



Tools and Frameworks

SOFTSKILLS ASSESSMENT
for
IT CORE CURRICULUM



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Soft Skills Assessment for an IT Core Curriculum



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Background

While working with faculty in technology programs, we received several requests for help in assessing soft skills. These skills, such as communication, problem solving and teamwork, are considered critical to success in industry, yet they are often underemphasized in programs as too difficult to assess. We found that in most courses, the students practiced these skills, but that too often the students received little feedback on their performance and few suggestions on how to improve.

This document was developed as a response to faculty's request for a set of criteria and guidelines to help them assess students' performance of soft skills. The soft skills included in this material were selected from the list of skills published in the *NWCET Information Technology Core Skill Standards-Based Curriculum*, © 1999. These particular skills have been identified by industry representatives as critical to the success of all IT professionals.

Note: Although the context for the development of these assessment criteria was IT programs, the guidelines published in this document can be readily adapted and applied to all professional/technical programs.

Information Content and Implementation

For each skill, 3 levels of proficiency with increasing skill performance and complexity were defined: Basic, Intermediate and Advanced. These levels and associated criteria are meant to be suggestions and have not been validated by a large team of faculty. They were defined for a 2-year college level environment. If one were to use this information in a high school environment, the emphasis should be on the lower 2 levels. In the same way, if one were to use this information in a higher education environment, the emphasis should be on the upper 2 levels.

For each level, 5 criteria were identified defining expected performance for the specific level. Based on the specific program and discipline areas, some criteria could be emphasized more than others. As an example, in a Media program, emphasis could be placed on the visual elements and the use of technology in the "Organization/Delivery of Presentations" skill, while in a Marketing program, emphasis could be more on content and delivery style.

The criteria can be used as tools to assess students' work products and ultimately assign grades. However, they are also powerful tools to help students recognize what constitutes "good" and expected performance of the specific skills, and therefore guide the self-assessment of their own performance and provide guidelines for continuous improvement.

The NWCET curriculum philosophy strongly supports alignment between activities/projects and assessment of student learning. Combining assessments with projects that incorporate simulated work-like activities and context significantly reinforces the learning process. For each proficiency level, sample activities are suggested to support the assessment of the specific skill. Some of these activities are more directly applicable to IT programs, while others are very general. Each activity can be further expanded to include specific deliverables aligned with the assessment criteria.

IT CORE CURRICULUM LEARNING COMPONENTS

IT Core Curriculum Learning Components

Project and Process Flow Skills

- Research
- Analysis and Synthesis
- Design and Development
- Testing and Validation
- Quality Assurance
- Project Management

Communication and Coordination Skills

- Oral Communication
 - Verbal Business Communication
 - Organization/Delivery of Presentations
- Written Communication
 - Written Business Communication
 - Proposal Writing
 - Technical Documentation
 - Project Documentation
- Workplace Communication
- Customer Relations
- Teamwork

Business Environment Skills

- Business Organization and Environment
- Professionalism
- Task Management
- Professional Development

Problem Solving

- Data Gathering, Analysis and Organization
- Problem Definition
- Solution Development and Testing

Note: Excerpted from NWCET's *Information Technology Core Skill Standards-Based Curriculum*, © 1999.

ASSESSMENT CRITERIA AND SUGGESTIONS

The following pages include criteria and suggestions for the assessment of foundation (soft) skills in the context of an Information Technology Core program. For each category of skills (i.e., Analysis), three levels of proficiency with increasing skill performance and complexity are suggested.

Project and Process Flow Skills

- Research
- Analysis and Synthesis
- Design and Development
- Testing and Validation
- Quality Assurance
- Project Management

Assessment Criteria and Suggestions: Project and Process Flow Skills

Research

Using individual and group research projects, the following assessment criteria can be used:

Basic Research Skills

- Purpose of research is clearly stated and relevant to project
- Information presented is complete, relevant, accurate and consistent
- Information is summarized in a clear and complete format
- Research sources are relevant to the project
- Presentation of research sources is complete and accurate

Sample Activity

Students research a topic related to a career or the use of computers in a specific job or context, and summarize their findings.

Intermediate Research Skills

- Selected research topics are relevant to purpose and scope of project
- Information is presented with the appropriate level of synthesis and organization
- Conflicts between information from different sources are identified, analyzed and resolved
- Search strategies are effective and appropriate to the research topic
- Internet-based research tools are effectively used

Sample Activity

Students select a research topic that can lead to the development of a product (such as a web page or newsletter of interest to the students), conduct the research using the Internet and present findings regarding what information could be included.

Advanced Research Skills

- Presentation of research results is appropriate in format and language, and includes references
- Presentation of the research is tailored to audience in format, level of details and complexity
- Research process is realistic and effective
- Scope of the research is realistically estimated based on research goals and available resources
- Research tools and methods are analyzed for effectiveness

Sample Activity

Students conduct research on a given topic (such as technology trends that support the learning of a set of skills), summarize and present findings. They also develop a research plan including scope, estimated time and resources before starting the project, and assess effectiveness of research process and adherence to plan at the end of the project.

It is recommended that some of the projects give latitude to the students in selecting a research topic within a broad definition. In order to assess the thoroughness of the research and the effectiveness of the research processes, it is recommended that students be asked, on selected projects, to summarize the process they used to research and select information, as well as which research tools were used, including a list of web sites visited.

