Student Performance in Principles of Macroeconomics: the Importance of Gender and Personality Type

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Introduction

The current debate on quality in higher education is taking place in many countries. Economists contribute to this debate by applying the educational production function, where academic achievement is a function of student ability, time devoted to learning, various attributes and attendance in an experimental treatment (e.g. Schmidt, 1983). Many empirical studies have been conducted on an aggregate level to test the relationship between school resource variables and student background characteristics to predict school outcomes (see Häkkinen *et al.*, 2003; Bonesrønning, 1998; Hanushek, 1996; Hedges and Greenwald, 1996).

Assessing the learning process and student performance we need empirical studies at an individual level. What we teach and how we teach it have turned out to be of importance for student performance in economics (Becker, 2004). Students' learning outcomes are linked to how the object of learning was handled, structured and presented (Pang *et al.*, 2006). However, another important question is whether economics students learn differently according to gender and personality type.

There are several studies indicating that males perform better in college economics than females (Siegfried, 1979; Ferber *et al.*, 1983; Lumsden and Scott, 1987; Gohman and Spector, 1989; Watts and Lynch, 1989; Anderson *et al.*, 1994). However, these results are not universal. Some studies have found no significant gender effect on student performance in economics when the course grade is a dependent variable (Kelly, 1975; Buckles and Freeman, 1983; Watts, 1987; Rhine, 1989; Borg and Shapiro, 1996; Fallan and Opstad, 2003; Parker, 2006; Swope and Schmitt, 2006).

An essential part of assessing the outcome of different learning processes is the influence of the personality of the student involved. Consequently, a student's personality type should be included in the educational production function. However, previous studies examining the effect of personality type on a student's performance in Principles of Macroeconomics (Borg and Shapiro, 1996; Ziegert, 2000) do not find significant gender effect on performance when personality types are included in the model. The missing gender effect on performance in the Borg and Shapiro study may be due to personality differences between men and women. If this is the case, gender effects will disappear when personality types are controlled for. A re-examination of the same sample of students (Borg and Stranahan, 2002b) concluded that gender does matter when gender is combined with personality type, i.e. looking at the effect of gender in conjunction with personality type. Gender combined with personality type form more subtle, interactive effects on a student's probability of success in economics.

Adopting the four temperaments developed by Keirsey and Bates (1984), based on the Myers-Briggs Type Indicator (MBTI), making them interact with gender, an interesting picture emerged. These four temperaments include a combination of two of the four Myers-Briggs categories. These four mutually exclusive combinations are sensing and perceiving (SP), sensing and judging (SJ), intuition and thinking (NT), and intuition and feeling (NF). These categories are briefly elaborated on in the next section. Borg and Stranahan (2002b) concluded that only female NF and NT students performed more poorly in Principles of Macroeconomics than their counterparts who did not have these gender/temperament combinations. Another study (Borg and Stranahan, 2002a) of upper-level economics courses does also reveal that certain personality types combined with certain race and gender affect performance in a way that some students out-perform other students.

The results of Borg and Stranahan (2002b) are based on a study of 119 college students enrolled in a class of Principles of Macroeconomics at the University of North Florida (UNF). They ask for further research into how personality type and gender affect student performance in the same type of course in other settings. Hence, further research is needed to analyse whether their findings are readily generalised or only should be interpreted in light of local considerations. The present study is carried out to answer this question.

This study explores how these gender/temperament combinations affect student performance in a Norwegian business school which is a different setting from an

American university. Trondheim Business School (TBS) is a public school financed by the government where the students do not pay any tuition fee. However, admission is restricted. Admission requires an above average grade point from high school. Principles of Macroeconomics is a compulsory course taught in the autumn semester of their second year. The school offers a bachelor (three years) and a master (two years) degree in business administration. In these settings we shall explore the robustness of the gender/temperament combinations on student performance in Principles of Macroeconomics.

The paper is organised as follows. The next section briefly identifies different personality and temperament types based on earlier literature. The section after that elaborates on the educational production function. Data and research methodology underlying the empirical study are explained. Thereafter the findings are reported, conclusions are drawn and, finally, some implications are indicated.

