

DEPLOYING FORMATIVE ASSESSMENT IN ACCOUNTING PRINCIPLES

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Most accounting instructors spend a significant amount of time on summative assessment when evaluating students. However, less attention is afforded formative assessment of student learning as a diagnostic tool that provides feedback for decisive instructional intervention. Documentation of formative classroom assessment can be of value to instructors who wish to show tenure committees that activities to improve instruction are taking place. In fact, this study was initially undertaken as a response to such a request by the author's tenure committee and now serves as the basis for an ongoing dynamic assessment plan that provides valuable feedback for instructional improvement. Institutionally, requirements are in place to administer student evaluations of instructors near the end of each course. Results of the student evaluations are provided to faculty upon completion of the semester and while these ratings are used by instructors for formative purposes, they are also used by administrators when evaluating faculty. This study attempts to lay the ground work for an effective formative assessment plan that augments the institutional student ratings and provides evidence driving constructive classroom instruction.

The process and results of several formative assessment techniques administered to accounting principles students at a small, baccalaureate institution during the course of two semesters are reported in this study. Accounting Principles I and Accounting Principles II are two three-credit courses comprising the year-long introductory sequence of accounting where the study took place. Open to anyone meeting the course prerequisites, the majority of students enrolled are business management majors along with a sprinkling of accounting majors. While not purporting to identify optimal instructional methodology, this study provides a plan that may be replicated by faculty wishing to document formative assessment for a number of reasons including institutional initiatives such as annual review, accreditation, or promotion and tenure.

FORMATIVE ASSESSMENT TECHNIQUES

Three formative assessment techniques were chosen and developed specifically for this study. Two of the assessment techniques were administered over consecutive semesters in order to increase sample size and improve credibility of the measurement. These techniques are briefly described as follows:

- A series of four Defining Features Matrices (see Appendix, Figures 1-4) were administered to students over the course of the first and second introductory accounting courses at various intervals in an effort to document topics in need of instructional improvement. Results of these data have been tabulated and analyzed.
- Mid-semester feedback forms (see Appendix, Figure 5) were completed by students to gain knowledge of their opinions regarding the introductory accounting courses. The student comments were analyzed and organized by major theme in order to determine whether such opinions warranted possible modification of classroom teaching methodology.
- As a means to determine test reliability, a statistical measure was chosen and used on test result data. Cronbach's alpha is a coefficient of reliability utilized to determine whether acceptable internal test reliability existed for three selected tests in accounting principles.

Each technique is discussed further along with consideration of the data collected for analysis purposes. Concluding remarks and future considerations concerning the assessments are also presented.

Defining Features Matrix

The Defining Features Matrix technique is designed to assess students' skills at distinguishing between apparently similar concepts (Angelo & Cross, 1993). This technique allows instructors to quickly assess how well students can distinguish between similar but not identical concepts thereby isolating areas for further instructional concentration and clarification. Many topical areas in accounting require knowledge and skill at distinguishing between closely related concepts so this assessment technique appeared to be a good fit for the accounting courses. Four Defining Features Matrices were developed to align with certain topical areas of concern in accounting principles. Two of the matrices were administered to students enrolled in the first principles course while the other two were given to students in the second course. Students were not allowed to use notes or textbooks in completing the forms. Although students must take the courses sequentially, both courses are offered concurrently during spring and fall semesters thereby allowing for the administration of all matrices each semester.

The first Defining Features Matrix appears as Figure 1 in the Appendix. This matrix considers the topic of deferrals and accruals usually covered at about the third or fourth week into the first accounting course. Table 1 reports the corresponding data in terms of number and percentage of incorrect responses for each item. Consistent with how the matrix was originally designed; the table begins with item number two as the first feature eliciting a response by the student.

[Insert Table 1 here]

A threshold for instructional intervention was established for items exceeding a 30% incorrect response rate. Table 1 reports six of the ten items exceeding that threshold level. Overall, this is an indication that many of the differences between deferrals and accruals were unclear and indistinguishable to the students. Because of the high rate of incorrect responses, revamping coverage of the entire topic rather than isolating specific items for clarification might be the most appropriate course of action.

