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UNIVERSITY OF WOLLONGONG

DEPARTMENT OF ACCOUNTANCY

COGNITIVE STYLE AS A FACTOR IN ACCOUNTING STUDENTS' PERFORMANCE ON MULTIPLE CHOICE EXAMINATION

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ABSTRACT

Using 59 final year accounting students as subjects and multiple regression analysis, this paper tests the hypothesis that accounting students' performance on multiple choice examinations is related to field dependence cognitive style. Results support the hypothesis and suggest that in evaluating student performances in multiple choice examinations, accounting academics should bear in mind that the scores on these examinations may be partly a function of students' cognitive style. This finding has implications for the use of multiple choice examinations in classroom evaluations.

COGNITIVE STYLE AS A FACTOR IN ACCOUNTING STUDENTS' PERFORMANCE ON MULTIPLE CHOICE EXAMINATIONS

The issue of improving accounting education and training has received a great deal of attention in the accounting literature. In particular, the identification and study of variables that affect student examination performance has generated a considerable amount of research interest [Siegel, 1987]. One such issue, which has come into focus in recent times, is the question of the usefulness of multiple choice examinations (MCE) as a tool for evaluating student performance.

Collier and Mehrens [1985], in a recent paper on the use of multiple choice examinations [MCE] to improve classroom teaching of professional accounting students, concluded that accounting educators should place more reliance on MCE as a basis of evaluating students' performance. Since large public accounting firms consider academic achievement as one of the major requirements for entry into the firm, based on discussions with senior partners, grades obtained from the evaluation of academic performance are an important determinant of a student's future in the profession. One way by which accounting academics can improve the evaluation process of students' performance is by testing the reliability and validity of Collier and Mehrens [1985] argument in favour of MCE.

The arguments presented by Collier and Mehrens [1985] are intuitively appealing except that they did not consider the possibility that individual cognitive style difference could affect the validity of MCE. The nature of the task facing a student in a MCE may be such that some students, because of their individual psychological predispositions, may perform better than other students, after controlling for student abilities, intelligence, and other confounding factors. If this is the case scores on a MCE are not only affected by students' knowledge and understanding of the subject but also by individual congnitive style differences. This paper tests the hypothesis that cognitive styles may affect students' scores in MCE. Cognitive style could affect MCE performance especially when

the MCE contained multiple choice statements that are 'syntactically ambiguous', statements where (1) alternative groupings of phrases are possible and (2) alternative logical relations exist [e.g. Chomsky, 1976; Foss, Bever and Silver, 1968]. Obviously not all multiple choice questions in a standard MCE contain 'syntactically ambiguous' statements, but there have been a number of such questions set by the AICPA where 'alternative groupings of phrases are possible', resulting in more than one possible answer.

The field dependence/independence dimension is selected as a measure of cognitive style since there is a considerable body of literature [Witkin and Goodenough, 1977; Frank and Noble, 1985] supporting the relevance of this dimension in problem-solving tasks similar to MCE. In general terms, cognitive style refers to the methods by which individuals receive, store, process and transmit information [Pratt, 1980]. Thus it deals with methods of performance of intellectual tasks, rather than with intelligence [Messick, 1976]. An example of cognitive style includes the idea that some people scan information, while others tend to focus [Hadfield and Maddux, 1988].

FIELD DEPENDENCE/INDEPENDENCE PERCEPTUAL DIFFERENTIATION

Field dependence or independence may be defined at one extreme by a global mode of field approach (field dependent) and at other extreme by an articulated mode of field approach (field independent) [Witkin, Dyk, Faterson, Goodenough and Karp, 1962; 1974]. Experiences from people with a relatively global cognitive style are governed by the organization of the field. By contrast, experiences for people with a relatively articulated cognitive style can be analysed and structured in new ways, depending on the task at hand [Goodenough, 1976]. Goodenough [1976] defines field independence "as the ability to overcome embedding context in perceptual functioning, and it is considered to be the analytical aspect of an articulated mode of field approach." [p.675]

The field dependence/independence test developed by Witkin, et al [1971] measures the extent to which a person is field dependent [FD] or field independent [FI]. On the basis of scores on the Group Embedded Figures Test (GEFT) [Witkins et al 1971] subjects are classified as either FD or FI. In the test, subjects are asked to find simple figures in a relatively complex design that is so patterned that each component of the simple figure is thereby effectively hidden. To locate the simple figure it is necessary to break up the organised pattern so as to expose the figures. Subjects who have difficulty separating the simple figures are FD while those who find it easy to overcome the organised complex design are FI. Subjects are administered 18 'disembedding' tasks to be completed in 10 minutes. One point is awarded for each task completed correctly and scores range from 0 to 18.

