

STUDENT TESTING:
INSIGHTS FROM LEARNING AND TESTING THEORY

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ABSTRACT

Research found a very low correlation between student scores on multiple-choice and essay portions of tests. The author reviews literature in learning and testing and describes the experiment used to research this topic. Analysis of the findings suggest that instructors should be aware of testing methods and of their importance in assuring that tests actually measure what they are intended to measure.

INTRODUCTION

Success in marketing education could be defined as having students who understand both marketing principles and real world marketing practice. If marketing students are to be a "good product," they need to understand the basic principles and concepts of the discipline, their significance and relevance, their implications and applications.

Learning theory recognizes an ordered hierarchy of levels of learning. The higher levels involve putting together the principles of a discipline to form a structure or system, evaluate and solve problems. Lower levels involve relation, association, and memorization. Competency in today's highly competitive job market necessitates that, for the best jobs, our students need the higher levels of skill in mastering marketing.

This paper reviews education theory in the areas of learning and evaluation and suggests that, perhaps, we should be more aware of the relationship between the chosen means of student evaluation (testing) and the type of learning that various means of testing measure most effectively. It looks at learning theory and develops suggestions to possibly assist in giving our students better tests of what they have learned. It concludes by suggesting that we, as marketing educators, must acknowledge the importance of testing our students to assure that they understand the basic concepts of the marketing discipline.

CAUSE FOR CONCERN

The concern is periodically voiced that marketing education should be made more relevant to the world of business. The argument suggests that marketing education too often stresses memorization of concepts and shortchanges understanding principles and problem solving. This theme appears periodically in both popular press and academic journals. As expressed in *Business Week* (1979, p. 190): "A growing concern inside universities and the business community (is) that B-School instruction should be tailored more to fit the experiences of the real world." The 1976 president of the American Marketing Association, John Keane (1976), expressed the concern as fol-

lows: "Optimum marketing education depends upon understanding both principles and real-world practice" (p. 1). Arthur Done finds that "Businessmen (employers) are looking for graduates which evidence some development of managerial skills rather than subject-matter mastery (Done 1974)." The conclusion of Berding and Hopkins (1974) is that "Students must be able to apply their knowledge and techniques to practical situations" (p. 19).

The author's experience with business recruiters seeking to fill marketing positions suggests that understanding the basics of the marketing discipline and having the ability to communicate and utilize them effectively in new situations are two quite important abilities. Perhaps a statement by David Hardin (1972), 1972 president of the American Marketing Association, summarized these concerns well: "What the marketing field needs is a much better way of putting business pragmatism and academic professionalism together" (p. 1).

WHAT CONSTITUTES LEARNING?

Learning theory and the objective requirements for learning have been extensively discussed by Bloom (1965) and Gagnes (1970). Relevant for the concerns of this paper are the learning domains these authors discuss. They develop several levels of mental learning abilities and describe corresponding levels of performance that are evidenced at each level. These are presented in Table I.

Gagnes appears to concentrate on describing lower levels of learning. He begins his description of learning domains with the most basic reflex and stimulus-response types of learning, progressing to a level which involves linking a series of stimulus-response activities in series. It is not until he gets to his sixth level, concept learning, that he describes a level appropriate for upper-level marketing education. This seems to correspond to the lowest level Bloom describes, knowledge or recall.

Where Gagnes drew finer shades of differentiation in lower levels of learning, Bloom appears to draw finer shades in higher levels. Bloom's typology is interpreted as adding three levels (comprehension, application, and analysis) before the two scales again correspond. The highest two levels of each author are approximate equivalents.

If we look at the combined list as presented in Table I, we see that the upper half are appropriate objectives in our teaching. Jerome Reed (1979) summarizes the work of Bloom and Gagnes for purposes of marketing education, finding that their higher levels of attainment are appropriate for university course objectives. Combining insights from these two lists, Reed describes three levels of learning that would be appropriate lev-

els of attainment for a university course. His summary is presented in Table II.

