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## The Impact Of Immediate Feedback On Student Performance: An Exploratory Study In Singapore.

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# The Impact Of Immediate Feedback On Student Performance: An Exploratory Study In Singapore.

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## **Abstract**

This study is designed to determine whether providing immediate feedback improves the analytical review skills for accounting students trained in a setting where feedback is not normally used. In this exploratory study, a combination of training and practice with explanatory feedback improved judgment accuracy for inexperienced student auditors performing analytical review tasks. Participants receiving both training and practice with feedback outperformed participants who received training and practice without feedback and other participants who received no training or practice. The results suggest that inexperienced accountants in an educational setting that provides little exposure to feedback might improve their analytical skills through teaching methodology that includes training and practice with explanatory feedback.

**KEYWORDS:** Analytical procedures, explanatory feedback, immediate feedback

# THE IMPACT OF IMMEDIATE FEEDBACK ON STUDENT PERFORMANCE: AN EXPLORATORY STUDY IN SINGAPORE

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## ABSTRACT

This study is designed to determine whether providing immediate feedback improves the analytical review skills for accounting students trained in a setting where feedback is not normally used. In this exploratory study, a combination of training and practice with explanatory feedback improved judgment accuracy for inexperienced student auditors performing analytical review tasks. Participants receiving both training and practice with feedback outperformed participants who received training and practice without feedback and other participants who received no training or practice. The results suggest that inexperienced accountants in an educational setting that provides little exposure to feedback might improve their analytical skills through teaching methodology that includes training and practice with explanatory feedback.

**Key words:** Analytical procedures, explanatory feedback, immediate feedback.

**Data availability:** Contact the author regarding data availability

## INTRODUCTION

Educational systems use a variety of methods to encourage student learning. In many educational settings, immediate feedback is used to improve student performance. This exploratory study to determine whether immediate feedback improves student performance

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on analytical review tasks considers the effect of feedback on judgment accuracy for students in a teaching environment where feedback had not previously been used.

Analytical review procedures have often been used by accounting researchers to investigate auditor performance (e.g. Bonner and Walker, 1994; Hirst and Koonce, 1996). Analytical review procedures include simple comparisons of financial statement numbers (i.e. current year balance sheet and income statement numbers compared to the prior year financial statement numbers) and the use of more complex models (i.e. financial statement ratios) to examine financial differences between two years. Past research suggests that analytical review skills are cognitive processes that are difficult to teach, requiring more active methods of instruction than lecture presentation and rote memorization (e.g., Bonner, 1999).

Consider a Singapore university setting, structured after the British educational system, where accounting instruction focuses on mass lectures (450-800 students), supplemented by tutorial sessions of 30-35 students. In this setting, quizzes are not given and homework is not collected. Students do not volunteer answers to questions posed in class or participate in class discussion. Because students in this setting have had little exposure to immediate feedback, it is unclear whether student performance will be improved by such methods. But recent research (e.g. Bonner and Walker, 1994) suggests that an educational experience that includes such feedback may improve undergraduate learning in selective analytical procedures.

In analytical procedure studies done in the United States, educational methods using explanatory feedback have been successful in improving judgment accuracy (e.g., Bonner and Walker, 1994). These findings may be applicable in a setting where feedback has not previously been used. This research project is designed to determine whether training and practice that includes explanatory feedback improves judgment accuracy with inexperienced participants whose educational system does not normally use explanatory feedback.

The participants (who were Singaporean undergraduates) were divided into three groups. The control group received no training, practice or feedback. A second group received training and practice without feedback (treatment 1). A third group received training and practice with feedback (treatment 2). The training for the treatment groups provided basic knowledge of analytical procedures. A practice session for each treatment group allowed participants to exercise analytical review decision-making. Treatment 2 participants got explanatory feedback in the form of correct answers and explanatory justifications. On analytical review tests designed to identify financial statement errors, participants (in treatment 2) who received training, practice and feedback outperformed the other groups. Given the relatively short time devoted to training and feedback in the study and the importance of analytical review skills to contemporary audit approaches, the results are encouraging. Education methods using feedback were effective in improving judgment accuracy for students in an educational setting not previously exposed to feedback methods.

The remainder of the paper is organized as follows. The second section contains the background and hypothesis development. The experimental method is described in the third section, and the results are presented in the fourth section. Section five concludes with implications of the results, limitations of the study and suggestions for future research.

