Transfer of Elaborative Strategies in College Students

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Abstract

The use of elaboration as a memory strategy has been researched for decades and has been shown to be effective for preschool through adult ages (Pressley, 1982). However, the literature examining elaborative strategy use among students in college is lacking. Therefore, the purpose of this study was to investigate the transfer of elaborative strategy use in a sample of college undergraduate students. This study employed two separate samples with slightly different data collection strategies over a period of two years. Both samples came from undergraduate students enrolled across multiple sections of an educational psychology course required for entry into the undergraduate teacher education program at a regional state university in the Mid-South region of the United States. Sample one consisted on 149 students in either Professor A or B's courses that were administered five non-comprehensive multiple-choice exams and sample two consisted of 111 students with the same professors that were administered four non-comprehensive, multiple-choice exams with a *Study Habits Survey* administered before each exam (see appendix). Professor A utilized songs and chants for instruction leading to the first exam while Professor B employed traditional lecture methods. Results from the first sample indicated student performance on all five exams was higher in Professor A's class as compared to Professor B's class, with the last two being statistically significant. Sample two, however, did not yield similar findings, although Professor A's students did perform better on the exam for which the Professor utilized elaborative strategies for students during instruction. Generally, students who reported using elaborative strategies to remember content material consistently outscored students who did not report using those strategies; however, it seemed that students failed to initiate these memory strategies on their own. Quasi-experimental design for further study, along

with measures of student metamemory as suggested by Borkowski, Peck, Reid, and Kurtz (1983) would enhance the further study of this topic. From this information, it would seem that professors should not only provide examples of elaborative memory strategies during instruction, but also explain to students why such strategies work and encourage independent use by students as a study tool. (4 tables; 2 appendices)

The use of elaboration as a memory strategy has been researched for decades and has been shown to be effective for preschool through adult ages (Pressley, 1982). The varieties of elaborative strategies investigated have included rhyming, music, gesture, elaborative questioning, and mnemonics (both keyword and visual).

Rhyming as a memory strategy has not shown much effectiveness. Preschoolers recalled rhyming stories less well than those written in prose (Hayes, 1999). College students using rhyming as a strategy to remember a word list did not recall significantly more of the list than students who analyzed whether the words were in lower or upper case font (Bugg, DeLosh, & McDaniel, 2008).

Music and gesture have been more effective. Music has been helpful for elementary students who were taught songs with content-related words (Campabello, Di Carlo, O'Neil, & Vacek, 2002), especially when the words were set to well-known tunes (Calverley, Grafer, & Hauser, 2002). Feyereisen (2006) found that college students watching a video of an actor delivering sentences with or without accompanying gestures remembered significantly more of the sentences that had gestures. If the gestures meaningfully represented the sentence content in some way, those sentences were remembered significantly more frequently than sentences in which the gestures were unrelated to the content.

Memory strategies that employ a deeper level of processing have been shown to be more effective than those that use relatively shallow processing. In Bugg, DeLosh, and McDaniel's (2008) study of college students, those who asked themselves whether each word presented would fit into a stock sentence recalled significantly more words than those who analyzed font style or thought of a rhyming word. This effectiveness may be age-dependent, however. Second grade students were not successful when instructed to

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use visual imagery or elaborative questioning in order to remember animal facts (Willoughby, Porter, Belsito, & Yearsley, 1999), although when they were provided a keyword to scaffold their imagery their recall performance improved as long as the animals were already familiar to them. The implication from Willoughby et al.'s study is two-fold. First, lack of previous knowledge hampers students' ability to process new content at a deep level, and second, scaffolding an elaborative strategy will improve student success with it.

Beuhring and Kee (1987) found that seniors in high school spontaneously used elaborative strategies more often than fifth grade students and their recall of the word pairs was correspondingly better. The fifth graders, however, performed nearly as well on the recall test as the senior students after they were instructed to make up a sentence showing how the two words related. Using the strategy worked to increase recall for the younger students, although their failure to use it spontaneously illustrated a production deficiency.

