The Interaction of Students' Cognitive Style and Concept Attainment Strategies on Students' Achievement

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Abstract

This study examines the effectiveness of interaction cognitive style (Levelling vs. Sharpening) and concept attainment strategies (Successive Presentation – Simultaneous Presentation) on three different aspects of students` achievements. Achievement Wechsler Adult Intelligence Scale (Visual Reproduction I) were administered to (60) students enrolled in physics courses to the first grad of secondary school in Warsaw. There was no significant interaction between cognitive style and concept attainment strategies on factual content, conceptual generalization content, nor total content achievement test. However there were significant main effects of cognitive style and concept attainment strategies.

Keywords: Cognitive style, Levelling vs. Sharpening, Successive vs. Simultaneous Presentation

تفاعل الأنماط المعرفية واستراتيجيات اكتساب المفاهيم لدى الطلاب على تحصيلهم الدراسي

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ملخص البحث:

يهدف البحث الحالي إلى معرفة أثر التفاعل بين الأسلوب المعرفي للطلاب (التسوية – الإبراز) مع إستراتيجيات اكتساب المفهوم (العرض المتتابع – العرض المتآني) على التحصيل الدراسي لطلاب الصف الأول الثانوي في مدينة وارسو ببولندا، وقد طبق الباحث اختبار وكسلر لذكاء الراشدين (الصورة البصرية رقم I) لقياس الأسلوب المعرفي (التسوية – الإبراز) على عينة مكونة من ٦٠ طالباً يدرسون مادة الفيزياء من طلاب المدارس الثانوية في بولندا.

كما طبق الباحث عليهم اختبار تحصيلي موضوعي في مادة الفيزياء في نهاية الفصل الدراسي الأول بعد تدريس وحدة (التوصيل الكهربي) بطريقة العرض المتتابع للمجموعة التجريبية وطريقة العرض المتآني للمجموعة الضابطة.

وأشارت النتائج إلى عدم وجود تفاعل دال إحصائياً بين الأسلوب المعرفي (التسوية – الإبراز) للطالب وإستراتيجيات اكتساب المفهوم (العرض المتتابع – العرض المتآني) على التحصيل الدراسي للطلاب.

وقد ناقش الباحث تلك النتائج في ضوء فروض البحث مسترشداً بالمفاهيم الأساسية والدراسات السابقة، كما قام الباحث بوضع بعض التوصيات.

Introduction:

There are many interindividual differences among learners which have been isolated for study by psychologists and educators in an attempt to improve the teaching – learning process. A number of these studies have attempted to relate the cognitive functioning's of the learner to a more appropriate method of instruction which will lead to greater achievement gains in information acquisition and retention (Nashaat, 1996). Educators and researchers have long recognized the unique differences among individuals and the influence these differences can have on learning. Concern for these differences led to research on the cognitive variables or cognitive style that individuals posses According to Green cognitive styles consist of four attributes. He contends that cognitive styles are: Bi-polar, value neutral, consistent across domains, stable over time, (Harold, 1996). Several studies focusing on cognitive styles and students' achievement in online instruction have found that field dependent learners do not perform as well as field independent learners in an online learning environment, (Eunjoo, 2005). The way in which cognitive style is manifested in an educational setting is important because a particular cognitive style can

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promote or stifle learning. One cognitive style may lead to more effective learning in one

situation "when the cognitive style matches the response required in the situation" out may be detrimental in another situation "when the cognitive style mismatches the response required in the situation". For example, a student with an analytic cognitive style may succeed in a situation requiring analytical skills whereas a student with a global cognitive style may fail in the same situation (Olivia, 1998). Cognitive styles, which are concerned with the form rather than the content of cognitive activity, have been defined as "individual differences in how we perceive, think, solve problems, learn, and relate to others and as an individual's characteristic and consistent approach to organizing and processing information and experience, (Armstrong, 2004). Aim of the Problem: The present study is an examination of the relationship between cognitive style and strategies of concept attainment. Statement of the problem: Researchers in psychology and education fields define learners` cognitive styles as the information processing habits of individual learners. Researchers also found that individuals are different in their ways of seeking and processing information, and cognitive styles serve as relatively stable indicators of how learners perceive and interpret information, and respond to learning environments (Wolfe & Johnson, 1995). The present study, however, is concerned with a cognitive style (Leveling vs. sharpening) defined by Christian (1997) as a "Levellers and sharpeners are two ends of visual sensitivity continum. Sharpeners tend to notice contrasts and levellers are most likely to notice similarities or things that look alike. Sharpeners find it easy to shift from one conceptual framework to anther, levellers do not". Our use of the terms, levelling and sharpening shares certain features of these meanings, but implies more. We employ the terms to describe