## **BACKGROUND AND HYPOTHESIS DEVELOPMENT**

### **Singapore education system**

Singapore is a small island country (with an area of 647 square kilometers) and a population of approximately 3.5 million people. A former British colony, Singapore gained independence in 1965. Singaporean leaders give high priority to education. As a small country with no natural resources, the focus of government efforts has been on the development of intellectual skills among the citizens (Cohen, 1999). The British model of education served as the basis for the university structure from 1965 to the late 1990's. In Singapore's modification of the British system, there was no use of immediate feedback. After a 1999 survey (Cohen, 1999) conducted by the Singapore Ministry of Education that found significant businessmen's dissatisfaction with their university graduate employees, the education leaders in government and the universities moved away from their traditional education program toward an American system in part to develop some of the feedback features common in American universities. To accomplish this agenda, the two established universities in Singapore formed collaborations with United States universities (including Massachusetts Institute of Technology, the University of California at Berkley, the University of Chicago and Cornell University) and a new public university was opened in July 2000, modeled after a United States institution, the Wharton School of the University of Pennsylvania (Cohen, 1999).

### **Definition of Analytical Review Procedures and a Discussion of their Importance in the Audit Process**

Analytical review procedures include simple comparisons of financial statement numbers (i.e. current year balance sheet and income statement numbers compared to the prior year financial statement numbers, often referred to as trend analysis) and the use of more complex models (i.e. financial statement ratios) to examine financial differences between two time periods. Analytical review is used in a variety of situations during an audit. It is often used to detect the presence of errors in the financial statements. Hylas and Ashton (1982) found that a large proportion of financial statement errors are not identified by detail testing, but by less rigorous audit procedures such as analytical review and discussions with audit clients. As a planning tool, analytical review is used to detect potential problem areas so that substantive testing can be concentrated on those areas where there is higher risk of material financial misstatement. Analytical review also requires less auditor time and resources than other, more detailed, substantive-testing procedures, so it is often used to gather substantive audit evidence. It is less time consuming and less costly, for example, to review payroll expense using analytical procedures than to perform detailed tests of the payroll account. Where analytical review procedures reveal significant evidence in support of the account balances, fewer detailed tests need be done on these balances so that the audit can be performed in a cost-effective manner. As a result of concerns about audit efficiency and effectiveness, analytical procedures are increasingly used as a method to gather audit evidence (Hirst and Koonce, 1996).

Education methods that increase the student's level of skill in performing analytical procedures will be of benefit to the contemporary accountant. To support such a process, Blocher and Willingham (1988) suggest that analytical review procedures contribute to audit effectiveness and efficiency only as auditors themselves appreciate its functions and are aware of its limits. It must be noted, however, that criticism has been directed against the auditors' use of analytical review procedures because misinterpretations will sometimes arise from inaccurate expectations. If such

preliminary errors in judgment are made, these may impair the subsequent audit, thus calling analytical review procedures themselves into question (e.g., Bell and Wright, 1997). Blocher and Willingham (1988) suggest that auditors who use analytical procedures in audit planning may reach incorrect conclusions regarding the source of financial statement errors. Such criticism can be countered in the educational process by teaching auditors not only the techniques of analytical review, but also the limitations of the method and the appropriate rationale for the approach.

### **Difficulties in Acquiring Analytical Review Skills**

Analytical review procedures are not simple tasks to perform and should be learned prior to professional employment rather than “on the job”. Prior research has indicated the difficulties of auditors’ learning from “experience” in the working environment. Lack of a strong foundation of audit or accounting knowledge combined with weak learning skills complicates the acquisition of knowledge in a complex working environment (Brehmer, 1980). Regarding the acquisition of audit skills, Bonner and Pennington (1991) found that “the tasks that experts perform best are not only those with a fair amount of instructions, but are also those with instructions provided early in auditors’ careers, normally prior to the actual performance of the task.” In this context, it is important for auditors to possess a strong foundation of analytical review skills. This crucial foundation should emerge from the university learning environment and the earliest training efforts in auditing firms. Singaporean auditors trained in the old system may have missed a chance to develop analytical review skills during their undergraduate training because there was too much emphasis on rote memorization. This study suggests that feedback techniques may have better prepared auditors in these complicated review procedures. An education system emphasizing rote learning rather than skill development may not prepare students to perform analytical tasks.

