Cognitive Learning Styles and Academic Performance in First-Year University Courses:
High Achieving Students and Low Achieving Students
Benjamin J. Schwartz, Asia University

Abstract

This study investigated the relationship between cognitive learning styles and academic performance among freshmen students at a major research university in the Southeast of the United States. The *Gregorc Style Delineator* was used to assess the learning styles of forty different randomly selected students in the college of education. The students had taken identical core courses throughout the course of one year. The study found that the average GPA based on the learning style was significant ($p < 0.05$). Students with a concrete sequential or abstract sequential learning style had significantly higher GPAs than students with abstract random or concrete random learning styles. However, there was no statistical difference between the GPAs of sequential learners ($p = 0.922$). Similarly there was no significant difference between the GPAs of random learners ($p = 0.682$).

Introduction and Literature Review

There are a number of different attributes which can impact a student's GPA. Among them are age, gender, socio-economic status, and attitudes (Ethington, 1990). Additionally there are institutional factors which can also impact a student's GPA: faculty support, availability of tutoring, teacher effectiveness, and psychological support services (Johnson, 1994). These variables can interact to affect GPA. Finally, according to this study, learning styles have been found to impact the GPA of a student. Learning style is defined by Hergenhahn and Olson (1993) as a consistent way that a student responds to and uses stimuli in a learning context.

As Drysdale, Ross and Schulz (2001) report, the *Gregorc Style Delineator* (Gregorc, 1982b) is a self-report tool used to measure thinking and learning processes. It is designed to help individuals understand and recognize the channels by which they receive and process information efficiently. According to Gregorc (1982b), the assessment categorizes learners in four different ways: Concrete Sequential (CS), Abstract Sequential (AS), Abstract Random (AR), and Concrete Random (CR). Gregorc briefly describes the above learners thusly, CS: practical, organized, structured, perfectionists; AS: intellectual, logical, thorough; AR: emotional, interpretive, idealists, conversational; CR: intuitive, experimental, investigative (Gregorc, 1982a).

In a previous study, O'Brien (1991) found that among college students with GPAs of 1.0 or lower, a significant number of those students scored lower on the AS learning style than other students. The study also found that students who already held a baccalaureate degree scored higher on the AS scale than non-degree holders. Finally, O'Brien (1991) suggested that, "it is possible that the AS style is most closely associated with academic achievement, and that as students attain higher educational levels, they become more intellectual and less emotional in dealing with the academic environment (p. 492)."

Research Question

What, if any, is the correlation between first year academic performance and cognitive learning styles?

Methodology

At the end of the first year of classes forty students from the college of education were asked to take the *Gregorc Style Delineator*. These students were chosen randomly from a pool of students at one university who had all taken exactly one year of the same classes. The classes were a mix of core classes that included mathematics, human sciences, English, psychology, history and science. After the students took the learning styles assessment they were placed into four different learning style groups according to their dominant score: CS, AS, AR, CR. There were ten students in each of the four groups. Then the students' GPAs were compared to see if successful students shared a learning style and if students who performed poorly similarly shared a learning style. The GPA scale can range from 0.0 to 4.0 and is rounded to the nearest tenth. A high GPA indicates high academic success, whereas a low GPA indicates poor academic achievement. A GPA represents the average grade point for all classes taken.

As Drysdale, Ross and Schulz (2001) indicate, "Gregorc (1982c) reported reliability coefficients for the four learning style scales from 0.89 for the AS scale to 0.93 for the AR scale ($p<0.001$). Gregorc also reported that 89% of the participants in his studies either agreed or strongly agreed with the outcome of the *Gregorc Style Delineator...* (p. 271)." Finally, Schulz further indicated that research had supported the reliability and validity measures of the *Gregorc Style Delineator* (1993). This confirms the reliability and validity of the instrument.

Results

The independent variable in this study, which was categorical, was the dominant learning style with four different levels: CS, AS, AR, and CR. The continuous dependent variable was the GPA of the students who took the *Gregorc Style Delineator*. The relation between the two variables was examined by running a one-way ANOVA analysis.

CS students were assigned a value of (1); AS students were assigned a valued of (2); AR students were assigned a value of (3); and CR students were assigned a value of (4). Of the four categories of the independent variable, each one had ten participants for a total of forty participants. The mean GPAs of each group are as follows: CS: M=3.4; AS: M=3.4; AR=2.8; CR=2.7. The standard deviations of each group follow: CS: SD=.43; AS: SD=.67; AR: SD=.35;

and CR: SD=.74. The Levene's test indicates that we did not violate the assumption of equal variance with p=0.117; much greater than the critical value of 0.05, and *df* (3,36).

The one-way ANOVA analysis indicates that there are statistically significant differences among groups (F $(3,39)$=4.975, p=0.005). The effect size was large (η^2 = .293). In order to determine where the differences are between groups, an LSD post hoc test was conducted. The LSD test found that CS learners had significantly higher GPAs than AR (p=0.015) and CR (p=0.005) learners; whereas there was no significant difference between CS and AS learners (p=0.922). AS learners did show a significantly higher mean GPA than AR (p=0.019) and CR (p=0.007) learners. Likewise, there was no significant difference in the mean GPA between AR and CR learners (p=0.682).

