

NDSU Computer Science Assessment Process

The Computer Science Department has adopted an assessment process with multiple levels. The topmost level is the general departmental objectives which derive from the University's Mission Statement.

The general computer science departmental objectives are:

1. Continuous review and improvement of our undergraduate programs to ensure that all graduates remain competitive for quality jobs,
2. Continuous review and improvement of our service courses to ensure that they meet the needs of students and community members in successful ways,
3. Enhancement of our M.S. and Ph.D. programs to ensure that our graduates are nationally competitive,
4. Expansion of our research activities,
5. Expansion of our service activities to provide more varied and extensive service to the state and region, including leadership and participation in economic development activities, and
6. Development of increased cooperation with other departments at North Dakota State University and with departments at other schools in the state.

Only the first general objective directly concerns the B.S. in Computer Science. We have derived four overall learning objectives from this general objective. These are:

Overall B.S. Learning Goals
1. Knowledge in Scientific and Technical areas. Graduates will have sufficient breadth and depth in the fundamental scientific and technical areas of computer science, to provide for their success as computer science professional practitioners, lifelong learners, professional software developers, and graduate students.
2. Development of computer-based systems. Graduates will be capable of applying scientific methodology to the design, implementation, analysis, and evaluation of computer based systems.
3. Skills in project-oriented teamwork and communication. Graduates will have the ability to work collaboratively with others in complex problem settings involving cross-functional relationships, including effectively communicating both orally and in writing..
4. Understanding of ethical, cultural, societal, legal and global issues in computing. Graduates will understand and be able to incorporate into their work considerations that relate to empowerment, quality of life, risks and responsibilities,

and privacy

The preceding goals are assessed externally. In addition, we have derived two sets of outcomes from them which also are assessed. The first set applies to the coursework required for the B.S. degree. These outcomes are:

Coursework Learning Outcomes
1. Interpretation of computing materials
2. Summarizing articles
3. Problem solving
4. Solution analysis
5. Oral and written communication

The second set applies specifically to the B.S. capstone project experience. These outcomes are:

Capstone Outcome Goals
Knowledge in Scientific and Technical Areas Team members should have sufficient technical knowledge to provide for project success.
1. Teamwork/Dedication to task Team members should show good teamwork and a dedication to completing the project on time and with high quality.
2. Communication/Formal Formal communications by students with their team and project sponsor throughout the semester should be timely and effective.
3. Communication/Informal Conference calls, emails, and technical interchanges should be regular and effective.
4. Process Team members should apply good software development processes.
5. Program Management Program management issues, such as agreement on goals, project schedule and deliverable, should be handled well.
6. Overall Performance Team members should be successful in the capstone project.

The following two tables show how these outcomes are derived from the overall learning goals:

Table 1: Relationships among Overall Learning Goals and Student Learning Outcomes

Overall Learning Goals					
Coursework Learning Outcomes		Knowledge in Scientific and Technical Areas.	Development of computer-based systems	Skills in Project-oriented teamwork and communication	Understanding of ethical, cultural, societal, legal and global issues in computing
	Interpretation of computing materials	✓	✓	✓	✓
	Summarizing articles	✓			✓
	Problem solving	✓	✓	✓	
	Solution analysis	✓		✓	
	Oral and written communication	✓	✓	✓	✓

Table 2: Relationship between Capstone Learning Outcomes and Coursework Outcomes

Capstone Learning Outcomes								
Coursework Learning Outcomes		Knowledge in Scientific and Technical	Teamwork/ Dedication to task	Communication/Formal	Communication/Informal	Process	Program Management	Overall Performance
	Interpretation of computing materials	✓				✓		✓
	Summarizing articles	✓			✓			
	Problem solving	✓	✓		✓	✓	✓	✓
	Solution analysis		✓	✓		✓	✓	✓
	Oral and written communication	✓	✓	✓	✓		✓	✓

The overall learning goals and the capstone outcomes are assessed externally. The coursework learning outcomes and the capstone outcomes are assessed internally. Figure 1 shows the relationships and the types of assessment done for each of the three sets of outcomes or goals we assess:

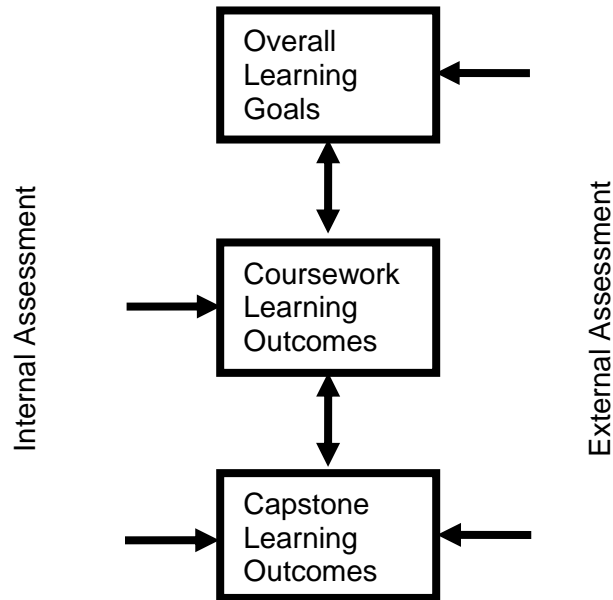


Figure 1: Assessment Relationships Among Goals and Outcomes

The coursework learning outcomes are of central importance, and have bidirectional linkages with both the overall learning goals and the capstone learning outcomes. The capstone learning outcomes are assessed both internally and externally, the coursework outcomes only internally, and the overall goals only externally.