Previous research has indicated that university education methods in general and training in the firms have not placed enough emphasis on analytical review (e.g., Bonner and Pennington, 1991; Bonner and Walker, 1994). American universities have sometimes focused too much on rote learning. Bonner and Walker (1994) note that merely providing specific ratio definitions and the basic instruction of audit steps to be performed in analytical review does not teach the rationale behind calculating the ratios. Without an understanding of this rationale, students merely learn to calculate ratios according to memorized formulae and may fail to understand the causal explanations for changes in the ratios. This lack of understanding may inhibit the development of analytical skills (Bonner and Walker, 1994). The present study builds upon Bonner and Walker’s insight. Because Singapore students have had little exposure to immediate feedback in the education process, it is not known whether their performance will be improved by practice and feedback opportunities. Rather than a process of experience, immediate feedback, revision, and re-evaluation, their modification of a British system of education had focused only on the final examinations’ evaluation of achievement. This study hypothesizes frequent assessment with an immediate feedback component may be an important step in the development of analytical skills, going beyond the practice of minimal (and delayed) feedback of final exam marks.

Despite the common belief that analytical review skills are cognitive processes that are difficult to teach, Bonner and Walker (1994) found that students in the United States who practiced ratio analysis problems and received immediate explanatory feedback showed improvement in analytical review skills. Bonner (1999) also found that “for the more complex skills of rules and

cognitive strategies, more active methods” of teaching are necessary and effective. Bonner and Walker (1994) used both explanatory feedback (providing the subject with an explanation of why the outcome occurred) and outcome feedback (providing the subject with the outcome or correct answer). Their findings showed that explanatory feedback resulted in performance improvement in ratio analysis problems. No improvement in student performance was demonstrated when they were given outcome feedback. Given Bonner and Walker’s result, the present study will not examine outcome feedback.

### **Hypothesis Development**

The current study investigates, in an environment where feedback has not normally been used, the impact of training, practice and immediate feedback on the performance of students on analytical review tasks. Bonner and Walker demonstrated that explanatory feedback allows a student to develop a set of rules for generating financial statement errors from analytical procedures. This study seeks to show that introducing explanatory feedback in the education experience will improve the performance of the students in analytical review tasks. This study considers whether performance improves for students after receiving training and practice or if classroom training and practice must be combined with explanatory feedback to improve performance. Merely providing students with training and practice opportunities should not improve performance, because, consistent with the results of previous researchers (e.g. Bonner, 1999), skill development in analytical procedures requires more active methods of education (i.e. feedback) than training and practice opportunities. Providing students with only training and practice without explanatory feedback may even worsen performance. Based on prior research, training and practice in performing a task will only improve judgment accuracy when the subject learns from the process (e.g. Hirst et al., 1999; Bonner and Walker, 1994; Bonner, 1994). If the subject does not know how to perform a task, he does not learn how to perform the task by repetition. Performance repetition might actually worsen performance as the subject becomes more frustrated at working a series of problems he does not know how to solve.

Performance differences will be investigated among three experimental groups: a control group and two treatment groups. The control group will receive no training or practice. Treatment 1 will receive training and practice and treatment 2 will receive training, practice and feedback. The research question examines whether the performance of either treatment group exceeds the performance of the control group on analytical review tests of trend and ratio analysis. The final questionnaire presented to participants in all three groups was a set of four questions related to analytical review procedures – two multiple-choice ratio analysis problems, a trend analysis problem and an open-ended ratio analysis problem. The trend analysis problem and the open-ended ratio analysis problems required the students to analyze the client’s background information and financial statements. These problems were more unstructured than the multiple-choice problems because the students had to process more information, discriminate useful information and filter out irrelevant information. This increased the complexity and difficulty of the questionnaire and allowed the researcher to evaluate the benefits of the training session on different analytical review skills from those taught during the training session.

Performance differences are not expected on the multiple-choice problems, representing basic knowledge of analytical review problems because all participants should have acquired this basic knowledge in their accounting classes. This expectation is formally stated as hypothesis one.

**H1:** Performance on questions related to general knowledge of analytical review procedures will not be significantly different between the control and treatment groups.

Training and practice with feedback should have a positive effect on the judgment accuracy of participants. Participants trained on analytical procedures, given opportunities to practice using analytical procedures and receiving immediate explanatory feedback after each decision, should perform better than participants who are given training and practice opportunities but no feedback. This expectation is formally stated as hypothesis two.

**H2:** Judgment accuracy will be greater for participants receiving training and practice with explanatory feedback (treatment 2) than for participants who receive training and practice without feedback (treatment 1).

Training and practice without feedback should not improve the judgment accuracy of participants. Without feedback, the participants are not actively involved in the learning experience, so training and practice alone will not improve judgment accuracy. This expectation is formally stated as hypothesis three.

