Textbook Learning Strategies in Traditional and Nontraditional Students

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Abstract

A growing field of research in education examines active learning strategies to find the most successful study strategies for students. Of these, generative learning, an active learning process of physically creating a representation of study material, provokes high-level cognitive processing thereby improving retention. In addition, as age differences in the college student population continue to increase, examinations into successful study strategies for varied age groups become increasingly important. This study examined note taking, question writing, and basic reflection on text as generative learning strategies for traditional- and nontraditional-aged college students. Participants read a textbook chapter prior to engagement in one of the three study strategies and completed a retention quiz immediately following the study session. Results revealed that quiz performance did not differ by age alone; however, differential performance by age depended on the learning strategy condition of the participants. Nontraditional-aged participants engaged in question writing and note taking outperformed other non-traditional-aged participants engaged in basic reflection. In addition, traditional-aged participants outperformed nontraditional-aged participants engaged in basic reflection whereas within the question writing condition, nontraditional-aged participants outperformed traditional-aged participants. We consider these results in a discussion of how age affects cognitive processes involved in generative learning.

Keywords: generative learning, note taking, question writing, traditional students
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Active learning and the cognitive processes involved in student retention of study material interests educators across a variety of disciplines. Across these disciplines, students receive, and are expected to learn, information from varied sources including lectures, textbooks, instructor-assigned coursework, discussions (both within and outside of the classroom), and interactive activities, among others. Simple provision of the information across these sources does not automatically equate to students learning the information. An essential feature in learning from these sources involves student engagement with course material.

Research on facilitating student learning largely focuses on how students can actively engage in study material to improve information retention, thereby improving their success in academia. Wittrock (1992) proposed a model of generative learning involving study strategies that allow students to actively process, encode, and subsequently integrate information with existing knowledge and prior experiences. This allows students to externalize this information by producing a physical, representative interpretation of the information in a personal way that promotes a high level of comprehension (Bugg & McDaniel, 2012; Carter & van Matre, 1975; Davey & McBride, 1986; Dyer, Riley, & Yekovich, 2001; King, 1989; King, 1992a; King, 1992b; Yoder & Hochevar 2005). In addition, this allows students to evaluate their understanding of the material and refocus on material they did not fully comprehend—a process known as metacomprehension (Bugg & McDaniel, 2012; Davey & McBride, 1986; King, 1989; King, 1992a; King, 1992b).

Another growing area of research in academic settings focuses on the differences in cognitive abilities between age groups. Empirical studies examining cognitive abilities report that younger adults tend to outperform older adults on a variety of tasks measuring processes such as source memory (Kuhlmann & Touron, 2012) and distraction control (Darowski, Helder, Zacks, Hasher, & Hambrick, 2008). Castel et al. (2011) found that younger adults and adolescents recalled more words relative to both young children and older adults in an encoding procedure where participants sought to recall words of differing point values to earn higher scores. Contrary to these findings, when examining metacomprehension of text material, Dunlosky, Baker, Rawson, and Hertzog (2006) found that older adults could judge their learning of text material just as well as younger adults. In addition, Justice and Dornan (2011) found that nontraditional-aged college students do in fact readily engage in high-level cognitive study strategies. This area of research becomes increasingly important as the U.S. Department of Education (2013) reported that between 2000 and 2011, enrollment for students 25 years of age and older increased at a greater rate than students did less than 25 years of age with the expectation that this trend will continue.

The current study examined question writing as a high-level cognitive study strategy for traditional-and nontraditional-aged college students. As an active learning strategy, question writing follows the model of generative learning by facilitating students’ active role in focusing and restructuring information into questions and answers. Several studies successfully show that question writing allows students to encode and externalize information from text passages and
lecture material, thereby increasing the retention and metacomprehension of material to-be-learned (Bugg & McDaniel, 2012; Davey & McBride, 1986, King, 1992a; King, 1992b). Specifically, Foos, Mora, and Tkacz (1994) found that students who generated their own questions and answers on study material achieved the highest levels of performance in classroom settings. More recently, Bugg and McDaniel (2012) found that participants engaged in question writing retained a higher amount of information relative to participants who simply reread the material. In their theoretical framework, question writing allows for more active processing of text material and promotes metacomprehension by increasing students’ self-awareness of accurate judgments as to how well they retain information. In doing so, students reduce overconfidence, allowing them to make better judgments in how they will use their study strategy.

On the other hand, note taking is the most widely practiced form of studying throughout educational settings. Research regarding the cognitive processes involved in note taking concern the encoding and external storage processes involved (Barnett, Di Vesta, & Rogozinski, 1981; Fisher & Harris, 1973; Kiewra, 1985). However, prior studies examining note taking suggest that the process of recording notes in and of itself promotes high-level cognitive processing involved in generative learning (Fisher & Harris, 1973; Haynes, McCarley, & Williams, 2015; Williams et. al, 2013).