Figure 2 below illustrates the assessment plan at a high level. Solid lines indicate direct feed forward linkages. Dotted lines indicate feedback connections. The plan provides for an iterative cycle in which reflection, analysis and change is applied to courses, the program, and the general computer science environment. The environment includes such characteristics as: (1) availability of various types and numbers of computers and software; (2) availability of various kinds of assistance including tutoring and faculty office hours; (3) use and availability of laboratories; (4) availability of course notes and supplemental materials online; (5) scheduling of required and elective courses; and others.

Walking through the figure, the process begins with incoming students and their attributes. We follow a value-added assessment approach. The incoming students join the Computer Science learning environment, and take courses for which there are five high-level learning outcomes. Results of internal assessment of these outcomes feed back into the courses themselves and the environment for improvement purposes.

The capstone projects course is shown separately, because it has a special role. This course calls upon students to use much of what they have learned in earlier courses to develop a useful software application for a local firm. Thus the course has both internal and external aspects. Internally, it provides an excellent source of assessment data concerning student learning in the rest of the B.S. program. Accordingly, it is the only course where we directly assess the overall learning goals. Externally, the course places each student team in an actual commercial environment to develop an application of value to that local company. We illustrate the dual nature of this course by showing it crossing the boundary of the learning environment in Figure 2. There are six outcomes specifically associated with the capstone, all assessed separately from the other outcomes and learning goals. We do annual internal and external assessments of these outcomes. Assessment results affect the capstone course and the other courses in the B.S. program.

The four overall learning goals shown in the figure are exogenous, and are assessed by alumni and their employers after students have left the program. The cycles illustrated in the diagram underscore the overarching departmental goal of continuing improvement of student development.

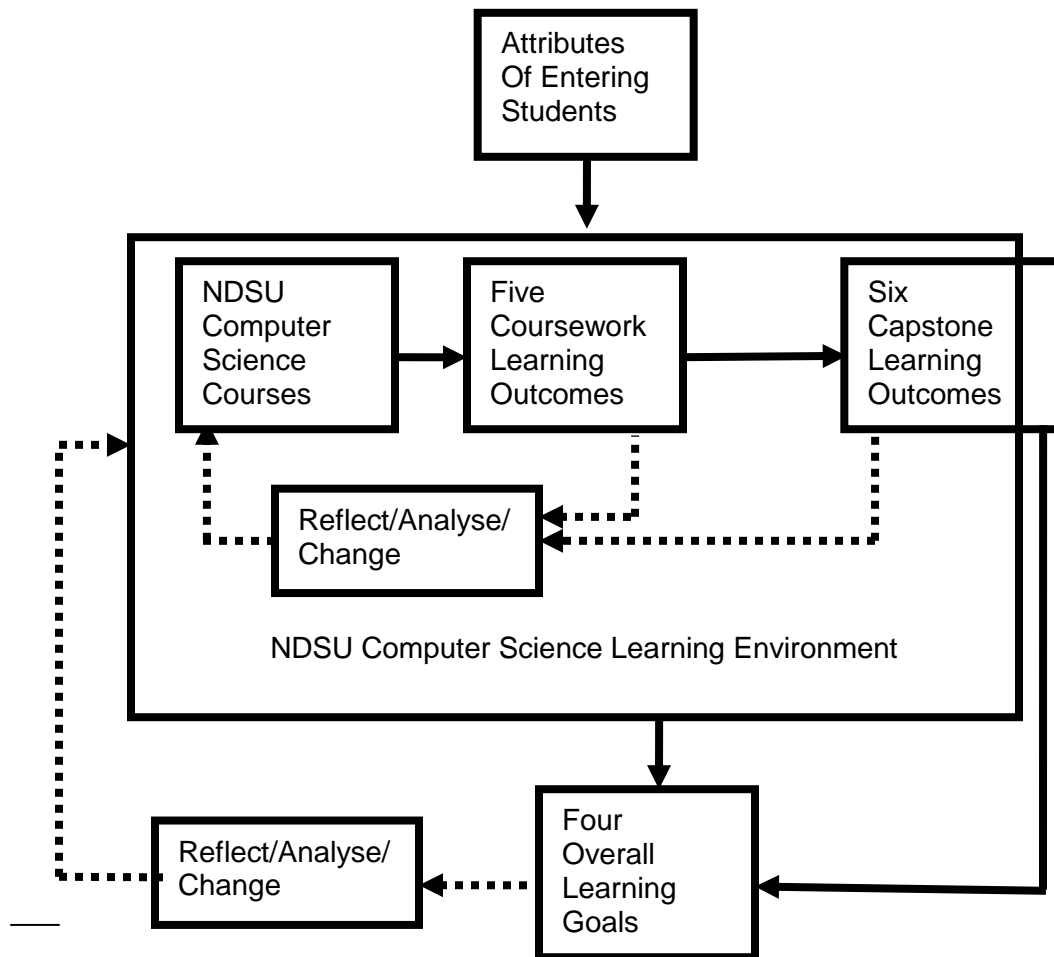


Figure 2: Assessment Process with Feedback Relationships