

NWCET CURRICULUM PHILOSOPHY

The curriculum developed, adapted, and recommended by the NWCET shares the following four essential characteristics:

- **The curriculum is based on industry-defined and -validated competencies, or standards.** The curriculum identifies what learners must know and be able to do, at the levels of achievement articulated in the standards.
- **The curriculum clearly communicates the learner outcomes.** Explicit outcomes provide learners with an expectation of the knowledge, skills, and abilities they must acquire and demonstrate by the end of the learning experience.
- **The curriculum integrates technical content and employability skills.** Activities and assessments support the integration of technical knowledge/skills and foundation, or employability, knowledge/skills.
- **The curriculum specifies performance-based assessment methods.** Performance-based assessments require learners to apply their knowledge and demonstrate their skills in meaningful contexts.

The following information provides additional contextual background for the curriculum framework and philosophy of the NWCET, as summarized above. The four essential curricular characteristics are discussed in greater detail.

Skill Standards-Based Curriculum

The impacts of the rapidly changing workplace are especially evident in information technology careers. In a 1996 report, the Information Technology Association of America documented a conservative estimate of 190,000 unfilled positions in information technology. The challenge of high schools, colleges and universities is to provide an adequate number of students with the appropriate skills to meet this demand.

Skill standards provide an agreement of what is expected to be successful in a given career area. They provide a validated, industry consensus upon which educators can build curricula. Using industry skill standards as the foundation for curricula will result in a closer alignment between educational programs and workplace expectations, and result in a better skilled workforce.

Competency-Based Education

Industry skill standards describe what employees must know and be able to do to be successful. The corresponding curricula must also emphasize what learners know and can do as a result of the learning process. Competency-based curriculum identifies and articulates explicit expectations for performance. This approach makes it easier, therefore, to identify benchmarks for appropriate education levels and facilitates articulation.

Learner Program Outcomes

These are outcomes that describe what learners must know and be able to do by the end of a program of study. It is a goal statement specifying the desired knowledge, skills, and

abilities to be developed as a result of educational experiences. Course/module outcomes, in contrast, are measurable aspects of learner performance for a course/module. They need to be identified and sequenced to support the learner program outcomes. Skill standard-based curriculum must specify the learner outcomes in terms of performance to the level of knowledge, skill, and ability described in the standard.

Performance Assessment

Assessment is the key to knowing whether the learner has met the level of performance set by the standard. They are observations of student performance or student work that tell us what and how well learners have achieved. Quality performance assessment has pre-established performance criteria.

Integrated Curriculum

The fast changing workplace requires workers to utilize sophisticated technical knowledge to solve problems that are constantly changing. Integration of technical content with foundation skills in the teaching/learning process provides realistic applications, portability of skills across experiences, and increases relevance for learners.

Industry skill standards are the foundation that provides a basis for educational programs. The elements described above provide the primary framework educators need to use to make an effective translation. Each key characteristic is now covered in more detail.

Competency-Based Education

Why Competency-Based Education?

Competency-based education is structured around competent performance by learners, where competence is defined in terms of achievement to the level of industry standards. The quality of education is more easily measured, therefore, because the criteria for achievement are more precisely defined. Since the levels of performance are described by the standards, consistency of expected performance between programs and schools is more easily achieved.

What is Competency-Based Education?

Competency-based education is an organized set of learning experiences that are:

- based on knowledge, skills, and abilities to be demonstrated by the learner
- derived from occupational expectations
- explicit in stating expected mastery levels

Competency-based curricula contains:

- Competencies (knowledge, skills, abilities) to be demonstrated by the learner that are:
 - derived from industry-identified skill standards
 - stated so as to make possible assessment of a learner's behavior in relation to specific competencies
 - made public in advance
- Criteria used to assess competencies that are:
 - based upon, and in harmony with, specified competencies

- explicit in stating expected levels of mastery under specified conditions
 - made public in advance
- Assessment of the student's competency that:
 - uses performance as the primary source of evidence
 - measures performance against a competency standard
 - strives for objectivity
 - Modular in its approach which allows for flexibility — the mix-and-match of program components

The learner's rate of progress through the program is determined by demonstrated competency rather than time or course completion. The instructional program is intended to facilitate the development and evaluation of the learner's achievement of specified competencies.

