VARK LEARNING STYLES AND STUDENT PERFORMANCE IN PRINCIPLES OF MICRO- VS. MACRO-ECONOMICS

Ambrose Leung, Mount Royal University Maureen McGregor, Mount Royal University David Sabiston, Mount Royal University Stefano Vriliotis, Mount Royal University

ABSTRACT

Principles of economics courses are known to be taught primarily using a lecture-based format with strong emphasis in the presentation of visual materials such as graphs and tables. While students with certain learning styles can likely appreciate this unique style of presentation, others may find it difficult to comprehend and become frustrated. Evidence has shown that a mismatch between the method used to present course materials and a student's learning style can adversely affect the student's performance in a principles of economics course. However, the literature has not distinguished the potential difference of student performance in principles of micro- versus macro-economics and its relationship with student learning styles.

Using a sample of students from principles of economics courses taught at Mount Royal University in Calgary, Alberta, we examine the relationship between student learning styles, using the VARK (visual, aural, reading/writing, and kinesthetic) inventory, and their performance in principles of micro- versus macro-economics courses. The purpose of this study is to identify whether different student learning styles are related to the performance of students in principles of micro- versus macro-economics.

JEL classification: A10, A22. Keywords: Learning styles; teaching economics

INTRODUCTION

Students who have taken both courses in principles of microeconomics and principles of macroeconomics quite often express their preference for one over the other. Despite the fact that both branches of economics share the common underlying objective of allocating scarce resources to their best possible uses, microeconomic and macroeconomic analysis tend to require different approaches in terms of information processing that can be associated with differences in personality and learning styles (Bisping and Eells, 2006). The study of microeconomics, which is about how individuals and businesses make decisions, tends to follow logical sequences that are highly structured. The study of macroeconomics, which is about understanding aggregate behaviour of the economy, tends to encourage debates over diverse viewpoints generated by different schools of thoughts. Such differences in the nature between microeconomics and macroeconomics are clearly shown in the textbooks written for the two fields, in that there is much

more variation in the content across macroeconomics textbooks than that in microeconomics textbooks. While the content of microeconomics textbooks appear to be quite standardized using similar logical sequence, macroeconomics textbooks show much greater variety in content, depending on the different viewpoints adopted by the authors. The differences in the content and approaches used in microeconomics and macroeconomics raise the question that students with different personality types, thinking and learning styles may show different preferences for the two fields of study. The literature has seen some studies using personality types to explain such differences. The goal of this paper is to further examine whether preferred learning styles by students affect their course performance in principles of microeconomics versus macroeconomics.

The paper is organized as follows. Section 2 reviews the literature and provides the motivation for the empirical analysis in this paper. Section 3 contains results from the empirical analysis. Section 4 provides interpretation of the empirical results and suggestions for further research.

LITERATURE REVIEW

A typical introductory economics course is lecture oriented (Becker, 2000; Lopus and Hoff, 2009) and relies heavily on visual presentation of information with graphical analysis (Boatman, Courtney, and Lee, 2008; Fleming, 1995). Yet students often show preference for either microeconomics or macroeconomics. Research suggests that course preference and performance of students can vary in relations to their thinking and learning styles. Zhang (2004), for example, found that students with specific thinking styles preferred specific teaching styles. According to Zhang, students with a creative thinking style tend to prefer a learning-oriented and student-focused teaching style. Students with a conformity thinking style tend to prefer a teacher-focused teaching style that emphasizes the transmission of information.

Research in economic education has examined the relationship between learning styles of students and teaching styles of instructors in principles of economics courses. A study by Charkins, O'Toole, and Wetzel (1985) identified three types of student learning styles (dependent, collaborative, and independent) and found that the larger the gap between an instructor's teaching style and a student's learning style, the worse the student's performance in the introductory economics course.

Other studies subsequently examined the relationship between personality types and student performance in principles of economics courses. A common feature among these studies is the use of the Myer-Briggs Type Indicator (MBTI) to identify personality types of individuals. Borg and Shapiro (1996) used a sample of 119 students and found that gender is not a significant factor to determine student performance in principles of macroeconomics once MBTI personality types are accounted for. Ziegert (2000) reached the same conclusion from using a sample of 617 students in principles of microeconomics. McCarty, Padgham, and Bennett (2006), however, found that matching gender of students and instructors significantly improved student performance in both principles of microeconomics and macroeconomics after accounting for MBTI personality types. Another common finding is that personality types were found to be related to student performance. For example, introverts were found to perform better in principles of economics than extroverts (Borg and Shapiro, 1996; Ziegert, 2000). However, it has also been suggested that

personality traits are related to student performance in principles of macroeconomics, but not microeconomics (Bisping and Eells, 2006).

