After a project has been completed, project team members may be involved in legal actions if there are failures of the built structure or its performance. In these cases, project team members will be required to use a wide range of techniques to communicate to a broad audience, often in stressful situations.

In all these cases, project team members may be subject to inquiries by a wide range of interested parties, each party with its own agenda regarding the project and the information being transmitted. To deal with what, in some cases, are very adversarial situations, all project team members must be confident in the knowledge and ability to communicate their story.

Examples

Following are examples of abilities that evidence the attainment of this outcome.

- Using modern word processing programs, develop written documents that can be read by the general population (8th- to 10th-grade reading level), which explain projects and component activities.
- Produce technically concise and accurate reports for communicating with other team members or members of the legal profession.
- Develop presentation materials using modern software and present them to audiences of interested parties.
- Use knowledge of current trends in communication to promote projects and educate interested parties on the benefits and progress of the project teams' work.
- Provide developers with information and graphics that are suitable for use on modern social media platforms, including Facebook, Twitter, Instagram, and so on.
- Speak before audiences of varying type, size, and temperament.
- Produce concise and technically accurate reports in communicating with project and legal team members.

Foundational Outcome 11: Business Acumen

Level of achievement: Describe efficient and effective business principles and operations (L2)

Overview

Civil engineering project teams must be able to manage projects, including their financing, human resources, communications, and a wide variety of other activities. They must do this in a way that reflects modern business practices. The organizations that are most successful are composed of team members at all levels who understand good business practices and conduct their work in ways that are consistent with these practices.

Application

Civil engineering projects, by their nature and at every level, need the use and outlay of resources to be accomplished. Funds are required to support or acquire all resources, whether labor, equipment, or materials. These funds, whether for public or private projects, must be managed in a fiscally responsible and efficient manner. To responsibly and efficiently manage resources, project team members must have a broad knowledge of modern business practices. This is the case not only at the highest level of corporate or government management, but also at the level of work teams responsible for designing or building a project.

Project team members have broad business concerns that often involve multiple responsibilities, such as managing the salary and wage expenses that are a large component of project cost. CETs must be able to manage their own budgets for their salary expenses and for equipment used to test and monitor work. They must be able to monitor how much they spend so they not only stay within their own budgets, but also can properly monitor work throughout the life of the project. For example, in monitoring work, they must be able to determine how much time it takes to do tests, interpret data, and write monitoring reports. Further, they must keep records that verify their own cost expenditures.

CETs on a work site may be responsible for monitoring or making decisions that affect the productivity and efficiency of contractors and subcontractors doing specific tasks. It is important for them to understand the implications of such decisions, especially when their decisions are driven by technical specifications and affect the contractors' means and methods for accomplishing a job.

While there are often fiscal, human resource, budget, and purchasing support teams available for a project, decisions on details of data collection and resource use are often made at the field level. So every project team member must be aware of how to do these things properly. Also, since many project team members aspire to higher-ranking positions, it is especially important that they hone their business skills, as those positions typically require increasingly more business acumen and less technical ability.

Examples

Following are examples of abilities that evidence attaining this outcome.

- Provide timely and accurate reporting of project and organization functions to fiscal, human resource, purchasing, budget, and other administrative agencies.
- Know fiscal, human resources, purchasing, budget, and other administrative functions as they relate to business operations and project cost.
- Demonstrate understanding of the legal implications of handling and managing the resources of the owners they work for or monitor work for.
- Use modern technology to record and track project activities, progress, and expenditures.
- Understand a basic profit and loss statement for their agency or organization.

Foundational Outcome 12: Leadership

Level of achievement: Inspire a group to perform a prescribed task or series of tasks (L3)

Overview

One definition of leadership appropriate to a civil engineering workplace reads, "Leadership is a process of social influence, which maximizes the efforts of others, towards the achievement of a goal" (Kevin Kruse, *Forbes*, April 2013). In the context of guiding a group of co-workers or subordinates to complete a task, the attributes that distinguish leadership from management or supervision include the ability to obtain cooperation through articulating a mission, develop a shared vision within the group, build trust, and exhibit openness to ideas from group members and the confidence to give up authoritarian control.

A leader obtains voluntary cooperation from a group, as opposed to using fear or specific rewards. He/she builds two-way trust, trusting group members to accept and carry out their responsibilities and instilling trust in return. This enables group members to speak honestly and seek solutions to problems, even if articulating the problem conveys information that is unpleasant to others.

Application

By applying leadership principles to enable a group to successfully complete a task or project, a CET demonstrates the ability to use learned material in new situations. In contrast, the technician is provided a specific task to complete and the schedule for completion. A CET does not have to be the designated leader of a work team to exercise leadership. The CET may still motivate, guide, and influence co-workers and/or subordinates using learned and developed leadership skills.

Examples

Following are examples of abilities that evidence the attainment of this outcome.