**H3:** There will be no difference in judgment accuracy between participants receiving training and practice (treatment 1) and participants who receive no training or practice (control group).

## RESEARCH METHOD

### Participants

Participants for this study were 85 undergraduate students enrolled in the basic auditing course at a large public university in Singapore. Singapore university students are admitted to a degree program as a group based on standardized test scores and are eligible for admission only at the end of their high school equivalency exam. Participants for this study were second-year accounting majors with similar test scores on standardized entrance exams.

The auditing course was taught in four contact hours per week--a two-hour lecture to 450 students and a two-hour tutorial session with 25 students per class. For a study designed to test whether training, practice, and feedback are effective means of improving judgment accuracy in analytical procedures before the accountant enters the job market, student participants are more appropriate than more experienced auditors. This is because more experienced auditors would have already acquired practice and training in analytical procedures on the job. Students volunteered to participate in the study in exchange for the opportunity to learn more about analytical procedures.

The participants were randomly divided into three groups of 27, 29 and 29 students, referred to as control, treatment 1 and treatment 2, respectively.<sup>1</sup> The control group received *no training or practice* before completing the audit tasks. Treatment 1 received one hour *training and practice*, but

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<sup>1</sup> The participants were asked to report to a classroom to participate in the research project. As they arrived at the classroom, they were randomly assigned to one of three rooms (each room represented one of the three groups).

no feedback on the practice problems before completing the audit tasks. Treatment 2 received *one hour of training, practice and explanatory feedback* on analytical procedures before completing the audit tasks. All training and testing was done in a classroom setting. The three groups were given thirty minutes to complete the audit tasks. The effect of training, practice and feedback was assessed by the differences in performance between the three groups on the audit tasks.

### **Development of Training Material**

The multiple-choice questions used in the analytical review training for the treatment groups were developed based on a list of commonly expected accounting errors reported in Coakley and Loebbecke (1985, p. 236). From the Coakley and Loebbecke list, I selected material errors that occurred with the highest frequency in different transaction cycles. Table 1 provides a list of the errors. The errors used in the training material were overstated revenue, returned goods not counted in inventory, overstated revenue and cost of goods sold, capitalizing wage expense to inventory, and recording duplicate payments on accounts payable.

I then determined the impact of each error on four financial ratios – current ratio (current assets / current liabilities), inventory turnover (cost of sales / ending inventory), receivables turnover (sales / ending accounts receivable) and gross margin ratio ((net sales-cost of sales) / net sales). These four ratios were found by Libby (1985) to be used most commonly by auditors in performing ratio analysis. Consistent with Bonner and Walker (1994, p. 168), I set the expected values of all four ratios to be constant across the problems (current ratio = 2.5, inventory turnover = 4.4, receivables turnover = 5.5 and gross margin ratio = 0.4). Bonner and Walker (1994) used these expected values because they were representative of “typical” manufacturing companies.

In performing analytical procedures, the auditor would compare the unaudited ratio value (determined by the client) to the expected ratio value (based on the prior year audited financial statements). The unaudited value of each ratio was calculated based on the effects of the errors on the ratios. After calculating the unaudited ratio values, I adopted the fluctuation manipulations of Bonner and Walker (1994) as follows: (1) if the error had no effect on the ratio, the expected value was shown again; (2) if the ratios were not as expected, predetermined higher or lower numbers were presented; and (3) higher (lower) numbers were determined by adding (subtracting) 0.6 to the expected values for the first three ratios and 0.2 for the gross margin ratio. Pilot tests conducted indicate that these fluctuations were large enough to be perceived as unusual fluctuations.<sup>2</sup> Since the multiple choice questions have one right answer, judgment accuracy is determined by evaluating the multiple choice answer selected by the subject.

### **Training Session**

The training session for participants in the treatment groups lasted one hour. The participants were first given a brief lesson on the four financial ratios - current ratio, inventory turnover, receivables turnover and gross margin ratio. They were then introduced to the three main

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<sup>2</sup> The pilot tests involve a review of the ratios used in the training session by several students not involved in the experiment. The purpose of the pilot test was to determine that the ratio fluctuations were seen as potential errors by the students, to determine that the students understood the questions, and to evaluate the time needed to complete the exercise.