This difference in perceptual differentiation has been shown to be related to a wide spectrum of human behaviour [Witkin and Goodenough, 1977]. In problem-solving situations, FD individuals demonstrate more difficulty than FI individuals and FD individuals have been shown to be more receptive than FI individuals to ambiguous information and situations [Witkin and Goodenough, 1977, p.664]. In the accounting context, this dimension has been shown to be related to how individuals use financial and ambiguous-type accounting information. Lusk [1973], for example, showed that FI subjects demonstated greater cognitive skills in analysing annual reports and Gul [1984] found that FD individuals are more confident in judgments as a result of ambiguous information. In the non-accounting context there are a large number of studies that have shown that field dependence cognitive style is related to individual's problem-solving behaviour. Frank and Noble [1985], for example, found that FI students solved anagram problems more quickly than FD students. FD students also perceived the anagram task as more difficult.

Of interest in this study is the relationship between field dependence cognitive style and student performance in a MCE. This interest was motivated because prior research has shown that this dimension is related to restructuring tasks which are similar to MCE such

as sentence disambiguation [Witkin and Goodenough, 1981, p.33]. Linguistic ambiguity has attracted the attention of several researchers since it is important in both language use and language theory [Katz and Postal, 1964]. Witkin and Goodenough [1981, p.32] drew attention to the relationship between sentence ambiguity and restructuring tasks:-

> "Sentences are considered ambiguous when they are open to two or more semantic interpretations. Sentence disambiguation which requires subjects to identify several meanings in an ambiguous sentence, meets the definition of a restructuring task."

Several researchers have found a relationship between field dependence and sentence disambiguation. Goodman [1971], for example, found that FI subjects performed better than FD subjects in disambiguating syntactically ambiguous sentences. In another similar study, Powers and Lis [1977] found that FI students performed sentence transformation tasks more efficiently than FD students.

Of interest in this exploratory study is the relationship of field dependence cognitive style with restructuring skills in terms of student performance in a MCE. There is a body of evidence [Goodenough, 1976] which suggests that subjects who perform better at problem solving tasks are also field independent in the "disembedding" test. This is based on the notion that FI subjects are more analytical in their processing ability, and, therefore, better at cognitive restructuring skills than FD subjects. Performance in a MCE is seen as a restructuring task since the selection of an appropriate answer demands some analytical ability. Moreover, since MCE questions also sometimes contain ambiguous statements that are open to two or more semantic interpretations, it is likely that there would be differences between FD and FI subjects ability to disambiguate these statements and this, in turn, may affect their MCE performance. Following the theory underlying field dependence cognitive style and the evidence available, it is hypothesised that subjects who scored higher in the GEFT tests (that is, more FI) would also exhibit superior performance in the MCE. The MCE in auditing was selected for study since it was one of the more common subject areas examined in the MCE mode and a test in this context would be of interest to both practitioners and academics.

METHOD

Subjects were 59 final year accounting students enrolled in the advanced auditing course at the University of Wollongong, Australia. Their ages ranged from 21 to 38 years. The students were administered a MCE made up of 25 auditing multiple choice questions (including a number of questions adapted from past AICPA examinations) selected from a bank of 80 questions. Appendix A contained the 25 questions. The assistance of several academics who had previous experience teaching auditing were enlisted to select the multiple choice questions. In order to select the correct answer, students had to "disambiguate" the four possible alternative answers provided for each question. Following immediately after the MCE, students were asked to assess their perceptions of the degree of ambiguity to each question on a 7-point Likert-type scale with 1 indicating little or no ambiguity and 7 very high ambiguity. MCE questions were considered ambiguous when they contained syntactically ambiguous statements. The hypothesis was tested using both the 25 questions and 10 questions[1] which were perceived by the students to be the most ambiguous.

Approximately four weeks after the MCE, the students were also administered the GEFT to measure field dependence. Using multiple regression analyses, the contributions of the field dependence measures in explaining performance on MCE were assessed.

A potential source of bias was possible differences in ability between the groups, which could affect the internal validity of this study. In order to control for individual differences in student abilities, a grade point average (GPA) was computed and introduced into the analysis. A GPA score for each student was calculated by using the average mark for five second year accounting subjects (Financial Accounting IIA, Financial Accounting IIB, Management Accounting II, Information Systems in

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1 The 10 questions selected had mean scores of between 3.6 and 4.2 (range 1 to 7) and were found to be significantly [$p<0.05$] more ambiguous than the other 15 questions.