The actual content of the elaboration is not always crucial. Wood, Willoughby, Kaspar, and Idle (1994) discovered that high school students who developed their own elaborations (after being told to ask themselves questions about provided animal facts) significantly outscored the group that was provided the entire elaborative question and answer for each fact and the group that was told simply to repeat the facts. Within the group that generated elaborations, however, the adequacy of the elaboration did not matter – any elaboration a student came up with raised the probability of getting the item correct compared to no elaboration at all. This again indicates the efficacy of deeper processing of content and suggests that student-generated elaborations will be more supportive of memory than ones provided by the teacher.

Boudreau, Wood, Willoughby, and Specht (1999) investigated the use of elaboration strategies during the reading of textual materials, a typical activity performed by college students. They randomly assigned 100 college students to one of five conditions: 1) generating their own questions and answers regarding main ideas they picked up from the text, 2) generating their own questions and answers regarding main ideas identified for them (underlined), 3) generating their own answers to questions posed for them about underlined main ideas, 4) rewriting the main ideas (repetition) they picked up from the text on their own, and 5) any self-chosen method of studying the main ideas picked from the text (the methods most used were highlighting and repetition). All students were given two tests following the study period, a free-recall test of main and secondary ideas and a multiple-choice test. Analysis across the three groups that had to pick out the main ideas on their own (i.e., conditions 1, 4, and 5) revealed no statistical difference in recall of content on the multiple-choice test. Students in all those groups expressed difficulty determining what the main ideas were from their reading. Students who used elaboration but did not receive underlined text (condition 1), however, recalled significantly more main ideas on the free recall test than the students in condition 4 who simply rewrote the main ideas they found in the text. Analysis of the groups that only used an elaboration strategy (i.e., conditions 1, 2, and 3), showed that students who did not get the main ideas identified for them scored significantly lower than the students from the groups that also received underlined textual material. They concluded that the process of underlining may have acted as scaffolding for use of the elaborative strategy, but that cannot be concluded from Boudreau et al.'s study, as there was no non-elaborative group that received underlined text.

A continuing series of studies of the mnemonic keyword method, which combines semantic and visual elaboration to learn new material, has been conducted by Carney and Levin (2003; 2007; 2008). Their research has involved college students learning material as diverse as the names and classification of fish (2003), musical composer/composition pairs (2007), and the names and definitions of obscure phobias (2008). In each case, the group using mnemonics outscored the control group on tests of simple recall as well as of higher order skills – analogies (2003) or categorical inference (2008) -- sometimes with effect sizes of over one standard deviation (2008). This advantage persisted over time, with the mnemonics group still outscoring the control two days after learning the material (2003; 2008).

It is significant for educators that teaching elaboration strategies to students of various ages and scaffolding their use can be effective in increasing their recall of content material. The question of whether students independently transfer use of a particular strategy to new material, however, has not been as well-researched (Pressley, 1982). Scruggs and Mastropieri (1988) found that 5th and 6th grade students identified as gifted more readily transferred a peg-word mnemonic strategy to new material than did students of the same age who were in regular education. They concluded that teachers working with regular education students should provide direct instruction in strategy use, provide the mnemonics for the students, then follow-up with prompting and reminding to use the strategy. A study of African-American Kindergarten and 3rd grade students (Grier & Ratner, 1996) found that none of the students transferred previously taught elaborative questioning strategies when given a second set of words to learn, but needed some scaffolding about what kinds of questions to ask and when to ask them.

Bjorkland, Schneider, Cassel, and Ashley (1994) taught 3rd and 4th grade students organizational (rather than elaborative) strategies. They found that although students transferred the strategies to a new task, their recall was not different from an untrained group of controls on the second task. Bjorkland et al. viewed this as a sign of utilization deficiency, perhaps due to poor metacognition. Borkowski, Peck, Reid, and Kurtz (1983) tested 2nd and 3rd grade students for metamemory in addition to training them on strategies for recalling pictures they were shown. The children with higher metamemory scores were more likely to transfer the strategies to a new task even after partialing out variance related to impulsiveness and vocabulary achievement.