Personality and temperament type

Except for the study of Borg and Stranahan (2002b) there is little current research on how the combination of gender and personality types affects academic achievement in economic courses. However, there is a voluminous amount of research into how personality types affect learning in general. The majority of studies in this area are using the Myers-Briggs Type Indicator (MBTI) to evaluate the effect of personality types on educational outcomes. This study adopts this type of indicator because it uses a person's preferences rather than a clinical diagnosis to indicate personality type (Benfari and Knox, 1991).

The personality dimensions are measured through a series of items in the MBTI (see Fallan, 2006). The individual is asked to distinguish between dichotomous choices of phrases designed to reveal his or her preferences in the four mental processes included in the MBTI. The series of items distinguish between thinking (T) and feeling (F) persons in terms of judging processes and between sensing (S) and intuitive (N) persons in terms of perceiving processes. Similarly, the choices differentiate judgement (J) from perception (P). According to the MBTI these mental processes in pairs are seen as polarities.

The few studies on how personality types and learning styles affect performance in economics (Borg and Shapiro, 1996; Ziegert, 2000; Borg and Stranahan, 2002a, 2002b) have adopted four temperaments based on the MBTI from Keirsey and Bates (1984). So did Fallan (2006) who studied the relationship between personality type and preferred learning style and self-selected majors in a business school. The same four temperaments are adopted in this study. These four temperaments include a combination of two of the four Myers-Briggs categories. These four

Table 1: The four polarities describing a person's personality type

E: Extroversion The person's interest flows mainly to the outer world of actions, objects, and persons.	**I: Introversion** The person's interest flows mainly to the inner world of concepts and ideas.
S: Sensing The person prefers to perceive the immediate, real, practical facts of experience and life.	**N: Intuition** The person prefers to perceive the possibilities, relationships, and meanings of experiences.
T: Thinking The person prefers to make judgements and decisions objectively, impersonally, considering causes of events and where decisions may lead.	**F: Feeling** The person prefers to make judgements and decisions subjectively and personally, weighing values of choices and how they matter to others.
J: Judgment The person prefers mostly to live in a decisive, planned, and orderly way, aiming to regulate and control events.	**P: Perception** The person prefers mostly to live in a spontaneous, flexible way, aiming to understand life and adapt to it.

Source: Lawrence (1982).

mutually exclusive combinations are sensing and perceiving (*SP*), sensing and judging (*SJ*), intuition and thinking (*NT*), and intuition and feeling (*NF*). These temperaments are described in Table 2.

Data and methodology

The sample includes 296 students of our Principles of Macroeconomics enrolled in three classes at Trondheim Business School (TBS). The sample was not chosen at random. In fact the sample comprised students in three compulsory classes in the autumn semester of their second year at TBS. No optional subjects were offered in the first year of their business education. Therefore, these students had taken the same compulsory subjects and, consequently, should have had an almost identical background knowledge of business subjects.

The personality test was conducted during the last lecture of the compulsory course of the principle of macroeconomics in the autumn term of the second academic year. The students answered questionnaires based on MBTI to reveal which of the non-equivalent personality temperament groups they belonged to. The participation was on a voluntary basis. The students answered a few more questions, e.g. relating to how many of the classroom lectures in macroeconomics they had participated in during the term. The participating students provided their

Table 2: The four temperaments and learning styles

SP: The sensing and perceiving student

SP students prefer physical involvement in the learning process and want to be able to try things themselves through hands-on experience. They learn best when they are entertained, so they enjoy multimedia presentations such as videos and computer simulations. SPs tend to be competitive and do often respond well to group projects, particularly if the groups are involved in some sort of contest, such as a stock market game. These students require a great deal of variety in the learning process, and will be bored by a standard class lecture and traditional paperwork such as workbooks and end-of-the-chapter questions. The subjects that SP students prefer are music, drama, art, crafts and mechanics.