**TABLE 1**  
**Commonly Expected Accounting Errors**  
**in a Manufacturing Setting**

**Common Errors:**

- Failing to record collections on receivable.
- Recording sales and related cost of goods sold entries at year-end even though goods were not shipped.
- Failure to count all goods in warehouse resulting in an incorrect stock figure to be adjusted to the perpetual records (cost of goods sold correct).
- Recording payments on accounts payable twice.
- Recording too many items on the sales invoice and in sales while all shipping documents and inventories are done correctly.
- Goods returned by customers not counted in inventory although customer accounts were credited. The goods are still in good condition.
- Uncollectible accounts not written off.
- Goods received but purchase not recorded (assume periodic inventory system where ending stock balance is the stock count amount).
- Expensing items that should be recorded as prepaid.
- Recording tax accruals twice.
- Recording more hours than actually worked to manufacture a finished product later sold.

(Adapted from Coakley & Loebbecke 1985, p. 236)

components of analytical procedures - trend analysis, ratio analysis and reasonableness tests (as identified by Blocher and Willingham, 1988).

Five multiple-choice questions were used in the one-hour training session. Each multiple-choice problem had four possible answers. Each multiple-choice question was based on one specific error with the correct answer to the multiple choice question being the only choice that would explain all the ratio differences between the expected ratios and the unaudited ratios. For example, the training material included a set of ratios where the current ratio was overstated and the accounts receivable turnover ratio was understated (the unaudited ratios were different than the expected ratios). In this question, the inventory turnover ratio and the gross margin ratio were unchanged. The participants were given four choices of accounting errors that might have caused the differences between the actual and expected ratios: (1) too many items were recorded in the sales account, but all shipping and inventory entries were correct; (2) sales and cost of goods sold were recorded at year-end, although goods were not shipped; (3) uncollectible accounts were not written off; and (4) payments on accounts payable were recorded twice. Participants were asked to identify the error that could have caused the difference between actual and expected ratios. Participants in the group receiving immediate explanatory feedback were told that number 3 was the correct answer immediately after they answered the question. Then they were told that explanation 3 is the correct

answer because accounts receivable would be overstated when companies fail to write off uncollectible accounts. Sales, cost of goods sold and ending inventory would not be affected by failing to write-off uncollectible accounts. Therefore, the current ratio would be overstated and the accounts receivable turnover ratio would be understated.

For the training material, the multiple-choice questions were sequenced in order of increasing difficulty. In this sequence, answers to the more difficult questions included a higher number of nearly correct explanations (the answer explained most but not all of the ratio changes) than did the answers to the less difficult questions. Participants were given five minutes to do each multiple-choice question. Treatment 2 received immediate explanatory feedback after each question as described above. Treatment 1 answered the questions, but did not receive explanatory feedback. The control group did not participate in the training session.

### **Feedback for Treatment 2 Participants**

The format of multiple-choice questions facilitated the use of explanatory feedback for treatment 2 participants. Past research (e.g., Bonner and Walker, 1994) shows that performance in ratio analysis is enhanced by *practice with explanatory feedback*. This type of feedback provides an explanation of why the outcome occurred, not merely the correct answer. The conciseness of each multiple-choice question enabled the students to practice several questions during the training session. This made the explanatory feedback more manageable. Students were able to complete the questions quickly and received immediate explanatory feedback after each question. This was done because explanatory feedback may be more effective if provided without delay (Lewis and Anderson, 1985).

### **Evaluating Performance on the Audit Tasks**

The audit tasks were administered to the participants in a classroom setting. The treatment groups completed the audit tasks after the one-hour training session. The control group completed the audit tasks immediately without receiving training or the opportunity to practice analytical review problems.

The multiple-choice problems on the audit questionnaire were similar to the questions used in the training session and were developed according to the procedures previously described for training material. The errors used in the training sessions (overstated revenue, returned goods not counted in inventory, failure to write off uncollectible accounts, capitalizing wage expense to inventory, and recording duplicate payments on accounts payable) differed from the errors in the audit task questionnaire (understatement of ending inventory and overstatement of revenue and cost of goods sold).

For the open-ended questions, participants were given one page of background information on the company, the prior year's audited balance sheet and income statement, the current year's unaudited financial statements as prepared by the client, and the current year's projected financial statements as prepared by the auditor. The participants were told that this study was part of an experiment to determine how auditors perform certain audit tasks. They were asked to assume the role of an audit supervisor taking part in the continuing audit of a manufacturing company during the preliminary planning stage of the audit. The trend analysis task required participants to identify problem areas in the client prepared financial statements using trend analysis (comparing the current

year unaudited financial statements to the current year's projected financial statements prepared by the auditor). Three material errors were seeded into the financial statements (understated accounts receivable, understated cost of goods sold, and understated salary expense).