Analysis and Synthesis

Using individual and group projects involving the analysis of requirements and the development of recommendations, the following assessment criteria can be used:

Basic Analysis and Synthesis Skills

- Information presented is complete and accurate
- Information presented is consistent and relevant
- Critical information is identified and well summarized
- Sources of information are well documented and reliable
- Recommendations are consistent with information presented and are realistic

Sample Activity

Given a set of information resources, students analyze the information and come up with a recommendation to a specific question. As an example, students analyze information on the use of computers in a particular job, summarize the information and make recommendations on what computer skills would be beneficial to someone working in this job.

Intermediate Analysis and Synthesis Skills

- Conflicts between different viewpoints or requirements are clearly identified and appropriately resolved
- Recommendations include potential risks and benefits
- Information has been validated with clients or stakeholders
- Time, technology and resources constraints are identified
- Recommendations are realistic and include options and alternatives

Sample Activity

Students conduct an interview process of end-users regarding a specific problem/concern, summarize needs/requirements/constraints and develop a set of recommendations.

Advanced Analysis and Synthesis Skills

- Proposal is consistent with identified requirements and standard resolution processes
- Proposal is well organized and includes necessary supporting information
- Cost/benefit analyses of different alternatives are complete and realistic
- Proposal has been validated with clients or stakeholders
- Valuable recommendations to improve the analysis process are presented

Sample Activity

Students develop a proposal for a new service or product or to solve a problem. The proposal should include requirements, constraints, proposed designs or solutions with associated cost, advantages and risks. They validate the proposal with potential clients/users. This could be best accomplished through an internship or real-world application project.

Assessment Criteria and Suggestions: Project and Process Flow Skills

Design and Development

Using individual and group design and development projects, the following assessment criteria can be used:

Basic Design and Development Skills

- Critical elements of the design are accurately identified
- Design and development plan is documented with appropriate level of detail and complexity
- Tools and supplies necessary to complete the project are accurately identified
- Time and resources are estimated for each phase of the design and development
- Information to be acquired to support design is identified in a realistic manner

Sample Activity

Students develop a proposal outline to build a product or service. The outline should include: elements of design, project phases, necessary resources and budget and time estimate.

Intermediate Design and Development Skills

- Design and development plan is developed organizing design elements, development tasks, resources, schedule and cost
- Necessary feedback and checkpoints on design effectiveness are identified and put in place
- Current team skills are assessed against design and development needs
- Design ideas and concepts are refined based on available and negotiable resources and time
- Contingency plans are realistic and applied appropriately

Sample Activity

Based on a proposal to develop and test a product or service, students develop a complete design and development plan.

Advanced Design and Development Skills

- Outside help and resources are researched, selected and acquired in an effective manner
- Design and development are thoroughly documented including design changes
- Prototypes and pilots are used effectively to shorten development time within budgetary constraints
- Design and development prototypes are tested and modified to achieve desirable performances
- Design and development process is thoroughly analyzed and recommendations for improvement are made

Sample Activity

Based on a specific design and development plan, a team of students implements the plan to design, build and test a product or service. At the end of the project, students analyze the development process and the accuracy of the original plan.

Testing and Validation

Using individual and group projects involving the testing and user validation of products or services, the following assessment criteria can be used:

Basic Testing and Validation Skills

- Testing tools and methods are applied according to specifications and procedures
- Test results are thoroughly analyzed and accurately summarized
- Test procedures and results are thoroughly and accurately documented
- Realistic recommendations/deductions are made based on test results
- Simple mathematical and statistical principles and tools are used in the analysis of test data

Sample Activity

Given a specific hypothesis/assumption and a set of testing procedures, students are asked to conduct the experiment and comment on the validity of the hypothesis. This assumption can be non-technical as in “the majority of students in the program prefer to spend their free time reading rather than watching TV”.

Intermediate Testing and Validation Skills

- A wide range of testing tools and techniques are used effectively
- Testing tools and techniques selected are effective and appropriate to the testing purpose
- Student develops testing procedures and scenarios that are realistic and effective
- Trends in data are recognized and interpreted to answer initial query
- Test results are interpreted and organized in meaningful graphs and reports

Sample Activity

Given a specific hypothesis/assumption, students are asked to develop testing procedures, select the appropriate tools and conduct the experiment and comment on the validity of the hypothesis. The testing procedures and results are to be documented and presented (verbally or in writing).

Advanced Testing and Validation Skills

- Student develops testing/validation plan including testing purpose, testing parameters and procedures, schedule and cost
- Recommendations for corrective steps and modifications are based on test results and are appropriate
- Complex mathematical and statistical tools and techniques are used to analyze test data
- The effectiveness of the testing procedures and tools is assessed accurately and recommendations for improvement are appropriate
- Impact of errors introduced by experimental design on validity of test data is accurately assessed

Sample Activity

Given a specific hypothesis/assumption, students are asked to develop and implement a complete testing plan. The problem should be complex enough to require the use of mathematical and statistical techniques to analyze the data. Students are asked to assess and document the validity of the test data and the effectiveness of testing plan and procedures, and make recommendations for improvement.