SJ: The sensing and judging student

SJ students prefer the traditional learning style with a lecture-based classroom. SJs prefer structure in their learning environment and a sequential presentation of the material in increments that make sense to them. They do best when the tasks are well-defined and are given to them and having clear direction. Hence, they prefer to have paper topics assigned to them rather than having to choose their own. SJs may become uncomfortable in classroom discussions and, hence, being silent, unless they are carefully controlled by the professor. These students prefer to study facts and procedures and may dislike assignment which requires improvisation and creativity. At the university level, SJs are supposed to prefer business and professional classes, and often choose practical professions such as accounting and teaching.

NT: The intuitive and thinking student

NT students tend to be independent learners and are often self-sufficient in the classroom. They prefer to choose their own paper topics and would even like to have some control over the subject matter of the course. NTs prefer theoretical, logical and didactical presentation and need few examples to follow up a theoretical presentation. They may become impatient in the classroom if the professor devotes too much time on explanation. These students are often loners in the class, especially if they are introverted as well. NTs prefer to have discussions with the professor rather than with other students, and they do not interact well in group discussions or group assignments.

NF: The intuitive and feeling student

NF students prefer a democratically run classroom where there is much interaction with other students and with the professor. They enjoy group work being cooperative rather than being competitive. NFs tend to be sensitive to hostility and conflict and, hence, they will dislike very competitive environments. These students learn best through class discussions and case studies because they like instruction to relate to people. They express themselves easily, and do better in classes that require papers and essays rather than more objective means of evaluation. NF students are motivated by personal recognition and approval on papers or tests rather than good grades.

Source: Lawrence (1982).

student identification number allowing us to follow them up when they had finished their final exam and received their grade in the Principles of Macroeconomics course.

The sample contains only those students (1) who participated in the last class before the final exam and (2) who voluntarily answered the questionnaire and allowed us to follow them up. Most students attended this last class and very few of them refused to participate in the study. However, since the sample only contains students who participated in the last class, this could cause a slight upward bias in the grades. Like Borg and Stranahan (2002b) we believe that drop-outs primarily include students who are doing very poorly in the course. However, this is a compulsory course, and students cannot easily drop out because then they forfeit their bachelor degree in Business Administration.

The voluntary participation could probably cause another bias in the distribution of personality types in the present study. Students with personality types suited for the study of economics are more likely to participate. This bias may cause the strength of temperament effects on academic performance to be slightly underestimated, since *SJ* students are probably more willing to participate than students of other temperaments. Fallan (2006) found that business students are more likely to have a sensing and judging (*SJ*) personality temperament rather than a sensing and perceiving (*SP*) and an intuitive and feeling (*NF*). However, this is hardly any serious threat to the present study because most students participated.

The same professor was teaching three classes in the autumn of 2003, 2005 and 2006, respectively. These courses had an identical curriculum, the exam questions were differently made though having the same degree of challenge for the students, and the same grading scales were used in each course. The best way of measuring academic achievement may probably be a pre-test before the start of the course and a post-test when the course is finished. However, a course grade is the most common proxy for academic achievement in the studies of macroeconomics. Some of the studies have adopted 'Test of Understanding College level Economics' (TUCE), but this test is not common in the Norwegian college system. A lot of different multiple-choice tests are developed by the professors and used in the Norwegian college system, but there is no common understanding of a standard test. Therefore we have adopted grades in the course as a proxy in the present study. A grade is a discrete dependent variable in the educational production function. There is one more letter grade in the European grading system than in the American one, i.e. A, B, C, D, E and F. The letter grades are given the following numerical values: A = 5, B = 4, …, F = 0.

We adopt the educational production function where the independent variables are student ability, student effort or attendance and some other variables representing student attributes that may systematically affect the output.

The proxy for student ability is the grade point average (GPA) from high school. In the Norwegian school system we have nothing like the SAT. GPA is the competing factor in business schools having restricted admission. According to Keirsey and Bates (1984) *SJ* students do very well in a traditional school setting, e.g. in high schools. Hence, there is no surprise that Fallan (2006) found that *SJ* students were the majority group among students in a Norwegian business school having restricted admission.

