive. In short, the authors concluded that the more experienced a learner is with online classes, the more motivated he or she is and the deeper learning strategies he or she uses.

One conclusion regarding gender, however, was unclear. The study found no statistical significance between gender and the use of learning strategies and motivations. Richardson and Newby (2006) added, “[O]ne should also be heartened that this was the case” (p. 33). I found this to be an emotional rather than scholarly statement, introducing very small researcher bias. It sounded as though this was the result that the authors had hoped for and, having confirmed it, felt triumphant about it. They mentioned further, though, that there was a 5% variance on the achieving motive scale in favor of male students, which they attributed to “a larger cultural and societal issue” (p. 33) and hoped for additional research on this finding in the future. I think that political correctness came into the way of research in this conclusion, particularly the desire to find no differences between males and females in terms of learning capacities, but when there are differences, attributing them to something outside the scope of the research questions.

How well did the author relate the results to the study’s theoretical base?

All the results of the study are related directly to the study’s theoretical base. The authors answer the two research questions posed at the beginning of the study concretely. First, they found that less experienced students use surface or achieving learning strategies and motivations and more experienced students use deeper learning strategies and motivations. Second, they concluded that cognitive engagement is affected by age, prior online experiences, employment status, and program focus but does not seem affected by gender. All findings were reported using the language of the
conceptual framework that the authors utilized in the study and were explained within this conceptual framework. In this sense, the results were well aligned with what the authors promised at the beginning of the study.

What is the significance of the study? What are its primary implications for theory, future research, and practice?

The study is significant because it is one of the earliest studies that explored cognitive engagement in online settings. Prior studies of online environments did not bear this focus, but the authors showed that the SPQ could well be used to assess online learners’ cognitive engagement. This study, thus, contributed to the theoretical debate on this topic.

The authors also identified avenues for future research—cognitive engagement factors that can be influenced by instructors in online courses (e.g., learning designs, scaffolding strategies) and the relations between online cognitive engagement and perceptions of a course-related online community. The authors, however, do not justify such avenues other than saying that “future research should go beyond the demographic and self-selecting factors explored here” (Richardson & Newby, 2006, p. 35). This is weak justification that does not follow logically from the study’s result.

The implications of the study for practice are manifold. The authors suggest using the results of the study to enhance the design of online courses so that it increases learners’ cognitive engagement. For example, more introductory materials on how to approach online learning for students who only begin to explore online courses or interventions that encourage the broadening of students’ skill sets that go beyond surface learning strategies and motivations. The authors advise to use the demographics and background data of online learners to inform the design of online courses. They stated that program focus area, learners’ age, and prior online learning experience are better predictors of the kinds of strategies that learners will use in online settings. The authors also mentioned that the findings can inform the design of learners’ interaction in online courses, but they did not specify as to how exactly this could be done. To sum it up, the implications of this 2006 study provided a guidance to designing online courses that could increase cognitive engagement.
References