Assessment Criteria and Suggestions: Project and Process Flow Skills

Quality Assurance

Using individual and group projects involving the application and evaluation of quality assurance processes, the following assessment criteria can be used:

Basic Quality Assurance Skills

- Student presents the basic concepts of quality assurance and associated practices
- Quality check points are applied throughout the development and implementation process
- Quality policies and procedures are followed and appropriately applied
- Student discusses how communication impacts quality assurance
- Student analyzes products and services for quality

Sample Activity

Given a specific process or product, students are asked to evaluate how quality could have been improved, and the impact of these improvements on process efficiency and product effectiveness.

Intermediate Quality Assurance Skills

- Student presents the trends in today's organization in quality assurance strategies and implementation
- Critical elements of design, development and service for quality are identified and applied throughout the process
- Effective check points for quality and quality monitoring processes are developed and applied throughout all phases of the process
- Models and prototypes are analyzed for consistency, completeness and conformance with specifications
- Effective communication processes and channels are established to support quality assurance

Sample Activity

Given a specific project, students are asked to develop and implement checkpoints and quality assurance monitoring processes specifically designed for each phase of the project.

Advanced Quality Assurance Skills

- Student presents the different issues and challenges that affect quality assurance in organizations
- Quality monitoring systems are developed, tested and implemented
- Different quality assurance systems are analyzed and compared for effectiveness and applicability to specific environments
- Recommendations for quality assurance improvement are realistic, effective and appropriate to the environment
- Quality assurance methods and checkpoints are integrated in all design, development and implementation processes

Sample Activity

Given a specific organization/environment, students are asked to evaluate the overall quality assurance system, including existing barriers to quality, and make recommendations for overall quality improvement, including the cost/benefit for these recommendations.

Assessment Criteria and Suggestions: Project and Process Flow Skills

Project Management

Using individual and group projects, the following assessment criteria can be used:

Basic Project Management Skills

- Tasks are appropriately identified, prioritized and organized
- Participation in project reviews is effective
- Stakeholders and decision-makers are correctly identified
- Project documentation is accurate, complete and timely
- Status and quality of task completion evaluated and improvements made when needed

Sample Activity

During the course of a project, students develop a personal task list, report on and document task completion and performance. For a given project, students are asked to identify the key stakeholders and their role in deciding the project direction. Typical projects would include one to three students and cover a one-to-two week period.

Intermediate Project Management Skills

- Project flow chart is accurate and realistic, and identifies critical tasks and interdependencies
- Project time, personnel, budget and equipment requirements clearly/realistically identified
- Resource availability clearly and realistically identified
- Project reviews are effectively organized and conducted
- Management style is effectively adapted to project team, purpose and environment

Sample Activity

During the course of projects, students develop project charts, estimate resource needs, interact and communicate with the project team. Typical projects would include three to six students and cover a two-to-five week period.

Advanced Project Management Skills

- Negotiation for necessary resources is effectively conducted
- Critical project milestones are identified
- Conflicts affecting the project are anticipated and/or recognized in a timely manner and appropriately resolved
- Contingency plans are realistic and appropriately applied
- Project management process thoroughly analyzed and valuable recommendations made

Sample Activity

Industry internship or real-world simulation projects would be best. Typical projects would include a team of five to ten students and cover a five-to-ten week period. Students should be asked to document their plan of action, their monitoring process, the problems they ran into in terms of task completion and scheduling, and how these problems were resolved. A project could be the research, design, development and testing of a computer-generated product (such as a newsletter, spreadsheet or web page).

Self-evaluation, peer-evaluation, industry feedback and, whenever possible, instructor observation should be used for assessment purposes. Asking students to keep logs of activities is also helpful for assessment by instructor.

Communication and Coordination Skills

- Oral Communication
 - Verbal Business Communication
 - Organization/Delivery of Presentations
- Written Communication
 - Written Business Communication
 - Proposal Writing
 - Technical Documentation
 - Project Documentation
- Workplace Communications
- Customer Relations
- Teamwork

Assessment Criteria and Suggestions: Communication and Coordination Skills

Verbal Business Communication

Using individual and group communication with varying degrees of formality, the following assessment criteria can be used:

Basic Verbal Business Communication Skills

- Language is clear, specific, and grammatically correct
- Communication serves a specific purpose and presents the intended idea
- Student is professional and courteous when communicating with others
- Student listens and paraphrases effectively what has been said
- Communication is timely and appropriate in content and format

Sample Activity

Students communicate verbally through in-class and group discussion, and informal in-class presentations.

Intermediate Verbal Business Communication Skills

- Communication is clear, complete and targeted to its purpose
- Verbal report is tailored to audience and purpose in style, format, and level of details and complexity
- Verbal report is persuasive and includes appropriate supporting information
- Use of technical terminology is appropriate to purpose and audience
- Escalation methods and channels for communication are appropriately used

Sample Activity

Students develop oral reports on topics of interest. These projects are well suited to combine Research, Analysis and Communication skills. The length, complexity, style and purpose of the reports should vary between projects.

