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Experimental Investigation of the Effects of Cognitive Elaboration on Accounting Learning Outcomes

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Abstract

This study analyzed how self-generated elaboration, instructor-assisted elaboration, and self-generated followed by instructor-assisted elaboration, affect accounting students' acquisition of procedural knowledge, intellectual skills, and their attitudes towards learning. The results indicate that the self-generated elaboration instructional strategy improves accounting students' acquisition of procedural knowledge and intellectual skills more than the instructor-assisted elaborations. However, the effects of these instructional strategies on attitudes are not significantly different. Also, our three-way ANOVA results indicate that the students who have higher GPAs and pretest scores tend to have more intellectual skills, but not necessarily more procedural knowledge or more positive learning attitudes, using the self-generated elaboration instructional strategy.

Keywords: accounting education, attitudes, cognitive elaboration, GPA, intellectual skills, procedural knowledge

1. Introduction

1.1 Introduction

The development of accounting expertise involves the acquisition of various sets of knowledge and skills. Given the breadth of the knowledge and skills required in the accounting profession it may be difficult to develop expertise in school. The ability to learn and apply knowledge to different situations is therefore very critical to accounting students. Many different expert-learning instructional strategies have been explored to help students learn how to learn (Stone, Shelley, & Pincus 1997, Cook & Hazelwood, 2002; Benek-Rivera & Mathews, 2004). Cognitive elaboration approaches emphasize active learning (Anderson, 1993) and have therefore received considerable attention as an alternative mode of instruction. However, little attention has been paid to the effects of cognitive elaboration approaches on accounting learning outcomes.

This study investigates the effects of three alternative forms of cognitive elaboration on first accounting course students' learning outcomes. Specifically, this study examines how self-generated elaboration, instructor-assisted elaboration, and self-generated followed by instructor-assisted elaboration, affect first accounting course students' acquisition of procedural knowledge, intellectual skills, and students' attitudes.

1.2 Motivation of the Study

This research is motivated by two issues. First, this study explores alternative instructional models in the field of accounting. Traditional instructional models were described as instructor-centred: simply presenting information, giving examples, and providing opportunities for practice (Hosal-Akman et al., 2010). In complex and ambiguous settings such as accounting, a simple presentation of information is not adequate for students to learn (Bonner, 1999; Cook & Hazelwood, 2002). Especially the first accounting course is a gateway subject for business education. Students' experience with their first accounting course is an important factor in their selection of accounting as a major (Geiger & Ogilby, 2000). Therefore, find an optimal teaching strategy for introductory accounting course is a central recurring theme in business education (Lloyd & Abbey, 2009) In addition, the Accounting Education Change Commission states that students must become active participants in the learning process and instructors need to utilize methods to promote interaction with students (AECC, 1990). Teaching students the ability of learning to learn has therefore become an important task for accounting educators today (Lightbody, 1997; Cook & Hazelwood, 2002). This study attempts to provide some additional evidence on the effects of active learning in the accounting learning process.

Secondly, this research explores how different cognitive elaboration strategies might help teachers achieve desired learning outcomes for their first accounting course students. As previously stated, little is known about the potential effects of cognitive elaboration strategies on accounting students' learning outcomes. This study seeks to provide some insights in that direction.

1.3 Literature Review

1.3.1 Cognitive Elaboration

Cognitive elaboration refers to the generation and integration of new information into one's pre-existing knowledge structure (Anderson, 1983). In the context of learning, cognitive elaboration refers to an instructional strategy that helps students to elaborate on new course material in order to relate it to other information in the course material and/or information that the students already possess (Shuell, 1988). There are three alternative forms of cognitive elaboration, including the self-generated elaboration, the instructor-assisted elaboration, and the self-generated elaboration followed by the instructor-assisted elaboration. The self-generated elaboration encourages students to take a central role and generate their own way of integrating new course material with pre-existing knowledge structures. On the other hand, both the instructor-assisted elaboration and the combined elaboration models allow students to take a peripheral route by giving them instructions to generate the integration process without active thinking.

1.3.2 Learning Outcomes

There are several taxonomies of learning outcomes available in educational and cognitive psychology (Bloom, Engelhart, Furst, Hill, & Krathwohl 1956; Anderson, 1976; Gagne, 1984; Stone et al., 1997). Three important categories of learning outcomes documented in educating for expertise are procedural knowledge, intellectual skills, and attitudes (Stone et al., 1997). Declarative and intellectual skills are two long-term stores of knowledge.

Procedural knowledge consists of facts, instructions, examples, and definitions (Anderson, 1993). It is factual knowledge that students are able to recall in essentially the same form as it was originally presented to them (Bonner, 1999). Students are not asked to apply knowledge but merely to retrieve from memory.