Student effort devoted to learning has been interpreted in different ways and with mixed results in the educational production function (Parker, 2006). Some studies measure effort as out of class study time (Leppel, 1984; Borg *et al.*, 1989; Park and Kerr, 1990). However, study time does not say anything about the productivity of the time devoted to these activities. Consequently, most studies use class attendance as a proxy for student effort (Romer, 1993; Durden and Ellis, 1995; Stratford and Sulock, 1995; Marburger, 2001). Fallan and Opstad (2003) and Parker (2006) conclude that their general finding is that greater attendance benefits performance. We use class attendance as a proxy for student effort in the present study. Once a week there are classes lasting three hours over a period of 14 weeks. The attendance variable may have values from 0 to 14.

When it comes to other variables representing student attributes that may systematically affect the output, we have restricted these variables to include gender and the four temperaments of Keirsey and Bates (1984). The measurement of gender is Female = 1 and 0 if not. Alternative measurement is Male = 1 and 0 if not. MBTI = dummy variables indicating temperament type. Our aim is to follow up the study of Borg and Stranahan (2002b) revealing whether the interaction of gender and temperaments is valid in another setting than theirs. These interactions are measured by variables indicating the interaction of gender and temperament type, e.g. Female *NF* = 1 and 0 if not, and from the alternative measurement of gender the interaction with temperament type, e.g. Male *NF* = 1 and 0 if not. The same interaction terms are developed for Female *NT*, Female *SP*, Female *SJ*, Male *NT*, Male *SP* and Male *SJ*.

An ordered probit model is adopted because the dependent variable is discrete. The ordered probit estimation technique is appropriate in studies of economic education research where the dependent variable is course grade (Becker, 1983; Borg *et al.*, 1989). Borg and Stranahan (2002b) used ordered probit in order to

Table 3: Measurement of variables. Descriptive statistics for the sample: N, mean (standard deviation) and percent females

Variable	Measurement of variables	Mean (SD)
Performance = Grade	A = 5, B = 4, C = 3, D = 2, E = 1, F = 0	3,0 (1,28)
Ability = GPA from high school	Grade scale from best to worst: 6, 5, 4, 3, 2, 1. GPA is multiplied with 10 and special points are added.	51,46 (4,00)
Effort = Class attendance	Attended all classes = 14 Attended no class = 0	11,91 (1,81)
Female	F = 1, M = 0	0,50 (0,50)
MBTI	SP, SJ, NT and NF (see Table 2)	
Interactions	Female SP, Female SJ, Female NT, Female NF, Male SP, Male SJ, Male NT and Male NF	

control for variables that have been shown to affect grades in Principles of Macroeconomics in other studies. They were able to isolate the gender personality interaction terms from other effects on a student's grade. We shall compare our results with those of Borg and Stranahan (2002b), and therefore it is important to adopt the same estimation technique.

Empirical model and estimated results

The empirical model is of this form:

GRADE = *f* (Female, GPA, Attendance, MBTI, Interactions)

The results from the ordered probit analyses estimated with a maximum likelihood estimation technique are presented in Table 4. The table shows the estimated regression coefficients, with the standard error in parentheses. Previous research results provide *a priori* expectations about some of the signs of the predicted coefficients, but not for all. Therefore we decided to conduct a two-tailed test of significance, with a null hypothesis of no predicted relationship between the student input variables and achievement.

Table 4: Ordered probit regressions dependent variable: student grades in principles of macroeconomics. Estimated coefficient, standard error in parentheses and z-score.