Although certain relationships have been detected between personality types and course performance, it is possible that such relationships exist because MBTI is an indirect indicator of student learning styles through an evaluation of personality. More direct measure of learning styles may be useful in explaining this kind of relationship.

Fleming and Mills (1992) developed an inventory of learning styles know as VARK. The four modes in VARK are visual (V), aural (A), read/write (R), and kinesthetic (K). These modes are frequently referred to as a person's "sensory modality preferences." A person may show no preference, unimodal, or multiple modes of sensory preferences. According to Fleming (1995), students with a visual preference learn best from presentation of materials using graphs, charts and diagrams; aural learners prefer to receive information through listening; read/write learners prefer to take in information through writing and reading from printed words; kinesthetic learners gain better understanding of materials through concrete examples and applications. The most recent version of the VARK questionnaire consists of 16 questions and identifies a person's preferred method or mode of presenting and processing information.

The VARK questionnaire has been widely applied to explore issues related to learning style of students. Some studies showed no gender difference in the numbers or types of sensory differences (Bhaskar, 2011; Slater, Lujan, and DiCarlo, 2007), while others found gender differences in learning style preferences (Dobson, 2010; Rogers, 2009). Attempts have also been made to identify the relationship between VARK learning style preferences and student performance in university courses. For example, Dobson (2010) found that a strong kinesthetic learning style had a significant negative relationship with performance in physiology courses among a sample of 64 students; but Eudoxie (2011) found no significant relationship between VARK learning style preferences and course performance among a sample of 62 students studying soil management science. Other studies used the VARK inventory to show that understanding students' learning style preferences can help to improve the communication of course materials and the educational experience of students. (Dobson, 2010; Rogers, 2009)

Boatman, Courtney, and Lee (2008) used the VARK inventory of learning styles developed by Fleming and Mills (1992) to assess the relationship between student learning styles and their performance among 211 students from a mix of introductory microeconomics and introductory macroeconomics courses. They conclude that students who are visual learners perform better in introductory economics courses and suggest that this result is partly due to the fact that a significant portion of the concepts are taught using a graphical analysis approach. Another observation made by the authors is that once students' learning styles have been addressed, there appears to be no gender-based differences in student performance in introductory economics. This is an interesting point because such finding seems to be consistent with the suggestions from earlier literature in that gender has been found to have no significant relationship with performance in principles of economics courses once personality types are accounted for (Borg and Shapiro, 1996; Ziegert, 2000).

In short, the existing literature has come up with two main findings about the relationship between performance in principles of economics courses and personality types/learning styles. 1) Personality types are related to student performance, and the relationship may be different between microeconomics and macroeconomics. 2) Gender appears to have no significant relationship with student performance once personality types or learning styles have been taken into account. However, it is not clear whether the relationship between learning style preferences and student performance is different for microeconomics and macroeconomics, which is the main issue to be examined in this paper.

METHOD AND DATA

Our study aims to further examine the relationship between VARK-based student learning styles and student performance in first year university microeconomics versus marcroeconomics courses.

The data in this study came from student surveys based on version 7.1 of the VARK questionnaire developed by Fleming and Mills (1992). The questionnaire consists of sixteen questions that identify the preferred learning styles of students. The data was collected from students enrolled in principles of microeconomics and macroeconomics courses at Mount Royal University in Canada. 1472 students participated in the survey over an 18 months period. Participants were requested to respond to the VARK questionnaire along with information on their age and gender. Each of the sixteen multiple choice questions on the VARK questionnaire has four possible choices that imply preferences for visual, aural, reading/writing, and kinesthetic learning styles respectively. Participants were instructed to choose all the answers that apply to them and not be limited to just one answer to each question. Hence the raw score on each of the sensory modality (i.e., V, A, R, and K) can range from 0 to 16 for each participant. Participants' final grades, measured as a percentage, were collected from the instructors at the end of the term.

Table 1 provides the summary statistics of the variables. Observations used in the empirical analysis must satisfy two criteria. First, observations with any missing variable were eliminated. Second, only those students who passed the course (50% and above) were included. Students who failed or withdrew from the course did so for many different possible reasons that are beyond our control; these observations were therefore eliminated to minimize potential bias.