Learner Program Outcomes

Why Learner Program Outcomes?

Learner program outcomes are a translation of the performance expectations in industry skill standards into a measurable description of what learners must know and be able to do by the end of a program. They provide students with a clear expectation of the knowledge, skills and abilities they must acquire and be able to perform in order to be successful in a given career field.

What are Learner Program Outcomes?

Learner program outcomes should be:

- clear, concise and measurable
- focused on what learners must know and be able to do
- described in terms of competency attainment to the level of performance defined in the skill standard
- amenable to credible assessment

The learning process emphasizes the attainment of specified outcomes. The focus of a competency-based program is on outcomes — what learners actually achieve. Skill standards-based curriculum must specify the learner outcomes in terms of performance to the level of knowledge, skill, and ability described in the standard.

The learning process developed based on the outcomes should:

- be congruent with the learner program outcomes
- include authentic assessments that measure performance to the level of the skill standard
- integrate technical content and foundation skills
- give balanced emphasis to both technical content and foundation skills

To capture all the key curriculum outcomes, learner program outcomes should be developed from all the categories of the skill standards: functions, tasks, performance

criteria, technical knowledge, and foundation skills.

It is essential when framing the outcomes that the expectation for performance is to the level of the standard. The performance criteria should be used as the benchmarks/indicators for competency attainment to the standard.

Why Develop Learner Program Outcomes?

- To develop integrated curriculum, learning experiences (activities), and learner assessments, it must be clear what is expected of the learner. Developing learner outcomes requires teachers and other stakeholders to agree to and articulate what students should know and be able to accomplish once they complete a project, course, or program. From the learner outcomes, appropriate learning activities and assessment strategies can be developed.

How Do Learner Program Outcomes, Activities, and Assessments Fit Together?

Learning activities and assessments provide learners opportunities to develop the knowledge and skills necessary to demonstrate competency at the level of the outcomes.

Performance Assessment

Why Performance Assessment?

Evidence of achievement of the learning outcomes is essential in a competency-based curricular framework. An effective and authentic method for measuring performance is key to competency-based curriculum founded on industry skill standards. Assessment methods need to be congruent with the curriculum and the skill standards, aligned with the learning activities, and [designed to continually evaluate outcomes and processes used to achieve outcomes.]

What is Performance Assessment?

Assessment is the process of quantifying, describing, or gathering information about performance; it is direct observation of learner performance or learner work (products or processes). Performance criteria, or indicators, provide the standard for judging whether the desired level of performance has been achieved. Performance assessment assesses the attainment of competence against a set of criteria that is broadly understood and accepted. The industry skill standards provide a primary set of validated, endorsed criteria on which to establish assessment standards.

Characteristics of good, authentic assessment:

- Measures student performance in relation to learning outcomes
- Places a high priority on the validity and reliability of assessment
- Requires learners to apply skills and integrate their knowledge
- Is based on multiple, integrated competencies rather than discrete skills
- Employs multiple indicators of student performance
- Gives meaningful feedback to students
- Is free from cultural, racial or gender bias

Integrated Curriculum

Why Integrated Curriculum?

The new world of work requires the use of holistic, integrated skills and competencies rather than discrete competencies and isolated skill sets. The emphasis is on the ability to solve problems that require drawing on all competencies and applying them in ever-changing contexts. Competency- or performance-based curriculum informed by industry skill standards improves the correspondence between workplace requirements and educational preparation.

Increases Relevance for Learners

Realistic applications increase motivation and enhance learning acquisition. Learners experience skills as related and applicable to many contexts. (In addition, a more explicit focus on foundation, or employability, skills allows for greater accountability for learners and the portability of foundation skills.) Transfer of learning is higher when the competency-based program provides for realistic learning experiences based on solving real problems.

Infuses Higher Order Skills into Technical Programs

- One of the key aspects in the development of competency standards and in the skills and other attributes believed to be most needed in the workforce are those of critical thinking, problem solving and the ability to use and combine knowledge and skills to address new challenges.

Foundation skills such as problem solving and critical thinking have traditionally been taught in academic classes. Integration of technical content and foundation skills brings more related emphasis to the foundation skills and puts technical content in the context of solving work- related problems.

