Temperament-Learning Styles Associated with True/False, Multiple Choice and Multiple-Multiple Choice Exam Formats

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Abstract

A study was developed to determine if one or more individual personality traits, or temperament–learning styles, influenced the student's ability to successfully answer questions presented in the traditional true/false or single correct answer multiple choice format, relative to those same questions presented as multiple correct answer multiple choice exams. The resulting data suggests that, while differences are not generally observed in the proportion of correct answers, significant differences were observed in the reasons for error (incorrect answers) for the varied personality traits and/or temperament–learning styles.

Introduction

An earlier report (Pinckney et al. 1993) compared student success on exams presented as true–false, single answer multiple choice, and multiple–multiple choice exam formats. The data suggested that, although statistical differences are not observed between the proportion of correct answers and the exam format, significant differences were detected in the source of error for incorrect answers. Students answering true–false questions were less likely to mark a true question false, and more likely to mark a false question true, than were students answering the same question in either of the multiple choice formats. Differences were also noted for gender, academic major, and final grade when comparing formats.

Golay (1982) suggests four basic temperament–learning styles associated with educational programs. These, he defines in terms of "Actual" (actual–spontaneous & actual–routine) or "Conceptual (conceptual–specific & conceptual–global) learners. Furthermore, each temperament–learning style, as defined by Golay, can be identified by, and associated with, components of the Myers-Briggs Type Indicator (Barrett, 1993). Understanding the basic nature of the varied learning styles and being able to differentiate between each, identifying temperament–learning style values and shortfalls (Golay, 1982), and applying this information to the exam format may be of some value to the educator and student.

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The following study was undertaken to determine if one or more individual personality~, traits, or temperament–learning styles, influenced a students ability to successfully answer questions presented in the traditional true/false (TF) or single correct answer multiple choice (MC) format, relative to those same questions presented as multiple correct answer multiple choice (MMC) exams.

Methods

The study involved 64 undergraduate students enrolled in an upper level Animal Science (Anatomy/Physiology) course. The study was conducted within the laboratory section of the course throughout the semester with each student receiving seven laboratory exams. For each exam, approximately one-third of the students received fifteen questions in one of the formats (i.e. TF, MC & MMC). Furthermore, these exams were randomly distributed among students, with the intent that each student would receive approximately one-third of the exams in each format.

Exams were structured such that each question on the TF exam appeared as the same question on the MC and MMC exam formats, as shown in Table 1. This question was identified as the "primary question" (PQ), and comparisons were made as to the students' ability to correctly answer this question, or portion of the question, relative to each format. The remaining portion of the MC and MMC questions (i.e. those not identified as the primary question) were designated as "secondary questions" (SQ) and comparisons were made, between MC and MMC exam formats, in the students' ability to correctly indicate those answers

Each exam was scored as to the percent of primary questions answered correctly. Furthermore, those primary questions answered incorrectly were identified as being either a true question marked false (TMF) or a false question marked true (FMT), and recorded as the percent of the total true or false questions, respectively. The percent of correctly answered SQ (MC & MMC formats only) were also determined, as was the percent SQ incorrectly answered as TMF 5 or FMCS.

Each exam was identified according to questioning format (TF, MC or MMC), and chronological number (exam #1 - 7), and each student identified according to Myers-Briggs Typology (Myers, 1962). The resulting data were analyzed by analysis of variance as a completely randomized design SAS (1986). Differences were considered statistically significant if $p < .05$.

Table 1 Examples of the true/galse, multiple choice and multiple-multiple choice exam formats showing the "primary" and "secondary" questions.

Example, True/False Question:

True or False:

Stimulation of the right vagal nerve causes a dramatic slowing of the heart. (true)

Example, Multiple Choice Question:

Stimulation of the right vagal nerve causes a:

a. increase in cardiac out-put.
b. **dramatic slowing of the heart.** (true)
c. increase in atria-ventricle contractions.
d. decrease in the transition via the bundle of His.

Example, Multiple-Multiple Choice Question:

Stimulation of the right vagal nerve causes a:

a. decrease in the cardiac out-put. (true)
b. **dramatic slowing of the heart.** (true)
c. increase in the atria-ventricle contractions.
d. increase in the distance between the resting membrane potential and stimulatory threshold. (true)

Answers in bold indicate the primary question within each exam format. Correct answers indicated as being "true."

