



ACE Mentor Program of America, Inc. Educational Goals and Learning Objectives

Educational Goals

The primary goal of the ACE Mentor Program is to excite high school students about the many careers in the integrated construction industry – architecture, engineering, construction management, and related skilled trades. ACE realizes this goal by involving students in workshops and field trips and engaging them in a realistic process of designing a project and planning its construction. The ACE program extends over 15 to 20 afterschool sessions each lasting 2-3 hours, for an overall total of approximately 40 hours. Several mentors drawn from different design/construction fields, paired with 10-20 students, work as an integrated design team throughout the program.

As an afterschool program, ACE is a form of informal education. It does not mandate a fixed curriculum or formally measure students' mastery of a prescribed body of knowledge or skills. Rather, mentors follow a general programmatic model and draw upon a tested body of hands-on activities which reflect many aspects of designing and constructing a building – for example, construction document reading, beam design, or cost estimation and bidding.

ACE follows a project-based learning strategy. Mentors meaningfully engage students with realistic design projects that introduce them to the basic skills and knowledge of the design/construction industry. Through personal example, explanation, and tours of offices and construction sites, they also inform students about career paths and work-life in the design/construction professions.

Because development, buildings, infrastructure, and landscape significantly impact the global environment, ACE strives to instill in students a culture of sustainability. The principles and techniques of sustainable design are woven into many parts of the program.

Through ACE, students acquire a set of skills and experiences which are among those cited as essential for the 21st-century workplace:

- Critical thinking and problem-solving
- Teamwork and collaboration
- Creativity and innovation
- Information technology application
- Communication in a cross-cultural environment.

Finally, ACE equips students, regardless of their ultimate career choice, to appreciate the built environment and thus to be better citizens of the world that we build, use, and share.

Several experienced ACE mentors, each representing different professions, have contributed to the development of this document – Brandi Hall (Denver), Darris James (New York City), Doug Lacy (Dallas/Fort Worth), Scott Peterson (Indianapolis), Jack Tipton (Nashville), and Doug Whiteaker (Sacramento).

Learning Objectives

The ACE experience provides students with **knowledge** and **skills**. The **knowledge** they gain concerns the fundamental processes of designing and building a structure and the requirements and pathways for different careers in the design/construction industry. Students acquire two sets of **skills**, the first specifically related to the design/construction industry and the second pertaining more generally to the workplace and life.

During the course of the program, each mentor-student team works toward development of a design project which is either set out for all teams within an affiliate or devised by individual teams. At the conclusion of the program, the students present their project in a public forum. “Deliverables” typically required for a final project include architectural drawings with sections and/or a model, site plans, landscape design drawings, structural design plans, finish boards, mechanical and electrical schematics, estimated construction costs, and a construction schedule. Students often produce computer-generated drawings and documents as well as virtual models.

When meeting ACE’s learning objectives, mentors may improvise and add/substitute creative elements that play to their strengths and knowledge.

KNOWLEDGE

I. Relevant to Careers in the Design/Construction Industry

After completing a year in the ACE Mentor Program, students should:

- Know the working relationships and responsibilities of building owners, architects, engineers, construction managers, and skilled building trades.
- Understand the major opportunities and career paths available in the design/construction industry – architecture (including landscape architecture and interior architecture), engineering (structural, civil, and mechanical, electrical, architectural), urban planning, construction management, and the skilled building trades.
- Understand the preparation and training needed to enter careers in the design/construction industry.
- Know about possible postsecondary school options and apprenticeships relevant to the design/construction industry.
- Know about career requirements such as licensure or certification.
- Experience the work places and work lives of design/construction industry professionals.

II. Relevant to the Processes, Principles, and Practices of the Design/Construction Industry

At a minimum, after completing a year in the ACE Mentor Program, students should have a basic understanding of:

- Components of a building and their mutual relationships (client, site, program, design, structure, infrastructure, construction, etc.)
- Phases of a project and their relationships (pre-design, schematic design, design development, construction documentation, construction administration, value engineering, etc.)
- Methods of project delivery and their relationships (construction documents, specifications, shop drawings, etc.)
- Design process (identifying need, defining the problem, conducting research, analyzing set criteria, developing concepts, finding alternate solutions, evaluating solutions, making a decision, communicating the product)
- Terminology employed in the design/construction industry
- Principles and strategies for sustainable design and construction (impacts on the environment, solutions for saving energy and other natural resources, and rating systems)
- Functions and roles of the skilled trades relative to the success of the overall construction process.