More Congruence between Disciplines

Dividing knowledge into distinct categories of knowledge is artificial. Work, community, and personal experiences are integrated; providing knowledge and skills in separate educational experiences requires learners to work harder to integrate and make connections.

Reduces Redundancy in Curriculum

When technical content and foundation skills are integrated, there is likely to be less duplication of time and effort in the curriculum. Integration allows for greater efficiency of curriculum content and therefore, may provide opportunity to add additional courses or modules.

What is Integrated Curriculum?

One of the keys to the development of curriculum informed by industry skill standards is integration. This means the explicit identification of both the technical knowledge and foundation skills appropriate for a particular program. They are both then integrated into learning activities that allow for the development of foundation skills within the context of solving real problems. The learner sees the context for learning foundation skills as well as the technical knowledge. Being an effective team member, problem solver, and self-learner has a purpose, context, and connection that provides motivation for holistic learning.

Implications of Industry Skill Standards-Based Curriculum*		
Changes in:	Traditional	Skill Standard-Based
Content	<ul style="list-style-type: none"> ➤ Technical content and foundation skills separated ➤ More emphasis on attainment of technical skills ➤ Foundation skills not explicit ➤ Content-focused ➤ Course-based 	<ul style="list-style-type: none"> ➤ Infusion of math and science to strengthen problem solving ➤ Integration of technical content and foundation skills ➤ Foundation skills are explicit ➤ Competency-based ➤ Module-based
Student Outcomes Expected	<ul style="list-style-type: none"> ➤ General objectives ➤ Emphasis on inputs ➤ Students are exposed to content 	<ul style="list-style-type: none"> ➤ Learner outcomes are explicit and measurable ➤ Emphasis on outputs
Methodology	<ul style="list-style-type: none"> ➤ Teacher as expert and provider of lectures, demonstrations ➤ Learner as receptacle ➤ Delayed feedback ➤ Narrow range of learning approaches 	<ul style="list-style-type: none"> ➤ Teacher as resource and mentor; one of many resources ➤ Learner more self-directed and responsible for own learning ➤ Immediate feedback ➤ More flexible delivery approaches
Assessment Techniques	<ul style="list-style-type: none"> ➤ Subjective criteria, often unstated ➤ Emphasis on assessment of knowledge ➤ Norm-referenced assessment 	<ul style="list-style-type: none"> ➤ Objective criteria tied to outcomes ➤ Emphasis on performance/competence ➤ Criterion-referenced assessment
Work-Based Experiences	<ul style="list-style-type: none"> ➤ Limited field experience 	<ul style="list-style-type: none"> ➤ More emphasis ➤ Greater variety of field experiences
Professional Development	<ul style="list-style-type: none"> ➤ Everyone doing their own thing ➤ Emphasis on content 	<ul style="list-style-type: none"> ➤ Faculty working more collaboratively ➤ More emphasis on process ➤ More interdisciplinary emphasis

*Adapted from: Harris, Roger; Guthrie, Hugh; Hobart, Barry; Lundberg, David. *Competency-Based Education and Training*. MacMillan Education, 1995.

SKILL STANDARDS CRITERIA

A. Industry Relevance and Currency of Curriculum

Industry relevance and currency of curriculum are critical to ensure a high placement rate for students graduating from the program or the course. This can only be accomplished by having effective and regular contributions from industry into the development of new curriculum and the updating of existing curriculum. Skill standards are an essential tool in infusing industry needs into the curriculum. They also serve as an effective framework for communication with industry advisory committees.

- A1.** The knowledge and skills covered in the program, course or module should be congruent with industry needs as summarized in NWCET's *Building a Foundation for Tomorrow: Skill Standards for Information Technology* (2003). Programs should cover all knowledge and skills identified in the set of skill standards relevant to the program objective. Courses and modules cover only a subset of the skill standards.
- A2.** Programs, courses, and modules should receive periodic reviews (at least twice a year) and inputs from an industry advisory committee. The advisory committee should be representative of the potential employers for the program/course/module graduates.
- A3.** The curriculum development/update process should be well documented and designed to ensure industry currency of curriculum.

