

## DOCUMENT RESUME

ED 454 445

CE 081 964

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 TITLE Field Dependence-Field Independence and Vocational Teachers. Working Paper.  
 INSTITUTION Technology Univ.-Sydney, Broadway (Australia). Research Centre for Vocational Education and Training.  
 SPONS AGENCY Australian National Training Authority, Melbourne.  
 REPORT NO RCVET-WP-00.51  
 PUB DATE 2000-12-00  
 NOTE 11p.; Paper presented at the Annual International Post-Compulsory Education and Training Conference (8th, Gold Coast, Queensland, Australia, December 3-5, 2000).  
 AVAILABLE FROM For full text:  
<http://www.uts.edu.au/fac/edu/rcvet/working%20papers/WP0051Pithers.pdf>.  
 PUB TYPE Speeches/Meeting Papers (150)  
 EDRS PRICE MF01/PC01 Plus Postage.  
 DESCRIPTORS Cognitive Processes; \*Field Dependence Independence; Foreign Countries; \*Learning Processes; Locus of Control; Perception Tests; Personality Measures; \*Personality Traits; Postsecondary Education; Student Characteristics; \*Teacher Characteristics; \*Teacher Student Relationship; Teaching Methods; \*Vocational Education Teachers  
 IDENTIFIERS \*Australia; Group Embedded Figures Test

## ABSTRACT

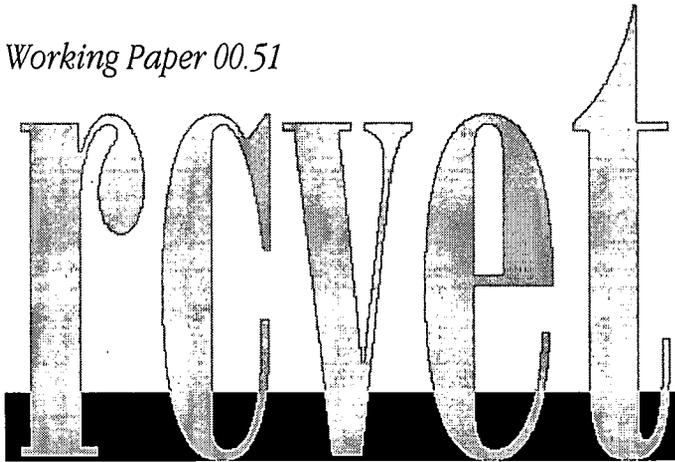
A study used the standardized Group Embedded Figures Test to assess field dependence-field independence among groups of vocational education teachers of varied ages and teaching backgrounds. The sample consisted of 170 volunteers who were vocational education teachers and trainers in the process of completing the requirements for either a diploma or a bachelor's degree at a university in Australia. Overall, it was found that the sample was "moderately" field independent. There was a significant between-group course effect but none attributable either to gender or to stage of course. Earlier research has shown that more field-independent teachers as compared to more field-dependent teachers tend to do or be the following: (1) perceive objects as separate from their fields; (2) more easily abstract an item from the field and solve new problems presented and organized in different contexts; (3) be less dependent on authority and depend more on their own values and standards; (4) be oriented towards "active striving"; (5) appear more distant and aloof; (6) be more socially detached but have deeper analytical skills; and (7) prefer occupations where they can work alone. The study determined that a degree of field independence is an important consideration in vocational learning because people who are more analytic appear to be able to more effectively use their differentiation and analytical skills in problem solving. The study posits that while in the short term there is a positive benefit of a match between teacher and learner field dependence-field independence, learning styles may be able to be modified. Therefore, it may be more advantageous to learners to experience both field-dependent and field-independent teachers and thereby learn to become more flexible in their learning approaches. (Contains 20 references.) (KC)

# Field dependence - field independence and vocational teachers

*Paper presented at the International Post-Compulsory Education and Training Conference, Gold Coast, Queensland., December 2000*

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*Working Paper 00.51*



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# *Field Dependence - field independence and vocational teachers*

*Bob Pithers*

## **ABSTRACT**

Field dependence/field independence is a dimension of cognitive or learning style that has been researched for some time with various student groups as well as individuals in the business world. Nevertheless, there appears to be a dearth of published research in this area relevant to vocational education practitioners. In this study the standardised Group Embedded Figures Test was used to assess Field dependence/field independence among groups of vocational education teachers of varied ages and teaching backgrounds. Overall, it was found that this sample was 'moderately' Field independent. There was a significant between-group course effect but none attributable either to gender or to stage of course. The implications of this finding for teaching-learning are discussed.