Accounting and Business Finance.[2]) The confounding effects of gender were also checked and found to be insignificant. There were no significant differences in field dependence scores or MCE scores between male and female respondents.

RESULTS

Table 1 represents the descriptive statistics for the experimental variables. A simple correlation analysis between the independent variables was also performed. The absence of significant correlations suggests that the regression model has not been affected by multicollinearity. To test the hypothesis the following regression equations were fitted to the data:-

$$Y = \beta o + \beta_1 X_1 + \beta_2 X_2 + \xi$$

where Y = performance in multiple choice examination (MCE),

X_1 = group embedded figures test scores (GEFT)

X_2 = grade point average (GPA).

Table 1

Variable Statistics

Dependent Variable	**Mean**	**Range**	**S.D.**
MCE Score (Y_1) - 25 questions	15.83	21 - 8	2.84
MCE Score (Y_2) - 10 questions	6.15	9 - 2	1.75
Independent Variables			
GEFT Score (X_1)	13.29	0 - 18	5.46
GPA (X_2)	61.08	25 - 84	12.35

Multiple regression runs were initially performed on MCE scores from the set of 25 questions. The results are presented in Table 2.

2 The other second year papers were in non-accounting subjects.

Table 2

MCE Scores on Twenty-five Ambiguous Questions

Variable	Regression Coefficient	Standard Error	t	Probability
GPA	0.04	0.02	2.45	<0.01
GEFT	0.10	0.04	2.49	<0.01
Constant	2.31			

$$R^2 = 0.20, F_{2,56} = 7.21, p < 0.01$$

As shown in Table 2, the GEFT and GPA scores are significant in explaining MCE performance on the 25 questions. The significance of the GPA score also indicates the importance of including the GPA in the analysis. As a further test of the results, a regression was run again, this time on the set of the 10 most ambiguous questions selected by the students. The results, presented in Table 3, provided further evidence to support the earlier findings.

Table 3

MCE Scores in Ten Most Ambiguous Questions

Variable	Regression Coefficient	Standard Error	t	Probability
GPA	0.19	0.14	2.18	<0.05
GEFT	0.30	0.06	3.23	<0.01
Constant	2.31			

$$R^2 = 0.24, F_{2,56} = 8.92, p < 0.01$$

The higher R^2 (24%) and 't' values (3.23) for the second regression run suggest that the GEFT effect is greater for more ambiguous questions.

DISCUSSION AND CONCLUSION

These results provide some evidence that field dependence cognitive style is an important variable in the evaluation of student performance on MCE. Since field independent individuals are more capable in cognitive restructuring skills and in providing "structure for an ambiguous stimulus 'complex'" [Frank and Noble, 1985], it is likely that they will perform better on MCE which contain ambiguous answers. The results are also consistent with the findings of Goodman [1971] and Lefever and Ehri [1976] who found a relationship between "disambiguation" and embedded figures test performance. As pointed out earlier, Goodman [1971], for example, found that embedded figures test

scores were related to disambiguating ability when subjects were presented with syntactically ambiguous sentences.

In evaluating the arguments presented by Collier and Mehrens [1985] it is perhaps useful to recognise that individual psychological differences may affect students' performance in MCE. In particular, the results obtained here suggest that field dependence/independence cognitive style may be a relevant variable affecting student performance. In particular the level of ambiguity of the sentences may in a MCE, affect the relationship between perceptual differentiation and performance. MCE questions are considered ambiguous when the statements are syntactically ambiguous. An implication of this study is that MCEs should as far as possible not contain ambiguous statements to ensure that performance is a result of student ability and knowledge rather than cognitive styles. More importantly, academics who are evaluating student performance in MCE should bear this in mind and at least ensure clarity of statements in MCE. At a general level the results obtained here suggests that the use of MCE, in itself, regardless of sentence/statement ambiguity in the MCE, needs further scrutiny and study. Alternatively, future research should consider the efficacy of providing special instructions for those diagnosed as FD so that they may have the same facility as FI subjects to perform in a MCE. This includes practice exercises involving the extraction of simple concepts from an array of seemingly unrelated scenarios [Hadfield and Maddux, 1988}. Some evidence exists that a person can be taught to move from a global approach to thinking to a more articulated approach, that is, a field dependent person can be taught to be more field independent [Witkin, 1974]. Finally, in using the results of this study, it should be pointed out that the study suffers from the usual limitations of laboratory experimentation.

REFERENCES

Chomsky, N., Aspects of the Theory of Syntax, (Cambridge, Mass.:MIT Press, 1965).

Collier, H.W. & W.A. Mehrens, Using Multiple Choice Tests Items to Improve Classroom Testing of Profession Accounting Students, *Journal of Accounting Education*, (Fall, 1985), pp. 41-51.