The second Defining Features Matrix (see Appendix, Figure 2) considered the topical area of uncollectible accounts receivable and, more specifically, the difference between estimates based on sales versus analysis of accounts receivable. Perceived as a difficult topic for first semester accounting students to grasp, results were slightly better than the initial matrix regarding accruals and deferrals. Table 2 reports the data for uncollectible accounts and indicates that three items exceed the 30% threshold established as an unacceptable level of response.

[Insert Table 2 here]

Upon completion of each topic, Accounting II students were also asked to complete two Defining Features Matrices (see Appendix, Figures 3 and 4) from which to gauge the amount of learning that was taking place. The first matrix required students to distinguish between methods of analysis based upon the ability of a firm to meet its financial obligations (solvency) versus various earnings measures (profitability) of the enterprise. Table 3 presents the data in similar fashion and illustrates that item numbers 9 and 11 exceeded the established acceptable rate of 30% being used as a benchmark. Those particular items will be considered for further elaboration via clarification or modification of teaching methods while covering the topic.

[Insert Table 3 here]

The second Defining Features Matrix administered to the Accounting II classes considered product costing systems where students are to distinguish between a job order cost system and a process cost system. Of the ten questions, three were in excess of the 30% incorrect response rate threshold so those items will be selected for further clarification. Table 4 presents the results of that matrix.

[Insert Table 4 here]

Based on data from the matrices, the Accounting II students do a better job of correctly distinguishing between items that were apparently quite similar when compared to Accounting I students. Results for first semester students on matrix one and two indicate composite incorrect response rates of 34% and 33% while Accounting II students performed at 24% and 23% respectively. Higher performance by second semester students was anticipated when considering the level of critical thinking that the students have demonstrated through almost two semesters of accounting. A comparison of overall results between first and second semester students appears to lend some credence to that notion.

Mid Semester Feedback Forms

Mid semester feedback forms were administered to all students in accounting principles courses. The forms were limited to a simple two-question format and appear as Figure 5 in the appendix. The two questions posed to the accounting students were:

1. How is this class going (What is going well or not so well)?
2. What could the instructor do to improve the class?

A survey of Accounting I students over two semesters resulted in a sample size of 62 while a similar survey of Accounting II students resulted in a sample of 84 respondents. Responses were first transferred to a worksheet and reviewed for content as to general themes. Several themes were identified and the individual statements were coded and categorized as to similarity.

Tables 5 and 6 summarize results pertaining to question 1 and question 2 by major theme for the first semester accounting principles students.

[Insert Tables 5 and 6 here]

Tables 7 and 8 summarize results pertaining to question 1 and question 2 by major theme for the second semester accounting principles students.

[Insert Tables 7 and 8 here]

The first question produced similar results from both groups with 63% and 64% positive, 23% and 26% negative, and 14% and 10% indifferent responses respectively. Overall, nearly two-thirds of the students responded positively that the class was going well.

While the top three response categories of “do nothing”, “collect more homework”, and “cover material before it is assigned” were similar for both groups when responding to the second question, there were notable differences in other themes that emerged from this second question. In particular, while 13% of Accounting I students indicated they wanted more in-class work and participation, the Accounting II students did not mention this option. Rather, 10% of the Accounting II students indicated they felt the difficulty level could be reduced, whereas, this was not articulated by the Accounting I students.

Test Reliability

Hanna and Dettmer (2004) suggest that test reliability relates to consistency of measurement and is a major consideration in developing effective classroom tests. Cronbach’s alpha, a coefficient of reliability, was utilized to determine whether acceptable internal consistency exists for three tests in accounting principles. The Statistical Package for the Social Sciences (SPSS) software was used to analyze results of two tests in Accounting Principles I and results of one test in Accounting Principles II. Related output from SPSS is shown in Table 9.