Intellectual skills are the application of knowledge to a specific use or task (Anderson, 1993). It includes knowledge of concepts, rules, and procedures needed for problem solving in a given domain. The key challenge with regard to intellectual skills is for students to be able to apply these skills to novel situations (Bonner, 1999). Intellectual skills cannot be verbalized, but are manifested through performance on a task.

Attitudes are beliefs that influence individuals' choices and actions (Stone et al., 1997). Attitudes determine to what extent the students' recognize that learning is needed (Feldman, 1986). Gal and Ginsburg (1994) find negative attitude impede learning or hinder the extent to which students will develop useful information and apply what they have learned outside the classroom. They believe that one goal of education is to engender in students a positive outlook about learning and its applications, and have confidence in themselves in the learning process.

1.3.3 The Impact of Cognitive Elaboration on Learning Outcomes

Cognitive research emphasizes the cognitive processes that turn novices into experts (Anderson, 1983). Prior research suggests that different categories of learning outcomes require different instructional approaches and make different information processing demands for learning (Anderson, 1985; Gagne, 1984). Traditional accounting education has emphasized procedural knowledge (Bonner & Walker 1994). Other research has focused on the use of different instructional strategies to improve the acquisition of procedural knowledge in the first accounting course (Gieger &Ogilby 2000; Lloyd & Abbey 2009). Schadewald and Limberg (1990) investigated the effects of cognitive elaboration on students' ability to memorize facts related to tax accounting. Their results show that students under self-generated elaboration have greater ability to recall tax facts than students under instructor-assisted elaborations. Hermanson (1994) found that students who generated their own elaboration had better recall of both simple and complex accounting and tax concepts than did students who were provided with the instructor-generated elaborations.

The public accounting environment is changing rapidly, requiring an increased emphasis on complex decision-making and problem solving skills. Accountants rely more heavily on analytical skills and the ability to transfer knowledge than ever before (Elliott, 1998). In order to improve students' abilities in acquisition and transfer of knowledge, a focus on intellectual skills and attitudes is necessary. With intellectual skills, students are able to differentiate and integrate alternative problem solving perspectives, identify accounting-related information resources, structure problem solutions, and develop written communication skills (Stone et al., 1997). Attitudes are also very important as they strongly influence the recognition of the need for learning procedural knowledge and the need for applying intellectual skills (Ennis, 1987). Similar experience is found in other learning fields such as Statistics (Gal & Ginsburg. 1994). Gal and Ginsburg (1994) shows that teachers should build an emotionally supportive atmosphere in a problem-solving environment for learning statistics, so students feel safe to explore, conjecture, hypothesize, and brainstorm; are motivated to keep working on problems which may not have right or wrong solutions and may require extended investment of energy; feel comfortable with temporary confusion or a state of inconclusive results; and are not afraid to experiment with applying different (statistical) tools or methods.

Certain forms of cognitive elaboration encourage the development of intellectual skills and attitudes by emphasizing active learning (Anderson, 1985; Feldman, 1986; Stone et al., 1997). The major objective of this study is to explore whether teachers could help students attain desired learning outcomes by choosing different cognitive elaboration strategies. To achieve this goal, this study attempts to provide experimental evidence on the effects of alternative forms of cognitive elaboration on the accounting students' learning outcomes.

1.4 Hypotheses Development

The self-generated elaboration instructional model encourages students to be actively involved in the learning process. The intent of this strategy is to improve students' procedural knowledge by allowing students to independently acquire it. Stone et al. (1997) compared the effectiveness of a comprehensive instructional program, Project Discovery (PD), with traditional accounting education on students' learning outcomes. Their results show that PD effectively emphasizes acquiring intellectual skills and improving attitudes without losing traditional accounting procedural knowledge. Therefore the self-generated elaboration might more effectively increase students' procedural knowledge than the instructor-assisted models by developing students' abilities to independently acquire the knowledge. However, prior research also shows that instructional strategies that emphasize active learning de-emphasize declarative, but rather enhance students' ability to develop intellectual skills and attitudes (Anderson, 1993). Students under the self-generated elaboration instructional model might exhibit less procedural knowledge than students under the instructor-assisted models. Since the research is contradicting, our first hypothesis will be as follows:

Hypothesis 1: *Students who are taught under self-generated elaboration will exhibit no difference in procedural knowledge than students who are taught under instructor-assisted elaborations.*Developing and increasing cognitive complexity is an important objective of instructional strategies. Cognitive complexity refers to the ability to differentiate alternative perspectives and integrate these perspectives into a well-reasoned analysis (Streufert & Swezey 1986). In complex, ambiguous environments such as accounting, increasing cognitive complexity is necessary for improving problem-solving skills (Breuer & Tennyson 1995). The self-generated instructional strategy seeks to enhance students' cognitive complexity by letting students take a central role in the learning process. Consequently, hypothesis 2 is stated as follows:

Hypothesis 2: *Students who are taught under the self-generated elaboration exhibit more intellectual skills than students who are taught under the instructor-assisted elaborations.*

Different cognitive elaborations have different impacts on student's attitudes toward instruction. The self-generated instructional strategy involves students in the learning process and elaborates on their cognitive effort (Pincus, 1991). Therefore, hypothesis 3 states as follows:

Hypothesis 3: *Students who are taught under the self-generated elaboration exhibit more positive attitudes about their learning method than students who are taught under the instructor-assisted elaborations.*

Extensive research indicates that individual ability has significant impact on accounting performance and GPA has been found to be one of the strongest predictors of accounting performance ((Hite & Parry, 1994; Hill, 1998). Therefore, GPA was included as a control variable in the statistical analyses to control for performance difference that result from individual differences in ability.

2. Method

2.1 Subjects

Seventy-seven students in an introductory accounting course were used in this experiment. Twenty-six students received the self-generated elaboration treatment, twenty-six received the instructor-assisted treatments, and the other twenty-five received the self-generated followed by the instructor-assisted treatment.

2.2 Procedures

The experiment was carried out in one class session. In order to determine the initial knowledge of the subject, a pretest/posttest design was used. Table 1 presents the experimental design for this study, including tasks and conditions for the pretest, the treatments, and the posttest.

Table 1. Experimental design

Steps	Pretest	Treatment	Posttest
Task	Answer some concept, definition questions and work some case problems	Read Materials	Test procedural knowledge, intellectual skills, and attitudes
Conditions	Common to all subjects	Three cognitive elaborations and three types of knowledge tests 1.procedural knowledge test 2.Intellectual skills 3. Attitudes	1.Definitions and conceptual questions 2.Cases analysis 3.Questionnaire

Students were first given five minutes to respond to the pretest, which included definitions and conceptual questions, case problems and a simple questionnaire. Then students were randomly chosen for the treatments (Cognitive elaborations materials). Subjects were given ten minutes to read and engage those elaborations. Finally, students were administered the posttest, which included the procedural knowledge test (definition and conceptual questions), the intellectual skills test (Case analysis), and the attitudes test (questionnaire). Students were instructed not to discuss the experiment with classmates and that the experiment was a class exercise.

2.3 Materials/ Strategies

The three cognitive elaboration strategies were designed using similar procedures to those used by Schadewald and Limberg (1990) and Choo and Tan (1995). The actual accounting problems include steps to calculate the operating cycle for a company. The instruction was different for each cognitive elaboration strategy. A pilot test was conducted to get feedback on the experimental materials before they were given to the students. The pilot test was administered to five students from the testing class. We wanted to know whether students would understand the questions on the experimental materials and whether there are ambiguous questions. The five students had no problem understanding the questions, so the same experimental materials were used in the test.

The Self-generated elaboration: The self-generated elaboration required the students to follow the instructions given and helpful hints to figure out their own solutions to the operating cycle problems. Lastly the students were asked to verify their answers with the answer keys. Students under this elaboration were guided through the self-cognitive elaboration process.

The Instructor-assisted elaboration: The instructor-assisted elaboration was operationlized by providing students with the suggested solutions to the problems. The students were prompted to follow the instructor-assisted elaboration in the traditional sense. That is, students were simply given the solution without explicitly guiding them through the cognitive elaboration process.

The Self-generated elaboration followed by the instructor-assisted elaboration: This combined elaboration was operated by first giving the students the above self-generated elaboration instructional material, and then providing them with the suggested solutions. In this process, the students first experienced a self-cognitive elaboration process, and were then given instructional help. To be consistent, all these elaboration strategies were administered in ten minutes.

2.4 Measures

The number of correct answers out of eight total questions on the pretest and posttest was used as measures for pretest and posttest performances. The pretest and posttest were graded by an independent person who had no knowledge of what was being tested.

Following Stone et al. (1997), we measure procedural knowledge by the definitions and concept questions adopted from the CPA exams. Intellectual skills were measured by the case questions. Attitudes were measured by asking the students to rank the instructional method on a seven-point scale. The GPAs were obtained from the pretest.

3. Results

None of the students knew the answers about the operating cycle during the pretest. Also, no significant difference was found in the average GPAs of the students in the three elaboration groups due to the random process of the subject selection.

Figure 1 presents the mean scores of correct answers for procedural knowledge and intellectual skill under the three cognitive elaboration strategies in the posttest. According to Figure 1, students taught under the self-elaboration instructional strategy outperformed those taught under the instructor-assisted and the combined strategies on both the procedural knowledge and the intellectual skills tests.

