

Application of Pedagogy or Andragogy: Understanding the Differences between Student and Adult Learners

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Abstract – Psychologically, people become adults when they develop a self-concept of being responsible for their own lives. As people become biologically mature, start assuming adult roles, and take more responsibility for their decisions and actions, they also become self-directed in their learning. The appropriateness of instructional models relies heavily upon the psychological maturity of the learners. This paper explores and contrasts the meaning, application, and methods of pedagogical and andragogical instructional models for civil engineering undergraduates. Pedagogy, the art or profession of teaching, as an instructional model assigns the teacher a number of responsibilities, including making decisions about what content will be learned, how and when it will be learned, and how and when the learning will be assessed. The result of this teacher-directed education places the student in a submissive role in the educational dynamics because the teacher controls the student's grade and eventually decides if and when the student will be promoted and then graduate. This submissive role of the student is not congruous with ASCE BOK Outcome 9 of demonstrating "a recognition of the need for, and an ability to engage in life-long learning" (ABET i). In contrast to pedagogy, andragogy promotes self-directedness or self-concepts associated with adult-like roles normally assumed after college graduation, including control of the learning process. With adult learning defined as "the process of adults gaining knowledge and expertise," the result is an educational model for an adult learner consistent with his/her personal goals and ASCE BOK Outcome 9.

Keywords: Pedagogy, andragogy, adult learners, self-directed

INTRODUCTION

Pedagogy and andragogy are chief components of learning and motivation. Although primarily associated with education, the application of pedagogy and andragogy should be prefaced with a distinction between education and learning. Education is the "act or process of imparting or acquiring general knowledge and of developing the powers of reasoning and judgment." [14] Education emphasizes the educator, who instigates changes in students' knowledge, skills, and abilities, presents stimuli and reinforcement for learning [6]. The term learning, in contrast, is a "process (rather than an end product) that focuses on what happens when learning takes place and concentrates on the person or student in whom the change occurs or is expected to occur [3].

This paper addresses the processes of learning when applying a pedagogical or andragogical model to the education of engineering students. Particular interest is paid to a defining characteristic of adult learners – the self-directed learner – and its connection to ASCE BOK Outcome 9 (ABET i). In addition, this paper will present a plan for implementing andragogical applications and methods in the instruction of undergraduate engineering students. But before delving into the particulars, a broader look at student and adult learning will be presented.

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WHAT ARE PEDAGOGY AND ANDRAGOGY?

In 1968, Malcolm Knowles proposed a model of adult learning to distinguish it from preadult schooling or learning. The result was a contrast between pedagogy or preadult learning and what Knowles termed andragogy, meaning “the art and science of helping adults learn” [3].

According to Webster, pedagogy is (1) the function or work of a teacher; teaching. (2) the art or science of teaching [15]. This view as an instructional model assigns the teacher a number of responsibilities, including making decisions about what content will be learned, how and when it will be learned, and how and when it will be assessed. The result of this conventional teacher-directed education places the student in a submissive role in the educational dynamics in order for him/her to earn a grade and be promoted or graduated [6].

Andragogy, as noted above, is “the art and science of helping adults learn [7].” Table 1 summarizes the characteristics of Knowles’ assumptions [7].

