

# An Assessment of Graphics Faculty and Student Learning Styles

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## Abstract

*It is generally accepted that the ability to visualize is an important tool for engineers and technologists especially in engineering graphics. Enhancing the spatial visualization abilities of engineering students has long been a focus of engineering graphics educators. Over the years a variety of tests and procedures have been developed to determine learning styles. As professors, we tend to teach the way we learn, whether that is an effective approach for the students or not. Understanding our own learning style as well as the styles of our students might help us become more effective as communicators and teachers. Kolb (2004), and Herrmann (1995) have developed different theories on learning styles. The Myers Briggs Type Indicator test (MBTI) is given to high school students to help them make educated decisions about their career choices. Traditionally, instructors have been encouraged to present information in several different modes to engage students with a variety of learning styles.*

*This paper presents the results of a pilot study that examined the assessment of learning styles of graphic educators and graphics students. It was based on the Style Delineator by Anthony Gregorc (2000). The Style Delineator, a self-assessment instrument for adults, can be used as a tool for understanding learning as well as teaching styles. For the purpose of this pilot study, the student participants were limited to undergraduates majoring in computer graphics technology. The faculty participants were university graphics instructors with a variety of academic and industrial backgrounds.*

## Introduction

Much research has been done to assess how the human mind operates, perceives and processes information. Individual learning differences are referred to as "learning styles" (Butler, 1987). As a result, many learning models have been developed to assess an individual's style of learning. Educators can begin an assessment of their own teaching style and compare their findings to an assessment of their students' learning styles. Butler (1987) points out that a change in teacher attitude and action can form a "bridge" to the learner when the educator first begins to identify with the learning perspective of the student. The next step is taking action to lead the learner

through the task in another way more conducive to his/her style. Several of these learning models are presented in this paper for comparison.

## The Gregorc Style Delineator

### History

As early as 1970, Anthony Gregorc (2000), a teacher, school administrator and professor of education, was working on an assessment tool to address what, why, and how individuals learn. Gregorc's interpretation of style was based on his Mediation Ability Theory describing how the mind works. He believes that each person has "natural qualities" that are expressed through mind channels. How a person uses these channels is referred

to as his or her “mediation abilities” (Butler, p. 12). He defines four types of mediation abilities: perception, ordering, processing, and relating. His Style Delineator focuses on two of these abilities — perception and ordering.

Gregorc states, “perceptual abilities are the means through which you grasp information ... Ordering abilities are the ways in which you authoritatively arrange, systemize, reference and dispose of information”(Butler, p.13). Perceptual ability is the way in which the individual perceives the world in abstract or concrete terms. Ordering ability is the way in which the individual organizes information, whether it is sequentially or randomly.

Through extensive research interviews, Gregorc (2000) identified four channels of mediation that individuals use for perception and ordering. These “channels” serve as the “frames of reference” which influence the individual’s experience and resulting behavior. The Phenomenology Research Method was used to classify overt behaviors (phenos) and match them with underlying causes (noumena) in order to draw conclusions about the nature (logos) of the individual’s style. He stated, “Styles are symptoms of underlying psychological frames of reference and of driving mental qualities of the mind” (Butler, p.12).

**Assessment Instrument**

As a result of his early research, the Gregorc Style Delineator was developed in 1982. The Gregorc Style Delineator is a self-analysis tool that identifies an individual’s “mediation abilities” or the channels used to receive and express information. The outward appearance of one’s “mediation abilities” is the individual’s “style” (Gregorc, 1982).

The Gregorc Style Delineator is used to determine a person’s style by assessing two types of mediation abilities: perception and ordering. Perceptual ability is determined by two qualities: abstractness and concreteness. Whereas the qualities that control one’s ordering abilities are sequence and randomness. Each mind has all four of these qualities, but we use them with different intensities. The channels defined by Gregorc (2000) couple these qualities to determine the person’s “qualitative orientation to life.”