Results

Results obtained by comparison of correct answers for TF, MC and MMC exam formats, according to the students' Myers-Briggs type are presented in Table 2. Significant differences were not detected ($P>0.05$) for any of the four personality type categories, nor within an exam format or across formats. The highest level of significance observed was $P<0.13$ for the overall comparison of *Feeling* versus *Thinking* individual. Statistical differences ($P>0.05$) were detected between exam formats within specific personality types (i.e. TF versus MMC, for *Introvert* and for *Judgmental;* and MC verses MMC, for *Judgmental* only)

Statistical differences were also detected for each, and all, personality types when comparisons were made between the SQ exam format (i.e. MC verses }=(C; not shown in the tables). Average SQ score for MC was 86.8 (range, 85.7 to 88.1), while that for the MMC was 71.8 (range 68.1 to 73.7). *Judgmental* and *Perceptive* individuals had the high and low scores for the MC format, respectively. *Thinking* and *Feeling* individuals had the high and low MMC scores, respectively.

When comparisons were made between exam format and student's temperament–learning style (Golay, 1982) significant differences were not detected ($P>0.05$) for the proportion of correct answers (Table 3). However, statistical differences were detected when assessing the basic reason for error. *Conceptual–global* individuals were less likely to mark a true question false, and more likely to mark a false question true, than were other temperament–learning style individuals. Furthermore, the *Conceptual–global* individuals were, for TF and MMC style questions, more likely to mark a false question true than if that same question was presented to them in the single answer MC format. *Actual* learners (i.e. *Actual–spontaneous* and *Actual–routine)* were, when taking the exam in the TF format, less likely to mark a true question false and more likely to mark a false question true, than when that same question was presented to them as a MC or MMC exam.

Table 2 Mean (%) correct and incorrect answers for true-false, multiple choice and multiple-multiple choice exam formats accoriding to the student's Myers-Briggs Type Indicator.*

		True-False	Multiple Choice	Multiple-Multiple Choice	SE**
Correct Answers					
Introvert	(n = 25)	79.7[a]	75.6[ab]	75.1[b]	1.5
Extravert	(n = 39)	75.7	78.4	78.7	1.7
Intuitive	(n = 17)	78.0	79.0	76.4	2.4
Sensing	(n = 47)	77.8	77.3	71.7	1.3
Feeling	(n = 21)	76.0	75.6	76.2	2.1
Thinking	(n = 43)	78.7	78.5	77.9	1.4
Judgmental	(n = 33)	78.4[a]	78.9[a]	72.2[b]	1.7
Perceptive	(n = 31)	77.8	76.5	76.7	1.6
Incorrect Answers					
True Marked False					
Introvert		15.0[a]	32.6[b]	27.4[b]	2.3
Extravert		20.3	27.9	27.2	2.4
Intuitive		17.8[a]	29.6[b]	25.2[ab]	3.6
Sensing		17.2[a]	29.3[b]	27.3[ac]	2.0
Feeling		16.2[a]	33.5[b]	27.2[b]	3.2
Thinking		17.8[a]	27.8[b]	26.7[b]	2.1
Judgmental		18.0[a]	27.4[b]	27.0[b]	2.5
Perceptive		16.7[a]	31.4[b]	26.8[b]	2.4
False Marked True					
Introvert		26.7[a]	10.8[b]	20.3[abt]	2.4
Extravert		28.8[a]	11.5[b]	12.8[b]	2.5
Intuitive		28.0[a]	7.5[b]	21.0[b]	3.6
Sensing		27.7[a]	12. I[b]	15.8[b]	2.0
Feeling		34.6[at]	11.7[b]	17.0[b]	3.2
Thinking		24.9[a]	10.5[b]	16.8[ab]	2.1
Judgmental		26.0[a]	11.7[b]	16.4[b]	2.7
perceptive		29.5[a]	10.2[b]	17.4[b]	2.4

*Mean values were derived from the number of students (n) in each category and the seven exams per student. Values within a row with unlike superscripts are statistically different ($P < 0.05$). †Mean values between personality type statistically different ($P < 0.05$). **Indicates the pooled standard error.