Independent variable	(Model 1) Regression without interaction terms		(Model 2) Gender interaction terms included (all SJ's omitted)		(Model 3) Female interaction terms included (all males omitted)		(Model 4) Male interaction terms included (all females omitted)	
	Coef. (std.err.)	z	Coef. (std.err.)	z	Coef. (std.err.)	z	Coef. (std.err.)	z
Constant	1.20 (0.13)	9.42***	1.23 (0.13)	9.41***	1.22 (0.13)	9.42***	1.20 (0.13)	9.41***
FEMALE	−0.38 (0.12)	−3.09***						
GPA	0.03 (0.02)	2.10**	0.03 (0.02)	2.13**	0.03 (0.02)	2.08**	0.03 (0.02)	2.09**
ATTENDANCE	0.24 (0.04)	6.52***	0.25 (0.04)	6.68***	0.24 (0.04)	6.75***	0.24 (0.04)	6.64***
NF	0.25 (0.27)	0.91			0.25 (0.33)	0.75		
NT	0.02 (0.17)	0.09			−0.31 (0.26)	−1.20		
SP	−0.16 (0.24)	−0.69			−0.93 (0.33)	−2.80***		
FEMALE NF			0.42 (0.33)	1.27				
FEMALE NT			−0.14 (0.26)	−0.55				
FEMALE SP			−0.76 (0.33)	−2.32**				
FEMALE SJ					−0.33 (0.14)	−2.40**		
MALE NF			−0.25 (0.47)	−0.54			−0.10 (0.47)	−0.20
MALE NT			0.22 (0.22)	1.00			0.37 (0.22)	1.68*
MALE SP			0.46 (0.33)	1.40			0.61 (0.33)	1.83*
MALE SJ							0.38 (0.14)	2.75***
Chi-square	54.19***		54.35***		57.03***		54.76***	
N	295		295		295		296	

Table 4: (continued)

Significance level: * p < .10; ** p < .05; *** p < .01

Model 1: Regression without interaction terms

Model 1 shows a regression model including all the variables except the interactions between gender and personality type. The student's temperament type described by Keirsey and Bates (1984) is one of the four mutually exclusive combinations *SP, SJ, NT* and *NF*. These are dummy variables. However, one of them has to be omitted in order to avoid multicollinearity. Borg and Stranahan (2002b) have omitted *SJ*, because *SJ* students had the greatest success in principles of macroeconomics. Since we want to compare our results with those of Borg and Stranahan, we have done the same. Two of the coefficients of three personality types included (*NF* and *NT*) are positive, and one (*SP*) is negative. However, none of these coefficients are significant. This means that neither *NF*s, *NT*s nor *SP*s do significantly better or worse in the principles of economics course than identical students with *SJ* temperaments when both sexes are included.

The sign in front of the coefficients FEMALE, GPA and ATTENDANCE is in conformity with educational production function theory. Female students achieve significantly poorer grades than their male peers in Principles of Macroeconomics. The ability measured by GPA from high school has a positive and significant effect on the student's grade. Efforts are captured by class attendance and have a positive and significant effect on student achievement.

Fallan (2006) has shown that *SJ* students prefer optional courses having standard lecture class approach rather than courses adopting a problem based learning (PBL) approach in a business school. On the contrary, *SP, NT* and *NF* students prefer optional courses adopting a PBL approach rather than a standard lecture class approach. His results support the Keirsey and Bates (1984) description of the temperament types in Table 2. The principles of macroeconomic classes are teacher-centred and are expected to suit the *SJ* students at Trondheim Business School. These classes are too large and too time-constrained to provide independent projects, but the professor tries to initiate some classroom discussions. However, we do not find the expected superiority for *SJ* students. Model 1 above reveals coefficients of the temperament variables that are not significant for any of the three other temperaments. Consequently, there are no performance differences between *SJ*s and the other temperaments in Principles of Macroeconomics. What could be the reason for this surprising result? Probably the strong gender effect in Model 1 may dilute some effect from these temperaments which includes both females and males. We are able to reveal whether it is so by including gender and temperament interaction in the next models.

Model 2: Gender interaction terms included (all SJs omitted)

In order to show how gender interacts with temperament types to affect student achievement, male and female students are categorised into the four temperaments through use of interaction terms (Borg and Stranahan, 2002b). FEMALE *NF* is a dummy variable which is the product of FEMALE · *NF* and takes the value one for all females having the NF temperament. Otherwise, FEMALE *NF* = 0. MALE *NF* = 1 for all males with the *NF* temperament, otherwise, MALE *NF* = 0. FEMALE *NT*, FEMALE *SP*, MALE *NT* and MALE *SP* are interaction terms analogously defined. All students (male or female) having the *SJ* temperament are omitted from this model.