Depending upon students' level of advancement, mentors may delve deeper into subject matter specific to certain disciplines within the design/construction industry.

Advanced topics for Architects may include:

- A sense of design aesthetics of structures, space manipulation, and materials composition.
- Basic codes (zoning and building) affecting the design and construction of a project
- The role of various life safety elements within a building (exit requirements, rated constructions and separations, distances to exits, width of exit corridors, etc.)
- Furniture, finishes and materials appropriate to architectural and/or interior design.

Advanced topics for Landscape Architects may include:

- Site analysis including analyzing slope/drainage, shade/sun, site access and site context
- Programming a site; understanding what site amenities and components are needed
- The relationship between the building and site, the site and surroundings, and strategies for creating a sense of place
- Basic principles of planting design including selection and placement of plants.

Advanced topics for MEP Engineers may include:

- Various components of a building's mechanical, electrical and plumbing infrastructure and how they relate to each other (including: fire protection systems, plumbing, HVAC, electrical, lighting and telecommunications)
- Basic principles of HVAC and heat transfer
- Electrical power delivery system from generation to utilization
- Mechanics and basic properties of structural materials.

Advanced topics for Structural Engineers may include:

- The five fundamental load types (tension, compression, shear, bending and torsion)
- Some of the forces, both external and internal, that bear on structures
- Methods used to analyze simple structures, including load transfer mechanisms, stress-strain relationships of building structures, and load-bearing relationships of columns, and beams.

Advanced topics for Civil Engineers may include:

- Delivering services to the building and site (water, sewer, etc.)
- Site layout
- Grading and drainage.

Advanced topics for Contractors may include:

- Basic differences between the two most commonly employed project delivery methods (Design-Bid-Build vs. Design-Build/Design-Assist/Integrated Project Delivery)
- Sequencing of major phases and events for a construction project.
- Fundamental concepts of construction management, including a simple schedule and cost estimate for a defined event

- Safety requirements when designing a structure, and occupational and worksite safety when visiting construction projects.

Advanced topics for the Skilled Trades may include:

- Building codes and how they are applied to a construction project and specific skilled trades
- Estimation of equipment and materials based on blueprints and specifications
- Coordination by the different trades in the installation of materials and construction process.

SKILLS

I. Relevant to the Design/Construction Industry

After completing a year in the ACE Mentor Program, students should:

- Understand the conversion of scale and drawing dimensions (measurements) to full-size, on-site parameters.
- Acquire first-hand experience using some of the common tools of the design/construction industry – ranging from computer-aided design software and modeling programs to trowels and architect/engineer scales.
- Be able to use freehand graphic skills or sketches to communicate ideas visually and to represent design concepts.
- Use a scale to measure dimensions from a drawing and draw objects to scale.
- Identify the differences between a plan, section, elevation, and perspective and demonstrate how each is used.
- Understand construction drawings, diagrams, and specifications.
- Understand that lines and symbols represent real spaces and elements.
- Demonstrate an ability to read drawings by identifying spaces and interpreting symbols using keys and legends.

II. Relevant to Professional Development

After completing a year in the ACE Mentor Program, students should:

- Develop and deliver a multimedia presentation using different visual aids such as drawings, boards, and models (both virtual and actual) to describe their final project.
- Learn to follow technical directions.
- Work as part of a team whose members have different backgrounds and contribute constructively to its mission.
- Develop creativity and innovation necessary to solve design challenges.
- Hone critical thinking processes and strategies.
- Learn to meet deadlines.
- Learn to effectively communicate thoughts and ideas orally as well as graphically.
- Demonstrate an effective oral ability to critique their own work and that of others.
- Understand the importance of written communication in all aspects of business life.
- Appreciate the importance of professional decorum, behavior and dress in the work environment.