## **INTRODUCTION**

Cognitive styles are thought to be relatively stable strategies, preferences and attitudes which determine an individual's "...typical modes of perceiving, remembering and problem solving" (Messick, 1976, p. 5). They are said to be the modes by which learners approach, acquire and process information and include the consistent ways in which an individual memorises and retrieves information (Witkin & Goodenough, 1981). The concept is different from cognitive 'abilities' which are usually thought to be more domain specific and are rather about subject-content mastery and the individual's performance capacity in a specific subject-matter domain. Cognitive learning styles, however, are thought to be relatively stable ways of how a learner approaches a learning task across a range of different domains (Kahtz & Kling, 1999).

Learning strategies, on the other hand, involve learners' conscious choices about how they aim to handle how they will behave in a certain learning situation (Messick, 1976). Obviously, learning strategies can be affected by cognitive style but although strategies may be adapted to be more appropriate to a particular learning situation, the underlying cognitive style is thought to be much more permanent and persuasive. It, therefore, may influence the choice of the learning strategies that the learner tends to adopt over a range of learning tasks.

One major approach to the classification of cognitive styles has been concerned with the major cognitive processes of perception, memory and thought and a predominant approach to this subset of the cognitive or information-processing style concept has been the construct of 'Field dependence-field independence'. This whole approach involves an individual's ability to perform perceptual analytic type tasks (Riding & Cheema, 1991) and

is derived from the substantive work of Witkin, Ottman, Raskin and Karp (1971). These workers developed and trialed a series of standardised psychological tests, the most well used and substantiated of which is the *Group Embedded Figures Test* (GEFT). This instrument purports to measure a construct which is called 'Field dependence' and which is based on what they termed 'psychological differentiation'.

This perceptual, pattern-recognition test measures an individual's ability to 'break up' an organised visual field so that an embedded part or given shape in that field may be recognised and memorised as separate from the given total field. This process, over a range of given visual fields enabled the measurement of a bipolar construct: Field dependence-Field independence. In a Field-dependent (FD) mode, pattern recognition is strongly dominated by the holistic organisation of the total perceptual field with its parts being perceived as 'fused'. In contrast, the Field-independent (FID) mode of perceiving is more likely to see the parts of the field as distinct from the organised ground (Witkin, et al., 1971, p. 4). These workers go on to argue, based on their research evidence, that the individual who performs in a relatively FD way tends to follow the presented visual field structure. The FID individual, however, tends to be able to break up the given field organisational structure and locate a nominated structural part.

Witkin et al., (1971) discovered that Field independent (FID) individuals when compared to Field dependent (FD) ones are more capable of restructuring the perceptual field or imposing a structure if one is missing. They also tend to act more autonomously than FDs. FDs have a more social and interpersonal orientation. These bipolar dimensions appeared to be relatively stable and persuasive (eg., Witkin & Goodenough, 1981). Nonetheless, Witkin et al., (1971) were at pains to point out that being strongly FD or FID was neither 'good' or 'bad' and that scores on the GEFT formed a normal distribution. Since that time the validity, reliability and usage of the GEFT has been evaluated by a range of researchers with the general conclusion emerging that this instrument appears to have "desirable measurement characteristics (eg., Thompson & Melancon, 1987). The GEFT is used in the present research because it has underpinned most of the research effort and reported outcomes in the dimension of cognitive learning style since the early 1970s.

Witkin et al., (1971) summarised numerous studies, completed up until the time of his paper and using a precursor to the GEFT. This evidence indicated that: Firstly, there was a relationship between the strength of FID and problem solving performance, where the solution depends on the individual using a critical element in a different context from the one in which the element had originally been presented; thus showing a connection between analytical and structuring abilities. Secondly, FD individuals pay more attention to and remember faces. Thirdly, FD individuals are more strongly influenced by the immediate social context and are more inclined to attend to and learn about social aspects of their environment. Fourthly, FD individuals show greater incidental learning for social material than do FIDs and lastly, the use of the GEFT with a large number of liberal arts students showed a small but significant sex difference with men, on average, being more FID.

Many subsequent studies have found no significant GEFT between-group FD-FID sex differences. These studies used samples of accountants (McRae & Young, 1988), business students (eg., Murphy & Casey, 1997) as well as a sample of education students (Wieseman, Portis & Simpson, 1992).