B. Consistency and Clarity in Overview, Outcomes, Competencies, and Content

Throughout the design of the program, courses and modules, it is critical to maintain consistency and clarity of purpose, as well as alignment to the industry skill standards. This insures that the courses and modules form a coherent and complete set of learning competencies in line with the overall learning objectives.

- B1.** Program/course/module overview should be clear and include purpose and scope.
- B2.** The set of outcomes, competencies and content should be aligned with the purpose of program/course/module, and complete in its representation of the program/course/module objective.
- B3.** Outcomes and competencies should emphasize what students will be able to do and demonstrate rather than what students will know at the end of the program/course/module.
- B4.** Outcomes, competencies and content should include a balance of technical and foundation (soft) skills.

- B5.** Outcomes, competencies and content should be relevant to industry skill standards and show evidence of industry advisory committee input, support, and direction.

C. Progressive and Logical Organization of Courses/Modules

Organization of the learning throughout the modules and courses should support the student learning by introducing and reinforcing skills and knowledge in increasing levels of complexity, and including enough redundancy of skills and knowledge to help students gain mastery.

- C1.** Courses/modules and curriculum content should be organized in a sequential set to promote progressive learning of skills and knowledge. Skills should be reinforced and assessed throughout the program/course/module with increasing levels of complexity.
- C2.** Program/course/module structure and organization should emphasize critical skills and knowledge, as identified by industry.

D. Integrated and Interactive Activities/Projects and Teaching Strategies

Activities and projects are a critical forum for students to practice and master skills. Even though specific elements of knowledge can be acquired through a traditional lecture-style environment, student interactivity has proven to be critical in the acquisition and demonstration of skills. A diverse offering of interactive activities and projects is the key to a successful learning experience.

- D1.** Activities/projects should integrate technical and foundation (soft) skills.
- D2.** Teaching methodologies and activities/projects should promote student involvement/interaction and hands-on participation.
- D3.** Activities/projects should include a clear objective and description, and specific deliverables.
- D4.** Each program/course/module should include a capstone project giving students the opportunity to demonstrate and practice the primary technical and foundation (soft) skills learned throughout the program/course/module.
- D6.** Each relevant learning outcome/competency should be included in at least one activity/project in the course/module, and critical and complex skills should be repeated throughout the program/course/module to give students the opportunity to master these skills.
- D7.** Activities/projects should show increasing levels of complexity throughout the program/course/module. Activities/projects should show a decreasing level of instructor direction and support as the student's progress in the course/module/program.

- D8.** Activities/projects should be diverse in scope, complexity, and process and in the types of deliverables involved. Program/course/module should include a good balance of activities/projects requiring individual and team student involvement.

E. Authentic and Formative Assessments

Assessment is critical in helping students evaluate their progression through the learning process and in helping identify areas of deficiency early on in the module/course/program so that appropriate support can be given to the students. Assessment methods and criteria should be relevant to the learning objectives and closely aligned with the activities/projects used in the learning process.

- E1.** Assessments should be closely aligned with the activities/projects.
- E2.** Assessments should rely on authentic assessment methods.
- E3.** Assessment criteria should be clearly defined and relevant to the purpose and deliverables outlined in the associated activity/project, and relevant to the overall program/course/module objectives.
- E4.** Assessment methods should be diverse in type and process.
- E5.** Assessments should emphasize both technical and foundation (soft) skills. Student processes should be assessed as well as the products resulting from student activities.
- E6.** Each relevant learning outcome/competency should be included in at least one assessment in the program/course/module, and critical and complex skills should be repeatedly assessed throughout the program/course/module to give students the opportunity to master these skills.
- E7.** Assessments should show increasing levels of complexity throughout the program/course/module.
- E8.** Program/course/module should include a good balance of individual and team assessments.
- E9.** Students should be appropriately assessed prior to program/course/module entry and/or appropriate prerequisites should be established for entry into program/course/module to support student success through the program/course/module.

F. Work-Related Learning Strategies and Environment

To facilitate transition of students from the classroom to the work environment and to maximize the success of graduates once they have entered industry, it is essential to incorporate meaningful work-like experiences in the learning process.