	Table 1: Summ	ary Statistics of	Variables	
Variables	Mean	Standard deviation	Minimum	Maximum
Age	20.71	3.40	17	46
Gender (1 = female)	0.40	0.49	0	1
Visual (V)	4.92	2.91	0	16
Aural (A)	5.57	2.90	0	15
Reading/writing (R)	5.37	2.92	0	15
Kinesthetics (K)	6.43	2.77	0	16

The final sample used for the analysis consists of a total of 910 participants from first-year economic courses, of which 645 were from microeconomics and 265 were from macroeconomics, with an average age of 20.71 years old. There were slightly more male (60%) than female participants. The raw scores from the four sensory modalities show that participants are more

likely to show a preference for the kinesthetic learning style (mean = 6.43), and least likely to show a preference for the visual learning style (mean = 4.92).

RESULTS

The purpose of the regression analysis is to examine the relationship between total percentage grade and learning style preferences of students. According to Fleming (1995), a strong preference for a learning style can be identified by a score obtained on a learning style that is at least four points above the score of any other learning style. The raw scores on V, A, R, and K were therefore recoded according to Fleming's suggestion described above in our regression analysis. Each of the V, A, R, and K variables was recoded such that a value of 1 indicates a strong preference for a specific learning style, a value of 0 was recorded otherwise. We divided the sample into those students who took microeconomics from macroeconomics. The results are summarized in Table 2.

From the sample of students who passed principles of microeconomics, the results from Table 2 show that age and gender have a significant positive relationship with student performance in the course. Each year of increase in age tends to raise total percentage grade by half percentage point. Females on average receive 2.26 percentage points higher than males. The results for microeconomics show that none of the learning style preferences shows statistically significant relationship with total percentage grade. The adjusted R² shows that the explanatory variables included in the analysis account for about 3% of the variation in the final percentage grade from principles of microeconomics.

Variables	Microeconomics	Macroeconomics
	Coefficients	Coefficients
	(t-statistics)	(t-statistics)
Age	0.43***	0.30
	(3.45)	(1.81)
Gender	2.26***	0.30
(1 = female)	(2.46)	(0.23)
Visual (V)	-0.25	-1.43
	(-1.43)	(-0.81)
Aural (A)	0.20	1.37
	(1.16)	(0.87)
Reading/writing (R)	-0.02	-0.53
	(-0.10)	(-0.32)
Kinesthetics (K)	0.19	3.03**
	(0.98)	(2.19)
Constant	62.38***	64.66***
	(22.53)	(17.52)
Adjusted R ²	0.029	0.034
Number of observations	645	265

From the sample of students who passed principles of macroeconomics, only the kinesthetic learning style shows a significant positive relationship with total percentage grade. The empirical results imply that students with a strong preference for the kinesthetic learning style significantly increase the total percentage grade by about 3 percentage points. None of the other learning style preferences as well as age and gender show statistically significant relationship with performance in principles of macroeconomics. The adjusted R^2 shows that the explanatory variables included in the analysis account for about 3.4% of the variation in the final percentage grade from principles of macroeconomics.

The findings here show that different factors are related to student performance in microeconomics versus macroeconomics. Age and gender are positively related to student performance in principles of microeconomics. A strong preference for the kinesthetic learning style is positively related to student performance in principles of macroeconomics.

DISCUSSION

The goal of this paper is to analyze the relationship between student learning styles and student performance in principles of economics courses, and to examine potential differences in such relationship between principles of microeconomics and macroeconomics. First year students in both microeconomics and macroeconomics classes, at Mount Royal University, were requested to complete on a voluntary basis the VARK (visual, aural, reading/writing and kinesthetic) survey, along with information on their age and gender. The learning style preferences of each student were recorded, along with the final grade they achieved in the course.

Regression analysis was used with a sample of 910 students to determine whether the different learning styles as well as the age and gender of students are related to their performance in first year economic courses. Students who passed principles of microeconomics and principles of macroeconomics were analyzed separately.

The results from the microeconomics sample, with 645 students, show that age and gender have statistically significant relationship with final grades, while none of the factors representing the four different learning style preferences achieved statistical significance. Hence findings from the microeconomics sample in this study appears to provide different implications than earlier studies that suggested gender as an insignificant factor in relations to performance in introductory economic courses once learning styles or personality types were taken into account (Borg and Shapiro, 1996; Ziegert, 2000; Boatman et al., 2008). Furthermore, the results from the microeconomics sample show that females achieved significantly higher grades than males, which is different from the suggestions of some studies that economics has been a male-dominated discipline that favours male students (McCarty, Padgham, and Bennett, 2006).

The results from the macroeconomics sample, with 265 students, show that a preference for the kinesthetic learning style is the only factor that has a significant relationship with final grade. None of age, gender, or any of the other learning styles achieved statistically significant results. Hence our findings are different from the suggestion by Boatman et al. (2008) that students with strong visual preference performed better in introductory economics courses.