Furthermore, reviews and research completed by Saracho (1991) and Saracho and Spodek (1981) have indicated that more FD teachers as compared to more FID teachers tend to exhibit the following attitudes and behaviours:

- Rely on the whole perceptual field;
- Look to the global context and tend to conform to the total field;
- search for information from facial cues;
- are more strongly interested in people;
- have a greater sensitivity to others with higher developed social skills;
- are more dependent on authority;
- tend to prefer situations which require direct communication with others.

In comparison, more FID teachers tend to:

- perceive objects as separate from their fields;
- more easily abstract an item from the field and solve new problems presented and organised in different contexts;
- be less dependent on authority and depend more on their own values and standards;
- be oriented towards 'active striving';
- appear more distant and aloof;
- be more socially detached but have deeper analytical skills and
- prefer occupations where they can work alone.

Witkin and Goodenough (1981) also claimed that FIDs rely more on an internal frame of reference and that they provided structure for ambiguous stimulus complexes.

Whether an individual can learn to become more FD or more FID has become a greater field of contention since the 1980s. Originally, Witkin et al., (1971) and other researchers of the time considered that the degree of FD/FID a person possessed and the amount of an individual's psychological differentiation were stable and pervasive, especially over the growth years (eg., 10-24), although there was a hint in their data that a practice effect on FD was possible. Leonard, et al. (1999) has found that cognitive style may be malleable, based on research in organisations of the ability of successful managers to take on or select or adapt to styles (presumably more FID and analytic) needed in these positions.

Many studies in the area of cognitive learning style have examined the degree of FD/FID in various vocational fields. For example, generally business students in North America, tend to be 'moderately FID (eg., McRae & Young, 1990; Young, Keller & McRae, 1989). Osipow (1969) examined vocational preference and scores on FD/FID. Special education students and nurses tended to be more FD, whilst home economics, dental, pharmacy and fisheries students tended to be more FID. Lusk and Wright (1981) found that their business students sample were less FID than science and engineering students but more FID than

Witkin et al's liberal arts normative sample. Witkin et al. (1977) found that FID individuals preferred to work more in the less interpersonal, analytic domains such as the sciences which they argued required greater use of restructuring skills. Relatively FD individuals were seen to prefer vocational areas such as education which require greater use of their interpersonal skills.

The focus of the present research will be on the findings and implications of research on FD-FID, using the GEFT with a varied group of vocational teachers. It was not known, because of a dearth of published research, whether Australian vocational teachers would tend to be more FD or FID. It was predicted, however, based on existing research evidence, that there would be no significant sex difference in the obtained data. It was also thought that there may be a between-group Stage of course difference, that is if university courses developed the sorts of analytical approaches more associated with FID. It was also proposed to examine age as a variable in the measure of FD/FID among these teachers.

## **METHOD**

### **Sample**

The sample was composed of 170 vocational education teachers and trainers all of whom were volunteers and were in the process of completing requirements for either a Diploma or a Bachelor's degree at a university. They ranged in age from the early 20s to the mid-50s; there were 107 and 63 individuals under and over the age of 35, respectively. There were 102 males and 68 females in the sample. Of the total sample, 107 students were studying at the diploma level whilst 63 were studying at degree level.

### **Research instrument**

The *Group Embedded Figures Test* (GEFT) is a perceptual test. The subject's task is to locate a previously seen simple figure within a larger complex figure which has been organised to obscure or embed the simple figure. The test contains 18 complex figures and can be completed in about 20 minutes in a group setting. The GEFT is a standardised psychological test; norms and full details of numerous studies which report on the GEFT's validity and reliability (typical reported coefficients are in the order of .82- .90) can be found in the GEFT manual (see Witkin, et al., 1971).

### **Procedure**

The GEFT was administered to the 170 subjects in small groups of approximately 15-25 individuals over a period of two months. Subjects were read the standardised instructions, were provided with the practice examples. Then the sections of the test were administered according to the instructions given and to the set time frames. Scoring was completed using the procedures set out in the GEFT manual.

## RESULTS

Shown separately in Table 1 are the overall means and standard deviations for males and females obtained in this study. Comparative data is provided by the GEFT manual sample norms, based on liberal arts students. Also included is descriptive data from three other relevant studies, using a range of different groups. The significance of the between-group sex difference is also noted.

*Table 1*

Means and standard deviations (sd. in brackets) for men and women obtained from this study, compared with Witkin et al.'s, (1971) normative data and data from three other relevant studies. The significance of the mean group sex difference is also indicated (NS= Not Significant; SIG.= Significant; all at  $p < .05$ ).