Advanced Verbal Business Communication Skills

- A wide range of communication styles (formal, informal, technical, business, marketing...) is effectively used
- Communication style and content are adapted to audience feedback
- Effectiveness of the communication process is assessed and recommendation for improvements are made
- Presentation and verbal resolution of complex issues is creative and effective
- Communication is professional, courteous and effective in high-conflict and high-stress situations

Sample Activity

Over the course of the program, students develop a range of verbal reports, varying in degree of formality, technical complexity and type of audience (technical, management, marketing, end-user...). Students assess the effectiveness of their own communication as well as the effectiveness of peer communication. Given a verbal report developed for a specific audience, students may be asked to redesign the report for a different audience and purpose, and present their analysis and decision process.

Organization/Delivery of Presentations

Using individual and group presentations with varying degrees of formality, the following assessment criteria can be used:

Basic Organization/Delivery of Presentations Skills

- Language is clear, specific, and grammatically correct
- Presentation sustains a definite focus and presents ideas in a logical sequence
- Visual theme and style in the presentation are appropriate and sustained
- Visual elements are esthetic and respectful to audience
- Balance between visual elements and text is effective

Sample Activity

Students can be asked to develop and present short presentations. Students can also be asked to summarize and assess the effectiveness of a presentation they just heard.

Intermediate Organization/Delivery of Presentations Skills

- Balance of emotions, information, imagination and persuasion achieves the intended purpose
- Presentation is tailored to audience and purpose in style, format, and level of details and complexity
- Presentation is persuasive and includes appropriate supporting information
- Use of technology is effective and enhances the presentation
- Body language effectively supports the presentation

Sample Activity

Students develop and deliver formal presentations to the class using software presentation tools.

Advanced Organization/Delivery of Presentations Skills

- Presentation style is adapted to audience feedback and reactions
- Student projects a professional and confident attitude during presentations
- Effectiveness of the presentation is assessed and recommendation for improvements are made
- Presentation of complex ideas and concepts is creative and effective
- Visual style is adapted to the degree of formality appropriate to the situation

Sample Activity

Over the course of the program, students develop and deliver a range of presentations, varying in degree of formality, technical complexity and type of audience (technical, management, marketing, and end-user...). Students assess the effectiveness of their own presentations as well as peer presentations. Given a presentation developed for a specific audience, students may be asked to redesign the presentation for a different audience, and document the analysis and decision process.

Assessment Criteria and Suggestions: Communication and Coordination Skills

Written Business Communication

Using individual and group written communication with varying degrees of formality, the following assessment criteria can be used:

Basic Written Business Communication Skills

- Language is clear, specific, and grammatically correct
- Communication sustains a definite focus and presents ideas in a logical sequence
- Student is professional and courteous when communicating with others
- Student appropriately responds to written requests and feedback
- Appropriate format is used in letters and memos

Sample Activity

Students communicate in writing through emails, brief reports or essays.

Intermediate Written Business Communication Skills

- Written communication is clear, complete and well organized
- Written communication is tailored to audience and purpose in style, format, and level of details and complexity
- Written communication is persuasive and includes appropriate supporting information
- Use of email is effective and appropriate
- Type of communication method selected is appropriate to audience and purpose

Sample Activity

Students develop written reports on topics of interest. These projects are well suited to combine Research, Analysis and Communication skills. The length, complexity, style and purpose of the reports should vary between projects.

Advanced Written Business Communication Skills

- A wide range of written communication styles (formal, informal, technical, business, marketing...) is effectively used
- Written communication style and content are adapted to audience feedback
- Effectiveness of the written communication process is assessed and recommendation for improvements are made
- Written communication of complex ideas and concepts is creative and effective
- Communication procedures and channels are effectively applied

Sample Activity

Over the course of the program, students develop a range of reports, varying in degree of formality, technical complexity and type of audience (technical, management, marketing, end-user...). Students assess the effectiveness of their own reports as well as peer reports. Given a report developed for a specific audience, students may be asked to redesign the report for a different audience, and document the analysis and decision process.

Assessment Criteria and Suggestions: Communication and Coordination Skills

Proposal Writing

Using individual and group projects involving the development and documentation of a proposal, the following assessment criteria can be used:

Basic Proposal Writing Skills

- Proposal outline is well organized and includes all necessary elements
- Proposed concept is in line with specifications and constraints
- Proposal is complete and coherent, and follows appropriate format
- Supporting research and documentation are included in proposal
- Proposal level of detail and technical sophistication are appropriate to purpose and audience

Sample Activity

Students develop simple proposals to fill a specific customer need. The proposal can be verbally outlined and presented to the class and/or customers.

Intermediate Proposal Writing Skills

- Proposal development process is effective and well communicated
- Alternative solutions are developed and evaluated to support the proposal development process
- Budget, schedule and allocation of resources are realistic and congruent with the proposed plan
- Proposal document is professionally prepared and published
- Proposed concept and plan are effectively presented to customers

Sample Activity

Students develop proposal solving actual business problems/needs. The proposal includes timelines, budgets and allocation of resources, and is presented to actual customers.

Advanced Proposal Writing Skills

- The proposal process and proposal documents are analyzed for effectiveness and completeness, and effective recommendations are made for improvement
- Risks are clearly identified, and contingencies are developed and documented in the proposal document
- Proposal is presented to and negotiated with customers in an effective and professional manner
- Customer culture and expectations are analyzed and used effectively in the proposal design, content and layout
- Proposal format follows accepted industry standards

Sample Activity

Students assess the proposal process to identify areas for improvement, and practice their communication and negotiation skills in the presentation of the proposal to customers.