The empirical analysis in this paper shows some interesting differences between microeconomics and macroeconomics regarding factors that are related to student performance in

principles of economics courses. In examining the relationship between personality types and student performance, Bisping and Eells (2006) found that personality traits had no significant relationship with performance in principles of microeconomics, but personality traits appeared to play a role in determining performance in principles of macroeconomics. In particular, the authors suggested that students who performed well in macroeconomics had personality traits that favour real and tangible information rather than general patterns. This description shares some similarities with Fleming's (1995) description of the kinesthetic learners who learn concepts and theories through applications and real life examples. Hence our finding that kinesthetic learners performed well in macroeconomics is consistent with evidence from existing literature regarding personality traits.

Why do students with personality traits and learning styles that favour tangible real life applications tend to perform better in principles of macroeconomics, but not microeconomics course? One possible explanation is that there tends to be more coverage of macroeconomic topics and policies in the news media such as changes in interest rate, unemployment, inflation, and so on. Perhaps such abundance of available information makes it easy for instructors to access and discuss "real life issues" in class. More research in this area will be useful to further explore such relationship.

Why do age and gender matter in relations to performance in principles of microeconomics, but not macroeconomics? Perhaps most students take microeconomics before macroeconomics, and older students are more adaptable to understand economics, given their maturity level and stronger work ethics. The same phenomenon may apply along the gender line in that young adult females are more mature than males in the same age group in dealing with initial exposure to the study of economics. This is another interesting issue that requires further research.

More research effort needs to account for the different learning environments offered in first year economics courses as well as instructor characteristics in terms of gender and learning styles. This should provide a more comprehensive picture of what is required to encourage more productive learning, given the different learning styles of our students.

REFERENCES

- Becker, W. E. (2000). Teaching economics in the 21st Century. Journal of Economic Perspectives, 14(1), 109-119.
- Bhaskar, S. (2011). Implications of perceptual learning style preferences on management pedagogy. *International Journal of Research in Commerce & Management*, 2(2), 109-114.
- Bisping, Timothy O., and James B. Eells (2006). Personality type as a determinant of student performance in introductory economics: Macroeconomics vs. microeconomics. *Journal of Economics and Economic Education Research*, 7(1), 3-28.
- Boatman, K., R. Courtney, and W. Lee (2008). "See how they learn": The impact of faculty and student learning styles on student performance in introductory economics. *The American Economist*, 52(1), 39-48.
- Borg, M. O., and S. L. Shapiro (1996). Personality type and student performance in principles of economics. *Journal* of Economic Education, 27(1), 3-25.
- Charkins, R. J., D. M. O'Toole, and J. N. Wetzel (1985). Linking teacher and student learning styles with student achievement and attitudes. *Journal of Economic Education*, 16(2), 111-120.
- Dobson, J. L. (2010). A comparison between learning style preferences and sex, status, and course performance. *Advances in Physiology Education*, 34(4), 197-204.
- Euodxie, G. D. (2011). Learning styles among students in advanced soil management class: Impact on students' performance. *Journal of Natural Resources and Life Sciences Education*, 40(1), 137-143.
- Fleming, N. D. (1995). I'm different; not dumb: Modes of presentation (VARK) in the tertiary classroom, In A. Zelmer (Ed.), Research and Development in Higher Education, Proceedings of the 1995 Annual Conference of the Higher Education and research Development Society of Australasia (HERDSA), HERDSA 18 (pp. 308-313).
- Fleming, N. D., and C. Mills (1992). Not another inventory, rather a catalyst for reflection. *To Improve the Academy*, 11, 137-155.
- Lopus, J., and J. Hoff (2009). Is there a disconnect between teaching styles and learning styles in high school economics classes? *The Journal of Private Enterprise*, 24(2), 157-164.
- McCarty, C., G. Padgham, and D. Bennett (2006). Determinants of student achievement in principles of economics. *Journal for Economics Educators*, 6(2), 1-9.
- Rogers, M.A. (2009). A preliminary investigation and analysis of student learning style preferences in further and higher education. *Journal of Further and Higher Education*, 33(1), 13-21.
- Slater, J. A., H. L. Lujan, and S. E. DiCarlo (2007). Does gender influence learning style preferences of first-year medical students? *Advances in Physiology Education*, 31(4), 336-342.
- Zhang, L-F. (2004). Do university students' thinking styles matter in their preferred teaching approaches? *Personality* and *Individual Differences*, 37(8), 1551-1564.
- Ziegert, A.L., 2000. The role of personality temperament and student learning in principles of economics: Further evidence. *Journal of Economic Education* 31(4): 307-322.