GROUP	MEN Mean (sd)	WOMEN Mean (sd)	SIG.
This study; N= 170, vocational educators and trainers	13.4 (4.8)	13.2 (4.4)	NS
Witkin, 1971- norms; N=107 liberal arts students	12.0 (4.1)	10.8 (4.2)	SIG
Murphy & Doucette, 1997; N=89, business students	13.0 (5.4)	12.0 (4.3)	NS
Murphy & Casey, 1997; N=63, Information management studs.	11.9 (6.2)	11.4 (4.9)	NS
McRae & Young, 1988; N=150, business students	13.3 (4.2)	13.1 (4.3)	NS

The data shown in Table 1 indicated that both the men and women in this study, on average, tended to score above a range of other study samples but were closest to data obtained from a range of business students obtained by McRae and Young (1988). The group means for both the men and women vocational educators in this study were above those obtained from Witkin et al.'s (1971) normative sample of liberal arts students (see Table 1). According to the suggested GEFT normative sample, the results obtained indicated that the men and women in this study were 'slightly' and 'moderately' field-independent, respectively.

A one-factor Analysis of Variance (ANOVA) test applied to the data in this study indicated no significant sex difference ( $F = .05$ ,  $df = 169$ ;  $p < .05$ ; an alpha level of .05 was set for all further tests of significance). Furthermore, a two-factor ANOVA results applied to course studied (ie, Diploma or Bachelor course) indicated a significant between-group difference ( $F = 7.16$ ), with, on average, the Bachelor of Education vocational student group having a higher mean score on Field- independence (FID) than the diploma group (mean of 14.7 vs 12.5, respectively). For example, 58.8% of the bachelor students and 43.9% of the Diploma students fell into the 8<sup>th</sup> and 9<sup>th</sup> percentile, respectively (mode in the 9<sup>th</sup> percentile in both

cases). This shows in both groups most students scored relatively higher on field-independence. Stage one vs two of the course was not a significant variable ( $F = .82$ ) nor was the interaction effect.

The total sample were also separately divided into two broad age groups depending on whether they were below ( $n= 107$ ) or above ( $n= 63$ ) 35 years of age. A one-factor ANOVA applied to this data indicated a significant between-group difference ( $F= 7.4$ ); the 'younger' group, with a mean score of 14.1 was significantly higher (or more FID) than the 'older' group, whose mean score was 12.1.

## DISCUSSION

There appears to be a dearth of published research which has examined the FD/FID characteristics among teachers, let alone of adult, vocational teachers and trainers. There is in comparison, a voluminous research literature that has used various types of student samples. Nonetheless, based on the data obtained from the sample of vocational teachers of various sorts obtained from this study it was concluded, on average, that these individuals were 'moderately' FID, compared to the GEFT normative sample. Furthermore, it was concluded that there was no significant between-group gender effect, a result common with many other recent studies. There was no significant main effect due to stage of course. The between-group age data was significant, indicating, on average, that individuals in the sample under 35 years of age scored higher on FID when compared with the 'older' (than 35) sub-sample. The reason for this intriguing finding needs to await the results of future research.

It has been shown, at least for early childhood teachers, that teachers' cognitive style can affect how they interact with others and select either a more social or more abstract curriculum content. Saracho (1991), in another study, obtained data showing that FI teachers as well as their students, were more content oriented and that furthermore, the cognitive style orientation of the teacher (as well as of the students) can come to affect their perception of their learning experience. For example, FD teachers reported 'more satisfaction' with their students while FD students reported a greater preference for 'socially oriented' teachers.

A degree of FID is an important consideration in many forms of vocational learning because individuals who are more analytic appear to be able to more effectively use their differentiation and analytical skills in problem solving. This is especially so when the field is structured and conceivably, they are better able to impose a structure when the field lacks these components (Witkin & Goodenough, 1981).

Witkin, Moore and Cox (1977) reported evidence that FID teachers preferred to use more formal teaching methods whereas FD teachers preferred more frequent two-way interaction with their students. Riding and Cheema (1991) have summarised much of the available literature in this area and have indicated furthermore, that FID teachers tended to use questioning as an 'instructional tool', whereas FD teachers used this technique to check on student learning. Teachers who tended to be more FID tended to emphasise standards and,

during explanations of subject-matter content formulate their own explanatory principle. FDs were more inclined to involve the students in structuring the content and in sequencing content in the teaching-learning process. Furthermore, FIDs tended to correct the learners and to provide explanatory feedback even if critical. More FD teachers were less inclined to provide critical feedback to their learners. More FIDs or so it was found, tended to focus more on subject-matter content and its coverage and were less inclined, than FD teachers to worry about creating positive student classroom attitudes and relationships.