- Motivate co-workers and/or subordinates to extend themselves to complete a set of plans given a short deadline or some other obstacle.
- Guide co-workers and/or subordinates through adopting a new testing procedure or learning to use a new piece of equipment.
- Influence co-workers and/or subordinates to continuously increase their technical and personal skills and knowledge.
- Obtain cooperation from others under challenging conditions.
- Articulate a group's mission and find connections between the mission of the group and the personal missions or ambitions of the participants.
- Successfully complete a task or project through cooperation and collaboration, without the need for authoritarian control.

Foundational Outcome 13: Public Policy, Laws, and Regulations

Level of achievement: Explain public policy, laws, and regulations applicable within an area of specialization (L2)

Overview

Public policy consists of the objectives of a governing body regarding the health, morals, and well-being of the citizenry (BusinessDictionary.com). Laws and regulations differ in that laws are created through legislation to address societal needs, and regulations are adopted by government agencies empowered to enforce the laws. Knowledge of the motivation, source, and specific provisions of laws and regulations applicable to one's area of specialization is critical to functioning responsibly within a civil engineering workplace.

Application

A CET should know what elements of public policy may be applicable to the success of a project. Understanding public policy goals helps the engineering team better interpret the resulting laws and regulations and predict the consequences or effects of future trends.

The CET should be aware of applicable laws and regulations and grasp the meaning of specific provisions that must be followed. For example, the CET may need to know the potential impact on a project of environmental regulations, worker safety requirements, or planning and zoning policies. Workplace functions that may require comprehension of public policy, laws, and regulations include determining whether the conditions are met for a project to be granted a specific type of permit and then developing or assembling the information required to apply for a permit or agency approval.

Examples

Following are examples of abilities that evidence the attainment of this outcome.

- Advise the engineer in responsible charge on which permits or agency approvals may be required.
- Name the federal, state, or local agencies with jurisdiction over a specific project.
- Explain the provisions of regulations or policies applicable to the project.
- Have sufficient knowledge of policies and regulations to avoid activities that may be out of compliance.
- Ensure that any data required to apply for or show compliance with a permit are collected.
- Know when it is necessary to refer questions, issues, or direct communication with an agency to the engineer in responsible charge.

Foundational Outcome 14: Teamwork

Level of achievement: Apply knowledge of roles and responsibilities of team members in a multidisciplinary environment and operate effectively as a member of a multidisciplinary team (L3)

Overview

Nearly every project or task in a civil engineering workplace requires the efforts of more than one individual for successful completion. Most definitions of teamwork incorporate phrases like "combined efforts," "cooperative efforts," or "working collaboratively" to describe the interaction of members of a group working together to achieve a common goal. True teamwork differs from a process of individuals receiving assignments supportive of a goal or project and completing them independently because teamwork includes these attributes: respect for individual contributions, putting aside individual motives, consensus building, clear communication, and compromise.

Functioning as an effective member of a multidisciplinary team requires several attributes in addition to technical expertise and subject matter knowledge. Examples include reliability in completing assigned tasks, support of other team members, enthusiasm and commitment to the goal(s) of the team, courage and ability to constructively identify shortcomings interfering with the ability of the group to accomplish a goal or task in a way that does not produce anger or resentment, ability to absorb constructive criticism without anger or defensiveness, and openness to the ideas of others.

Application

Bloom's Level 3 calls for "the ability to use learned material in new and concrete situations." An effective CET understands the typical roles of multidisciplinary team members in the context of a specific type of workplace and engineering discipline and uses that knowledge to function as an effective team member, particularly in knowing when to take initiative and when to collaborate with or defer to others. By contrast, a

technician would have a prescribed role and be expected to carry out tasks when assigned.

Efforts that may involve participation in a multidisciplinary team could include completion of a task or project involving engineering disciplines other than civil engineering, or one involving disciplines other than engineering, such as economics, demographics, archaeology, or social sciences.

Examples

Following are examples of abilities that evidence the attainment of this outcome.

- Describe the roles and responsibilities of team members typical of the CET's workplace and engineering discipline.
- Define, schedule, and carry out one's own tasks, collaborating as needed and meeting the schedule of the team.
- Successfully complete a project requiring participation in a multidisciplinary team.

Foundational Outcome 15: Professional Growth and Responsibility

Level of achievement: Demonstrate professional growth and responsible behavior as related to society, employers, and clients (L3)

Overview

The quantity of technical and nontechnical knowledge required to work in the civil engineering enterprise increases at a steady rate. Complicating this challenge is the increasing involvement of multidisciplinary fields, such as information technology, which can increase the accuracy, productivity, and cost-effectiveness of project delivery. The knowledge, skills, and experience acquired at the beginning of a career are not sufficient for a career spanning several decades. Lifelong learning through additional formal education, continuing education, professional practice experience, active involvement in professional societies, community service, coaching, mentoring, and other learning and growth activities is critical to keep pace with changing regulations, techniques, practices, tools, and materials.

Application

Successful CETs will determine self-directed learning goals that include formal education, training, and practical work experience to develop the breadth and depth of skill sets necessary to reach their career goals.

Examples

Following are examples of abilities that evidence the attainment of this outcome.

- Develop a five-year individual development plan.
- Identify work opportunities that provide experience and contribute to career-advancement goals.
- Become active in professional and/or community organizations.