TABLE II

ACCEPTABLE LEVELS OF LEARNING IN A UNIVERSITY MARKETING COURSE (HIGHEST TO LOWEST)

TABLE I

LEVELS OF LEARNING (HIGHEST TO LOWEST)

BLOOM	GAGNES
EVALUATION Judgements and standards	PROBLEM SOLVING Combining old principles into new ones
SYNTHESIS Putting together of elements to form a structure or a system	PRINCIPLE LEARNING Chaining of two or more concepts or relationships
ANALYSIS Breaking down into elements	
APPLICATION Use in concrete situations	
COMPREHENSION Relating and association	
KNOWLEDGE Recall and properties	CONCEPT LEARNING Memorizing names
	MULTIPLE-DISCRIMINATION Choosing among a class of possibilities
	VERBAL ASSOCIATION Verbal chaining
	CHAINING Linking a series of stimulus-response events
	STIMULUS-RESPONSE Voluntary response to a signal
	SIGNAL LEARNING Involuntary reflex response

NOTE: While an attempt has been made to correlate the work of these two authors, the levels of learning do not necessarily correspond in side-by-side comparison as in this table

SOURCE: Bloom (1965) SOURCE: Gagnes (1970)

PROBLEM SOLVING

The ability to make an integrated whole of the material learned and then apply this to solve new and unique problems

INTEGRATING THE IDEAS

The ability to integrate the ideas, to chain them, to synthesize them, to make principles, to see the course content in a holistic manner

UNDERSTANDING OF THE SPECIFIC IDEAS

The ability to understand the specific ideas and concepts and how these are used

SOURCE: Reed (1979)

 cation process, they should be "wean(ed) ... from studying for tests to become lifelong learners." He suggests that this may necessitate examinations that require "broader integration and more detailed analysis." This is consistent with the higher levels of learning as summarized by Reed.

We are all familiar with the problems of testing and, while it is sometimes assumed that essay tests are more appropriate for evaluating higher levels of learning, we are aware of the testing paradox: the inverse relationship between ease of test preparation and difficulty of test grading. Subjective tests can be made up quickly but require a long time to evaluate; objective tests, particularly quality ones, require lengthy preparation but can be evaluated quite quickly. At times we may feel that class size takes priority over educational goals, directing the method of testing to be used: large classes may receive easy-to-grade objective exams while small classes may receive more essay based tests.

McKeachie discusses appropriate testing techniques for college teachers and suggests that, for evaluating higher levels of learning, the quality of test question is more important than the type. He discusses briefly each of the major types of exams, pointing out some of the strengths and weaknesses of each type.

 The learning hierarchies of Bloom and Gagnes and their adaptation to marketing education by Reed can aid us in defining our role in the marketing education system and in reflecting on how well our student evaluation tools measure the performance level of our students. We can use this insight to aid us in forming objectives for our testing and in designing methods to attain these objectives.

TEST CONSTRUCTION

McKeachie (1978, p. 154) introduces the topic of testing by stating that as students become more experienced and enter the later years of the edu-

AN EXPERIMENT WITH SUBJECTIVE AND OBJECTIVE QUESTIONS ON A TEST

The Experiment

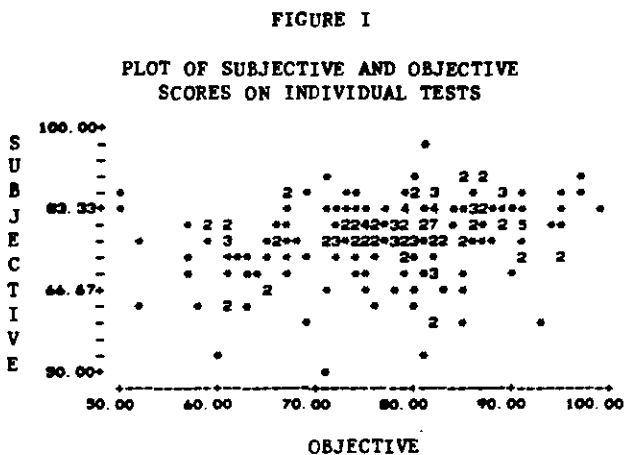
At the beginning of his career in marketing education the author observed that some students appeared to prefer subjective tests while others preferred objective tests. His testing procedures evolved to include both types of questions on tests. The subjective questions made up approximately half of each test and were designed to evaluate higher levels of learning. All required understanding of concepts and principals. Many required integrating and applying ideas and prob-