Assumptions about Learners	Preadult Learning (Pedagogy)	Adult Learning (Andragogy)
1. The need to know	Youths only need to know that they must learn what the teacher teaches if they want to pass and get promoted; they do not need to know how what they learn will apply to their lives	Adults need to know why they need to learn something before undertaking to learn it. The most potent tools for raising the level of awareness of the need to know are experiences in which the learners discover for themselves the gaps between where they are now and where they want to be.
2. The learner’s self-concept	The teacher’s concept of the learner is that of a dependent personality; therefore, the learner’s self-concept eventually becomes that of a dependent personality.	Adults have a self-concept of being responsible for their own decisions, for their own lives.
3. The role of experience	The learner’s experience is of little worth as a resource for learning; the experience that counts is that of the teacher, the textbook writer, etc.	Adults come into an educational activity with a greater volume and a different quality of experience from that of youths. The downside is that as adults we tend to develop mental habits, biases, and presumptions that tend to cause us to close our minds to new ideas, fresh perceptions, and alternative ways of thinking.
4. Readiness to learn	Learners become ready to learn what the teacher tells them they must learn if they want to pass and get promoted.	Adults become ready to learn those things they need to know and be able to do in order to cope effectively with their real-life situations.
5. Orientation to learning	Learners have a subject-centered orientation to learning; they see learning as acquiring subject-matter content. Therefore, learning experiences are organized according to the logic of the subject-matter content.	In contrast to children’s or youth’s subject-oriented orientation to learning (at least in school), adults are life-centered (or task-centered or problem-centered) in their orientation to learning. Adults are motivated to learn to the extent that they perceive that learning will help them perform tasks or deal with problems that they confront in their life situations.
6. Motivation	Learners are motivated to learn by external motivators (e.g. grades, the teacher’s approval or disapproval, parental pressures).	Adults are responsive to some external motivators (better jobs, promotions, higher salaries, and the like), but the most potent motivators are internal pressures (the desire for increased job satisfaction, self-esteem, quality of life, and the like). Normal adults are motivated to keep growing and developing, but this motivation is frequently blocked by such barriers as negative self-concept as a student, inaccessibility of opportunities or resources, time constraints, and programs that violate principles of adult learning.

Table 1. Assumptions Contrasting Preadult and Adult Learners

Self-directedness is a personal attribute or characteristic of an adult learner [4]. In addition, self-direction is a major tenet of adult education, or andragogy. [7]. This attribute manifests itself in the motivation of students to be primarily grade-oriented or learning-oriented. Grade-oriented students apply a narrow focus toward subject-centered learning and class involvement, and literature associates them closely to teacher-directed or pedagogical learning environments. Learning-oriented students, on the other hand, demonstrate an attitude commonly associated with an andragogical learning environment and demonstrate a task-centered or problem-centered approach to learning [12].

Essentially, pedagogy focuses on preadult (child or youth) learning, while andragogy refers to adult learning. As young adults, college students are in a period of transition. Perry, in his model of cognitive development in college students, relates how students move from a dualistic (right versus wrong) view of the universe in their freshman year to a more relativistic view in their upper years and how students develop commitments within this relativistic world [8] [13]. This places certain responsibilities on the educator to develop a framework and environment that provides opportunities for and facilitates such a transition. Within this context, certain pedagogical or preadult practices may be inappropriate to the college student's natural maturation toward self-direction.

In discussing adult learning and comparing Knowles's andragogy to other models of adult learning, Merriam and Caffarella make the following statement [3]:

“Despite these rather grim predictions of andragogy's demise, practitioners who work with adult learners continue to find Knowles's andragogy, with its characteristics of adult learners, to be a helpful rubric for better understanding adults as learners. The implications for practice that Knowles draws for each of the assumptions are also considered to be good instructional practice for all ages, especially adults.”

Given the definition of pedagogy as preadult learning and the appropriateness of andragogical or adult instruction to engineering students, especially in the upper level courses, it is fitting to relate andragogy to a specific and purposeful application of this educational model.

RELATING ANDRAGOGY TO ASCE BOK OUTCOME 9

In 2004, The American Society of Civil Engineering (ASCE) published the Civil Engineering Body of Knowledge (BOK) for the 21st Century. In this document, the ASCE delineated 15 outcomes that collectively prescribe the “knowledge, skills, and attitudes required of an individual aspiring to the practice of civil engineering at the professional level in the 21st century.” Within these outcomes are the 11 outcomes of the Accreditation Board of Engineering and Technology (ABET) [1]. Associated with both lists, BOK outcome 9 and ABET i, is the following outcome:

The 21st century civil engineer must demonstrate “a recognition of the need for, and an ability to engage in, **life-long learning**” [1].

In the BOK commentary to Outcome 9 [1], the following life-long learning mechanisms are identified:

- Additional formal education.
- Continuing education,
- Professional practice experience,
- Active involvement in professional societies,
- Community service,
- Coaching and mentoring, and
- Other learning and growth activities.

While the above life-long learning mechanisms are normally associated with the post-baccalaureate experience, the commentary identifies areas of personal and professional development that span the years of college and practice:

- Goal setting,
- Personal time management,

- Communication,
- Delegation,
- Personality types,
- Networking,
- Leadership,
- The socio-political process, and
- Affecting change.