- F1.** Activities/projects should, as much as practical, incorporate a work-like environment, context and organization.
- F2.** Assessment methods and criteria should show relevance to the work environment and to the industry skill standards.
- F3.** Industry representatives, as much as practical, should be brought in as lecturers or facilitators into the classroom.
- F4.** Students should be exposed to the work environment through visits to industry, internships, and work simulations.

G. Effective and Appropriate Student Support

To maximize student success through the program/course/module, appropriate support regarding the acquisition of skills and knowledge, and the use of technology needed in the learning process, must be made available to the students.

- G1.** Program/course/module objectives and competencies should be clearly communicated to the students.
- G2.** Program/course/module performance expectations, and assessment methods and criteria should be clearly communicated to the students.
- G3.** Adequate support for students to identify and remedy specific skill deficiencies (especially foundation/soft skills) should be available to the students.
- G4.** Adequate technology and technology training should be made available to the students to access necessary information and participate effectively in the learning process.
- G5.** Courses and modules should include specific student references/text books/supporting teaching materials.

H. Effective and Appropriate Instructor Support

To maximize the success of the learning process, instructors must be given the appropriate tools and knowledge to effectively deliver, facilitate, and assess the learning. Relevant and timely training, especially in rapidly changing fields, is a key to student success.

- H1.** Courses and modules should include specific instructor references/text books/supporting teaching materials.
- H2.** Support to instructors in the acquisition of new or the updating of existing technical and foundation (soft) skills and knowledge should be provided.
- H3.** Instructors should have access to peer support in assessing and teaching skills related to their program/course/module but outside of their area of expertise.
- H4.** Adequate technology and technology training should be made available to the instructors to access necessary information and effectively facilitate the learning process.

I. Appropriate and Effective Use of Technology

Technology tools are becoming a stronger part of today's learning environment. Which tools to use and how to use them in a specific program/course/module are critical decisions that impact the effectiveness of the learning process.

- I1.** Technology should be used in activities in creative and effective ways to enhance the learning process.
- I2.** Technology should be used in assessments in creative and effective ways to enhance the assessment process.
- I3.** A good balance of technology and non-technology driven processes should be used in the learning processes and environment.

J. Effective Curriculum Development and Update Process

- J1.** Regular updates to the curriculum are in line with changes in technology and industry.
- J2.** Development and update process is closely aligned with the NWCET skill standards and NWCET curriculum development process.
- J3.** Process by which regular industry input is gathered, analyzed and used in curriculum review is well established and clearly documented.
- J4.** Process by which faculty is involved in curriculum review is well established and clearly documented.
- J5.** Allow for periodic peer review during development and piloting.

K. Additional Criteria for Online Programs/Courses/Modules

The online environment offers particular opportunities as well as specific challenges to the teaching and learning process. While it can enhance individual student-instructor

interactions, it is not as conducive to the development and assessment of verbal skills. The transfer of classroom curriculum to the online environment needs to be well thought out and structured with the technology capabilities in mind to be effective.

K1. The online program/course/module should:

- demonstrate the application of instructional design theory
- focus on active participation by the student through use of interactive activities which allow dynamic exploration of content and student participation with feedback
- utilize the latest technology for animations, simulations, and streaming media, including audio and video
- provide critical thinking issues with follow-up online discussion forums
- include web links that enhance and supplement the content
- include synchronous and asynchronous collaboration features such as bulletin boards, email, chat sessions and whiteboard
- be full content

K2. Assessments used in the online program/course/module should show diversity of process and methods, as well as effective and creative use of the online media.

K3. The learning process should have an effective balance of student-instructor and student-student interactions.

K4. The use of the media and the organization of the content and activities/projects with the media should be creative and effective in supporting the learning process and student interest.

K5. The online program/course/module should demonstrate evidence of effective development and assessment of foundation (soft) skills.

K6. Specific training on how to best succeed in an online program/course/module should be made available to students.

K7. Specific training on how to best teach and organize the learning process in an online program/course/module should be made available to instructors.

K8. Technology system and technology support should be adequate to support the online program/course/module.

K9. Support to instructors in the design of online courses should be adequate.

K10. Technology requirements for students of online program/course/module should be clearly defined and realistic.

K11. Student orientation should help students decide if the online environment is suited to their personal style of learning.