Being female alone had a significant and negative effect on performance in the previous model. This model reveals that there is no significant impact on female student performance having *NF* and *NT* temperaments. Female *NF* and *NT* students do not perform worse than all the *SJ*s as a group. However, females having a *SP* temperament do perform poorer in Principles of Macroeconomics than *SJ*s of both sexes. Males having *NF*, *NT* and *SP* temperaments do not perform better and poorer than all the female and male *SJ*s as a group. These results indicate that temperament does affect student grades, but this is the case only for females with *SP* personality type.

Because the present model omitted *SJ*s of both sexes from the equation, these results can only answer the question whether gender-specific personality types perform differently than *SJ*s. It does not answer the question whether female personality types perform differently from males in general. The next model is designed to answer this question.

Model 3: Female interaction terms included (all males omitted)

In order to understand the differences between male and female performance by temperament type, all male personality interactions are omitted. We do test whether females having specific personality types perform differently in Principles of Macroeconomics than males.

Female *SP*s and *SJ*s receive lower grades than males of all temperaments. We have already stated that female *SP*s perform poorer in principles of economics than *SJ*s of both sexes. However, female *NF*s and *NT*s do not perform differently than males. These results suggest that gender and temperament interaction is an important determinant of student performance. The present model reveals that the general conclusion from Model 1 that all females perform worse than males in Principles of Macroeconomics is only valid for female students of *SP* and *SJ* temperaments.

However, these results do not fully correspond to the study of Borg and Stranahan (2002b) and we will discuss these differences in the concluding section.

We have so far been focusing on the female students and exploring which of the female-temperament interactions are most likely to perform poorly. The next model is designed to find out which of the male-temperament interactions perform differently from females in general.

Model 4: Male interaction terms included (all females omitted)

Other studies have suggested that male students in general perform better than female students in Principles of Macroeconomics. The present model reveals that this is not true for all the male-temperament interactions. In fact male *NF*s don't perform differently than female students. However, the results show that male *NT*s, male *SP*s and male *SJ*s do perform significantly better than females as a group. The *SJ*s are the dominant temperament among business students. It is an interesting result that the largest group among male students, i.e. the male *SJ*s, receive higher grades than all the female students as a group. In contrast, the largest group among female students, i.e. the female *SJ*s, do significantly worse than all males as a group according to the previous model.

The educational production function where the gender-personality type interactions are included, suggest that gender is an important determinant of student performance as stated in the study of Borg and Stranahan (2002b). However, the present study reveals other gender-personality type effects on performance in Principles of Macroeconomics than stated by Borg and Stranahan (2002b). As already stated, we shall discuss these differences in the concluding section.

Gender and personality types do matter for academic achievement

The purpose of this study was to explore how gender and temperament type interactions affect student performance in Principles of Macroeconomics. The conclusion we are drawing is that gender does matter in student performance. However, when gender-temperament interactions are included in the model, a new picture develops. The simple and direct relation between gender and output is replaced by more subtle, interactive effects on performance.

The results from the educational production function on student performance yield three major findings. First, we do not find that personality type alone has any effect on performance. The strong and direct gender effect where female students achieve significantly poorer grades than their male peers in principles of economics (Model 1) has diluted some effect of temperament types. We have reached this

conclusion since the other models (2, 3 and 4) reveal gender-temperament interaction effects when gender is replaced by interaction.

Second, the strong and direct gender effect does not include all female temperaments (Model 2 and 3). There is no significant impact on the performance by female students having *NF* and *NT* temperaments. Female *NF* and *NT* students do not perform worse than all the *SJ*s as a group. Only females having a *SP* temperament do perform poorer in principles of economics than *SJ*s of both sexes.

Furthermore, female *NF*s and *NT*s do not perform differently than males. It is female *SP*s and female *SJ*s that receive lower grades than males of all temperaments. We know that *SJ* students represent the majority group in business schools (Fallan, 2006). This is also the situation among the female business students. Hence, the important question is what should be done to improve the performance of these female students. Contrary to the recommendation by Keirsey and Bates (1984) and the empirical findings in the study by Fallan (2006) where gender was no part of the study, the present findings implying as a general conclusion that *SJ* students of both sexes perform better in a traditional class-room setting is questionable. The present study indicates that this is not the case for a considerable group of female *SJ* business students. This result may certainly not be generalisable to all Principles of Macroeconomics classroom settings. Future research should consider how different learning modes may improve performance for this considerable group of female students.