The Gregorc Style Delineator uses a word

matrix as a basis for determining a person’s style. Ten sets of words, in groups of four, are presented to the individual. The individual is asked to rank (1 low - 4 high) each set of words according to how they apply to themselves. For example:

Set 1		Set 2	
Word	Rank	Word	Rank
objective	2	perfectionist	4
evaluative	3	research	3
sensitive	4	colorful	1
intuitive	1	risk-taker	2

After all the word sets are ranked, points are added across the rows and then down. Two row scores added together determine each style category. Once the scores are totaled, they are charted on a grid by quadrants — Concrete Sequential, Abstract Sequential, Abstract Random and Concrete Random. Any number over 27 indicates a dominant mediation channel. Once an individual understands his or her learning style, they can use appropriate strategies to strengthen their learning abilities. Students can compensate for differences in their learning styles and the teaching styles of the instructors by performing other activities. A teacher can try to accommodate different learning styles by offering a variety of learning activities.

**Teaching Styles**

Butler (1987) has developed a profile of four teaching styles based on the Gregorc mind channels. The following is a summary of the four styles and how the educator in each category approaches teaching:

**Concrete/Sequential**

The *concrete/sequential* learner is product-oriented as opposed to people-oriented, and can be characterized as ordered and objective (Gregorc, 1982). They can be described as hardworking, dependable and organized. An individual strong in this category learns in an orderly, step-by-step way and prefer hands-on activities (Butler, 1987).

According to Butler (1987) concrete/sequential teachers favor behavioral objectives that have measurable outcomes, and immediate and specific application for students regardless of instructional setting. They organize class

materials so students move through activities in a logical way and apply the knowledge gained in a practical way. Activities include informational lectures, demonstrations and self-paced instruction. Because they focus on “task-oriented achievement,” they may use outlines, overheads and checklists to help students structure content.

**Abstract/Sequential**

The *abstract/sequential* learner is evaluative, logical and rational. Butler (1987) describes the abstract/sequential learner as analytic, structured and systematic. This type of learner prefers reading and analysis, lectures and discussions.

“Abstract sequential teachers favor conceptual objectives with outcomes that indicate the student’s ability to analyze, theorize and evaluate ideas” (Butler, 1987). They present ideas sequentially through lectures or readings and provide reference sources for other support materials. Activities focus on lectures, debates, reports and presentations. Students analyze, interpret and report on topics.

**Abstract/Random**

The *abstract/random* learner tends to be people-oriented, not product-oriented, and can be characterized as lively and spontaneous (Gregorc, 1982). They can be described as imaginative, perceptive and spontaneous. Individuals in this category prefer to focus on themes, ideas, feelings and activities that allow for group interaction and communication (Butler, 1987).

“Abstract random teachers write global objectives. Outcomes show the students’ understanding, appreciation, and interpretation of the subject matter as well as of themselves” (Butler, 1987). Their classes provide students many ways to learn from each other through interaction and sharing. Activities include group projects, discussions and teaching/learning teams. Abstract random teachers are more concerned with the learning process than with the product produced.

**Concrete/Random**

The *concrete/random* learner is perceptive and likes to experiment and take risks (Gregorc, 1982). This learner can be described as curious, creative, and adventurous. As learners, they prefer experimentation and problem-solving approaches

to learning and like activities which encourage active investigations and applications (Butler, 1987).

