

Measuring the Value Added to Student Knowledge with the ISA Exam

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Abstract

The goal of this research is to measure the "value added" to the student's information system knowledge by a Computer Information System program. Students taking the first required course in the Computer Information System program are compared to those taking the Computer Information System capstone course at the end of the program, using the results of the Information Systems Analyst exam. This measure of value added provides a mechanism for assessment of program outcomes, which is useful for ABET and other accreditation.

Keywords: Knowledge Value-Added, Assessment, Accreditation, ABET, Information Systems Analyst Exam

1. INTRODUCTION

The Information Systems Analyst (ISA) Assessment Exam has been available since 2003 (Landry 2003, McKell 2004, McKell 2005). The ISA exam allows students completing an undergraduate degree to earn a certificate from the Institute for Certification of Computing Professionals (ICCP; www.iccp.org), a provider of vendor neutral certification for those in the Information Systems field. The exam was developed by the Center for Computing Education Research (CCER), a division of the Institute for Certification of Computing Professionals (ICCP) Education Foundation.

The exam questions map to the IS 2002 model curriculum for undergraduate Information Systems (IS) departments (Gorgone 2003). CCER identifies six IS core areas

covered by the exam: (1) Analysis and Design, (2) Role of IS in Organizations, (3) Data Management, (4) Networking and Telecommunications, (5) Modern Programming Language, and (6) Hardware and Software. The questions can also be mapped to the ABET program outcomes which makes the ISA exam a valuable objective, external assessment tool (i.e. <http://www.abet.org>).

Currently assessment is one of the highest priorities in higher education. For example, one recommendation from the Spellings Report (U.S. Department of Education, 2006) is that

"The results of student learning assessments, including value-added measurements that indicate how students' skills have improved over time, should be made available to students and reported in the aggregate publicly. Higher education insti-

tutions should make aggregate summary results of all postsecondary learning measures, e.g., test scores, certification and licensure attainment, time to degree, graduation rates, and other relevant measures, publicly available in a consumer-friendly form as a condition of accreditation.”

Assessment is a vital component for accreditation

(<http://www.abet.org/assessment.shtml>).

The ISA exam is critical to any CIS Department, but especially to those undergoing re-accreditation which is the case with our department. Our Computer Information Systems (CIS) department at Metropolitan State College of Denver (MSCD) is part of a school of Business, with about 400 CIS majors. Our institution has been using this exam since the fall of 2004. A summary of the results can be found at isa.shtml.

CIS 2010*	Computer Applications for Business
CIS 2110	Structured Problem Solving
First ISA Exam	
CIS 3050	Fundamentals of System Analysis and Design
CIS 3060	Database Management Systems
CIS 3145	Business Application Development with Visual Basic
CIS 3230	Telecommunication Systems and Networking
CIS 4050	Systems Analysis and Design

Figure 1
Required Course Sequence

* This course is not a CIS major requirement but is a prerequisite for CIS 2110.

Figure 1 shows the sequence of courses that are required of all CIS majors. CIS 2010 is required of all students in the School of Business Bachelors of Science program, of which CIS majors are one of five majors. CIS 2110 is a gateway course required be-

fore taking any of the required upper division courses. The 3000 level courses can be taken in any order, but are all prerequisites for the CIS 4050 capstone course.

The ISA exam is a requirement for completion of the capstone course (CIS 4050) and has been since the Fall of 2004. In the Fall of 2008 and the Spring of 2009, the exam was offered to students completing the CIS 2110 course, Structured Problem Solving. The strategy was to compare the students' score as they entered the CIS program, with their score after taking the core of the CIS program courses.

The main research question is: Does the CIS program add value to the student's knowledge of information systems as indicated by their ISA exam results?

2. METHODOLOGY

Students in both courses are informed that the ISA exam is a standardized test presented by the ICCP and the CCER, and that any student scoring 50% or higher on the exam earns an Information Systems Analyst (ISA) Practitioner certification once they complete an undergraduate degree. As indicated in the section 3 below the data from the ISA exam for CIS 2110 and CIS 4050 students is compared and analyzed and also compared to national averages.

In the CIS 2110 course the ISA exam is optional. To persuade/entice the CIS 2110 students to take the three hour exam instructors provide an opportunity for students to improve their course grades based on their ISA exam score. The score a student receives on the ISA exam is curved and then applied to improve one of the course grade component areas including lowest homework score, quiz score, or project score depending on which improves the student's overall grade average the most. They are also told that the exam will be given during the CIS 4050 course, and that the exam is used to gauge their IS knowledge at the end of the CIS program.

In the CIS 4050 course the ISA exam counts as an exam and the student cannot pass the course without taking the exam.

3. DATA

The data in Table 1 (see appendix) provides a measure of how our students scored overall on the ISA exam, and how that compares to all the students who took the exam nationally. These scores are part of the standard report generated by the CCER ISA exam website.

Historically an average of 61% of MSCD students score 50% or better, qualifying for the ISA certification. Since the ISA exam is based on the IS 2002 Model Curriculum (McKell 2005) this is a clear indication that students graduating from MSCD have gained a level of proficiency in the IS 2002 curriculum.