Third, the result from other studies does suggest that men perform better than females in Principles of Macroeconomics in general. This conclusion has to be modified. The present study (Model 4) reveals another picture. In fact, male *NF*s do not perform differently from female students. It is male *NT*s, male *SP*s and male *SJ*s who do significantly better than females as a group.

The present study supports the results of Borg and Stranahan (2002b) to some extent. Both studies conclude that gender does matter in a student's performance in principles of macroeconomics and that the combination of gender and temperament type is important to understand performance. However, what female-temperament interactions that matter differ from their study of 119 students of Principles of Macroeconomics at the University of North Florida and our study of 296 students of the same subject at Trondheim Business School. Among the UNF students, female *NF*s and female *NT*s performed poorer than all the *SJ*s as a group, while the result among the TBS students indicate that only the female *SP*s perform more poorly. Comparing the performance of female students' personality types with all male students there are more differences between UNF and TBS students. Among the UNF students, female *NF*s and female *NT*s perform more

poorly than their male peers, while at TBS female *SP*s and female *SJ*s perform more poorly than male business students.

Even if the subject studied is the same, these differences in female temperament types that significantly perform more poorly may be due to other differences not controlled for, e.g. classroom settings, modes of learning, culture, compulsory versus optional course and so on. However, race was an important part of Borg and Stranahan's study but was no part of the present study. Further research is needed to identify to what extent such differences may affect the relationship between gender-temperament interactions and performance.

Fallan (2006) pointed out the relationship between personality types and the content of optional majors in business schools, but gender was no part of his study. According to Fallan (2006) the *SJ* students prefer to study facts and procedures. Moreover, *SJ*s prefer majors in accounting and taxation, auditing, economics and finance. *SP*s, *NF*s and *NT*s are more likely to enrol in majors where the subject emphasises people and human relations. However, the present study is limited to principles of macroeconomics, but the present results for female *SJ*s indicate that his conclusions may change when gender is included. Future research should explore how gender and temperament type interaction affect performance both in Principles of Macroeconomics and in other subjects.

The present findings should also be an important input in exploring differences in the process dimensions of learning. Meyer (2000) has revealed gender sensitivity of variation in 'memorising' among first-year economics students. Meyer's empirical findings do unambiguously support an evaluative conclusion that the females are exhibiting theoretically more desirable response than their male peers. However, personality temperaments were no part of the study, and further research should explore whether the combination of gender and temperament type may reveal interactive effects on 'memorising' and learning as well.

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Adventures in Learning: Creating Role Playing Video Games to Teach and Learn Economics

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Abstract

This article examines pedagogical lessons derived from the learning theory embodied in commercially successfully video games and their link to reported increases in 'fluid intelligence' of student populations. The scholarly literature in this area is reviewed in order to elicit practical principles by which to guide the development of instructional video game modules for the teaching of economics. The authors' experiences in developing and pilot testing such a module, and in subsequently guiding student research efforts to develop an additional module, are then reviewed. The paper concludes that harnessing the benefits of video game technologies in the service of teaching and learning economics is both pedagogically sound and feasible for individual instructors.

Introduction

Despite the fact that intelligence testing indicates that populations around the world are rapidly becoming more capable (known as 'the Flynn Effect'), employers and educators fear that the quality of education received by the traditional college graduate is declining (see Dillon 2005 and Lewin 2005). Lecture-format education, while offering certain advantages, traditionally relies on the delivery of abstract content and deductive learning models to address and enhance what is referred to in the language of psychology as *crystallised* intelligence. World-wide intelligence gains, however, appear to be taking place primarily in the area of *fluid* intelligence, the type of cognition involved in inductive learning, adaptability in problem solving, and the understanding of new contexts.[1]