[Insert Table 9 here]

Alpha, here depicted as a reliability coefficient, measures internal consistency regarding the overall test construct. Numbers close to 1.00 are deemed as consistent and highly reliable, whereas, values close to 0.00 are inconsistent and unreliable (Cronk, 2004). George and Mallery (2007) offer a rule of thumb for acceptable classroom tests as an alpha coefficient higher than .70. Alpha values for all of the selected tests exceeded this value, falling into a range of .704 to .866.

In addition to the overall alpha value, SPSS provided individual item-total correlation values along with the alpha values if the item was deleted from the test. Negative item-total correlation values would indicate an improvement to alpha if the item was removed. For the two tests in Accounting I, only one question on each test contained a negative item-total correlation value and it was found that removing those specific test items (questions) would increase the alpha, or reliability, insignificantly. The Accounting II test data indicated that there were five item-total correlation values that were negative. Removal of those five items from the 45 item exam increased the alpha value from .704 to .736.

CONSIDERATION OF FINDINGS FOR FUTURE INSTRUCTION

Results of the initial Defining Features Matrix administered to the Accounting I students were disappointing but provided a fair amount of feedback from which to make instructional changes. The information revealed that six of the ten questions were answered unsatisfactorily by exceeding the assigned threshold of 30% incorrect responses. The second matrix was slightly better, but was still below expectations of what the students should be able to accomplish at that point in the course. For both topics, formative changes to instruction appear warranted. In particular, poor results from the deferral/accrual topic might indicate that wholesale changes in methodology or a total revamping of the subject should be considered. Given the large number of non-accounting majors in this course, perhaps a more general approach to the topic needs to be considered.

Accounting II students appear to be better prepared than Accounting I students to distinguish between concepts where there were only slight differences. Therefore, there are no plans at wholesale change of either teaching methods or content as measured by the matrices, but efforts at clarifying the few features that seem to present the most problems are being addressed.

A positive note emerging from administration of the Defining Features Matrices is that students appear to be improving in critical thinking as they progress sequentially through the accounting courses. Albeit limited to the few selected topics studied, the idea that second semester accounting students have more skill than the first semester students at dealing with diverse issues that are not always obvious seems plausible. Additionally, because of the useful feedback obtained from the Defining Features Matrices, this method of collecting data regarding student learning has been expanded and now includes topical areas not initially included in the study.

Regarding the mid-semester feedback, while 24% indicate that doing nothing is appropriate, nearly as many, or 23% of the first semester students were concerned with the limited amount of homework that was being collected. Further analysis of this response indicates that most students would like to see more of their total grade based on daily work rather than such a heavy emphasis on tests. Based on this feedback, electronic online submission of homework was implemented for both first and second semester accounting with credit given for everything submitted. Although final grades are still heavily weighted to exams, student satisfaction has increased because they receive credit for what they do as opposed to receiving recognition only at random homework collection points as was the case at the time of this study. Two other notable student concerns recommended covering material in class before it is assigned (17%) and additional in-class participation (13%). Both of these issues have been and will continue to be high priority items addressed in subsequent classes.

Test reliability information obtained by selecting a sample of the accounting tests lends some assurance that the measurement instruments being used are suitable. The data all fall above the .70 alpha levels generally considered acceptable for classroom tests. With iterative experimentation, some additional reliability could probably be achieved. However, one must weigh the cost-benefit factor into this when considering the additional time needed to complete such an undertaking for potentially small, incremental improvements in consistency.