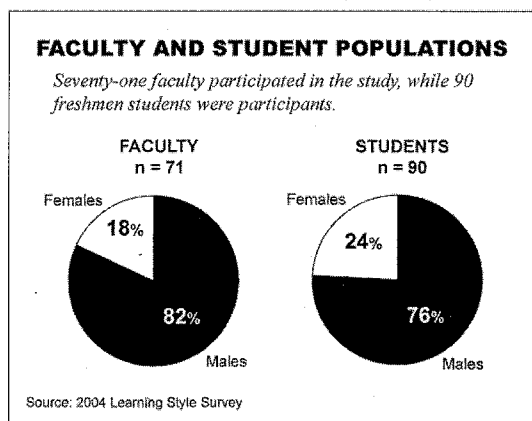
“Concrete random teachers favor global objectives that encourage students to raise questions, delineate problems, generate alternatives, and propose solutions” (Butler, 1987). They do not limit learning to the classroom and may contain unusual resources such as discarded appliances or art supplies that students can use to explore or be creative. Other activities include independent study projects, experiments, case studies or discussions. Students like to look at broad applications, so activities such as brainstorming and creative problem solving are encouraged.

**The Testing Group**

**The Sampling**

This study compared a group of graphics faculty with a group of graphics students. The faculty group was composed of 56 faculty members who attended the Engineering Design Graphics Division (EDGD) Mid-Year Meeting in Williamsburg, Virginia in November 2004 and 15 Computer Graphics faculty members from Purdue University. The student population was composed of 90 first-semester freshmen majoring in Computer Graphics Technology in the College of Technology at Purdue University.

The convenience sampling had a higher male to female ratio in both the student and faculty populations (Figure 1). There was approximately a 3:1 ratio of males to females with 68 male student participants and 22 female student participants (90 total). In the faculty sample there was approximately a 4.5:1 ratio of male to female participants with 58 males and 13 females (71 total).



**Figure 1.**

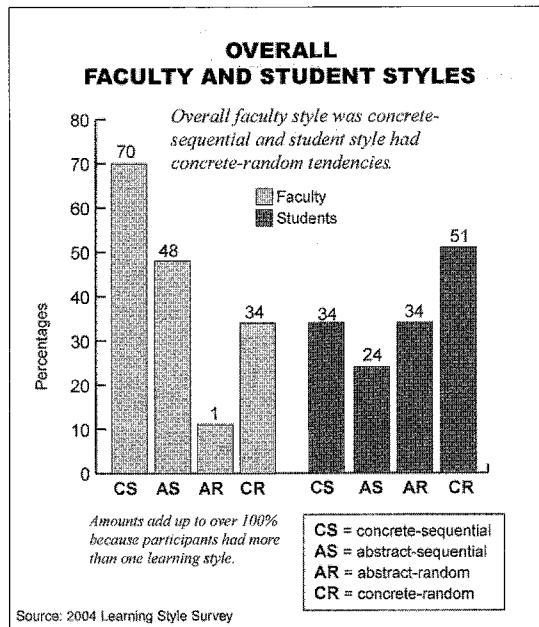


Figure 2.

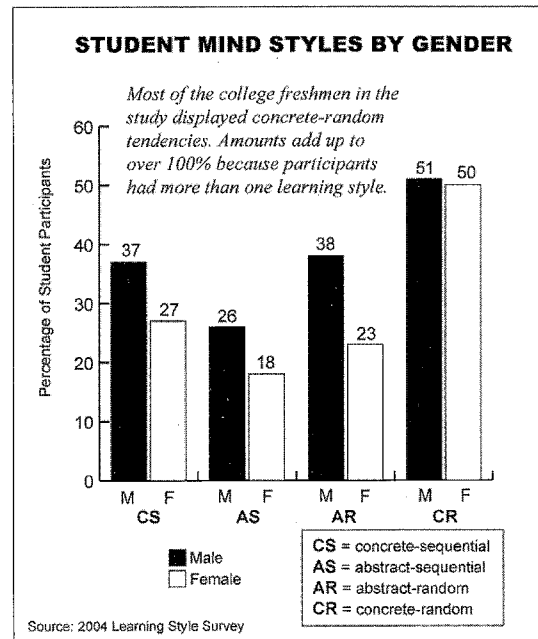


Figure 3.