lem solving. The other half of exams generally consisted of objective questions from the instructor's manual accompanying the course text. Questions selected called for understanding in as far as possible, although a number relied heavily on recall. They were perceived as being relatively difficult and representative of material covered in class.

It was hypothesized that, despite student preferences as to test type, those who would do well on subjective tests would also do well on objective tests. In order to test this hypothesis, data were collected from ten sections of upper division marketing courses over a period of two years. 202 students in ten marketing classes were given tests with both subjective questions (essay and short answer) and objective questions (multiple-choice and true-false). Grades were totaled separately for each half of each exam. Class means were calculated for both subjective and objective portions of individual tests and were standardized to a common mean in order to control for potential differences in difficulty in the two portions of each test. Correlation analysis was used as an appropriate test of the strength of the relationship between the scores on the two types of tests and to test the hypothesis.

The Findings

Figure I presents a plot of the scores of these 202 students on both subjective and objective portions of tests. Considerable dispersion or scatter is evident in the plot. The correlation was .310, indicating an unexpectedly weak relationship. Individual sections of classes in the experiment had correlations ranging from .064 to .669 (see Figure II).



106 students performed better on the subjective portions of tests, with scores averaging 8.28 percentage points above their corresponding objective portion scores. 33 (16.3%) had essay scores exceeding their multiple choice scores by 10 points or more. Of these, 12 did so by 15 to 19.99 points and 7 by 20 points or more.

The 97 students who performed better on the objective portions of the exams averaged 9.05 percentage points above their corresponding subjective

portion score. 39 (19.2%) had multiple choice scores exceeding their essay scores by 10 points or more. Of these, 9 did so by 15 to 19.99 points and 9 by 20 points or more.

Exams of 36 students who took two exams were compared to see if they consistently did better on one type of exam. 11 did consistently better on essay, 9 were consistently better on multiple choice, and 16 were inconsistent. Of those who performed consistently better on essay tests, three did so by an average of over 10 points, and one by over 20 points. Of those who performed consistently better on multiple choice tests, three did so by 20 points or more (average 25.8); the others averaged 5.0.

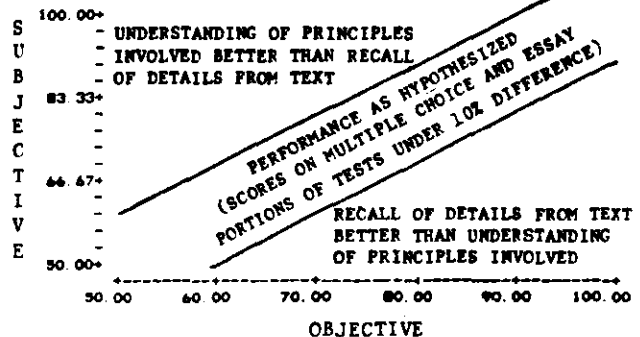
FIGURE II
RANGE OF CORRELATIONS IN EXPERIMENT

.064	.445
.083	.511
.104	.605
.113	.656
.161	.669

Conclusions

Referring to Figure III, a summary of Figure I, students in a band from the lower left quadrant to the upper right quadrant performed as hypothesized, approximately as well on one portion of a test as on the other. Those outside of this band toward the upper left quadrant performed significantly better on essay portions of tests. It is suggested that they probably understood the material but had poor recall of details from the text. Those outside this band toward the lower right did significantly better on multiple choice portions of tests. It is suggested that they probably recalled the details of the text but didn't clearly or thoroughly understand the concepts and principles involved or, perhaps, lacked the ability to communicate them. The ability to communicate in written form may be a contributing factor in these score differences and future studies of this phenomenon should control for this factor.