Unfortunately, none of these transfer studies used high school or college age participants, who ought to have better developed metacognition and metamemory than younger students. It might be expected that there would be a higher rate of strategy transfer in the older student population. Therefore, the purpose of this study was to investigate the transfer of elaborative strategy use in a sample of college undergraduate students.

<center>Methods</center>

This study employed two separate samples with slightly different data collection strategies over a period of two years. Both samples came from undergraduate students enrolled across multiple sections of an educational psychology course required for entry into the undergraduate teacher education program at a regional state university in the Mid-South. The sections were taught by two different instructors, but all sections had identical 50-item multiple-choice tests. The instructors conferred frequently to be sure they covered the same content material with their sections.

Sample One

There were five sections of the course taught with 149 undergraduate students providing data for this sample. One instructor taught three sections of the course and another instructor taught two sections. Five tests were given over the course of the semester and none of them was comprehensive. These data were collected as part of another study.

Sample Two

For this sample, there were 111 undergraduate students enrolled in four sections of the course. One instructor taught two sections of the course and another instructor taught two sections. Four non-comprehensive tests were given over the course of the semester. At the time of *each* test, students were given a short study habits survey (see Appendix A). These data also were collected as part of another study.

<div align="center">Results</div>

Sample One

Analysis of the test score data from Sample One using t-tests for unequal variances revealed a difference in scores between students in sections taught by professor A and those taught by professor B (see Table 1). A Bonferroni adjustment to hold experiment-wise alpha at 0.05 resulted in a single-test alpha level of 0.0102 for a result to be considered significant. With that adjustment, only the scores of the final two tests in the semester were significantly different by instructor, although the trend throughout all five tests was for scores in Professor A's sections to be higher than those of Professor B.

Table 1

Sample 1: t-tests on Average Test Scores between Instructors' Sections

Test	Instructor	n	Mean	St.Dev.	t	df	p
1	A	63	74.5	13.0	2.43	132	0.0165
	B	87	69.3	12.7			
2	A	62	79.1	12.1	1.24	135	0.2182
	B	86	76.7	12.3			
3	A	62	73.4	12.1	2.03	128	0.0447
	B	86	69.3	11.6			
4	A	60	83.1	11.0	4.55	143	0.0001
	B	86	73.4	14.8			
5	A	58	80.7	13.4	2.78	122	0.0063
	B	86	74.3	13.4			

It was theorized that Professor A's introduction of elaborative devices (songs, action chants, and mnemonics) for remembering material in the long overview of theories presented in the first chapter of the textbook was effective not only for the test over material in that chapter, but that the students transferred the elaboration memory strategy on their own when studying for the ensuing tests. This led to the analysis of data from Sample Two, which included a study survey that asked students whether they had used mnemonics, songs, or other elaborative strategies when studying.

Sample Two

Table 2 presents the percentage of students reporting use of elaborative strategies for each test during the semester. The highest reported usage was for Test 1, with nearly

two-thirds of the students in Professor A's sections reporting that they had used

mnemonics, songs, or other elaboration when studying the material. This first test

included the content from chapter one of the textbook, for which Professor A had

provided elaborations and required students to practice them in class. Anecdotal reports

indicated the higher percentage of students in Professor B's sections using elaboration for

Test 1 might be due to studying with friends in the sections taught by the other professor.

Table 2

Sample 2: Reported Use of Elaborative Strategies

Test	Number Using Strategies	%	% of Prof. A's Students Using Strategies	% of Prof. B's Students Using Strategies
1	51	46	64	21
2	14	13	17	6
3	12	11	11	11
4	10	9	6	13

For the remaining tests in the semester the proportion of students reporting use of

elaborative strategies dropped precipitously. Of the 51 students who reported using

elaboration on the first test, only 11 reported using it on Test 2, and only 7 continued to

use it on Tests 3 and 4. The differences between the strategy usage reports of students

from the two professors largely disappeared.