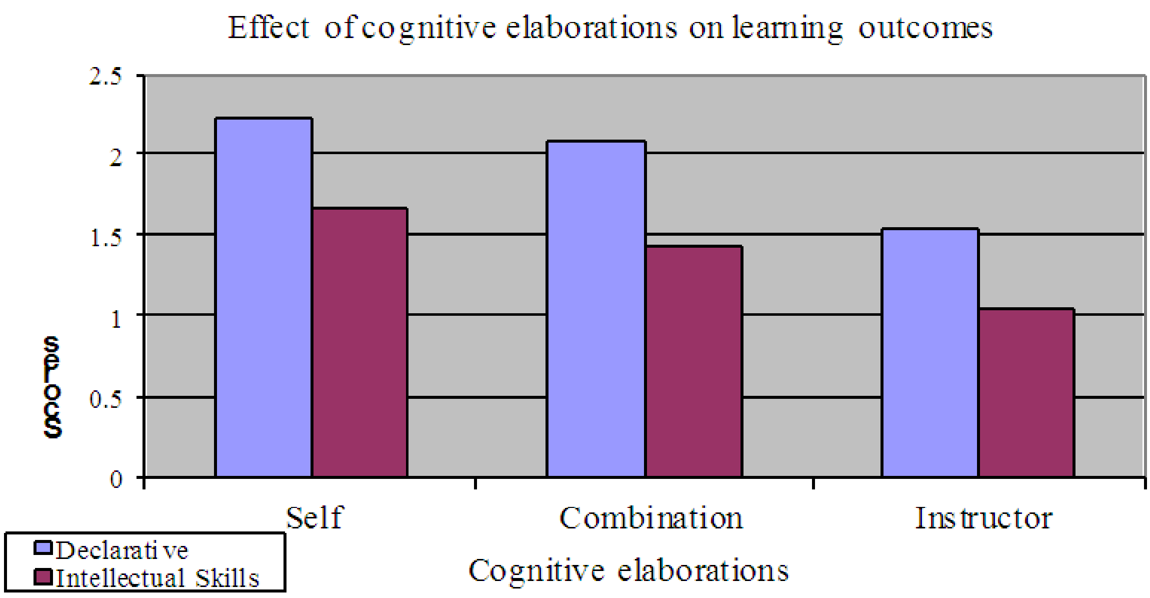

Figure 1. Effect of Cognitive elaborations on learning outcomes

An analysis of variance showing the effects of all of the cognitive elaboration strategies can be found in Table 2. The effect of the cognitive elaboration strategies is significant at the 10% level for the posttest ($F = 2.5$, $P= 0.09$). The pretest is an insignificant covariate for the posttest performance ($F= 0.24$, $p=0.63$). The pretest score is merely a control variable, the previous knowledge makes no prediction of the effect of the elaboration strategies on the posttest performance.

Table 2. The effect of cognitive elaborations and pretest on posttest, procedural knowledge, intellectual skills, and attitudes: ANOVA

Panel A: Dependent variable: Posttest

	DF	SS	MS	F	P
Cognitive elaborations	2	24.96	12.48	2.5	0.09
Pretest	1	1.18	1.18	0.24	0.63
Error	73	364.94	4.999		

Panel B: Dependent variable: Procedural knowledge

	DF	SS	MS	F	P
Cognitive elaborations	2	6.88	3.44	1.93	0.15
Pretest	1	0.02	0.02	0.01	0.91
Error	73	129.89	1.78		

Panel C: Dependent variable: Intellectual skills

	DF	SS	MS	F	P
Cognitive elaborations	2	5.02	2.51	1.65	0.19
Pretest	1	1.33	1.33	0.88	0.35
Error	73	110.85	1.52		

Panel D: Dependent variable: Attitudes

	DF	SS	MS	F	P
Cognitive elaborations	2	2.53	1.26	0.39	0.68
Pretest	1	0.18	0.18	0.05	0.82
Error	73	228.38	3.22		

Table 3 presents the mean scores, standard deviations, t-test, and p-values for the differences among the three groups for procedural knowledge, intellectual skills, attitudes, and the total posttest scores. Hypotheses 1 predicts that there is no difference on procedural knowledge among the three cognitive elaborations, while Hypotheses 2 and 3 predict that students under the self-generated elaboration will outperform students under the other two elaboration strategies in terms of intellectual skills and attitudes. We find that Hypothesis 1 is partially supported. (self v. instructor: t=1.99, p=0.05; self vs. combination: t=0.40 p=0.69; instructor vs. combination: t=-1.41 p=0.17). That is, the self-elaboration strategy does improve students' Procedural knowledge at 5% significance level compared to the instructor-assisted elaboration strategy. The results are positive but are not statistically significant when comparing the self elaboration with the combined strategy. Hypothesis 2 is partially supported as well (self v. instructor: t=1.91, p=0.06; self vs. combination: t=0.67 p=0.51; instructor vs. combination: t=-1.05 p=0.30). That is, the students taught under the self-elaboration strategy outperformed the students taught under the instructor-assisted strategy on intellectual skills at 6% significance level. However, the difference is not significant between the self-elaboration strategy and the combined strategy. e Hypothesis 3 is not supported (self v. instructor: t=-0.45, p=0.65; self vs. combination: t=-0.99 p=0.33; instructor vs. combination: t=-0.47 p=0.67), indicating the self-generated elaboration does not improve the students' attitudes compared to the other two strategies even though it improves students' procedural knowledge and intellectual skills.