Table 1. Defining Features of Deferrals and Accruals

<i>Item number</i>	Spring, N=25		Fall, N=46		Total, N=71	
	Number of incorrect responses	Percentage of incorrect responses	Number of incorrect responses	Percentage of incorrect responses	Number of incorrect responses	Percentage of incorrect responses
<i>2</i>	3	12	7	15	10	14
<i>3</i>	4	16	4	9	8	11
<i>4</i>	9	36	24	52	33	46
<i>5</i>	12	48	19	41	31	44
<i>6</i>	18	72	22	48	40	56
<i>7</i>	8	32	17	37	25	35
<i>8</i>	17	68	22	48	39	55
<i>9</i>	5	20	7	15	12	17
<i>10</i>	1	4	6	2	7	10
<i>11</i>	12	48	23	50	35	49

Table 2. Defining Features of Allowance Method for Uncollectible Accounts Receivable

<i>Item number</i>	Spring, N=24		Fall, N=40		Total, N=64	
	Number of incorrect responses	Percentage of incorrect responses	Number of incorrect responses	Percentage of incorrect responses	Number of incorrect responses	Percentage of incorrect responses
<i>2</i>	4	17	10	25	14	22
<i>3</i>	8	33	6	15	14	22
<i>4</i>	4	17	10	25	14	22
<i>5</i>	11	46	19	48	30	47
<i>6</i>	6	25	12	30	18	28
<i>7</i>	7	29	7	18	14	22
<i>8</i>	10	42	9	23	19	30
<i>9</i>	6	25	9	23	15	23
<i>10</i>	13	54	28	70	41	64
<i>11</i>	7	29	26	65	33	52

Table 3. Defining Features of Solvency and Profitability Analysis

<i>Item number</i>	Spring, N=80		Fall, N=18		Total, N=98	
	Number of incorrect responses	Percentage of incorrect responses	Number of incorrect responses	Percentage of incorrect responses	Number of incorrect responses	Percentage of incorrect responses
<i>2</i>	7	9	3	17	10	10
<i>3</i>	9	11	6	33	15	15
<i>4</i>	14	18	3	17	17	17
<i>5</i>	13	16	4	24	17	17
<i>6</i>	15	19	1	6	16	16
<i>7</i>	23	29	5	28	28	29
<i>8</i>	13	16	5	28	18	18
<i>9</i>	43	54	12	67	55	56
<i>10</i>	19	24	10	56	29	30
<i>11</i>	23	29	7	39	30	31

Table 4. Defining Features of Product Cost Systems

<i>Item number</i>	Spring, N=63		Fall, N=17		Total, N=80	
	Number of incorrect responses	Percentage of incorrect responses	Number of incorrect responses	Percentage of incorrect responses	Number of incorrect responses	Percentage of incorrect responses
<i>2</i>	5	8	5	29	10	13
<i>3</i>	24	38	12	71	36	45
<i>4</i>	10	16	2	12	12	15
<i>5</i>	7	11	5	29	12	15
<i>6</i>	6	10	4	24	10	13
<i>7</i>	13	21	5	29	18	23
<i>8</i>	30	48	5	29	35	44
<i>9</i>	8	13	4	24	12	15
<i>10</i>	20	32	5	29	25	31
<i>11</i>	14	22	3	18	17	21

Table 5. Responses of Accounting I Students to Question 1

Theme	N	%
Positive response – class going well	39	63
Negative response – class not going well	14	23
Indifferent response – not sure	9	14
Totals	62	100

Table 6. Responses of Accounting I Students to Question 2

Theme	N	%
Nothing – do nothing different	15	24
Collect more homework for more points	14	23
Cover material before it is assigned	10	17
Increase in-class work and participation	8	13
Slow down – moving too fast	3	5
Conduct review for tests	2	3
More problems on tests	2	3
Other – miscellaneous	8	13
Totals	62	100

Table 7. Responses of Accounting II Students to Question 1

Theme	N	%
Positive response – class going well	54	64
Negative response – class not going well	22	26
Indifferent response – not sure	8	10
Totals	84	100

Table 8. Responses of Accounting II Students to Question 2

Theme	N	%
Nothing – do nothing different	20	24
Collect more homework for more points	15	18
Cover material before it is assigned	13	15
Reduce test or course difficulty	8	10
Unsure as to what could be done	5	6
Conduct review for tests	3	4
More problems on tests	2	2
Other – misc. including no comments	18	21
Totals	84	100

