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Preparing Instructional Objectives and Educational Goals for Construction Management Courses

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Understanding the basic paradigms needed in preparing instructional objectives and educational goals for any given construction management course is the focal point of this article. The intent is to provide the reader with a linchpin that is necessary for planning and developing sound instructional objectives and educational goals in a construction management curriculum.

Keywords: Teaching, Instructional Objectives and Construction Education

Introduction

Why are instructional objectives or educational goals necessary in a Construction Management Curriculum? Four of the main reasons are: First, without a clear understanding of the intended learner outcomes for a course, the selection of the teaching methodology, instructional materials, evaluation of learners, and course duration has no logical basis for implementation. Second, the learner needs to understand the purpose of the course, the final expectations of the course, the system used in evaluation (grades), so they will be able to organize their efforts for the course. Third, without clearly knowing what the learner's final expectations are, any test or examination developed by the instructor may be misleading and unfair. And fourth, the main reason relates to the instructor's ability to organize the course to impart their intended educational purpose.

The planning process needed in developing a course with clear measurable instructional objectives and educational goals allows the reduction of overlap, misunderstanding or misleading course titles and allows for careful review of construction management courses that provide desired learner outcomes. *In construction terms, the contractor does not select the construction equipment for a project until they know the type of construction project.*

What are Instructional Objectives and Educational Goals?

The concept of "objectives and goals" (behavioral objectives) were developed by R. Tyler (1949), while the term "goals approach" was made popular by N. Gronlund (1991). R. Mager created a significant impact with his approach to preparing instructional objectives. Typically educational goals use broad general terms such as: to understand, to know, to apply, to appreciate, and so on. While instructional objectives are measurable terms such as: to solve, to build, to recite, to identify and so on. In D. Jacobsen, P. Eggan and D. Kauchak's textbook *Methods of Teaching,* a combination of these paradigms and goals approach is suggested. This

method of describing educational goals in this author's opinion provides the best planning tool for any professor in the construction management curriculum. Some examples of each are noted below.

Objective (Mager):

1. Given 25 construction definitions on the major parts of a building a freshman in construction management will be able to successfully answer 20.
2. Given 5 estimating questions on calculating the cubic yards of concrete in a monothlitic slab, beginning estimating students will successfully answer 4.
3. Given 10 contract law cases, the junior level construction management student will identify each that contains a breach of contract by the owner.
4. Given a set of plans, surveying students working in groups of three will correctly lay out a residential building with string lines and batter-boards to within 1/4" every time.

In following Mager's paradigm above, the system requires a great deal of specificity and does not state the educational intent of the professor.

Educational Goals:

1. Beginning estimating students will solve written problems, from a set of plans on the amount of concrete, rebar, chairs and grade stakes.
2. For scheduling students to learn how to develop a CPM for a commercial project.
3. For a surveying class to understand the steps in laying out a building
4. Students in the History of Construction class will understand how the build environment affects the culture of a society.

Educational goals can be introductory statements or complete sentences. They address three key planning needs for a construction management course: First, who is the audience; second, what learning task is required; and third, what learning is inferred rather than observed. Goals should be written as simple and precisely as the professor can determine.

In educational goals, the focus is on broad statements using terms that are typically abstract, while instructional objectives focus on answering three questions.

1. What is the performance? Which means what will the learner be able to do after the experience.
2. What is the condition? Which means under what circumstances is the performance expected to occur.
3. What is the criterion? Which means what type of evaluation is the professor using and what is considered acceptable.

The mission of establishing instructional objectives and educational goals provides the planning needed by a professor. They answer the critical questions.

1. What do I want my students to learn (to know, to understand, to appreciate) and

2. When and how will I know my students have learned the above?

What are the Taxonomy of Educational Objectives and Domains?

Much has been written about the Taxonomy of Educational Objectives using the affective, psychomotor and cognitive domain (see references). As facilitators of learning, a linchpin for categorizing learning is needed to develop instructional goals and objectives. Learning begins at a very early age from physical tasks such as tying shoes, buttoning a shirt, catching a ball, and eating. Next intellectual tasks such as parts of a car, items in a home, the alphabet, and simple math are learned. Finally, human values, attitudes, and feelings are learned, for example, a favorite color or number. While all of the above is learning they certainly are not the same type of learning. In education we describe these domains as: Affective, Psychomotor and Cognitive.