Table 3. The effect of cognitive elaborations on procedural knowledge, intellectual skills, attitudes, and posttest: Univariate tests

	N	Mean	Std.Dev.	Diff.	t	P
Procedural knowledge						
Self generated (A)	26	2.23	1.24	A-B (+0.69)	1.99	0.05
Instructor assisted (B)	26	1.54	1.27	A-C (+0.15)	0.40	0.69
Combined (C)	25	2.08	1.46	B-C (-0.54)	-1.41	0.17
Intellectual Skills						
Self generated (A)	26	1.65	1.1	A-B (+0.61)	1.91	0.06
Instructor assisted (B)	26	1.04	1.22	A-C (+0.23)	0.67	0.51
Combined (C)	25	1.42	1.37	B-C (-0.38)	-1.05	0.3
Attitudes						
Self generated (A)	26	4.25	1.57	A-B (-0.23)	-0.45	0.65
Instructor assisted (B)	26	4.48	1.96	A-C (-0.45)	-0.99	0.33
Combined (C)	25	4.7	1.66	B-C (+0.22)	0.47	0.67
Posttest						
Self generated (A)	26	3.89	2.06	A-B (+1.35)	2.40	0.02
Instructor assisted (B)	26	2.54	1.99	A-C (+0.39)	0.58	0.56
Combined (C)	24	3.50	2.6	B-C (-0.96)	-1.48	0.15

Hypothesis 4 predicts that there is a significantly positive relationship between the GPA and the learning outcomes. An analysis of variance in Table 4 presents the effects of the GPA on the posttest, procedural knowledge, intellectual skills, and attitudes. Panel A and Panel B show that the GPAs are significantly associated with the posttest scores and procedural knowledge at the 5% significance level (A: F=6.62, p=0.01; B: F=4.8, p=0.03). Panel C shows that the GPAs have significant effects on intellectual skills at the 10% level (F = 3.67, p=0.05). Panel D shows that there is an insignificant relationship between the GPA and the attitudes (F=2.3, p= 0.13), indicating that the students who have higher GPAs do not necessarily have more positive attitudes toward learning than those who have lower GPAs. Hypothesis 4 is partially supported. In addition, Table 4 presents an analysis of variance on the effects of cognitive elaboration strategies on the posttest, Procedural knowledge, intellectual skills, and attitudes. Similar to the results in Table 2, Panel A show that Cognitive elaboration strategies have significant effects on posttest at 5% significance level (F=2.96, P=0.05). However, no significant results were found for procedural knowledge, intellectual skills and attitudes.

Table 4. The effects of cognitive elaborations and GPA on posttest, procedural knowledge, intellectual skills, and attitudes: ANOVA

Panel A: Dependent variable: Posttest

	SS	MS	F	P
GPA	26.29	26.29	6.62	0.01
Cognitive elaborations	23.53	11.76	2.96	0.05
Error	261.95	3.97		

Panel B: Dependent variable: Procedural knowledge

	SS	MS	F	P
GPA	7.7	7.7	4.8	0.03
Cognitive elaborations	4.56	2.28	1.42	0.25
Error	105.83	1.6		

Panel C: Dependent variable: Intellectual skills

	SS	MS	F	P
GPA	4.65	4.65	3.67	0.05
Cognitive elaborations	4.75	2.38	1.88	0.16
Error	83.46	1.26		

Panel D: Dependent variable: Attitudes

	SS	MS	F	P
GPA	7.07	7.07	2.3	0.13
Cognitive elaborations	4.04	2.02	0.66	0.52
Error	199.59	3.07		

Table 5 presents the interactive effects of cognitive elaboration strategies, pretest, and GPA on posttest, procedural knowledge, intellectual skills, and attitudes. Panel A and Panel B show that there is no significant joint impact of cognitive elaboration strategies, pretest, and GPA on posttest (F=1.22, p= 0.38) or procedural knowledge (F=0.72, p=0.80). Panel C shows that the cognitive elaboration strategies, pretest, and GPAs are jointly and significantly affect the intellectual skills at the 5% significance level (F=2.45, p=0.05). Panel D shows that there is no joint effect of the cognitive elaboration strategies, pretest, and GPA on attitudes (F=0.57, p= 0.92). Thus, the results indicate that the students who have higher GPAs, pretest scores, self-generated elaboration instructional strategy would have more intellectual skills, but not necessarily more procedural knowledge or more positive learning attitude, than those who have lower GPAs, pretest scores, and other two cognitive elaborations. This suggests that the students' natural intelligence GPAs and pretest scores could influence the impact of cognitive elaborations on intellectual skills. Hypothesis 2 is again supported.