Foss, D.S., T.G. Bever & M. Silver, The Comprehension and Verification of Ambiguous Sentences, *Perceptions and Psychophysics,* (Vol. 4, 1968), pp. 304-306.

Frank, B.M. & J.P. Noble, "Field Independence - Dependence and Cognitive Restructing", *Journal of Personality and Social Psychology,* (Vol. 47, No. 5, 1985), pp. 1129-1135.

Goodenough, D.R., The role of individual differences in field dependence as a factor in learning and memory, *Psycholgical Bulletin,* 1976, pp. 675-694.

Goodman, D.R., ***Cognitive Style Factors in Linguistic Performance with Ambiguous Sentences,*** (Unpublished Master's Thesis, York University, Canada, 1971).

Hadfield, O.D. & C.D. Maddux, Cognitive Style and Mathematics Anxiety Among High School Students, *Psychology in the Schools,* (Vol.25, 1988), pp. 75-83.

Katz, J.J. & P.M. Postal, *An Intergrated Theory of Linguistic Descriptions,* (Cambridge, Mass: MIT Press, 1964)

Lefever, M.M. & L.C. Ehri, The Relationship Between Field Independence and Sentence Disambiguation Ability, *Journal of Psycholinguistic Research,* (Vol.5, 1976), pp. 99-106.

Messick, S., Personality Consistencies in Cognition and Creativity. In S. Messick & Associates (Eds.) *Individuality in Learning,* (San Fransisco: Jossey-Bass, 1976).

Powers, J.E. & D.J. Lis, Field Dependence - Independence as Performance with The Passive Transformation, *Perceptual and Motor Skills,* (Vol. 45, 1977), pp. 759-765.

Pratt, J., The Effects of Personality on a Subject's Information Processing: A Comment, *The Accounting Review,* (July, 1980), pp.501-506.

Siegel, P.M., Auditor Performance and Educational Preparation: An Analysis, *Issues in Accounting Education,* Spring 1987, pp. 127-140.

Witkin,H.A. & D.R. Goodenough, Field Dependence and Interpersonal Behaviour, *Psychological Bulletin,* (Vol.84, 1977), pp. 661-689.

Witkin, H.A., P.K. Oltman, E. Taskin, & S.A. Karp. *Embedded Figures Test,* (Consulting Psycholigcal Press, Inc., Palo Alto, California, 1971).

Witkin, H.A., *Educational Implications of Cognitive Style.* Unpublished paper presented at the Fourteenth Annual Meeting of the Council of Graduate Schools, Phoenix, Arizona, 1974.

APPENDIX A

MULTIPLE CHOICE

CIRCLE THE APPROPRIATE ANSWER FOR EACH OF THESE QUESTIONS AND RETURN THIS SHEET WITH YOUR ANSWERS

(* Ten most ambiguous questions selected by students)

1. Which of the following best describes why an independent audit is asked to express an opinion on the presentation of financial statements:

   (a) It is difficult to prepare financial statements that fairly present a company's financial position and changes in financial position and operation without the expertise of an independent auditor.

   (b) It is management's responsiblity to seek available independent aid in the appraisal of the financial information shown in its financial statements.

   (c) The opinion of an independent party is needed because a company may not be objective with respect to its own financial statements.

   (d) It is customary courtesy that all stockholders of a company receive an independent report on management's stewardship of the affairs of the business.

*2. The auditor's judgement concerning the overall fairness of the presentation of results of operations, financial position, and changes in financial position is applied within the framework of:

   (a) quality control

   (b) auditing standards which include the concept of materiality

   (c) the auditor's evaluation of the audited company's internal control.

   (d) accepted accounting principles

*3. Which of the following best described what is meant by auditing standards?

   (a) acts to be performed by the auditor

   (b) measures of the quality of the auditor's performance

   (c) the auditor's evaluation of the audited company's internal control

   (d) accepted accounting principles

4. Auditing standards state that due care is to be exercised in the performance of the examination. This standard should be interpreted to mean that a public accountant who undertakes an engagement assumes a duty to perform:

   (a) with reasonable diligence and without fault or error

   (b) as a professional who will assume responsibility for losses consequent upon error of judgment

   (c) to the satisfaction of the client and third parties who may rely upon it

   (d) as a professional possessing the degree of skill commonly possessed by others in the field.