In the open-ended ratio analysis task, participants were given five ratios: the inventory turnover, accounts receivable turnover, gross margin ratio, current ratio and quick ratio, calculated based on the unaudited and expected financial information. Participants were asked to explain the divergence between the unaudited and expected ratios with a single accounting error. They were also asked to prepare necessary journal entries with hypothetical dollar amounts to correct the error so as to ascertain that they understood the implications and consequences of the error. A target explanation was obtained by seeding one error (unrecorded sales in a perpetual inventory system) causing a pattern of discrepancy between unaudited and expected financial ratios.

Performance was measured by the number of correct responses. The correct answers to the problems are known because all errors used in the study were deliberately seeded into the financial statements. For the multiple-choice tasks, a score of 0 or 2 points was given. The subject received a score of 2 for identifying the answer that explained the difference between unaudited and expected financial statement ratios. All other answers received a score of 0. Participants received a score of 0-4 for the trend analysis task (1 1/3 point given for each problem area identified). Participants received 4 points for the ratio task (0-2 for identifying the individual accounts affected by the error and 0-2 for listing the correct accounts in the journal entries.) The total score possible was 12 points.

The answers to the experimental tasks were reviewed by an independent grader familiar with analytical review procedures. The subject responses were scored by two markers independently. There were few differences in coding and all differences were resolved into a common scoring rule that was used in the analysis. Descriptive statistics for the performance scores are reported in Table 2.

## **RESULTS**

Hypothesis 1 predicts that performance will be the same for the control and treatment groups on the general knowledge questions. To test hypothesis 1, ANOVA analysis was used to determine if the performance score difference on the multiple-choice questions between the three groups was significant. Results of the analysis are reported in Table 3, Panel A.

As shown in Table 3, hypothesis 1 is confirmed. Subject performance in the multiple choice analytical procedures does not vary between the three groups ( $p=.258$ ,  $F=1.376$ ). This indicates that student performance on multiple-choice tasks does not vary based on the level of training the students received. Given the education environment in Singapore, this result is not surprising. Singapore students are trained to memorize facts and rules and are expected to perform well at multiple-choice questions testing their application of these facts. Performance differences between training levels were not expected on the multiple-choice tasks.

Subject performance for the analytical review tasks (trend analysis, and ratio analysis) is shown in Table 3, Panels B and C. We would not expect student performance on trend analysis and ratio analysis tasks to be the same among the three groups. Identifying financial statement errors based on trend and ratio analysis requires an understanding of the error situation beyond memorized facts. As shown in Table 3, Panel B, student performance on the trend analysis task is not the same among the three groups ( $p=.065$ ,  $F=2.825$ ). Task performance on the trend analysis task differs by

**TABLE 2**  
**Descriptive Statistics**  
**Performance Variables**

**Cell Means for Multiple Choice, Trend Analysis and Ratio Analysis by Training Level**

<u>Measure</u>	<u>Score Possible</u>	<u>Treatment 2 Training, Practice &amp; Feedback</u>	<u>Treatment 1 Training, Practice</u>	<u>Control Group No Training or Practice</u>
Multiple Choice	4	2.74	2.14	2.21
Trend Analysis	4	2.17	1.52	1.79
Ratio Analysis	4	1.54	.74	1.07
Total Score	12	6.45	4.40	5.07

training level. Performance differences are also found for the ratio analysis task. As shown in Table 3, Panel C, task performance differs by training level on the ratio analysis task ( $p=.037$ ,  $F=3.426$ ). Student performance on the ratio analysis task is not the same among the three groups. These significant differences will be examined in the following section to determine the impact of training, practice and feedback on judgment accuracy.

A comparison of the significant performance differences by training level is examined in Table 4. Because performance is not the same among the three training groups, it is necessary to examine performance differences across all combinations of training levels to determine if training and practice without feedback improves performance or whether feedback is necessary for improved performance. This analysis allows us to evaluate the predictions stated as hypothesis 2 and 3. Hypothesis 2 predicts that judgment accuracy is greater for participants receiving training, practice and feedback (treatment 2) than for participants who receive only training and practice (treatment 1). As shown in Table 4, hypothesis 2 is confirmed. Participants receiving training, practice and feedback opportunities in analytical procedures outperformed participants who received only training and practice ( $p=.0007$ ). Hypothesis 3 predicts that there will be no differences in judgment accuracy between participants receiving training and practice (treatment 1) and participants who receive no training or practice (control group). As shown in Table 4, hypothesis 3 is confirmed. There is no difference in performance between participants who receive training and practice opportunities and participants who receive no training or practice ( $p=.1321$ ).

