

## **ASSESSING LEARNING COMPETENCIES IN ENTERPRISE SYSTEMS EDUCATION**

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### **ABSTRACT**

*Assessment of learning is a driven component of teaching and learning. It is one of the most important mission-focused accreditation standards. As a process innovation, learning assessment represents a change of traditional educational practices that can be costly and time-consuming to implement. In this paper, the authors present an assessment model in the context of Enterprise Resource Planning (ERP) education that provides a mechanism for business schools to effectively adopt and implement new curriculum assessment practices.*

**Keywords:** Assessment, Learning, ERP, Competencies.

### **INTRODUCTION**

In order to prepare business students with the knowledge, skills, and abilities required by knowledge-based organizations, Business Schools have established instruction-based alliances with technology companies such as SAP's University Alliance, IBM's Academic Initiative, and The MSDN Academic Alliance.

Up-to date, the focus of the SAP University Alliance members have been on tasks such as: identifying need, developing concept, evaluating alternatives available on the market, developing curriculum, and developing support materials such as lecture slides, hands-on exercises, and test questions and not on learning assessment. Thus, a question emerges as to how to design and implement a learning assessment process in the context of using the SAP R/3 System as a tool to enhance learning.

In this paper, the authors present an assessment model in the context of Enterprise Resource Planning education that provides a mechanism for business schools to effectively adopt and implement new curriculum assessment practices. The first section of this paper presents the AACSB International Assurance of Learning Standards and a learning assessment process. The next section describes the design and implementation of the assessment process to teaching Enterprise Resource Planning using the SAP R/3 System. The third section discusses the pedagogical challenges of implementing and executing the assessment process.

### **AACSB ASSURANCE OF LEARNING REQUIREMENTS**

As a business School seeks accreditation or reaffirmation of its AACSB (The American Assembly of Collegiate Schools of Business) accreditation, it is required to design, establish in writing, and set about executing an assessment plan. Assessment is the systematic collection, review, and use of information about educational programs undertaken for the purpose of improving student learning and development [5].

AACSB offers an assessment resource center that provides readings, AACSB positions on assessment, and guidelines for standards [2]. Two of the standards in the Assurance of Learning portion of the standards relate directly to the setting and achievement of learning goals, standards 15 and 16. In standard 15, AACSB requires that an academic institution establishes a Management of Curricula Process that includes learning experiences in such general knowledge and skill areas like analytic skills use of information technology, reflective thinking skills, etc. And management-specific knowledge and skills areas such as creation of value through the integrated production and distribution of goods, services, and information; Information technologies as they influence the structure and processes of organizations and economies, and as they influence the roles and techniques of management, etc.

In standard 16, an institution must define learning goals at the Bachelor's or undergraduate level. "The school need to specify learning goals and *demonstrates achievement* of learning goals for key general, management-specific, and/or

appropriate discipline-specific knowledge and skills that its students achieve in each undergraduate degree program.” Learning goals must be driven by the college mission statement.

AACSB’s reviewers will expect schools to explicitly identify the goals and the demonstrations of achievement for each of these standards [1].

### ASSURANCE OF LEARNING FRAMEWORK

The first step in the learning assessment process is a careful definition and development of learning goals based upon the strategic mission of the college. Once the learning goals are defined, they must be aligned with the curriculum and then learning objectives are developed to support the direction of the college (Figure 1). After determining in what course(s) the goals will be addressed, assessment methods are developed. The final steps in the learning assessment processes are the development of traits and rubrics, implementation or data collection and analyses and curriculum changes. Assessment results must be used to immediately enhance the student’s learning environment and/or to inform the continuous improvement of both course and curriculum management program. Two major questions must be address, how can the information obtained from the data analyses be used for course/program improvement? and how will the information acquired be incorporated into your core/program Assessment efforts? A complete representation of the learning assessment process is provided in Figure 1.