We compared note taking, question writing, and basic reflection on text as generative learning strategies to increase student retention of textbook material. We used basic reflection on text as a rote learning strategy that fits within the spectrum of Rickards and Di Vesta’s (1974) description of rote learning where learning occurs without the manipulation of the information from its original presentation. We expected question writing to improve retention the most, followed by note taking, with basic reflection promoting little retention of the textbook material. Participant engagement in question writing required a multiple choice format of one correct answer with three incorrect answers. This format would allow participants to pinpoint the criteria of the correct answer while also understanding how the three incorrect answers did not meet the criteria. In addition, we assessed differences between students 25 years of age and older (nontraditional-age) with students less than 25 years of age (traditional-age).

Method

Participants

Participants were 88 college students (M = 24.40 years, SD = 7.70; 59 females, 29 males) enrolled in Introduction to Psychology courses at a mid-size university in the Southeastern United States during the summer of 2013 through the spring of 2014. We tested each participant individually and randomly assigned him or her to one of three conditions: basic reflection (n = 30), note taking (n = 29), and question writing (n = 29).

We classified participants 18 to 24 years of age as traditional-age (n = 60; M = 20.40 years, SD = 1.89) and participants over 25 years of age as nontraditional-age (n = 28; M = 33.00 years, SD = 8.43). We considered this appropriate based on the division delineated by the U.S. Department of Education (2013). In addition, according to Bye, Pushkar, and Conway (2007), a
ratio of two traditional-aged participants to one nontraditional-aged participant is appropriate for these analyses.

Materials and Procedure

Upon entering the lab, we provided informed consent to participants at which time we explained that their performance on the retention quiz determined the amount of research credit they would receive. They would in fact receive the full 1.5 hours of research credit, regardless of performance. We did this to ensure that participants would engage in the experimental task with proper motivation. After providing informed consent, participants read a 10-page chapter entitled “Psychosocial Constraints on Motor Development” in *Life Span Motor Development* (Haywood & Getchell, 2005) for 30 minutes. We selected this topic, as most of the concepts in the chapter are common to the realm of Sports Psychology, which is not a course offered at the institution and, thus, was sufficiently novel to the participants. Following the 30-minute reading period, participants engaged in their randomly assigned study strategy (question writing, note taking, or basic reflection) with access to the chapter for 15 minutes. Participants assigned to the question writing strategy received two sheets of paper and composed multiple-choice questions, with four answer choices, that reflected the chapter material. We provided participants assigned to the note taking strategy with two sheets of paper and instructed them to take notes on the chapter material. We instructed participants assigned to the basic reflection strategy to reread and think about the material from the chapter. Participants were blind to the experimental conditions and hypotheses of the study. After engaging in the study strategy, participants completed a short demographic questionnaire followed by a 15-minute timeframe to complete a 12-question, multiple-choice retention quiz. Following the quiz, participants received debriefing at which time we explained that they would receive the full 1.5 hours of research credit.

Analyses

We used ANOVA to examine the impact of Age (Traditional-age vs. Nontraditional-age) and Strategy (Basic reflection vs. Note taking vs. Question writing) on quiz score, the key dependent measure. Data met appropriate ANOVA assumptions of normality and homogeneity of variance. When post hoc tests were necessary to examine key differences, we used Scheffé’s method.

Results

*Figure 1* reveals the results of a two (Age: Traditional vs. Nontraditional) x 3 (Strategy: Basic Reflection vs. Note Taking vs. Question Writing) ANOVA. The analysis revealed a marginally significant effect for study strategy (*F*(2, 82) = 2.74, *p* = 0.07, η² = 0.06). The basic reflection group (*M* = 8.80, *SD* = 2.12) tended to score lower on the retention quiz than the question writing and note taking groups (*M* = 9.21, *SD* = 2.02; *M* = 9.41, *SD* = 1.59, respectively). We found no significant effect for age classification (*F*(1, 82) = 0.39, *p* = 0.54, η² = 0.005). However, we did find a significant interaction for study strategy and age classification (*F*(2, 82) = 4.53, *p* = 0.01, η² = 0.099). Within the question writing group, nontraditional-aged participants (*M* = 10.00, *SD* = 1.47) outperformed traditional-aged participants (*M* = 8.56, *SD* = 2.22; *p* = 0.04). Within the basic reflection group, traditional-aged participants (*M* = 9.17, *SD* =
2.17) marginally outperformed nontraditional-aged participants ($M = 7.57, SD = 1.51; p = 0.049$). Within the nontraditional group, participants using the question writing and note taking study strategies ($M = 10.13, SD = 1.13$) outperformed nontraditional-aged participants using the basic reflection strategy ($p = 0.007, p = 0.009$, respectively).