Test scores of students who reported using elaborative strategies were compared

to those who did not report strategy usage (see Table 3). None of the differences was

significant given the Bonferroni-adjusted alpha of 0.0127. The difference between

average scores on Test 1, however, favored students reporting strategy use. They scored

about five points higher than those not reporting use of elaboration, which would be between a small and medium effect size. On the other tests the point difference never got much above two points and the direction was inconsistent.

Table 3

Sample 2: t-tests on Test Scores Contrasting Elaboration Usage

Test	Used Elaboration	n	Mean	St.Dev.	t	df	p
1	No	60	75.6	13.3	-2.02	109	0.0463
	Yes	51	80.8	13.4			
2	No	82	77.9	14.1	-0.33	91	0.7413
	Yes	11	79.5	13.6			
3	No	83	81.0	11.9	0.60	93	0.5500
	Yes	12	78.8	11.4			
4	No	81	80.7	12.4	0.43	87	0.6705
	Yes	8	78.8	9.9			

The differences between average test scores of the sections taught by the two professors in Sample 2 are displayed in Table 4. Tests 1, 2, and 4 had significantly different scores, according to the results of t-tests for unequal variances, but the direction of the difference varied. Students in Professor A's sections scored higher in Tests 1 and 2, but Professor B's students outscored them on Test 4.

Table 4

Sample 2: t-tests on Average Test Scores between Instructors' Sections

Test	Instructor	n	Mean	St.Dev.	t	df	p
1	A	64	81.7	13.1	3.51	101	0.0007
	B	47	73.3	12.7			
2	A	46	83.3	14.6	3.70	91	0.0004
	B	47	73.0	12.1			
3	A	59	79.2	12.8	-1.79	88.6	0.0775
	B	36	83.3	9.7			
4	A	52	77.6	13.5	-3.05	85.5	0.0031
	B	37	84.6	8.4			

Discussion

Students who reported using elaborative strategies to remember content material consistently outscored students who did not report using those strategies, thus it is possible that the difference on Test 1 was partially due to use of the elaborative strategies provided by Professor A. This fails as an explanation for the differences on the other tests, however, as the majority of students who used the strategies did so only when the professor presented them to all the students in the section and had them practice the strategies in class. When no elaborations were provided by the professor, use of this strategy was minimal. There seemed to be little transfer of strategy use from Test 1 to the ensuing tests. Even students who made higher scores on Test 1 using elaborative strategies did not subsequently make up their own elaborations for new material.

Students' self-reporting of study methods may have been inaccurate, which would threaten the internal validity of this research. A quasi-experimental design with sections of the course randomly assigned to receive example elaborations from the professor or not would increase internal validity. Treatment diffusion might still be a problem, however, as friends and roommates from different sections often study together. A future study also should test the college student population for metamemory, in line with the findings of Borkowski, Peck, Reid, and Kurtz (1983). If metamemory is an enabling variable in strategy transfer then some attention to developing it in undergraduate students might be helpful to their academic success.

From the standpoint of classroom practice, professors should clearly articulate why using elaborations is helpful (to help develop metamemory), provide examples of elaborations on course content [examples of content-related songs and action chants developed by the authors can be found in Appendix B], and require students to develop their own elaborations that could be shared with the rest of the class. Using class time to do this either individually or in groups could pay off in the form of greater retention of material in students' long term memory as it might lead them to create and utilize elaborations independently as a self-initiated memory strategy.

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Appendix A

EDF211 2005 Study Survey

Name _____   **Section** _____   **Test #** _____

How did you prepare for this test? (Please mark <u>all</u> that apply and fill in any blanks that are applicable.)

Time Spent Preparing

- ❑ I did not prepare for this test at all.