**The Freshmen Students Overall**

Fifty-one percent of the Purdue freshmen computer graphics students sampled were found to be concrete random learners, according to the 2004 study (Figure 2). The findings further indicated that the college freshmen were least likely to be abstract/sequential learners (24 percent). There were an equal number of learners who were concrete/sequential learners (34 percent) and abstract random learners (34 percent).

**The Faculty Overall**

According to the 2004 study, 70 percent of the faculty sampled was found to be concrete/sequential learners (Figure 2). The findings further indicated that the computer graphic faculty was least likely to be abstract/random learners (11 percent). Concrete/random learners (34 percent) and abstract/sequential learners (48 percent) completed the remainder of the total.

**The Freshmen Students By Gender**

Half of the male students and half of the female students were found to be concrete/random learners, according to the 2004 study. Male and female students were similar in learning style preferences with both indicating abstract/sequential as the least used mind style (See Figure 3).

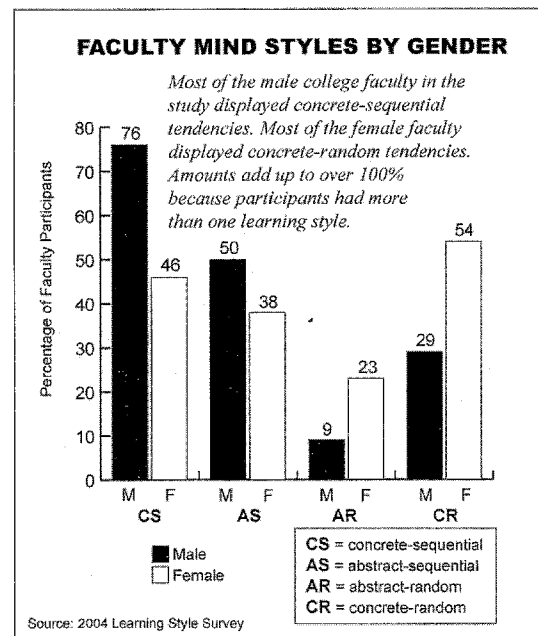


Figure 4.

**The Faculty By Gender**

If the faculty data by gender is reviewed, an interesting finding emerges. More male faculty were found to be concrete/sequential learners than any of the other mind styles, whereas more female faculty were found to be concrete/random learners (See Figure 4). Both genders were least likely to be abstract/random learners.