Table 9. Statistical Output from SPSS

Course/Test	Cases (students)	N of items (questions)	Cronbach's alpha
Accounting I Test I	50	49	.866
Accounting I Test II	49	45	.781
Accounting II Test I	53	45	.704

References

- Angelo, T. A., Cross, K. P. (1993). *Classroom assessment techniques: a handbook for college teachers*. San Francisco: Jossey-Bass.
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- George, D., Mallery, P. (2007). *SPSS for Windows step by step: A simple guide and reference. 14.0 update* (7th ed.). Boston: Pearson Education, Inc.
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APPENDIX

Figure 1

Defining Features of Deferrals and Accruals

Instructions: After reading each feature, place a + in the column that the feature most clearly describes and place a – in the column that the feature does not describe. The first item is shown.

Features	Deferred Items	Accrued Items
1. Literally means to bring into existence.	–	+
2. Data previously recorded is modified via an adjusting journal entry.		
3. Data not previously recorded is entered into the accounting system via an adjusting journal entry.		
4. Typically can be thought of as “receivables” and “payables”.		
5. A debit to an asset account and a credit to a revenue account.		
6. A debit to an expense account and a credit to a liability account.		
7. Initially, an entry may be to a “prepaid account”.		
8. An “unearned revenue” account is used.		
9. Previously recorded data.		
10. New data.		
11. Salary expense that is unpaid.		

Figure 2

Defining Features of Allowance Method for Uncollectible Accounts Receivable

Instructions: *After reading each feature, place a + in the column that the feature most clearly describes and place a – in the column that the feature does not describe. The first item is shown.*

Features	Estimate Based on Sales	Estimate Based on Analysis of A/R's
1. The estimate for uncollectible accounts receivable is added to any balance in the allowance account.	+	–
2. The estimate for uncollectible accounts receivable is compared to the balance in the allowance account to determine the adjusting entry.		
3. Concerned primarily with length of time an account receivable is outstanding.		
4. Concerned primarily with the amount of credit sales for a period of time.		
5. Does not consider the current balance in the allowance account when adjusting.		
6. An aging schedule will be prepared.		
7. Will require more analysis of the A/R balances.		
8. Emphasizes the current net realizable value of the A/R's.		
9. Emphasizes the matching of uncollectible accounts expense with related sales for the period.		
10. Considered a Balance Sheet approach.		
11. Considered an Income Statement approach.		

Figure 3

Defining Features of Solvency and Profitability Analysis

Instructions: *After reading each feature, place a + in the column that the feature most clearly describes and place a – in the column that the feature does not describe. The first item is shown.*

Features	Solvency	Profitability
1. The ability of a business to meet its financial obligations.	+	–
2. Earnings per share on common stock		
3. Inventory analysis		
4. Current position analysis		
5. Price-earnings ratio		
6. Rate earned on total assets		
7. Inventory turnover		
8. Acid test ratio		
9. Relationship between operating results and the resources available		
10. Working capital		
11. Margin of safety to creditors		

Figure 4

Defining Features of Product Cost Systems

Instructions: *After reading each feature, place a + in the column that the feature most clearly describes and place a – in the column that the feature does not describe. The first item is shown.*

Features	Job Order Cost System	Process Cost System
1. Uses separate work in process accounts for each department.	–	+
2. Job cost sheets serve as subsidiary records.		
3. Generally, uses one control work in process account.		
4. Typically, uses large machines to transform a flow of materials.		
5. Usually used when special order products produced.		
6. Usually used for continuous production of like-kind products		
7. Units are moved through production under a FIFO assumption.		
8. Professional service firms might also use this method.		
9. Likely to be used in “made to order” shops.		
10. Overhead is likely applied based on machine hours.		
11. Uses Cost of Production reports to convey information to management.		

Figure 5

**Accounting 2101
Mid Semester Feedback**

Name: _____ (Optional)

How is this class going (What is going well or not so well)?

What could the instructor do to improve the class?

**Accounting 2102
Mid Semester Feedback**

Name: _____ (Optional)

How is this class going (What is going well or not so well)?

What could the instructor do to improve the class?