5. The primary responsibility for the adequacy of disclosure in the financial statements of a publicly held company rests with the:

   (a) management of the company

   (b) partner assigned to the audit engagement

   (c) auditor in charge of the field work

   (d) NCSC

6. A basic objective of a Public Accounting firm is to provide professional services to conform with professional standards. Reasonable assurance of achieving this basic objective is provided through:

   (a) continuing professional education

   (b) a system of quality control

   (c) compliance with audit reporting standards

   (d) a system of peer review

7. In which case was the concept of "reasonable foreseeability" of damage as the cirterion for determining the existence of the duty of care raised:

   (a) Mutual Life and Citizens Assurance v. Evatt. 1968.

   (b) Pacific Acceptance Corporation v. Forsyth. 1970

   (c) Fomento Ltd. v. Selsdon. 1958.

   (d) Scott Group v. McFarlane & Others. 1978.

8. The Pacific Acceptance Case held that auditors have a duty where suspicion of fraud is around:

   (a) to uncover meticulously planned fraud

   (b) to uncover the fraud and interconnect with other possible irregularities

   (c) to investigate and interconnect with other possible irregularities

   (d) none of the above

9. In what two Commonwealth cases have auditors been found to be liable to a third party for negligence and have had damages awarded against them:

   (a) Hedley Byrne v. Heller & MLC v. Evatt

   (b) Scott Group v. McFarlane and Jeb Fasteners v. Marks Bloom

   (c) Haig v. Bamford and Twomax v. Dickson

   (d) Pacific Acceptance v. Forsyth and Cambridge Credit v. Hutchinson

10. The final decision on the Cambridge Credit case found the auditors liable for breach of contract

   (a) and damages of $19.5 million were negotiated out of court

   (b) and awarded $145 million damages

   (c) but any damages awarded were set aside pending a further hearing

   (d) none of the above

11. An independent auditor strives to achieve independence in appearance in order to:

   (a) reduce risk and liabilities

   (b) maintain public confidence in the profession

   (c) become independent in fact

   (d) comply with the auditing standards of fieldwork

*12. Triolo. AASA. CPA. has a small public accounting practice. One of Triolo's clients desires services that Triolo cannot adequately provide. Triolo has recommended a larger firm, Pinto and Company, to his client, and in return, Pinto has agreed to pay Triolo 10 percent of the fee for services rendered by Pinto for Triolo's client. Who, if anyone, is in violation of the Code of Professional Ethics?

(a) Both Triolo and Pinto

(b) Neither Triolo and Pinto

(c) Only Triolo

(d) Only Pinto

*13. An auditor who accepts an audit engagement and does not possess the industry expertise of the business entity, should:

(a) Engage financial experts familiar with the nature of the business entity

(b) Obtain a knowledge of matters that relate to the nature of the entity's business

(c) Refer a substantial portion of the audit to another auditor who will act as the principal auditor

(d) First inform management that an unqualified opinion cannot be issued.

*14. When assessing audit evidence "sufficiency" the auditor should consider:

(a) the time required to obtain the evidence

(b) the relevance of the evidence

(c) the source of the evidence

(d) the objectivity of the evidence

*15. Which of the following types of documentary evidence should the auditor consider to be the most persuasive?

(a) a sales invoice issued by the client and supported by a delivery receipt from an outside trucker

(b) confirmation of an account payable balance mailed by and returned directly to the auditor

(c) a cheque, issued by the company and bearing the payee's endorsement, that is included with the bank statements mailed directly to the auditor

(d) a working paper prepared by the client's controller and reviewed by the client's treasurer.

16. Which of the following is the least persuasive type of evidence?

(a) Vendor's invoice

(b) Bank statement obtained from the client

(c) prenumbered client invoices

(d) computations made by the auditor

*17. Audit working papers are used to record the results of the auditor's evidence-gathering procedures. When preparing working papers the auditor should remember that working papers should be:

(a) kept on the client's premises so that the client can have access to them for reference purposes

(b) the primary support for the financial statements being examined

(c) designed to meet the circumstances and the auditor's needs on each engagement

(d) considered as a part of the client's accounting records that is retained by the auditor

*18. When considering internal control, an auditor must be aware of the concept of reasonable assurance, which of the following are part of the concept:

(a) employment of competent personnel provides assurance that the objectives of internal control will be achieved

(b) establishment and maintenance of a system of internal control is an important responsibility of the management and not of the auditor

(c) cost of internal control should not exceed the benefits expected to be derived therefrom

(d) segregation of incompatible functions is necessary to ascertain that the internal control is effective

19. Which one of the following is **NOT** an inherent limitation of internal control:

(a) the fact that controls are often required to be cost effective

(b) the fact that controls tend not to be directed at unusual types of transactions

(c) the fact that management can make mistakes of judgment

(d) the fact that management is responsible for the implementation of a sound system of internal control.