In the tasks where performance was significantly different among the three groups (trend analysis and ratio analysis), the greatest difference between the group receiving training and practice with feedback (treatment 2) and the group receiving only training and practice (treatment 1) is the performance level for the ratio analysis tasks ( $p=.0058$ ). These tasks are the most difficult analytical problems to solve. Because treatment 2, the training and practice with feedback group, outperformed

**TABLE 3**  
**Anova Analysis**  
**Performance by Level of Training**

**Analysis of Variance: Performance Score on Multiple Choice by Training Level**

Panel A

	<u>df</u>	<u>SS</u>	<u>F Stat</u>	<u>P-Value</u>
Training	2	6.020	1.376	.258
Error	82	179.392		

Panel B

	<u>df</u>	<u>SS</u>	<u>F Stat</u>	<u>P-Value</u>
Training	2	6.057	2.825	.065*
Error	82	87.902		

Panel C

	<u>df</u>	<u>SS</u>	<u>F Stat</u>	<u>P-Value</u>
Training	2	8.912	3.426	.037**
Error	82	106.635		

\*\* Significant at .05 level

\* Significant at .10 level

treatment 1, the training and practice group, it is here that the benefits of feedback are the most evident. Singapore students in treatment 2 learned how to perform analytical procedures from the feedback they received during the practice session. The training and practice group received the same training and practice opportunities, but no feedback. Their performance did not improve as a result of the training and practice, so feedback seems to be the key to performance improvement.

Additional analysis of the results led to some interesting findings. Table 5 presents score distributions for the control and treatment groups. The range of scores for treatment 2 (training and practice with feedback) is 3.33 to 10.67, while treatment 1 (training and practice without feedback)

**TABLE 4**  
**Group Comparisons for Performance Variables**

**P-Values for Difference Scores for Group Comparisons**

Group Comparisons	P-Values for Differences		
	Trend Analysis	Ratio Analysis	Total Score
Treatment 1 & 2	.0107***	.0058***	.0007***
Treatment 2 & Control	.0873**	.0654**	.0136***
Treatment 1 & Control	.1573	.1387	.1321

Control - no training or practice  
 Treatment 1 - training and practice without feedback  
 Treatment 2 - training and practice with feedback

\*\*\* Significant at .01 level  
 \*\* Significant at .10 level

scored between 0 and 8, and the control group (no training or practice) scored between .5 and 10.67. Although the lowest score of the training/ practice/ feedback group was higher than the lowest score of the non-training group, the highest score for the training group was no higher than the highest score for the non-training group.

#### IMPLICATIONS AND FUTURE RESEARCH OPPORTUNITIES

The current research project was conducted in one of the established Singapore universities to investigate the effectiveness of United States teaching and assessment methods on students whose prior experience has been in classroom settings shaped by structured British education methods. Specifically, the study was designed to determine whether adding immediate feedback and practice opportunities to the learning experience results in improvement in the analytical review skills of Singaporean accounting students. Conducting this experiment in a setting like Singapore, where students have not yet been exposed to this method of instruction, provides an ideal opportunity to observe the impact of training and feedback for specific tasks of analytical procedures. What is more, given the educational agenda of the Singapore universities' switch to United States teaching methods, research efforts to evaluate the effectiveness of new assessment techniques in the Singapore environment are crucial and timely. The particular audit task considered in the study is a common audit procedure used by accountants to gather evidence. Preparing students to accurately perform analytical procedures that are common to the profession should be an important goal of the education process. If the education system improves student performance on analytical review procedures, students develop a valuable skill for their role as accountants.

**TABLE 5**  
**Score Distribution by Training Level**

**Score Distribution for Total Performance by Training Level**

<u>Measure</u>	<u>Treatment 2</u> <u>Training, Practice</u> <u>&amp; Feedback</u>	<u>Treatment 1</u> <u>Training,</u> <u>Practice</u>	<u>Control Group</u> <u>No Training or</u> <u>Practice</u>
Minimum Score	3.33	0.00	.50
Maximum Score	10.67	8.00	10.67
Mean Score	6.45	4.40	5.07
Median Score	6.33	4.00	4.67
Standard Deviation	2.22	2.06	2.49

Participants receiving training and practice combined with feedback outperformed participants who received only training and practice as well as the participants with no training or practice opportunities. This improvement in performance was based on a short feedback session, suggesting that effective feedback can have a demonstrable impact in a short time. Teaching methods that combine practice with brief feedback opportunities may be an effective way to improve judgment accuracy for inexperienced participants. The finding that students who received training and practice performed at a lower level than students who received no training or practice is consistent with prior studies of feedback results in the United States educational setting. Training and practice improves judgment accuracy only when the subject learns from the process (e.g. Hirst et al., 1999). Feedback is an effective method of improving performance because it allows the subject to correct earlier misunderstandings that developed during the lecture process. Providing feedback in the classroom can be done fairly quickly, with little expenditure of classroom time.