Conceptual–global individuals appeared to have the greatest difficulty (65.6% correct), and *Conceptual–specific* individuals the least difficulty (77.0%), when taking exams in the MMC (SQ) format ($P<0.05$). The difference in error was primarily due to *Conceptualglobal* individuals having the greater tendency to mark a false question true ($P<0.05$). No difference was detected between any of the four temperament–learning styles when considering the frequency of marking a SQ true marked false.

Discussion

Select-response exams such as TF, MC and MMC, in addition to being a reasonably quick and easy method of testing, can be used effectively in measuring the student'sknowledge of specific facts. However, critics believe such exams do not require much thought since the student must simply decide as to the question's right or wrong qualities (Haney & Madaus, 1989, Bracey 1990). The present study certainly does not dispute these beliefs. However, it was of considerable interest to learn that, although major differences do not occur in the proportion of correct answers for students taking TF, MC and MMC exam formats (Pinckney et al., 1993), statistical differences can be detected in the reasons for incorrect answers when taking such exams. And that these can be tied to the student's personality type and/or temperament–learning style. Thus while critics may suggest a lack of thought associated with TF, MC or MMC exam formats, students may be thinking differently when taking such exams.

The data suggests that when the answer to a select–response question is known the outcome, in the proportion of corrects answers, is similar irrespective of the student's personality type or temperament–learning style. However, in the absence of firm knowledge of the question's answer, students of varied temperamentlearning styles will respond differently. Most students tend to seek "truth" in answers. Thus when the answer is unknown students seem more likely to accept that answer as being true (Eble,1972; Grosse & Wright, 1985). The result being a greater tendency to mark a false question true, than a true question false. Exam formats which provide the opportunity for a greater proportion of correct answers, as in TF or MMC relative to MC formats, may give the struggling student some advantage. *Introverts* and *Feeling* type individuals appear to have the greater tendency for marking uncertain questions true, relative to their *Extravert* and *Sensing* counterparts.

Conceptual–global learners (i.e. *IntuitiveFeeling* types) were more likely to mark a false question true, and least likely to mark a true question false, than were the other three temperamentlearning style individuals. Gobay (1982) suggests that the *Conceptual–global* learner is least interested in facts and focuses on the positive, meaningful significance in learning. *Conceptualspecific* individuals, however, who learn through experimentation, comparison of ideas and inspecting hidden assumptions, displayed the greater success on specific-response (TF, MC &MMC formats) and the least variability in error when comparing across exam formats.

Table 3 Mean (%) correct and incorrect answers for true-false, multiple choice and multiple-multiple choice exam formats according to the student's temperament learning style.*

	True-False	Multiple Choice	Multiple-Multiple Choice	SE**
Correct Answers				
Conceptual–global (n = 5)	74.7	78.5	74.0	4.0
Conceptual–specific (n = 11)	79.4	79.1	77.8	3.1
Actual–spontaneous (n = 27)	78.1	78.9	77.1	1.8
Actual–routine (n = 21)	77.5	74.6	76.9	2.0
Incorrect Answers				
True Marked False				
Conceptual–global	16.8	30.1	19.0†	5.9
Conceptual–specific	18.5	29.0	29.3	4.6
Actual–spontaneous	18.6[a]	27.6[b]	27.2[b]	2.6
Actual–routine	15.5[a]	32.2[b]	27.5[b]	2.9
False Marked True				
Conceptual–global	37.7[a†]	10.4[b]	32.9[a†]	6.0
Conceptual–specific	23.4	16.7	13.9	4.7
Actual–spontaneous	26.2[a]	11.3[b]	16.3[b]	2.6
Actual–routine	29.9[a]	13.2[b]	15.5[b]	2.9

*Mean values were derived from the number of students (n) in each category and the seven exams per student. Values within a row with unlike superscripts are statistically different ($P < 0.05$). **Standard error of the pooled mean square. †Mean values for conceptual–global individuals statistically different from all others ($P < 0.05$).

Acknowledgments

Appreciation is expressed to Ms. Linda Pavlish for the statistical analysis. Published as journal article No. 93- , Nebraska College of Agricultural Sciences and Natural Resources.

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