Assessment Criteria and Suggestions: Communication and Coordination Skills

Technical Documentation

Using individual and group projects involving technical documentation with various degrees of complexity, the following assessment criteria can be used:

Basic Technical Documentation Skills

- Student explains the purpose of technical documentation, and specific formats such as logs, reports, training manuals
- Technical documentation is clear, accurate and complete
- Information included in technical documentation is appropriate and properly detailed
- Technical documentation is up-to-date and communicated to appropriate audience in a timely manner
- Appropriate format is used for technical documentation

Sample Activity

Students apply technical documentation in technical courses, in documenting experiments, or technical troubleshooting or procedures.

Intermediate Technical Documentation Skills

- Technical documentation is concise, precise and appropriate to the purpose
- Technical documentation clearly conveys technical problems, related issues and solutions
- Design specifications and changes are clearly documented and referenced
- Technical documentation adheres to guidelines and standards from industry and organization
- Organization of data in the systems repository follows appropriate procedures

Sample Activity

Students develop technical specification documents for products and services to support and guide the development process. These specifications are reviewed and updated throughout the project, with changes clearly identified and justified.

Advanced Technical Documentation Skills

- Technical documentation process and format is effectively evaluated for and adapted to the requirements of the project and the organization
- Technical documentation is created and updated through all phases of the system life cycle
- Technical documentation processes are evaluated for effectiveness, and recommendations are made for improvements
- Organization of the system repository is analyzed for effectiveness and usability, and recommendations are made for improvements
- Diagrams, blue prints and other technical documents are properly referenced and organized in the repository database

Sample Activity

Students evaluate and apply sophisticated technical documentation systems to keep track of technical information for a specific purpose and organization. Usability and accuracy of system should be emphasized.

Assessment Criteria and Suggestions: Communication and Coordination Skills

Project Documentation

Using individual and group projects, the following assessment criteria can be used:

Basic Documentation and Business Communication Skills

- Language is clear, specific, and grammatically correct
- Project documentation is well organized
- Information in documentation is relevant to the project and is detailed appropriately
- Project documentation is up-to-date and distributed to relevant audience
- Appropriate format is used for documentation

Sample Activity

As students work on projects, they are asked to keep project logs and summaries.

Intermediate Documentation and Business Communication Skills

- Project documentation is clear, complete and follows format standards of the organization
- Project documentation includes issues, problems and solutions
- Documentation includes appropriate supporting information
- Project documentation includes schedules, task organization, allocation of resources, and changes to plan as project evolves
- Project documentation process involves input from all relevant team members

Sample Activity

Teams of students working on project compile complete project documentation, including project plan, budget and schedule, and problems and solutions.

Advanced Documentation and Business Communication Skills

- Project documentation process is evaluated and adapted to the needs of the project and the organization
- Student explains the importance of project documentation and its different purposes based on industry and organizational culture
- Effectiveness of the project documentation process is assessed and recommendation for improvements are made
- Student explains the impact of government regulations on project documentation and adapts the documentation to meet such standards
- Project documentation format and style is evaluated for effectiveness and usability, and recommendation for improvements are made

Sample Activity

Over the course of the program, students are asked to analyze and test project documentation processes and formats, and develop recommendations for adaptation to specific environments and for improvement to effectiveness and usability.

Assessment Criteria and Suggestions: Communication and Coordination Skills

Workplace Communication

Using individual and group communication with varying degrees of formality, the following assessment criteria can be used:

Basic Workplace Communication Skills

- Communication is clear and focused
- Communication is professional and courteous
- Communication is timely and appropriate to the situation
- Communication uses the format and style appropriate to the purpose and audience
- Communication uses the appropriate level of formality or informality based on the audience

Sample Activity

As students relate to other classmates, team members and teachers, communication, both verbal and written, is evaluated for appropriateness in style, content and format.

Intermediate Workplace Communication Skills

- Conflicts and concerns are resolved through professional and courteous communication
- Established communication channels and procedures are effectively used
- Escalation procedures for communication are understood and properly used
- Communication is effectively adapted to the purpose and audience
- Body language supports the purpose and intent of the communication

Sample Activity

Students are asked to assess and practice a range of workplace skills as part of project and team interactions.

Advanced Workplace Communication Skills

- Student evaluates communication channels (formal and informal) in an organization for effectiveness, and make recommendations for improvement
- Student explains the impact of workplace communication values and processes on overall organization effectiveness
- Different communication styles are effectively practiced and used within the team environment
- Communication is effective in presenting complex and controversial issues and proposals
- Communication is respectful of proprietary information and confidentiality

Sample Activity

Over the course of the program, students are asked to analyze and test more complex workplace skills dealing with conflicts and controversial issues, and to explore different styles and formats, and assess their effectiveness based on context and purpose.

Assessment Criteria and Suggestions: Communication and Coordination Skills

Customer Relations

Using individual and group projects involving interactions with customers, the following assessment criteria can be used:

Basic Customer Relations Skills

- Input from customers obtained and summarized in an effective, accurate and complete form
- Customer questions and concerns are answered in a timely and effective manner
- Need to escalate or refer customer concerns to other groups is recognized
- Proprietary customer information is recognized and respected
- Multiple customer requests are effectively scheduled and managed

Sample Activity

Students interview simulated customers (such as teachers who want to incorporate the use of computers in their classes,) summarize their interview process, tools and results. Students are asked to identify which issues came up during the interviews that are outside of the scope of the research. Interviewees are asked to assess the effectiveness of the interview process. Teachers can also play the role of the customers, responding to students' inquiries or asking students to respond to questions or issues.