This research finding supports previous research that demonstrates that training with explanatory feedback improves students' performance. Accounting educators and public accounting firms may find that training and practice with explanatory feedback will achieve better learning than current non-feedback methods. The learning process-whether in the university setting or in the staff development of an accounting firm-may be enhanced by the addition of feedback. If the combination of training, practice and feedback improves students' performance in analytical review, not only does it indicate that analytical review skills can be taught effectively, but also that these skills can be learned during the university development process and through the early training experiences in auditing firms.

While learning occurs under a variety of education systems, feedback may be used effectively in the classroom to shorten the time needed to master a task. The teacher who is trained in the use of feedback can devote class time more efficiently to skills that students have not yet mastered. This allows the teacher to devote more classroom time to cover skills where students need practice and

feedback and less classroom time to areas where feedback indicates that student learning has occurred.

This study raises several questions that might be considered in future research projects. Training with feedback was limited to a one-hour session so that participants would volunteer for a brief commitment of time. Longer sessions or more frequent training and feedback may result in even greater improvement in judgment accuracy. It would be interesting to determine whether knowledge or intelligence level differences, or factors such as gender or grade point average are associated with better performance. Since the current study was exploratory in nature, the sample size was limited to 85 students. Although significant results were obtained with the current sample size, the sample size might be expanded in a follow-up study. One might ask, if feedback is effective in the accounting setting in improving judgment accuracy, is feedback also a useful tool to increase learning in other business disciplines? The design of future research might answer these questions.

### REFERENCES

- Bell, T. B., and A. M. Wright. 1997. When Judgment Counts. *Journal of Accountancy* (Vol. 184, No. 5) 73-76.
- Blocher, E., and J. J. Willingham. 1988. *Analytical Review - A Guide to Evaluating Financial Statements*. (New York, NY: McGraw-Hill).
- Bonner, S. 1994. A Model of the Effects of Audit Task Complexity. *Accounting, Organizations and Society* (Vol. 19, No. 3) 213-234.
- Bonner, S. 1999. Judgment and Decision-Making Research in Accounting. *Accounting Horizons* (Vol. 13, No. 4) 385-398.
- Bonner, S. E., and N. Pennington. 1991. Cognitive Processes and Knowledge as Determinants of Auditor Expertise. *Journal of Accounting Literature* (Vol.10) 1-50.
- Bonner, S. E., and P. L. Walker. 1994. The Effects of Instruction and Experience on the Acquisition of Auditing Knowledge. *The Accounting Review* (Vol. 69, No. 1) 157-178.
- Brehmer, B. 1980. In One Word: Not from Experience. *Acta Psychologica* (Vol. 45) 223-241.
- Coakley, J. R., and J. K. Loebbecke. 1985. The Expectation of Accounting Errors in Medium-Sized Manufacturing Firms. *Advances in Accounting* (Vol. 2) 199-246.
- Cohen, D. 1999. United States Replaces Britain as Singapore's Higher-Education Model. *The Chronicle of Higher Education* (November 5) A62-A63.
- Hirst, M., P. Luckett, and K. Trotman. 1999. Effects of Feedback and Task Predictability on Task Learning and Judgment Accuracy. *Abacus* (Vol. 35, No. 3) 286-301.
- Hirst, D. E., and L. Koonce. 1996. Audit Analytical Procedures: A Field Investigation. *Contemporary Accounting Research* (Vol. 13, No. 2) 457-486.
- Hylas, R. E., and R. H. Ashton. 1992. Audit Detection of Financial Statement Errors. *The Accounting Review* (Vol. 57, No. 4) 751-765.
- Lewis, M. W., and J. R. Andersen. 1985. Discrimination of Operator Schemata in Problem Solving: Learning from Examples. *Cognitive Psychology* (Vol. 17, No. 1) 26-65.
- Libby, R. 1985. Availability and the Generation of Hypotheses in Analytical Review. *Journal of Accounting Research* (Vol. 23, No. 2) 348-367.