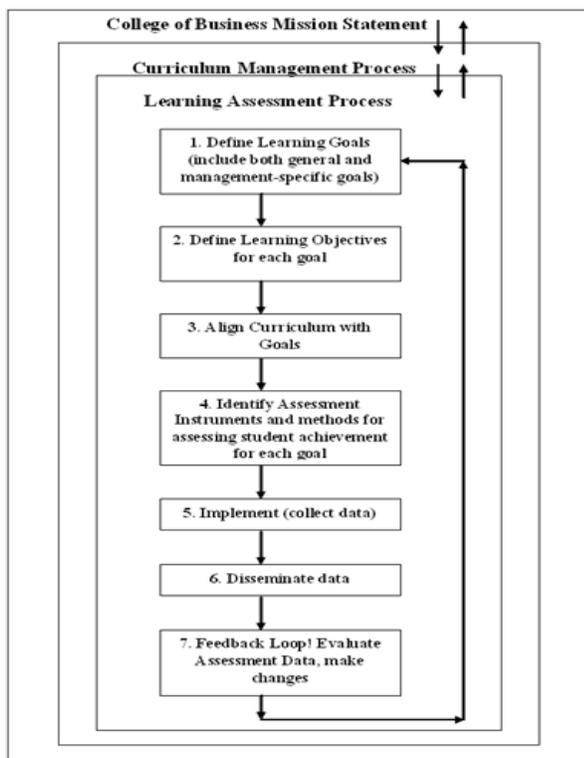


Figure 1. Assurance of Learning Framework

### LEARNING ASSESSMENT PROCESS IMPLEMENTATION

How business schools are able to respond to AACSB International accreditation standards that mandate systematic assessment and continuous improvement of business curricula?

Step 1. Define Program-Level Learning goals (include both general and management specific goals). Learning goals are broad statements about faculty’s judgment of the knowledge, skills, and attitudes that they expect students must have as a

result of completing their program of study. Learning goals are the roadmap for curriculum, and are the foundation on which the assessment program is built (Martell and Calderon 2005). Faculty has the responsibility for determining specific “program-level learning goals” for undergraduate and graduate college-level programs. Such learning goals will have to be translated into an objectives or objectives. Operationalizing learning goals by specifying measurements that assess achievement on those goals is a key step in the assurance of learning process [1, 2].

Learning goals are school specific... and mission driven. There are two set of learning goals to define: 1) General Knowledge and Skills and 2) Management Specific (AACSB, Standard 15). Examples of learning goals applicable for an undergraduate college-level program are provided in Standard 15 (Table 1). Such goals represent various content areas required in undergraduate and graduate business curricula. Enterprise Information Systems (EIS) as a content area is not listed. However, we have selected three content areas listed as they relate to EIS education (Table 1).

In addition, other general or management-specific learning goals could be identified by a school. According to the AACSB International, four to ten learning goals may be specified for each degree program [1, 2].

Often, learning goals involving general knowledge and skills areas target the lower levels Bloom’s taxonomy (knowledge, comprehension, and possible application). This is because most business students only receive a general or “principle-level” exposure to business disciplines outside their major (Rotondo 2005).

Step 2. Define Learning Objectives for each learning goal. The definition of objectives should address the effects of completion of learning activities on students. Objectives are indicators of Goals. In order to be assessable, objectives must be written so they specify behaviors or products that we can be observed. Objectives describe what we want our students to do. They identify specific, observable behaviors and actions related to a goal that faculty would use to describe, monitor, and assess student achievement [4]. Bloom’s taxonomy [3] is used to implement the pedagogical objectives in the context of EIS/SAP Learning. The problem’s questions should challenge students to develop higher order thinking skills, moving them beyond Bloom’s [3] lower cognitive levels of knowledge and comprehension to the higher critical thinking Bloom levels, where they analyze, synthesize and evaluate. This taxonomy provides a set of precise and observable verbs to formulate cognitive objectives at six different levels of learning. Thus, each faculty designs a set of cognitive objectives and discusses how the content could be taught so that students will be able to accomplish the objectives. A number of learning objectives for some of the learning goal are provided in Table 2.

Table 1. Learning Goals Applicable to Undergraduate EIS/SAP Education based on AACSB, Standard 15.