Table 2 below is a summary of the results.

	CIS 2110	CIS 4050	Difference
Average	48.3	57.9	9.6
Std Dev	10.6	12.5	
Median	47.3	59.9	
N	45	48	
Number 50% +	20	36	
Percent	44.4%	75.0%	30.6%

Table 2

CIS 2110 and CIS 4050 Compared

In the Fall 2008 / Spring 2009 semesters 93 CIS students took the ISA exam and 48 of these were in CIS 4050 and 45 were in CIS 2110. The students completing the senior capstone course, CIS 4050 score almost 10 points higher than the students in CIS 2110, the first required course for CIS majors. A two-sample independent t-test shows that this is a significant difference ($t = -4.01$, $p = 0.000$). The number of students showing a passing score of 50% or better in the ISA exam is 44% of the CIS 2110 students and 75% of the CIS 4050 students.

4. ANALYSIS

There is a clear difference in the results of students taking the exam early in the major versus at the end of the major. The CIS 4050 students score 10 points higher and 30% more get a passing score than the CIS 2110 students. In addition the box plot (Figure 2) shows that the two courses differ in the distribution of the data with the CIS 2110 scores being skewed toward the higher scores (the median is lower than the average) and the CIS 4050 scores being skewed toward the lower scores (the median is higher than the average), thus the high scores in CIS 2110 and the low scores in CIS 4050 are more characteristic of outliers.

It is also clear that MSCD students score well compared to other institutions even when the scores of CIS 2110 students are merged with those of the CIS 4050 students, in part because a large fraction (44%) of CIS 2110 students had scores of 50% or above. There are two issues to discuss in terms of why some CIS 2110 students perform so well in this study. The first is that the students have completed two of the seven required core courses, one of which is Computer Applications in Business (CIS 210) which covers important elements of the IS 2002 curriculum, namely the role of IS in organizations. Many of the later IS courses go into greater depth of the topics taught in the initial CIS 210 survey course. The second issue is that MSCD has many non-traditional students: MSCD students have an average age of about 26 years. Non-traditional students tend to take coursework more seriously; therefore they often digest and retain coursework at a higher rate than traditional students. Also many CIS majors have previous IS experience, in specialized areas of IS. Many of these students are in the CIS program to validate their IS knowledge and to advance a career that they have already started and thus have knowledge that allows them to pass the ISA exam with the skills they already have.

Language is a barrier to doing well in the ISA exam (Segall, Gollhardt, Morrell, 2007) in that students with English as a Second Language score about 12% below that of native speakers. A possible reason for the lack of a greater improvement in scores based on completion of the program could

be the language issue and is a rich area of study in the future.

In summary, even though this is a cross-sectional comparison rather than a 'before' versus 'after' repeated measures comparison (since the study is not longitudinal), the study gives a strong indication that there is value added by the CIS program.

5. DISCUSSION

This research indicates that using the ISA exam in a value added measurement model has the potential to be a potent tool in assessment of an IS program. Given that the national averages for the ISA exam are typically in the low to mid 50%, a 9.6 point increase from 48.3% to 57.9% shows that the department is meeting its goal of delivering IS 2002 related curriculum.

There are numerous questions to be answered about value added when more data is available. For example, of great interest will be the longitudinal study that will follow the students in the CIS 2110 course as they complete the CIS major. The drawback of a cross-sectional study is that there can be multiple explanations, such as variability of prior experience, as the reason that one group does not fair as well as another, other than the independent variable in question. Longitudinal studies remove many of these factors as explanations; however the drawback of longitudinal studies is the time it takes to complete them.

For assessment it is important to measure performance in specific areas. Thus the question, "Is the increase in scores consistent for all areas such as programming, networking, data management, analysis and design?" This would provide data for monitoring continuous improvement in specific program areas.

Another question of interest is whether language is a factor in the difference in the ISA scores after CIS 2110 and after CIS 4050.

6. CONCLUSIONS

Preliminary results indicate that the ISA exam provides a tool for measurement of value added by an IS program, and hence a mechanism for the assessment of program outcomes. The CIS program plans to use these results in our assessment processes for both

ABET accreditation and college level reporting requirements.

The CIS program adds value to a student's knowledge base as measured by the ISA exam. The high ISA scores for some CIS 2110 students is likely an effect of them being non-traditional students who already work in the IS field. Their second ISA score should still show improvement given coursework in the CIS program that is outside their IS work area. More importantly this study shows that the ISA exam can not only provide valuable objective, external assessment tool for program outcomes, but also can be valuable as an assessment of value-added by the program.

7. CITATIONS

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Table 1

Average of all Exam Takers (CIS 4050)

		<u>MSCD</u>	<u>All Institutions</u>	<u>Highest ranked MSCD Student</u>
Fall	2004	49.5	45.7	5th
Spring	2005	48.4	48.6	8th
Fall	2005	53.6	46.1	1st
Spring	2006	55.5	51.2	15th
Fall	2006	55.7	54.5	3rd
Spring	2007	56.0	54.8	17th
Fall	2007	51.8	51.9	1st
Spring	2008	56.5	56.7	3rd

Figure 2