Witkin and Goodenough (1981) had little doubt, based on available research evidence at that time, that cognitive style was associated with learning outcomes. They claimed that FID individuals, including teachers, relied on a more internal frame of reference when they were faced with ambiguous material. Subsequently, they were more likely to impose or provide their own structure, be analytical with material and be more likely to provide a different orientation to the visual field or subject-matter content than the one suggested by its elements. These workers claimed that FIDs were more capable in all of the foregoing areas. These observations made about teachers whose predominant style and behaviour were either more FD or FID tended to give more detail to Witkin and Goodenough's (1981) report.

Self awareness of cognitive or information-processing style is not only an important issue in developing more successful managers of organisations (Murphy & Doucette, 1997), it is important for developing successful teachers as leaders. For instance, if FD learners tend to favour more structure and feedback in learning and FID learners prefer more autonomy and less interpersonal interaction then vocational teachers should provide a variety of teaching methodologies to accommodate the range of FD/FID styles in their classes. A simpler approach would be to find out the predominant cognitive style in the student group (ie., FD or FID) and then match that style with the attitudes and behaviours of an 'appropriate' teaching style (ie., more FD or FID, respectively).

The style-matching approach, however, is problematic. One major problem is that FD-FID scores from the GEFT are conceived of as following a normal distribution. This, in practice, means that in any group there will usually be individual learners who exhibit FD and FID strength in various degrees. This means that if a teacher adopts one predominant cognitive teaching style to 'match' with a similar cognitive learning style (ie., FD or FID), they are bound not to 'connect' with some learners' cognitive style preferences.

It may be argued that FD learners who are exposed to more FID teachers (in particular in areas such as management or marketing) become more FID over the time of the course. The question, however, of whether learners can modify or change their cognitive style over a relatively short time period is still a point of issue in the sparse research literature on this subject. Hayes and Allison (1998), having examined much of the literature on cognitive style and practice have advised that there is a good possibility that cognitive style is 'malleable' over the long term.

There is, however, another serious problem with the cognitive style teacher-learner match concept, except in the short term. This is the notion that in spite of any short-term benefits in learner-teacher satisfaction, the approach simply brings about further practice and

positively reinforces those information-processing attitudes and behaviours with which the learner (perhaps, as well as the teacher) is already most comfortable. In recent times, a range of workers in the field have pointed to the dangers of this approach of cognitive or information processing style, other than for exploiting short-term benefits (Hayes & Allison, 1998; Sternberg, 1998).

Their viewpoint is that in the longer term there are considerable benefits for the learner in developing a flexible approach to information processing style. That is, when the situation demands it, that the individual is able to adopt or adapt greater FD or alternatively, more FID attitudes, characteristics and teacher leadership behaviours. What Steufert and Nogami (1989) have written about organisational employees can be seen to be important for vocational learners and teachers as well. That is that the employee or the learner may be better off in their workplace applying a different style or degree of style characteristic than the one that they were taught during their vocational education and training. The learner needs to be able to learn to differentiate between different styles, practice a range of them and then, later at work, apply the most appropriate style or level for the demands of the context that they find themselves in at a particular time. Of course, this ability is needed by the vocational teacher in the first place, who might conceivably then be able to practice and teach using a more flexible approach to information processing. More easier said than done if aspects of cognitive style, rather than cognitive strategies, are less malleable than recent workers have suggested. The flexible approach, nevertheless, has certainly led to many suggestions for improving variety in teaching methodology and the importance of the teacher demonstrating and engaging in problem-solving behaviours of different forms. Furthermore, it has led to a notion of the importance of the learner attempting to learn and apply style flexibility based on the type of problem to be solved.

In conclusion, this research has shown that vocational teachers as well as students ought to be aware of the range of cognitive style and how an information processing concept like FD/FID may impact on learning and problem solving. Teachers and their students need to be taught to adopt a flexible approach to information processing style attitudes, thinking and behaviours. Individuals also need to develop self-awareness about themselves in terms of any preferred cognitive style characteristics (eg., FD or FID preference) but then be able to select and apply the information processing approach (eg., interactive or individually analytical) which best suits the new problem or situation.

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