- *Affective*: Growth of values or attitude.
- *Psychomotor*: Development of muscle and coordination.
- *Cognitive*: Imparting intellectual skills and knowledge.

In a construction management curriculum we strive to impart all three of these domains. It is critical that each professor understand each domain in order to correctly provide the academic challenge of developing courses in the construction management curriculum. How many times have students taking a course and upon completion complain the course title and objectives are incongruent and course objectives were not clearly understood nor met. A better planning and understanding of the domains, educational objectives and educational goals creates a foundation for success.

The affective domain simply teaches attitude and value. While attitudes are feelings of like or dislike towards objects, people or environment, they are learned from experience. Professors normally hope for a positive attitude toward their class and learning experience.

The psychomotor domain focus relates to muscle development and coordination. This domain probably has the least impact in the construction management curriculum. However, some courses in field surveying, testing labs, computer labs, and materials labs would certainly require development of certain motor skills in order to achieve the results expected by the professor.

The cognitive domain is the most common domain used in all construction management curriculums. Its primary focus is on the transferring of knowledge to a learner.

While each domain has been defined it is critical that each professor understand that all three of the domains are interrelated and important in the development of instructional objectives and goals.

Example of using Instructional Objectives and Educational Goals

A sample course instructional objectives and educational goals follow. The syllabus is not complete, only the portions identifying instructional objectives and educational goals.

Construction Science Course
Survey: Construction Layout
4 Semester Hours

Objectives and Outline

Course Description

The fundamentals of plane surveying including the use and care of equipment. Precise measuring of distance, basic theory and practice of leveling, angles and bearing, principles and use of transit, curves, topographic and construction surveying are taught with class and field experience.

Course Objectives And Methodology

The student will have knowledge of surveying theory to establish a basis from which construction surveying applications are derived. The major objective of this surveying course is to impart basic knowledge and skills in the practice of surveying as it relates to construction project application.

The methodology employed to impart this knowledge will include lectures, text reading assignments, field orientation problems and assignments, demonstrations, and examinations.

The course contains five major areas. Each area progresses from easier topics to more difficult ones. The major objective of this surveying course is to impart basic knowledge and hands on training in the use of traditional surveying equipment-tape, transit and level.

Each unit has several instructional objectives that will be covered on examination or field assignments. Note instructional objectives prior to reading the assignments.

Required Text

Kavanagh, B. Surveying with Construction Applications, 3rd Ed. Englewood Cliffs, New Jersey: Prentice-Hall, 1997.

Area One

Surveying Fundamentals - This unit covers an introduction to surveying and the surveying task of controlling errors to achieve desired accuracy.

Instructional Objectives Chapters 1 and 2:

1. Given stations and elevations of two points, the student should be able to determine the slope between them.
2. Be able to list the six information items required in a field notebook.
3. Given an explanation of a source of error, the student should be able to decide whether or not measures should be taken to eliminate it based on whether it is systematic or accidental.
4. Given the necessary equipment, the student with a partner, should be able to tape on sloping ground, holding the tape and plumb bob in the various positions required for taping horizontally, employing voice signals, and recording entries in the field notebook. Distances should have an accuracy of 1:3,000.
5. Given a tape correction, the student should be able to correct a given measured distance to the nearest one/sixteenth of an inch.
6. Given an average temperature, the student should be able to correct a given measured distance to the nearest one/sixteenth of an inch.
7. Given a difference in elevation between two points and the slope distance between the two points, the student should be able to compute the horizontal distance to the nearest one/sixteenth of an inch.

Area Two

Leveling and Surveying Equipment - This unit covers horizontal/vertical distances which are the fundamentals of plane surveying.

Instructional Objectives Chapter 3 and 4:

1. Given the necessary equipment, the student with a partner, should be able to complete a level circuit of four turning points with an error not greater than .01 foot.
2. Given an architect/builder's level, the student should be able to demonstrate the proper procedure for setting it up and for reading the rod.
3. Given a level rod, the student should be able to select a satisfactory turning point, to hold the rod properly, and to wave the rod properly.
4. Given a series of rod readings as seen through the architect/builder level (either slides or pictures), the student should be able to read them correctly.
5. Given field data, the student should be able to keep complete notes, including an arithmetic check.
6. Given an object to be used as a benchmark, the student should be able to write an adequate description.