![Figure 1: Mean quiz scores (± 1 SEM) for traditional- and nontraditional-aged participants in the question writing, note taking, and basic reflection conditions.](image)

**Discussion**

The marginally significant effect between study strategies supports prior research that question writing and note taking contribute to higher levels of cognitive processing and therefore increase information retention (Bugg & McDaniel, 2012; Davey & McBride, 1986; Foos et al., 1994; Haynes et al., 2015; King, 1992a; King, 1992b; Williams et al., 2013). The finding that the nontraditional-aged participants performed, overall, as well as traditional-aged participants supports prior research that older adults can use encoding strategies as well as younger adults (Kuhlmann & Touron, 2012). This is an optimistic finding, as research indicates that nontraditional-aged students lack confidence in their academic abilities relative to traditional-aged students (Justice & Dornan, 2001). Furthermore, we found that nontraditional-aged participants outperformed traditional-aged participants using the question writing strategy. This follows prior suggestions that nontraditional-aged college students engage more readily in study strategies that activate cognitive processes closely related to generative learning (Justice & Dornan, 2001; Yonker, 2011). In addition, prior research indicates that older adults retain the ability to select relevant information for later recall despite potential deficits in memory (Castel
et al., 2011). The question writing strategy used in the current study may enable older, nontraditional-aged students to select the relevant information for later recall in order to compensate for the potential memory deficits.

In line with the conclusions of Justice and Dornan (2001) and Yonker (2011), who suggest that traditional-aged college students tend to engage in rote learning strategies more often than their nontraditional counterparts do, we found that when traditional-aged participants engaged in basic reflection they outperformed the nontraditional-aged participants who engaged in basic reflection. Our finding that within the nontraditional-aged participants those who used the question writing and note taking strategies outperformed those who used the basic reflection strategy further illustrates this result. The contradictory results of prior studies discussed earlier make sense within this framework where older adults tend to show lower cognitive abilities than younger adults (Kuhlman & Touron, 2012; Darowski et al., 2008; & Castel et al., 2011); however, older adults can engage in high-level cognitive study strategies (Dunlosky et al., 2006; Justice & Dornan, 2011). This indicates that active learning strategies such as question writing and note taking serve to enhance lower levels of cognitive processing in older adults.

Research on the roles of motivation and dedication in students’ academic careers and success also show age differences within higher education (Bye et al., 2007; Chao & Good, 2004; Chartrand, 1990). Bye et al. (2007) examined the learning motivations of traditional-aged and nontraditional-aged students and found that extrinsic rewards motivated both groups relatively equally, whereas intrinsic rewards tended to motivate nontraditional students more than traditional students. Extrinsic rewards refer to outcomes (e.g. higher grades or social approval) that occur because of the learning process whereas intrinsic rewards refer to the learning of the material itself as the desired outcome. This may fit with our use of deception in the current study. Specifically, our deception motivated both groups to engage in the material for research credit (extrinsic). However, the possibility exists for intrinsic rewards in this process, which could offer potential explanation as to why the nontraditional students performed best using the note taking and question writing strategies. These strategies may provide an intrinsic reward in understanding the material as well as understanding how to learn from a textbook. This explanation needs further exploration as motivating factors may influence how traditional and nontraditional students use certain study strategies as well as their receptiveness to learning new study strategies.

Although our group effect was marginal, prior studies revealed question writing’s generation effect after training (King, 1989; King, 1992a; King, 1992b). As we provided no training to the question-writing group, this may explain our marginally significant result for study strategy. Question writing may promote high levels of cognitive processing only after some form training. However, this speculation may conflict with the strategy’s ecological validity as training may require financial, time, and motivational expenditures on the part of the student, faculty, and college. Future studies should evaluate the delayed use of generative learning strategies and their effects on long-term retention, as we did not examine this aspect of generative learning.

In addition, our study examined differences between two age brackets that may be considered young adult (Traditional-age: \( M = 20.40 \) years of age, Nontraditional-age: \( M = 33.00 \))
years of age). Bye et al. (2007) and Justice and Dornan’s (2001) studies included similar nontraditional age brackets ($M = 35.00$ years & $M = 29.27$ years of age, respectively), whereas Castel et al.’s (2011) examination of middle-aged adults averaged 56.66 years of age. An exploration into the use of active learning strategies by middle-aged adults may reveal different results. Furthermore, a description of nontraditional students based on age may not be the most appropriate measure for these types of examinations. Chartrand (1990) categorized nontraditional students as those with two or more obligatory commitments aside from their coursework. Despite these limitations, research findings indicate that, overall, active learning strategies do provide great benefits to all students who use them, regardless of age, within the classroom setting (Bonwell & Eison, 1991; Yoder & Hochevar, 2005).

Future research should examine why traditional-aged students engage and perform well using rote learning strategies. Lacking exposure to generative learning strategies may explain why traditional-aged participants more readily engage in these strategies; however, it does not sufficiently explain why they perform better than nontraditional-aged students using the same strategies. In addition, the transition from using rote-learning strategies to generative learning strategies and, at what point this transition takes place, still remains unclear.

Learning from textbooks depends a great deal on the study strategies employed by students that allow them to actively engage the material, and in the process, learn and retain information. Generative learning strategies, like question writing, show a promising path for students to do this. We found that in addition to question writing, using note taking as a generative process might also provide students with the means to retain textbook information. However, the cognitive processes involved in these study strategies appear to work differently between age groups and this should be a consideration for future research in education. As more nontraditional-aged students enter the college population, it is imperative that researchers explore the ways in which they study and retain information from learning sources.

References


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