Program Level	Knowledge and Skills Level	Learning Goals
Bachelor of Business Administration degree (BBA undergraduate Program)	General	<ol style="list-style-type: none"><li>1. Be problem solvers</li><li>2. Have a global perspective</li><li>3. Be effective communicators</li><li>4. Be critical thinkers</li><li>5. Be users of information technologies to support the structure and processes of the organization.</li></ol>
	Management-specific	<ol style="list-style-type: none"><li>6. Have functional and technical knowledge and skills of Enterprise Information Systems (EIS)</li><li>7. Be Knowledgeable of information technologies as they influence the structure and processes of organizations and economies, and as they influence the roles and techniques of management.</li><li>8. Understand how value is created through the integrated production and distribution of goods, services, and information.</li></ol>

Table 2. Learning Objectives in terms of Bloom’s Taxonomy

Learning Goals (from table 2)	Learning Objectives	Bloom’s Levels of Learning					
		KN	UN	AP	AN	SY	EV
	• Students who complete this course will be able to						
6	- Define what is an Enterprise Information Systems	*					
6	- List the core SAP modules that support an Organization information needs	*					
7	- Describe the business process common to many organization	*					
6	- List advantages and disadvantages of EIS	*					
6	- Identify integration points within SAP supported processes	*	*				
6	- List the steps of EIS implementation	*					
6	- Describe the step of system configuration		*				
7	- Discuss the value of cross-functional integration		*				
7	- Illustrate how the SAP R/3 system supports business process integration		*				
8	- Use data flow diagrams technique to describe the steps of a business process			*			
8	- Give examples of how an organization benefits from Business process integration			*			
6	- Compare database modeling in SAP and Relational Model in Oracle.			*			
6	- Contrast EIS systems and Executive Information Systems functionality				*		
6	- What are the roles of Event Process Chain diagrams, Entity Relationship Diagrams, and SAP Implementation Guide in implementing an EIS?				*		
7	- Evaluate the value of business process integration					*	
6	- Assess the cost of implementing an EIS						*
6	- Compare the traditional development life cycle with the implementation of an EIS.						*
6	- Evaluate the scope, size, and challenges associated with EIS projects						*
6	- Evaluate EIS implementation Methodologies from various vendors (i.e., Oracle, SAP, etc.)						*

KN-Knowledge; UN-Understanding (Comprehension); AP-Application; AN-Analysis; SY-Synthesis; EV-Evaluation

**Step 3.** Align Curriculum with goals. Measurement of specific program-level learning goals occurs in multiple college-level undergraduate or graduate core courses through both direct and indirect assessment methods. The undergraduate course alignment grid, showing which courses cover and assess various goals is provided in Table 3. Numbers in each cell represent the percentages (5% to 100%) expected emphases in the course for that learning goal.

**Step 4.** Identify assessment instruments and methods for assessing student achievement for each goal. AACSB states that course grades and GPA are insufficient for measuring mastery of course topics because they are aggregate in nature rather than specific skill or knowledge based. On the other hand, graduate surveys have limited use because they are an indirect measurement method.

This step involves the selection of the assessment instruments, identification of behaviors, and the establishment of standards. AACSB provides various assessment methods that can be used to collect data for the assessment of students’ learning (Table 4), [1, and 2]. In many cases, faculty can use multiple assessment methodologies to measure specific undergraduate or graduate learning outcomes. On the other hand, faculty can both adopt existing assessment methodologies and develop new ones. In our case, we recommend that different evaluation methods be used to measure different learning objectives on Bloom’s Taxonomy. In addition, one should choose a method that will generate data that will be useful for analysis.

Step 5. Implementation (collect data). In this step, data is collected and analyzed. Faculty is responsible for determining if student outcomes are being achieved based on the output produced by students in the course activities. These classroom activities are direct indicators of student's knowledge and skills. For the purpose of meeting

AACSB-international standards relating to Assurance of Learning (Standards 16, 18, and 20), sampling may be utilized, as long as it is representative. Faculty has the responsibility for determining appropriate representative sample sizes.

Step 6. Disseminate data. In this step, faculty decides when, where, and how the results will be disseminated. Often, results are reported at the beginning of each semester, and they are posted on the program website.