Intermediate Customer Relations Skills

- Customer actual needs and desires are effectively differentiated
- Negotiations with customers conducted in a productive manner to arrive at best fit solutions
- Customer level of expertise recognized and communication or training tailored accordingly
- Effectiveness of customer interaction is assessed; recommendations for improvement made
- Student presents the elements of effective customer interaction and service

Sample Activity

Students interview potential users of a computer product (newsletter, spreadsheet, and computer system...) to assess their actual needs. Students analyze and summarize findings. Students assess the effectiveness of the interaction with the users and propose guidelines for effective interaction. Assessment from the interviewed users on the interview process can be used.

Advanced Customer Relations Skills

- Responsibilities of business units towards their customers, internal and external to the organization, are presented and discussed
- Feature-cost compromises and alternative options effectively communicated to customers
- Project plan, status risks and contingencies are effectively communicated to customers in a timely manner with appropriate level of details
- Follows up with customers to assess effectiveness of product or service over a period of time
- Student acts as a liaison between functional groups to coordinate delivery of products and services, and resolve conflicts

Sample Activity

Students present and discuss issues about customer interaction. During project in class or during internship, students document and assess the communication process with the customers or teacher acting as a customer. The customers assess the effectiveness of the communication process with the project team.

Assessment Criteria and Suggestions: Communication and Coordination Skills

Teamwork

Using direct observation when possible, through students' self-assessment and peer assessment, the following assessment criteria can be used:

Basic Teamwork Skills

- Feedback is effectively given and received, and used to improve performance
- Student learns from and teaches other team members; asks for help from others when appropriate
- Knowledge is shared with the team and risks in presenting ideas and recommendations are assumed
- Productive ideas and processes that contribute to the team process are suggested
- Student is respectful of other members of the teams and receptive to others ideas and styles

Sample Activity

Most of these skills can be assessed during team activities and class participation. Students write a brief report on what they learned from the team and how they plan to use this knowledge to improve their performance in a wide range of contexts (technical and non-technical).

Intermediate Teamwork Skills

- Organization of respective tasks and roles is effective to accomplish a given task/project
- A wide range of team processes (brainstorming, structured organization, meetings...) is effectively used
- Flexibility in participation style is displayed to accommodate changes in team dynamics
- Group process is supported by taking initiatives and helping resolve conflicts in an appropriate manner
- A wide range of team processes is organized and managed

Sample Activity

Some of these skills can be assessed during team activities and projects. Students present the advantages and limitations of different team processes. Given a set of goals and ground-rules, students organize the team to achieve purpose and reflect on process (verbally or in writing). Given a specific purpose, students organize the team, define roles and ground-rules to achieve goals.

Advanced Teamwork Skills

- Personal strengths and weaknesses in supporting the team process are identified, and improvements are made
- Effective team processes are selected for specific team environments and purposes
- Leadership styles that support the team process are exercised
- Effectiveness of the team process is assessed and valuable recommendations are made
- Conflicts between team members are effectively managed as they arise

Sample Activity

Some of these skills can be assessed during team activities and projects. Students write self-evaluations on their team style, team participation, and their strengths and limitation in the team process. Students develop a plan to improve their team effectiveness. Given a conflict scenario, students propose ideas on how to best resolve the conflict.

Business Environment Skills

- Business Organization and Environment
- Professionalism
- Task Management
- Professional Development

Assessment Criteria and Suggestions: Business Environment Skills

Business Organization and Environment

Using discussions, presentations and/or reports on business organization and environment, the following assessment criteria can be used:

Basic Business Organization and Environment Skills

- General business terminology is appropriately used
- Student explains the roles of different functional business areas: marketing, finance, accounting, research, development, manufacturing, management, human resources, etc.
- Student presents the interactions between different functional business groups
- Student presents how computer are used in today's business environment, and in specific functional business groups
- Student explains the basic differences between different legal business organizations, their respective advantages, limitations, and how they operate

Sample Activity

Most of these skills can be assessed through class discussion, and individual or group research and presentations.

Intermediate Business Organization and Environment Skills

- Student presents the internal and external forces and economic conditions that affect the operation of a business
- Student presents and discusses the social and legal responsibilities of businesses
- Student presents the particular issues and challenges of corporations doing business internationally
- Student presents the particular issues and challenges of corporations doing business over the Internet
- Student discusses intellectual property and privacy issues in today's business environment

Sample Activity

Most of these skills can be assessed through class discussion, individual or group research and presentations, and case studies.

Advanced Business Organization and Environment Skills

- Student presents and discusses the impact of computers on access and exchange of information on business
- Marketing and distribution plans developed by students are realistic, appropriately detailed and justified
- Resource allocation plans developed by students are realistic, appropriately detailed and justified
- Student presents contemporary business economic issues, principles and practices
- Student analyze and assess the effectiveness of different business organizations and cultures in the context of specific industries

Sample Activity

Most of these skills can be assessed through class discussion, individual or group research and presentations, and case studies.