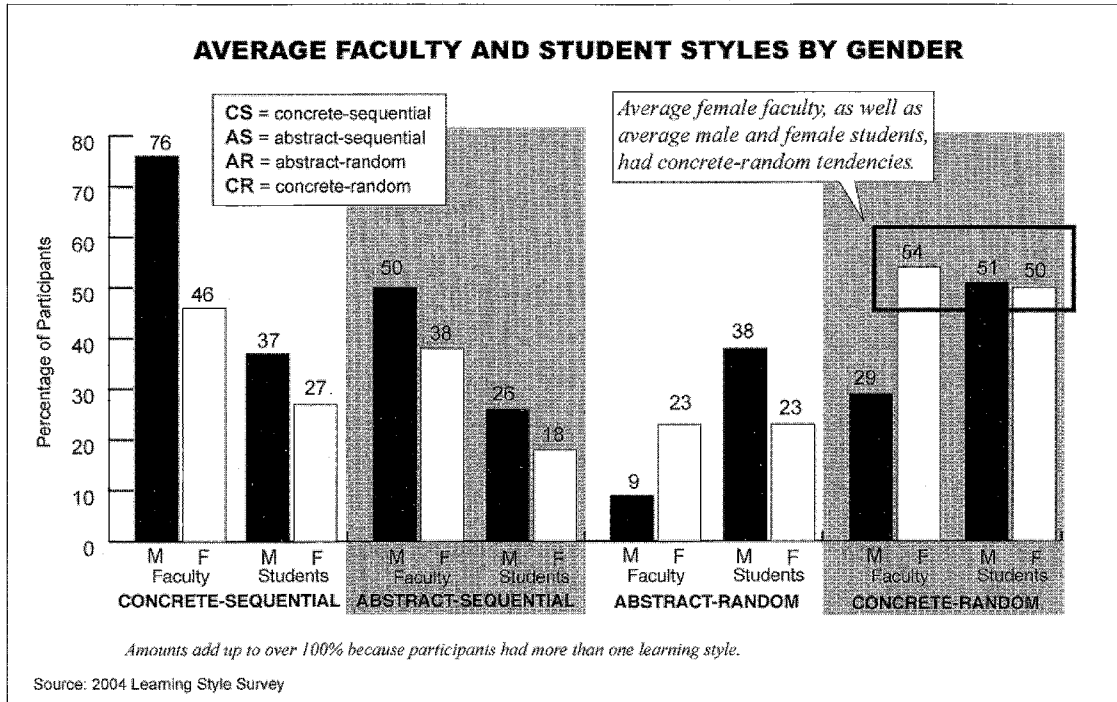


Figure 5.

### Comparing the Mind Styles of Students and Faculty

Male and female students were found to be similar to each other in learning style preferences, whereas male and female faculty were found to be different to each other in learning style preferences (Figure 5). Female faculty members in this study were found to have the same learning style as the majority of the freshmen students, so if they teach the way they learn, learning should take place.

Male faculty were found to be similar to the female faculty and sampled students in perceptual quality. They differed, however, in the ordering style they preferred.

More student and faculty participants in the study were concrete learners. As concrete learners, they perceive the world using their five senses of sight, hearing, touch, smell, and taste. The saying "It is what it is," tends to be the mantra of this group of learners. The learner who embraces the concrete perception of the world is one who does not look for hidden agendas or analyze the abstract relationships between ideas. Those strong in concrete learning have a tendency to be direct and literal communicators.

The difference between the participants in this study was in the preferred ordering style. More student participants and female faculty

preferred random ordering, and tend to organize information in "chunks" and in no particular order. Random learners tend to order information in three-dimensional patterns; in other words, events are linear, but can be affected by external variables. Often steps are skipped in a procedure, but still result in the same conclusion. Sometimes random learners begin at the end of the process and work backward. Sometimes they begin in the middle. They have a tendency to be more impulsive and less planned.

More male faculty in the study preferred a sequential ordering style. This is a logical and traditional approach to organizing information. A plan is the blueprint of the process. Because sequential learners tend to organize information in a step-by-step linear fashion, the ordering style of the random learners, appears haphazard to them.

The concrete/sequential male professors preferred not to change their plan and ordered objective. Because they are not people-oriented, they focus on the outcome rather than the process, and therefore are more product-oriented.

Because the majority of the female professors and the students were concrete/random learners, they preferred problem solving approaches and active investigation and experimentation. Process, methodology, application, and a preference in engag-

ing and competitive environments are significant for concrete/random learners. Because they like to take risks, they have a tendency to be inventive learners.

### Conclusion

In this specific test group we learned that 76% of the male graphics faculty displayed concrete/sequential learning styles. In contrast, 54% of the female graphics faculty displayed concrete/random learning styles, which matched the preferred learning style of 51% of the Purdue freshmen test group.

Learning styles assessment is a valuable tool for students and faculty to use because it allows them to think deeply about what their preferences are, what their dominant mode of thinking is, and how they view the world. We cannot adjust the way we teach and the types of activities we offer our students until we have identified the learning styles of our students. The preferred learning styles of one group of graphics students and one group of graphics faculty have been identified in this study. More data need to be collected before we can reach definite conclusions about the differences and similarities between faculty and students and between males and females; however, the data presented in this paper provide insight into the different styles of this small sample of faculty and students in computer graphics technology. There are specific teaching methodologies that would make students more engaged in the learning of graphics. This is the focus of a future study.

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