Step 7. Feedback Loop! Evaluate Assessment data, make changes.

The main purpose of learning assessment is to improve business curricula. AACSB expects schools to use the results to analyze curriculum, develop continuous improvement processes, and communicate results to stakeholders. Thus, schools must demonstrate the way they use assessment to change the education process.

## **LEARNING ASSESSMENT IMPLEMENTATION CHALLENGES**

The new AACSB Assurance of Learning (AOL) standards represent a significant change in the way business schools and their faculty performed assessment previously under "curriculum evaluation." Since its approval in 2003, AOL is a critical success factor in achieving and maintaining college of business program accreditation. As stated before, the new standards requires that schools articulate key learning goals for each of their degree programs, assess their students' learning related to those learning goals in a systematic, direct way, and use assessment data to improve learning [4]. Thus, AOL is very time consuming because of the number of activities it involves.

AOL outcomes in the school of business is considered a critical faculty responsibility to insure that students learn skills and acquire knowledge deemed important and appropriate by college faculty members. The new standards challenge faculty to use direct measures of assessment as opposite to the traditional practiced indirect method of assessment (see Table 4). Thus, the focus of AACSB assessment has shifted from traditional measures of institutional effectiveness towards student learning outcomes. In addition, as expected when adopting any process innovation, business schools are not clear about how to organize the assessment process. According to Martell and Calderon [4], dean's areas of greatest concern in meeting AOL standards are the financial and the resources it requires.

## **DISCUSSION**

As stated above, SAP University Alliance faculty spends the vast majority of their time on tasks such as: identifying need, developing concept, evaluating alternatives available on the market, developing curriculum, and developing support materials such as lecture slides, hands-on exercises, and test questions. However, we have yet to see widespread implementation of outcomes assessment methodologies in terms of student learning in Enterprise Information Systems/SAP education. This should provide a number of curriculum and research opportunities as we look forward to design and implement an effective Assurance of Learning program in the context of EIS/SAP education.

Table 3. Curriculum Alignment with Learning Goals

Learning Goal								Program Course
#1	#2	#3	#4	#5	#6	#7	#8	
5	5	5	10	30	5	30	0	Management Information Systems
5	5	5	5	5	65	5	5	Enterprise Information Systems
5	5	5	5	30	40	10	0	Accounting Enterprise Systems and Controls
15	5	10	15	15	30	10	0	Business Process Management using SAP
25	5	5	15	15	30	5	0	EIS Configuration and Implementation
5	5	5	5	5	5	10	60	Supply Chain Management Using SAP/APO

Table 4. Approaches to Assurance of Learning

Assessment Methods	Examples
1. Selection	<ul style="list-style-type: none"> <li>Language Proficiency</li> </ul>
2. Direct Measures of Learning: Course-embedded measurement Course embedded assessment involves the collection of data about what and how students are learning by using classroom activities. Direct measures are embedded in written tests, oral tests, essays/papers/theses, etc.	<ul style="list-style-type: none"> <li>Writing Assignments including cases, research reports, memos</li> <li>Oral presentations, debates</li> <li>Computer projects</li> <li>Simulations</li> <li>Classroom exercises</li> <li>Business plans and/or consulting projects</li> <li>Exams or embedded questions on exams</li> </ul>
3. Demonstration: stand-alone testing of performance: Students may be required to demonstrate certain knowledge or skills as a requirement for graduation or at some other specific point in their degree programs.	<ul style="list-style-type: none"> <li>Standardized exams</li> <li>Senior project or presentation</li> <li>Assessment center</li> <li>Writing and/or other assignments outside of classroom</li> <li>Reports on out-of-classroom learning experiences (e.g. internships)</li> <li>Student portfolios</li> <li>“Mock” interviews</li> </ul>
Indirect Measures of Learning: May be part of an assessment program, but alone are not sufficient	<ul style="list-style-type: none"> <li>Graduating Student Surveys</li> <li>Alumni Survey</li> <li>Questionnaires</li> <li>Interviews</li> <li>Focus Groups</li> </ul>

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