Assessment Criteria and Suggestions: Business Environment Skills

Professionalism

Using direct in-class observation and input from other sources (other students and teachers, industry internship feedback...), the following assessment criteria can be used:

Basic Professionalism Skills

- Student is in time for classes and meetings, turns in assignments on time, and does not miss classes or meetings
- Pride in own work is displayed and responsibility for personal actions is assumed
- Organization hierarchy and procedures are followed
- Displays a positive and professional attitude, and is courteous and respectful to others
- Student assesses one's performance against expectations

Sample Activity

Student's behavior in class and during projects is observed or assessed by self and/or peers. Student's responsibility towards commitments such as homework is evaluated.

Intermediate Professionalism Skills

- Established policies are followed and data confidentiality is respected
- Basic elements of work ethics, and the importance of work ethics to organizations are well presented
- Student defines one's role within a project or an organization accurately
- Feedback from a wide range of sources is solicited and effectively used to improve performance
- Effective decisions are made and initiative is displayed

Sample Activity

This is best assessed through industry internship projects. However, a project team environment can also offer the context to assess this level of skills. Students define their role within the team, assess their performance and make recommendations for improvement.

Advanced Professionalism Skills

- Employer expectations regarding job performance and attitude are accurately identified
- Culture of the organization is accurately assessed and its impact on explicit and implied expectations is explained
- Effective personal development plan is developed
- Leadership roles in a wide range of context is assumed in appropriate manners
- The basis for an effective professional network is established

Sample Activity

This is best assessed through industry internship projects. However, a project team environment can also offer the context to assess this level of skills. Students interview potential employers and write report documenting employer's expectations and organization culture (acceptable and expected behaviors). Students outline a personal development plan that would bring them to the standards expected by the employer. Students develop a basic plan to establish and sustain an effective professional network based on their own career/employment goals.

Assessment Criteria and Suggestions: Business Environment Skills

Task Management

Using individual tasks and group projects, the following assessment criteria can be used:

Basic Task Management Skills

- Effective work schedule is developed
- Task status reports are complete, accurate and timely
- Multiple tasks/ requests are effectively prioritized
- Problems are recognized and communicated in a timely and appropriate manner
- Initiative in organizing and completing tasks is displayed

Sample Activity

Students keep a log of activities in the course of completing homework or performing on assigned projects. Students flag problems in their log and note solutions.

Intermediate Task Management Skills

- Task organization is adapted to new demands and varying workload
- Responsibilities are delegated appropriately
- Task status and performance are monitored against expectations
- Estimates for task completion and needed resources are accurate
- Tasks are accomplished efficiently and on schedule

Sample Activity

During the course of projects, students are asked to define their role and tasks, estimate time and resources needed for completion, develop a task schedule and monitor task completion against plan.

Advanced Task Management Skills

- Effectiveness of task management process is assessed and improvements are made
- Task assignment is made according to perceived role and responsibilities
- Conflicts between tasks and/or with schedule are effectively resolved
- Creative and effective ways to improve work processes are developed
- Student recognizes when task is completed to expectations

Sample Activity

On selected projects, students are asked to document their plan of action, their monitoring process, the problems they ran into in terms of task completion and scheduling, and how these problems were resolved. In a team environment, students draw a task assignment plan with supporting justification and associated team roles. Students assess task performance against goals and make recommendations for improvement.

Self-evaluation, peer-evaluation, industry feedback and whenever possible instructor observation should be used for assessment purposes.

Professional Development

The following assessment criteria can be used:

Basic Professional Development Skills

- Feedback from peers and teachers is effectively applied to improve performance
- Student learns from others' experience and knowledge through class and/or project participation
- Personal level of proficiency in specific areas of skills is accurately assessed
- Importance of continuous learning in technology environments is presented
- Commitments to acquire new skills within agreed time frame are met

Sample Activity

Instructors observe students' attitude towards learning during class participation, their ability to use feedback to improve performance, and evaluate students' progress throughout course or program. Students write brief assessments of their skills and knowledge, and outlines of plans for improvement.

Intermediate Professional Development Skills

- Student takes the initiative in acquiring necessary knowledge and skills for a specific project
- Personal strengths and limitations in knowledge and skills as they apply to a given project are accurately assessed
- Learning forum (in-class, text book, practice, self-learning...) is selected that best fit personal learning style and the skill to be learned
- Costs (time, budget...) and benefits of specific training programs are accurately estimated
- Complete and realistic job description are developed for specific project roles

Sample Activity

Students write reports assessing own skills and knowledge, summarizing plans for acquiring new skills and knowledge, listing training options with associated advantages and disadvantages, and summarizing actions taken to acquire new skills and knowledge. Students develop job descriptions for project roles.

Advanced Professional Development Skills

- Effective personal education and training plan is developed for a given development purpose
- Job description/expectations are analyzed and gaps in personal skills to meet the requirements are identified
- Effectiveness of a training program is accurately evaluated the for a given purpose and audience
- Need for new skills and knowledge is anticipated based on industry trends and personal career goals
- Portability of personal skills from one area of application to a different context is recognized

Sample Activity

Students develop long-term development plan based on personal career goals, with specific steps and options to implement plans. Students assess own skills and knowledge as they apply in a wide range of job contexts and roles. Students assess effectiveness of specific training against intended goals.