- ❑ I prepared all along as the chapters were being discussed in class, plus some right before the test.
  (About how many hours per week did you spend in preparation, not including right before the test? _____)
  (How many hours did you spend in preparation right before the test? _____)

- ❑ I did most or all my preparation close to the time of the test.
  (How many hours did you spend in preparation right before the test? _____)
  (When was this preparation done?
  ____ the day of the test   ____ the day before   ____ two or more days
  before)

Methods of Preparation

- ❑ I read the textbook chapters.
  (How many times silently? _____)
  (How many times out loud? _____)

- ❑ I worked through the textbook's accompanying study guide for these chapters.

- ❑ I read over the notes I took in class.
  (How many times silently? _____)
  (How many times out loud? _____)

- ❑ I made a cheat sheet to use during the test.

- ❑ I made flashcards or note cards of terms or other information.

- ❑ I used mnemonics, rhymes, silly sentences, and so forth to help me remember the material.
  (Were these the ones the teacher suggested? ____ yes ____ no)
  (Did you make up any of your own? ____ yes ____ no)

❑ I wrote my own sample test questions.

❑ I rewrote the notes I took in class (NOT making a cheat sheet).

❑ I studied with someone else, who talked over the material with me.

❑ I got someone to quiz me over the material.

❑ I did some other kind of test preparation that is not listed above.
(Please use the back to describe what else you did to get ready for this test.)

Appendix B

Sample Elaborations on Human Growth and Development Content

(Elaborations #1, 3, 5, and 6 were used with students in this study.)

1. Piaget Chant (has actions and rhythm)

Ahhh, Jean! Piaget! Hands-on!

Sensorimotor, preoperational, concrete, formal.

2. Song for Piaget's Schemes

(To the tune of *Twinkle, Twinkle, Little Star*)

Schemes, schemes mean a lot,

Piaget said it's how we organize thought,

When experiences make sense we assimilate,

But in Disequilibrium we accommodate,

Through these steps we adapt and find,

We better understand our world over time.

3. Erikson Cheer (rhythmically punching fists in the air)

T-A-4-I-G-I

Erikson was one smart guy!

(To remember the stages: Trust, Autonomy, Initiative, Industry, Identity, Intimacy,

Generativity, Integrity)

 (There are 4 stage names beginning with I in the middle, thus the 4 I)

4. <u>Stages of Erikson's Psychosocial Theory</u>

(to the tune of *I've Been Working on the Railroad*)

Chorus

I've been working on some crises, trying to become me,

Erikson's psychosocial stages, to accept my identity,

From after the womb until the tomb, society tells me much

About what I'm supposed to be, what I value, and who I trust.

Verse I: Stages – Positive Resolutions (Dinah won't you blow…)

Trust, Autonomy, that's what I want you see

Please give me Initiative and Industry

Identity, Intimacy,

Positively resolved for me,

With Generativity allows for my integrity!

Chorus

I've been working on some crises, trying to become me,

Erikson's psychosocial stages, to accept my identity,

From after the womb until the tomb, society tells me much,

About what I'm supposed to be, what I value, and who I trust!

Verse II: Positive Resolutions (Dinah won't you blow…)

Mistrust and shame with doubt,

They're unsuccessful and make me pout,

Guilt and inferiority make me shout!

I'll confuse my identity, be in isolation don't you see,

I'll be stagnant and in Despair!

Chorus

I've been working on some crises, trying to become me,

Erikson's psychosocial stages, to accept my identity,

From after the womb until the tomb, society tells me much,

About what I'm supposed to be, what I value, and who I trust!

5. <u>Vygotsky's Sociocultural Theory and the Transmission of Prejudice</u>

(to the tune of *Twinkle, Twinkle, Little Star*)

Vygotsky's theory is so great,

It helps explain why people hate.

Adults around them teach to them

Certain people to condemn.

It's a sociocultural theory

Thought up by Lev Vygotsky.

6. <u>Bronfenbrenner's Ecological Systems Theory</u>

(to the tune of *Old McDonald had a Farm*)

Bronfenbrenner had a theory, M-M-E-M-C.

And in this theory he had some systems, M-M-E-M-C.

With a microsystem here, mesosystem there,

Here an exo, there a macro, everywhere a chronosystem.

Bronfenbrenner had a theory, M-M-E-M-C.