The BOK [1] continues to assert, “All 15 outcomes (guided by the commentaries) would be included, to varying degrees of thoroughness, in the B [baccalaureate] and/or M/30 [masters plus 30 hours]. That is, responsibility for providing students with the opportunity to advance to at least Level 1 (recognition) in all 15 outcomes, and to Level 3 (ability) in some, would reside within their formal education” [1].

From the description provided in the BOK commentary, does the student have an opportunity to advance to at least Level 1 in the areas of personal and professional development for Outcome 9 in a pedagogical or teacher-centered environment? Shuman supports this observation in his analysis of ABET professional skills, like Criterion *i* (BOK Outcome 9), can be taught and assessed, but not necessarily in the traditional lecture format [10]. Shuman states, “These skills can certainly be mastered as part of a modern engineering education format that utilizes active and cooperative learning, recognizes differences in learning styles, and is cognizant of teaching engineering in its appropriate context.”

As supported by the previous discussion, the appropriate format for teaching and assessing Outcome 9 – the recognition of the need for and an ability to engage in life-long learning – is in an andragogical or student-centered environment, that moves the student to higher levels of cognitive development by presenting internal motivators and involving him or her in activities and assignments with post-graduation or real-world application. Ideally, this environment of relatedness with real-world applications would encourage and motivate each student to begin thinking within his or her discipline -- in other words, thinking like an engineer.

ANDRAGOGICAL INSTRUCTION OF ENGINEERING UNDERGRADUATES

How can students who are proficient and possibly flourishing in a pedagogical learning environment be prepared for the challenges facing them after graduation and into their careers?

A careful reading of Wankat’s summary contrasting Piaget’s theories of childhood development with Perry’s theory of development of college students leads to a profound observation. This observation is that K-12 students having progressed to the highest stage of intellectual development in a pedagogical or teacher-directed educational system but may not necessarily be prepared to learn in conditions normally advocated for adults [13]. For example, many students are not prepared to make learning relevant, nor are they prepared to be self-directed in their learning [11]. Therefore, it is important to realize that what is valuable in the education and training of adults is significantly different from the environment desirable for younger learners.

A number of well-known reports call for reform of our nation’s engineering education. [2]. Several of these reports call for educating students for life by helping them learn how to learn. From the perspective that after graduation the student will rarely have the benefit of a structured college classroom environment, it is imperative that they be prepared to learn as adults. Achieving this level of preparation is not easy and requires considerable effort on the part of the student and on the part of the instructor.

An authoritative report from the National Academy of Engineering (NAE) entitled “The Engineer of 2020: Visions of Engineering in the New Century” presents a framework for engineering education in the United States for the future [5]. In this report, the following statement summarizes one of the key attributes of engineers in 2020:

“Encompassed in this theme is the imperative that engineers to be **lifelong learners**. They will need this not only because technology will change quickly, but also because of the career trajectories of engineers will take on many more directions – directions that include different parts of the world and different types of challenges and that engage different types of people and objectives. Hence, to be

individually/personally successful, the engineer of 2020 will learn continuously throughout his or her career, not just about engineering, but also about history, politics, business, and so forth.”

Taking an andragogical approach leads the instructor to create, develop, and implement activities associated with task-centered or problem-centered learning experiences that prepare students for their chosen career.

CONCLUSIONS

Engineering educators continue to share valuable approaches about teaching and learning, which has resulted in a sizable amount of scholarly work. For years, educators have been challenged to view their students as capable of higher levels of performance and learning. In the past ten years, a number of authoritative reports have called for reform in engineering education, and support the intent of a college education to prepare students for life-long learning.

But is the student or pedagogical education model conducive to preparing the learner for life-long learning? In other words, does a teacher-centered education model prepare a civil engineering student with “a recognition of the need for, and an ability to engage in life-long learning?” Evidence does not support such a contention. The more appropriate educational model is the andragogical model with its emphasis on being responsive to internal adult motivators like increased job satisfaction, self-esteem, and quality of life.

The appropriate format for teaching and assessing “the recognition of the need for, and an ability to engage in, life-long learning” is in an andragogical or student-centered environment. Ideally, this model would involve each student in activities and assignments with post-graduation or real world application. Within this environment of relatedness, these real-world or life-centered applications would encourage and motivate students to begin thinking within their discipline, in other words, thinking like an engineer. And this type of thinking forms a cornerstone of engineering education.

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