The effect size was calculated for this study. Results revealed an eta squared value at 0.293. This score indicated a large effect size which supports the ANOVA analyses that revealed a statistical significance in the difference between participants' GPAs relative their learning style. Output follows.

Output

Multiple Comparisons

GPA

LSD

(I) LearningStyle	(J) LearningStyle	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
CS	AS	.0250	.25412	.922	-.4904	.5404
	AR	.6500*	.25412	.015	.1346	1.1654
	CR	.7550*	.25412	.005	.2396	1.2704
AS	CS	-.0250	.25412	.922	-.5404	.4904
	AR	.6250*	.25412	.019	.1096	1.1404
	CR	.7300*	.25412	.007	.2146	1.2454
AR	CS	-.6500*	.25412	.015	-1.1654	-.1346
	AS	-.6250*	.25412	.019	-1.1404	-.1096
	CR	.1050	.25412	.682	-.4104	.6204
CR	CS	-.7550*	.25412	.005	-1.2704	-.2396
	AS	-.7300*	.25412	.007	-1.2454	-.2146
	AR	-.1050	.25412	.682	-.6204	.4104

Based on observed means.

The error term is Mean Square(Error) = .323.
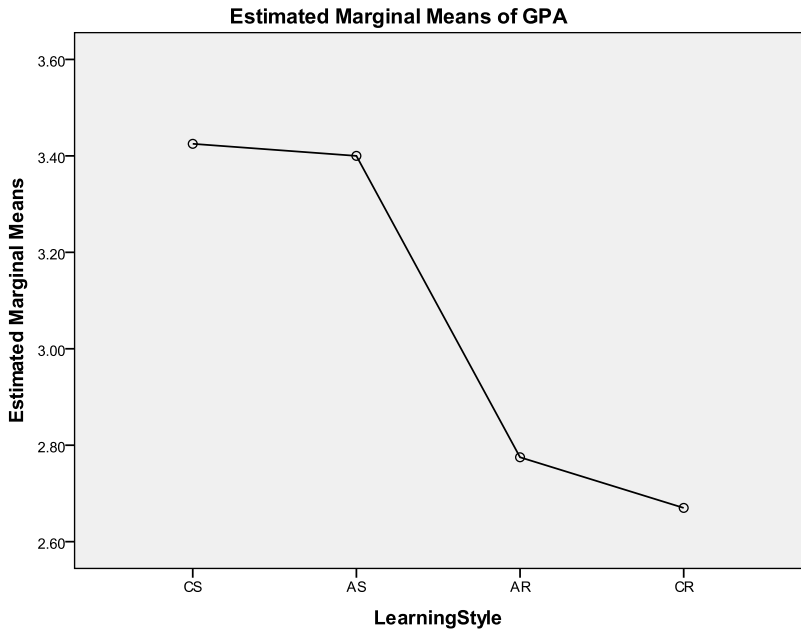
*The mean difference is significant at the .05 level.

Levene's Test of Equality of Error Variances[a]

Dependent Variable: GPA

F	df1	df2	Sig.
2.104	3	36	.117

Tests the null hypothesis that the error variance of the

dependent variable is equal across groups.

a. Design: Intercept + LearningStyle

Estimated Marginal Means of GPA

Descriptive Statistics

Dependent Variable: GPA

Learning Style	Mean	Std. Deviation	N
CS	3.4250	.42639	10
AS	3.4000	.66500	10
AR	2.7750	.35059	10
CR	2.6700	.73794	10
Total	3.0675	.64931	40

Discussion

The results of the study indicate that cognitive learning styles do play a role in the success or failure of first year university students. Concrete Sequential and Abstract Sequential learners show significantly higher GPAs than their Abstract Random and Concrete Random counterparts. There was no statistical difference between the GPAs of Concrete Sequential and Abstract Sequential students; likewise, there was no difference between Abstract Random and Concrete Random students. The study shows that sequential learners tend to have higher GPAs after one year of class, than random learners.

Limitations

The study was limited to forty participants. *The Gregorc Style Delineator* is a self-reporting tool. Though it is valid and reliable, results could be inaccurate in a small sample of participants. Only education majors were chosen for this study. Also, only one university was examined. It is possible a different type of university or a different major may yield different results.

Assumptions and Power

There were several assumptions associated with this study. It was assumed that the forty participants faithfully completed the *Gregorc Style Delineator*, that they fully comprehended the assessment and were able to correctly and accurately respond to the questions. It was assumed that the participants' GPAs were accurately and fairly reported, and that none of the participants had extenuating circumstances that led them to abnormal GPAs. The Levene's Test of Equality of Error Variances was not statistically significant, $p=.117$, therefore the assumption of homogeneity and equality of variance was not violated. The sample for this study was randomly and independently selected.

References

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