Problem Solving

- Data Gathering, Analysis and Organization
- Problem Definition
- Solution Development and Testing

Data Gathering, Analysis and Organization

Using individual and group projects, the following assessment criteria can be used:

Basic Data Gathering, Analysis and Organization Skills

- Sources of data are clearly identified and relevant to the problem
- Data is evaluated for validity, completeness and relevance
- Conflict between data is appropriately resolved
- Data is recorded accurately and organized efficiently
- Documentation of data follows standards and procedures

Sample Activity

Students are asked to gather data through direct observation and research, to analyze and document this data in a usable format.

Intermediate Data Gathering, Analysis and Organization Skills

- Need for data is clearly and accurately specified, and appropriately justified
- The scope of data gathering and analysis is congruent with the purpose, and the availability of time and resources
- Student accurately judges when there is sufficient or insufficient data
- Analysis of data is conducted using appropriate logical and statistical methods
- Data analysis and summaries are organized and documented in appropriate formats

Sample Activity

Students are asked to analyze complex sets of data and develop effective summaries based on the purpose of the activity.

Advanced Data Gathering, Analysis and Organization Skills

- Correlations and divergence within the data sets are identified and accurately interpreted
- Data gathering, analysis and organization process is evaluated for accuracy and effectiveness, and recommendations for improvement are made
- Analysis process is planned and designed to meet the specific purpose of the experiment
- Data is organized and displayed using sophisticated charting and display tools
- Errors and uncertainties in the data gathering process are clearly identified, and their impact on validity of data is clearly evaluated

Sample Activity

Students are asked to develop, test and apply data gathering, analysis and organization processes, and evaluate their effectiveness in the context of the activity.

Problem Definition

Using individual and group projects, the following assessment criteria can be used:

Basic Problem Definition Skills

- Critical and relevant questions are asked to identify problem
- Diagnostic tools and techniques are effectively used in assessing problem
- Problem is analyzed in a systematic manner
- Problems are accurately documented following procedures
- Criticality of problem is accurately assessed

Sample Activity

Given a specific problem, students keep a log of their problem identification steps. Students report verbally on problem definition. Typical problems are simple enough to be identified within a few hours.

Intermediate Problem Definition Skills

- A wide range of troubleshooting methods and tools is effectively used
- Appropriate experiments are designed and implemented to further define problem
- Effective hypotheses are developed and refined to guide the problem definition process
- Observations and measurements are accurate, well organized and interpreted in a meaningful way leading to problem definition
- Problem definition process and results are well documented

Sample Activity

Given a problem, students develop their own process and experiments to identify problem. Typical problems would take up to a few days to identify.

Advanced Problem Definition Skills

- Systematic analysis of system is performed and critical thinking strategies are applied to identify problems and root causes
- Effectiveness of the problem identification process is assessed, and recommendations are made
- Student applies innovative methods and perspectives in dealing with a variety of problems
- Testing of concepts and prototypes is used to support problem identification
- Risks associated with testing and problem identification are evaluated, and appropriate testing decisions are made

Sample Activity

Typical problems would take a few days to one week to identify and involve a team of students. Problems can be technical (the printer does not work properly) or non-technical (the project is running into cost or schedule overrun, or a key member of the team just quit). Students document problem in a formal report. Students analyze causes of problems and propose guidelines for problem prevention.

Solution Development and Testing

Using individual and group projects, the following assessment criteria can be used:

Basic Solution Development and Testing Skills

- Solutions are tested without making problem worse
- Proposed solutions are realistic and appropriate
- Solutions are tested in a systematic manner
- Prototypes are effectively used in the development and testing of solutions
- Solutions are accurately documented following procedures

Sample Activity

Given a specific problem, students keep a log of their problem resolution steps: What solutions did they test to resolve the problem? Which solution did they implement? Students report verbally on problem and summarize solution. Typical problems are simple enough to be resolved within a few hours.

Intermediate Solution Development and Testing Skills

- Risks in solution implementation correctly assessed; appropriate testing decisions made
- Cost/benefit estimates of alternate solutions (including non-implementation) are realistic
- Solutions and impact on users are clearly communicated
- Solution implementation is coordinated with appropriate personnel
- Tools and methods used to develop and test solutions are selected for and adapted to the specific problem and environment

Sample Activity

Given a problem, students analyze problem and recommend potential solutions with associated cost, benefits and risks. Students are asked to use at least two different resolution methods or tools and compare effectiveness of each approach. Typical problems would take up to a few days to resolve.

Advanced Solution Development and Testing Skills

- Resolution plan is in line with problem, and budget and resource constraints
- Effectiveness of the problem resolution process is assessed; recommendations are made
- System performance and/or user satisfaction is evaluated after resolution
- Recommendations for prevention of problem recurrence are realistic
- Plan for solution implementation is well designed and takes into account minimal impact on system performance and productivity

Sample Activity

Typical problems would take one-to-several weeks to resolve and involve a team of students. Problems can be technical (the printer does not work properly) or non-technical (the project is running into cost or schedule overrun, or a key member of the team just quit). Students document problem and resolution process in a formal report. Students analyze causes of problems, develop guidelines for problem prevention and assess effectiveness of resolution process.