FIGURE III
SUMMARY OF SUBJECTIVE AND OBJECTIVE SCORES ON INDIVIDUAL TESTS



SUMMARY

If our task as marketing educators is to prepare our students with the marketing skills they will need for the job market, is it possible we could do a better job through better testing? Several sources and this study suggest that we might.

The sources cited in this paper indicate that perhaps one place to start is to look at learning theory and, from it, gain an appreciation of the different types of learning and how these various levels relate to the requirements of marketing positions. With an understanding of the types of skills we need to help our students attain, we are much better positioned to assist them in attaining these skills.

We obviously want to avoid putting our product (students) in the marketplace with a lower level of learning than they are capable of. None of the authors cited in this paper found concept learning (memorizing names and properties) to be adequate for the needs of the business world. Synthesis and problem solving should be our objectives.

Based on the essay portions of the exams, this study found a significant number of students who, in the opinion of the author, did not have a thorough understanding of the subject matter. Almost 20% of the students did significantly better on multiple choice portions of tests. This, plus the low correlation between the essay and multiple choice, suggests looking more closely at the composition of tests. Close observation leads the author to believe that these students were scoring on recall rather than understanding.

We want to avoid stressing quantity of information covered to the detriment of quality of information understood and retained. Without doubt, some of the proposed testing methods fit individuals and situations better than others and there is room for individuality in accomplishing the task. One key to determining our success is designing exams that call for higher levels of learning for higher grades regardless of type of question utilized. The essential part of helping students attain the highest levels of knowledge involves testing for higher levels of learning. The quality of the individual test question is more important than the type of question. Avoiding testing for recall of specific facts would discourage memorization, and questions that necessitate predicting an outcome rather than labeling a phenomenon would be appropriate. Quality tests, designed to evaluate higher levels of learning can be developed using both subjective and objective types of questions. Likewise, both can also be poor.

Measurement and evaluation of comprehension are an essential part of helping students attain the highest levels of learning. Combining appropriate methods of increasing the relevance of marketing concepts with evaluation instruments that reward higher levels of learning instead of memorization would certainly be a step in the right direction.

REFERENCES

- Berding, W. R., and Patricia M. Hopkins (1979), "Toward a Professional Marketing Education," *Journal of Marketing Education*, 1 (Spring), 19-24.
- Bloom, Benjamin S. (1965), *Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain*, New York: David McKay Company.
- Business Week (1979), "The Swing to Practicality in the B-Schools", 2596 (July 23), 190-192.
- Done, Arthur A. (1979), "Matching the Marketing Curriculum to Market Needs," *Journal of Marketing Education*, 1 (Spring), 4-7.
- Gagnes, R. M. (1970), *The Condition of Learning*, New York: Holt, Rinehart and Winston.
- Hardin, David K. (1972), *Marketing News*, 6 (October 1), 1.
- Keane, John G. (1976), *Marketing News*, 10 (September 24), 1.
- McKeachie, Wilbert J. (1978), *Teaching Tips: A Guidebook for the Beginning College Teacher (Seventh Edition)*, Lexington, Massachusetts: D. C. Heath and Company.
- Monaco, G. E. (1977), *Inferences as a Function of Test-Expectancy in the Classroom*, Kansas State University Psychology Series, KSU-HIPI Report 77-3.
- Reed, Jerome B. (1979), "A Competency-Based Method of Grading for the Marketing Principles Course," *Journal of Marketing Education*, 1 (Spring), 45-51.