

# Pedagogical Characteristics Affecting Student Learning

S. Manjit Sidhu

*University Tenaga Nasional, Malaysia*

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## INTRODUCTION

Student in today's undergraduate level classrooms often display widely varying characteristics that extremely affect learning outcome. Although student characteristics have been widely studied in the more traditional teaching and learning environments, educators have just begun exploring the applications in interactive multimedia and its associated technological techniques. This article first describes some pedagogical characteristics that could affect students in their learning and then discuss some student learning styles.

## BACKGROUND

In recent years, approaches to teaching have shifted considerably and have led to a greater differentiation between teaching and learning. While studies on improving teaching have been ongoing for many years, only recently have studies on improving learning been initiated. More and more researchers today are looking into what characteristics affect a student's learning curve given that the teaching techniques are close to optimal.

A variety of student characteristics impact a student's performance and ultimately individual achievements in the classroom. Huitt (2002) lists six main characteristics as follows:

- Intelligence, achievement, and prior knowledge
- Learning style
- Cognitive development
- Gender
- Race
- Moral and character development

## Student Attributes Affecting Learning

As a case study the experiments under research have focused on a first year undergraduate level classroom that teaches engineering mechanics subjects. Considering that many first year undergraduates have different level of knowledge in science and mathematical subjects, the student characteristics list of learning as stated above can be extended as follows:

- **Basic knowledge background:** The characteristic represents the basic science and mathematics knowledge of the student. On a given scale, it shows whether, and how much, basic science and mathematics knowledge the student has. The scale is however multidimensional, showing not only the background knowledge in science and mathematics, but also knowledge of other categories required for a better understanding of the selected engineering mechanics subjects. Engineering mechanics subjects are better understood if the student has an intermediate knowledge of topics such as calculus, science, mathematics, and physics.
- **Academic performance:** A student's prior academic performance is often a factor that is overlooked in a student's current academic achievements. A good or bad performance often affects a student positively or negatively particularly during test or quizzes.
- **Exposure to modern educational technologies:** This represents the experience that students already have in using modern technological learning aids such as computer and learning packages that students use in their learning. The use of computer packages is more easily understood if students already have some elementary computing skills.
- **Learning style:** Student learning styles are probably one of the most researched factors affecting

student cognition and learning rate. Many studies have been performed on student learning styles with many different categorizations made available.

Learning styles are most often targeted in elementary education. A number of researchers have tried to categorize learning styles in different manners. Some of these are discussed in the next subsequent sections.

## **HISTORY OF LEARNING STYLES**

There have been several learning style questionnaires (instruments) and models developed to categorize the way learners take in and process information. Some most quoted and popular ones found in the literatures include, the Myers-Briggs type indicator (MBTI), Kolb's learning style model, Herman brain dominance instrument (HBDI), McCarthy's 4MAT model, Dunn and Dunn learning style model of instruction, Felder-Silverman learning style model, and Honey and Mumford learning styles evaluation. In general research conducted with engineering students using any of these learning styles mentioned is reported to provide a positive involvement.

The issue of how to help people to learn effectively has been an active research area over the last decade (Mumford, 1982). Most individuals have different learning styles, which indicate preference for particular learning experiences. Witkin's (1976) work on field dependent and field independent cognitive styles concentrates on the differences in the way individual structures and analyses information. Pask and Scott (1972) identify holist and serialist strategies in problem solving. Pask argues that the holist and serialist strategies are the manifestations of the underlying differences in the way people approach learning and problem solving. Miller and Parlett (1974) describe cue-consciousness and identify two distinct groups of students. The first group is respective to, and actively seeks out, clues and hints from their tutors regarding forthcoming examinations, these they termed as clues-seeking; whereas the second, who have less sophisticated strategies and do not pick up on available hints, are termed clue-deaf.

Dunn (1979) points out a person's learning orientation is perhaps the most important determinant of educational attainment. Logically, the greater its

congruence with the teaching method used, the greater the chance of success (Allinson & Hayes, 1990). Consequently, some instruments are available which seek to measure learning styles. In past years, a number of researchers have examined the concept of learning styles (Delahaye & Thompson, 1991). Marton and Saljo (1976a) believe that students' approaches to learning tasks could be categorized into two broad areas that they labeled as "deep approaches" or "surface approaches." Deep approaches involved an active search for meaning underlying principles, structures that linked together different concepts or ideas and widely applicable techniques. Surface approaches, on the other hand, rely primarily on attempts to memorize course work, treating the material as if different facts and topics were unrelated.

Further studies by Marton and Saljo (1976b), and Svensson (1977), demonstrate that most students were somewhat versatile in their choice of learning approach. The students' choice depended on such factors as their interest in the topic, the nature of their academic motivations, the pressure of other demands on their time and energy, the total amount of content in the course, the way in which a task is introduced, and their perceptions of what will be demanded of them in subsequent evaluations or applications of the material (Kinshuk, 1996). Recent work in the field is more expansive (in those issues are assessment, instruction, personality, and evaluation) as they relate to learning styles and strategies are comprehensively addressed (Ginter, Brown, Scalise, & Ripley, 1989; Green, Snell, & Parimanath, 1990; Weinstein, Goetz, & Alexander, 1988). However, the Kolb (1976) learning style model has motivated most researchers and is used widely to measure student-learning style.

## **Kolb's Learning Style Model**

Kolb developed the learning style inventory (LSI) in 1976 and revised in 1985 (Tendy & Geiser, 1998). The LSI was a nine-item self-report questionnaire in which four words describing one's style by which respondents attempt to categorize their learning style. One word in each item was used to correspond to one of four learning modes as shown in Figure 1. The four stage cycle of the learning modes in the figure are identified as Type-1: concrete experience (CE), Type-2: reflective observation (RO), Type-3: abstract conceptualization (AC), and Type-4: active experimentation (AE).

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