Table 5. The interactive effects of cognitive elaborations, GPA, and pretest on posttest, declarative, intellectual skills, and attitudes: Three-way ANOVA

Panel A: Dependent variable: Posttest

	SS	MS	F	P
Pretest* Cognitive elaborations *GPA	304.35	5.25	1.22	0.38
Error	47.29	4.30		

Panel B: Dependent variable: Procedural knowledge

	SS	MS	F	P
Pretest* Cognitive elaborations *GPA	94.21	1.62	0.72	0.80
Error	24.79	2.25		

Panel C: Dependent variable: Intellectual Skills

	SS	MS	F	P
Pretest* Cognitive elaborations *GPA	102.40	1.77	2.45	0.05
Error	7.92	0.72		

Panel D: Dependent variable: Attitudes

	SS	MS	F	P
Pretest* Cognitive elaborations *GPA	161.23	2.83	0.57	0.92
Error	54.54	4.96		

4. Discussion

This study investigates the effect of one type of expert learning and problem solving strategy, i.e., cognitive elaborations, on accounting students' learning outcomes. The results show that the students taught under the self-generated elaboration instructional strategy perform significantly better on procedural knowledge and intellectual skills than the students under the instructor-assisted elaboration instructional strategy. Although the students under the self-elaboration strategy perform better than the students under the combined strategy, the differences are not significant. What is noticeable here is that the means of the two methods that involve self-generation seem to be much closer to each other than were the two instructor-assisted methods for both learning outcomes. According to these results, in order to promote knowledge transfer and development of accounting expertise, instructional strategies should be chosen that promote self-generation elaboration.

In addition, there is no significant difference of students' attitudes among the three forms of cognitive elaboration approaches. While there are no significant differences among the means, it was interesting that the mean for the self-generated method was lower than for the instructor assisted methods, but the highest mean was for the combined method.

Finally, the study finds that GPAs have a significant effect on students' acquisition of procedural knowledge, intellectual skills, but have an insignificant effect on students' attitudes towards learning methods.

Overall, the findings imply different forms of cognitive elaboration strategies do have different effects on the learning outcomes. To promote knowledge transfer and development of accounting expertise, instructional strategies should be chosen utilizing methods involving self-generated elaborations.

One of the major limitations of this study is its failure to capture a real cognitive elaboration instructional setting. To avoid instructor effects and enhance the study's internal validity, the cognitive elaboration instructional strategies were conducted through instructional materials instead of real lectures. Future research could be conducted by giving real lectures to different classes to investigate the effects of cognitive elaboration on learning outcomes. Another limitation of this study is its weakened external validity. First, the sample size is too small; second, the sample was drawn from one class. Generalizations from this study are limited.

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Appendix A

Pretest

ID #______________Cumulative GPA ______________

1. Have you ever heard the term operating cycle?
2. What do you think operating cycle is? Give your best definition.
3. What in your best opinion is inventory turnover?
4. What in your best opinion is accounts receivable turnover?
5. The following data were taken from XYZ company's 1999 books:

Sales…………………………………..$3,000,000

Average Account receivable…………..$370,000

Cost of Good Sold…………………….$2,400,000

Average inventory…………………..…$500,000

Assume there are 365 days in a fiscal year for XYZ company.

a. What is Company XYZ's inventory turnover?

b. What is Company XYZ's receivable turnover?

c. What is Company XYZ's operating cycle?

d. What is your evaluation of Company XYZ's operating cycle?

6. Please rank the current accounting instructional method on a seven-point scales:

Strongly Medium Strongly

Disagree Agree

1 2 3 4 5 6 7

Appendix B (1)

Self-generated elaboration instructional strategy

Below is the selected financial data for Rey, Inc.. Please use the following data and instructions to compute the operating cycle of Rey, Inc for 1999 and 1998.

Rey, Inc

Selected Financial Data

	December 31,	
	1999	**1998**
Sales	$3,000,000	$2,000,000
Accounts receivables (net)	450,000	400,000
Merchandise inventory	540,000	420,000
Cost of Good sold	$ 2,100,000	$1,400,000

Assume that there are 365 days in Rey, Inc.'s fiscal year.