Area Three

Measuring Angles - This unit covers angular measuring. Distance and direction are required to establish relationships between points.

Instructional Objectives Chapter 4 and 5:

1. Given a transit of a type decided by the instructor and a point the size of a nail head, the student should be able to set up the transit over the point.
2. Given a transit the student should be able, over a point and two additional points, to turn an angle between the two points to the left or right as directed.
3. Given a transit the student should be able, over a point and one additional point, to determine the vertical angle to the point from a horizontal line.
4. Given a field notebook and horizontal and vertical angle data, the student should be able to enter satisfactory notes, including a sketch.
5. Given a total station, students will be able to set up and use equipment.

Area Four

Traverse - This unit covers traversing which is measuring the lengths and directions of successive lines. The traverse provides an accurate framework the surveyor needs to locate objects from convenient points on the framework and to relate them to each other quickly, without mistakes and without accumulating errors.

Instructional Objectives Chapter 6:

1. Given several bearings and azimuths, the student should be able to convert bearings to azimuths and azimuths to bearings.
2. Given angles and distances verbally as they would be read in the field, the student should be able to record complete traverse notes, including a sketch.
3. Given complete field notes for a traverse, the student should be able to:
   a. Plot the traverse to scale
   b. Determine angular error and adjust the angles
   c. Determine bearings of all courses based on the bearing of one course in the notes
   d. Determine latitudes and departures for each course
   e. Determine accuracy of the survey
   f. Determine corrections for each station
   g. Adjust the traverse

Area Five

Construction Surveys and Layout - This unit will provide the key areas required in this course. The surveyor is responsible for identifying the property line and the builder is responsible for the construction stake out. Layout errors have critical importance in the construction industry.

Instructional Objectives Chapters 8, 9, 11 and 13:

1. Given outside dimensions of a building and its distance from a parallel line, desired offset distance and a point for the transit setup, the student should be able to prepare a sketch showing all dimensions needed to lay out the building by the baseline and offset method.
2. Given the same data, the student should be able to calculate angles and distances to lay out the building by the angle and distance method.

3. Given a transit setup over a point, back sight and distance to set a construction stake, tape, hammer, stake and nail, the student should be able to act as instrument man, rear tape man or head tape man in setting a point for construction control.
4. Given elevation of construction stake, finished grade and desired grade rod length, the student should be able to determine the distance above or below the construction stake to build a batter board.
5. Given a transit, stakes, batter board, nylon line, nails and a set of blueprints the student should be able to stake out the building for construction to within one/eighth inch accuracy.

Summary

With clearly defined objectives and goals, not only will the students have a clear understanding of the requirements to satisfactorily complete the course, but fellow faculty can be clearly understand the courses. The linchpin benefit from this paper is the ability to properly integrate between courses in the construction curriculum. These goals and objectives provide a distinct direction for each course thus eliminating gaps or duplication of contents in the curriculum.

In preparation for teaching a course in construction management curriculum it is recommended that each professor carefully determine and state clearly what are the instructional objectives and educational goals of that particular course. From that determination, create and develop a set of experiences that will meet the planned intended educational goals. The planning, implementing and evaluating methods used in any construction management course will always establish the value of the final product – the successful student.

In conclusion, the instructional objective for this article is to become familiar with the development and use of instructional objectives and educational goals so that when creating a course in a construction management curriculum the professor will be able to correctly perform this planning task.

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Appendix A

Key Definitions

Learning: Defined as a change in behavior caused by a permanent experience rather than growth.
Objectives: Typically stated using behavioral terminology, attempting to precisely determine educational outcomes, or a desired performance which learners must exhibit before evaluating them as competent. The results of instruction rather than the process of instruction.
Educational Goals: A statement of educational intent usually in broad statements using general, abstract terms.
Instructional Objectives: Describe an intended outcome of instruction rather than an instructional process.
Performance: What the learner is able to do.
Conditions: Important circumstances under which the performance is expected to occur.
Criterion: The level or quality of performance that will be considered acceptable.