I. In order to compute the operating cycle, you should first calculate the average No. Days Inventory in stock. Accordingly, you should consider:

a. What is the inventory turnover?

The inventory turnover ratio measures the efficiency of the firm's inventory management. A higher ratio indicates that inventory does not remain in warehouses or on the shelves but rather "turns over" rapidly from the time of acquisition to sale.

Helpful Hint: To calculate **average** inventory in 1999**,** you need to total the inventory at the end of 1999 and at the end of 1998 (or at the beginning of 1999), and then divide it by 2.

Inventory Turnover = Cost of Goods Sold ÷ **Average** Inventory

My calculation and answer is:

(Answer key: 4.375)

b. What is the average No. Days Inventory in Stock?

The inverse of this ratio can be used to calculate the average number of days inventory is held until it is sold.

Average No. Days Inventory in stock = 365÷ Inventory turnover

My calculation and answer is:

(Answer key: 84 days)

II. In order to compute the operating cycle, you should then calculate the average No. Days receivables outstanding.

c. What is the receivable turnover?

The receivables turnover ratio measures the effectiveness of the firm's credit policies and indicates the level of investment in receivables needed to maintain the firm's sale level.

Helpful Hints: To calculate **average** account receivable in 1999**,** you need to total the account receivables at the end of 1999 and at the end of 1998 (or at the beginning of 1999), and then divide it by 2.

Receivables Turnover = Sales ÷ **Average** account Receivables

My calculation and answer is:

Answer key: 7.06)

d. What is the average No. Days Receivables outstanding?

The inverse of this ratio can be used to calculate the average number of days receivables is outstanding.

Average No. Days Receivables Outstanding = 365 ÷ Receivables Turnover

My calculation and answer is:

(Answer key: 52 days)

III. In order to compute the operating cycle, you should add the average No. Days Inventory in stock and average No. Days receivables outstanding together.

e. What is operating cycle?

The operating cycle is one indicator of short-term liquidity measure. The operating cycle is the sum of the number of days it takes to sell inventory and the number if days until the resultant receivables are converted to cash.

Operating cycle = Average No. Days Inventory in stock + Average No. Days Receivables Outstanding.

My calculation and answer is:

(Answer key: 136 days)

Appendix B (2)

Instructor-assisted elaboration instructional strategy

Below is the selected financial data for Rey, Inc.. Please use the following data and instructions to compute the operating cycle of Rey, Inc for 1999 and 1998.

Rey, Inc

Selected Financial Data

	December 31,	
	1999	**1998**
Sales	$3,000,000	$2,000,000
Accounts receivables (net)	450,000	400,000
Merchandise inventory	540,000	420,000
Cost of Good sold	$ 2,100,000	$1,400,000

Assume that there are 365 days in Rey, Inc.'s fiscal year.

I. In order to compute the operating cycle, you should first calculate the average No. Days Inventory in stock. Accordingly, you should consider:

a. What is the inventory turnover?

The inventory turnover ratio measures the efficiency of the firm's inventory management. A higher ratio indicates that inventory does not remain in warehouses or on the shelves but rather " turns over" rapidly from the time of acquisition to sale.

Inventory Turnover = Cost of Goods Sold ÷ Average Inventory

Suggested Solution is:

Inventory turnover = 2,100,000 ÷ (540,000 +420,000)/ 2

=2,100,000 ÷ 480,000

= 4.375

b. What is the average No. Days Inventory in Stock?

The inverse of this ratio can be used to calculate the average number of days inventory is held until it is sold.

Average No. Days Inventory in stock = 365÷ Inventory turnover

Suggested Solution is:

Average No. Days Inventory in stock = 365 ÷ 4.375

=84 days

Ⅱ. In order to compute the operating cycle, you should then calculate the average No. Days receivables outstanding.

c. What is the receivable turnover?

The receivables turnover ratio measures the effectiveness of the firm's credit policies and indicates the level of investment in receivables needed to maintain the firm's sale level.

Receivables Turnover = Sales ÷ Average Trade Receivables

Suggested Solution is:

Receivable turnover = 3,000,000 ÷ (450,000 + 400,000)/2

= 3,000,000 ÷ 425,000

= 7.06

d. What is the average No. Days Inventory in Stock?

The inverse of this ratio can be used to calculate the average number of days receivables is outstanding.

Average No. Days Receivables Outstanding = 365 ÷ Receivables Turnover

Suggested solution is:

Average No. Days Receivables Outstanding = 365 ÷ 7.06

= 52 days

Ⅲ. In order to compute the operating cycle, you should add the average No. Days Inventory in stock and average No. Days receivables outstanding together.

e. What is operating cycle?

The operating cycle is one indicator of short-term liquidity measure. The operating cycle is the sum of the number of days it takes to sell inventory and the number if days until the resultant receivables are converted to cash.

Operating cycle = Average No. Days Inventory in stock + Average No. Days Receivables Outstanding.

Suggested Solution is:

Operating cycle = 84 +52

= 136 days

Appendix B (3)

Self-generated elaboration followed by instructor-assisted elaboration

Below is the selected financial data for Rey, Inc.. Please use the following data and instructions to compute the operating cycle of Rey, Inc for 1999 and 1998.

Rey, Inc

Selected Financial Data

	December 31,	
	1999	**1998**
Sales	$3,000,000	$2,000,000
Accounts receivables (net)	450,000	400,000
Merchandise inventory	540,000	420,000
Cost of Good sold	$ 2,100,000	$1,400,000

Assume that there are 365 days in Rey, Inc.'s fiscal year.

Ⅰ. In order to compute the operating cycle, you should first calculate the average No. Days Inventory in stock. Accordingly, you should consider:

a. What is the inventory turnover?

The inventory turnover ratio measures the efficiency of the firm's inventory management. A higher ratio indicates that inventory does not remain in warehouses or on the shelves but rather " turns over" rapidly from the time of acquisition to sale.

Helpful Hints: To calculate **average** inventory in 1999**,** you need to total the inventory at the end of 1999 and at the end of 1998 (or at the beginning of 1999), and then divide it by 2.

Inventory Turnover = Cost of Goods Sold ÷ **Average** Inventory

My calculation and answer is:

b. What is the average No. Days Inventory in Stock?

The inverse of this ratio can be used to calculate the average number of days inventory is held until it is sold.

Average No. Days Inventory in stock = 365÷ Inventory turnover

My calculation and answer is:

Ⅱ. In order to compute the operating cycle, you should then calculate the average No. Days receivables outstanding.

c. What is the receivable turnover?

The receivables turnover ratio measures the effectiveness of the firm's credit policies and indicates the level of investment in receivables needed to maintain the firm's sale level.

Helpful Hints: To calculate **average** account receivable in 1999**,** you need to total the account receivables at the end of 1999 and at the end of 1998 (or at the beginning of 1999), and then divide it by 2.

Receivables Turnover = Sales ÷ **Average** account Receivables

My calculation and answer is:

d. What is the average No. Days Receivables outstanding?

The inverse of this ratio can be used to calculate the average number of days receivables is outstanding.

Average No. Days Receivables Outstanding = 365 ÷ Receivables Turnover

My calculation and answer is:

Ⅲ. In order to compute the operating cycle, you should add the average No. Days Inventory in stock and average No. Days receivables outstanding together.

The operating cycle is one indicator of short-term liquidity measure. The operating cycle is the sum of the number of days it takes to sell inventory and the number if days until the resultant receivables are converted to cash.

Operating cycle = Average No. Days Inventory in stock + Average No. Days Receivables Outstanding.

My calculation and answer is:

Ⅳ. Please compare your answers with the suggested solutions.

Suggested solutions:

a. Inventory turnover = 2,100,000 ÷ (540,000 +420,000)/ 2

=2,100,000 ÷ 480,000

= 4.375

b. Average No. Days Inventory in stock = 365 ÷ 4.375

= 84 days

c. Receivable turnover = 3,000,000 ÷ (450,000 + 400,000)/2

= 3,000,000 ÷ 425,000

= 7.06

d. Average No. Days Receivables Outstanding = 365 ÷ 7.06

= 52 days

e. Operating cycle = 84 +52

= 136 days

Appendix C

Posttest

ID #____________________

1. **Define the operating cycle.**
2. **Define inventory turnover**
3. **Define receivable turnover**
4. **What happened to operating cycle when the sale increases and all other things held constant?**
5. **Case A.**

Corp A's account receivable (net) were $250,000 and $200,000 for the years ended December 31, 1999 and 1998, respectively. And its sales totaled $1,500,000 and $ 1,000,000 at December 31, 1999 and 1998, respectively. What is the account receivable turnover ratio?

6. **Case B.**

Corp B's inventories were $270,000 and $210,000 for the years ended December 31, 1999 and 1998, respectively. And its cost of good sold totaled $1,000,000 and $ 700,000 at December 31, 1999 and 1998, respectively. What is the inventory turnover ratio?

7. **Case C.**

The following computations were made from Corp. C's 1999 books:

Account receivable turnover ratio……………………6.5

Inventory turnover ratio…………………………… 11

What was the Corp. D's 1999 operating cycle?

8. **Case D.**

On December 31, 1999, Corp. D increased its sale by 10% compared to 1998 while all the other things hold constant. Did this increase on sales increase or decrease Corp E's operating cycle?

9. **Please rank the new instructional method on a seven-point scale:**

Strongly	Medium		Strongly			
Disagree			Agree			
1	2	3	4	5	6	7