opposite poles of a dimensional principle of cognitive control concerning the degree of assimilation between perceptual processes and memory traces, (see Holzman & Gardner, 1960). This approach assesses how people observe and memorise imagery. Levellers are more likely to overlook inconsistencies, make stories simpler and assimilate information more willingly, but sharpeners are more likely to distinguish between similar images, remember detail and rely more on memory. Christian (1997) has already defined sharpener – leveller: this dimension describes reliable individual variations in the assimilation of information in memory. Santostefano (2001) has already defined sharpening – levelling: the manner in which a child constructs and conserves iconic memory images of information and compares them to present perceptions. Norma (1968) has already defined Levelling is the tendency to perceive or to recall something as having greater symmetry, less irregularity, less incongriuty than it objectively has. Operationally levelling includes differentiation of the stimulus field by reduction of figure ground distinction or assimilation of new stimuli to a dominant organization. Sharpening is the tendency to accentuate differences in perceived objects; a memory distortion that over – emphasize distinguishing characteristics so that events recalled are better defined and more distinct than the originals. Sharpeners are characterized by a high level of articulation in a sequence of stimuli. Shipman, (1985) has already defined this style is known as the difference between individuals in the method of recognizing the continuous stimuli in memory, the extent of individual's cognition of identifying the cognitive field stimuli and merging it with the other data in the memory as to keep it separate. At times, it will be difficult for the individuals who are inclined to levelling to recall what they have stored in their memory in an accurate way. Moreover, it will be difficult for these individuals to identify accurately the

differences present in their stored data. On the other hand, the individuals inclined to sharpening are characterized by being less liable to distraction. Literature of Review: Besides, it will be easy for them to identify the differences present in the data stored in the memory. The emphasis of the aptitude treatment interaction (A.T.I) being by assuming that people with different abilities learn in different ways. The assumption is not that those with less of a specific ability are just slower is that area, the assumption is that they are qualitatively and quantitatively different. This difference may be dealt with if different methods are used to support learning. This intuitively makes sense when you look at the variety of teaching techniques that are proposed by educators in educational methods (Nashaat, 1996). Yongjin (2002) has already demonstrated that the (A.T.I) approach is to adapt instructional methods, procedures, or strategies to the student's specific aptitude information. As several review of (A.T.I) research has pointed out, the measures of various aptitude variables were used to investigate their interactions with instructional treatments. Tinajero (1998) has demonstrated that cognitive style may influence the acquisition of efficient learning strategies. The imagery strategy has been highly effective in memorizing very different types of materials, its effect on recall in children with different cognitive styles. The second portion of the present study is concerned with the differential effectiveness of two memory conditions as a teaching methodologies. Solis and Yudin (1964) evaluated the influence of memory upon concept attainment. They compared the simultaneous condition where all previous instances remained exposed as each new instance was added with the successive condition where only the new instance was shown. They offered evidence that efficiency was greater for the simultaneous condition where the demands upon memory were minimized. They have indicated that the concept

attainer needs only to remember the attributes of the first positive instance of any conjunctive series. Thereafter, he simply eliminates each attribute that changes on each succeeding positive instance. If this view is correct, then the concept attainer, who remembers the first positive instance, will be as efficient on concept problems where only the new instance is successively exposed as on concept problems where all instances are exposed simultaneously. Giambra (1971) have indicated that nonexampler start cards were not used as the key or anchor card in the focusing strategy. Concept definitions have been shown to be maximally facilitative of concept attainment when stated in terms of the relevant attributes of the concept and when written at a level appropriate for particular groups of students. (Klausmeier & Feldman, 1975). McMurray & Klausmeier, (1977) reported a model of conceptual learning and development in which an invariant sequence of four successively higher levels of concept attainment was proposed: concrete, identity, classificatory, and formal. The invariant sequence of levels which was predicted from an analysis of the cognitive operations necessary for attainming each level has been supported by cross sectional research with school age children. Ronald, (1988) has already demonstrated that the concept attainment strategies (Simultaneous vs. successive) related with reading achievement. The orientation of this study was very much in the tradition of aptitude – treatment interaction approach. The simultaneous and successive tasks were pretty typical as measures of the two kinds of coding processes: Raven's coloured Progressive Matrices, Figure copying, and Memory for Designs were the marker tests for eliciting simultaneous processing, whereas Serial Recall of Words, Visual Short – term memory, and Digits pan were the measures of successive processing. The analysis of variance clearly showed that reading achievement, as measured by vocabulary as well as by comprehension,

had significant main effects for each of the coding processes. The significance of the study for an aptitude – treatment interaction model was clear.

Hypotheses:

From a presented of the research relative to cognitive style and concept attainment strategies, the following hypotheses were generated:

1. There is significant interaction effect between students` cognitive style (levelling vs. sharpening) and the concept attainment strategies (successive presentation – simultaneous presentation) on factual content achievement test.

There is significant interaction effect between students` cognitive style (Leveling vs. Sharpening) and concept attainment strategies (Successive Presentation – Simultaneous Presentation) on conceptual – generalization content achievement test.

2. There is significant interaction effect between students` cognitive style (Leveling vs. Sharpening) and concept attainment strategies (successive presentation – simultaneous presentation) on total content achievement test.

Method:

1- **Sample**:

Participants were (60) students of first year of secondary school in Warsaw (ranging in age from 16 to 17 years, Mean= 16.3) each of them given The Wechsler Adult Intelligence Scale (Visual Reproduction I), (Wechsler, 1997) on the first semester. In this test, the examinee is shown five pages with geometric designs, one at a time, for (10) seconds each. After viewing each stimulus design, the examinee is asked to draw it from memory in the response booklet. The range of recall total score is (0) to (104) seconds. A person who scored

above (52) was sharpening, and who scored below (52) was Leveling. The (30) most levelling students and the (30) most sharpening students were identified and assigned at random to two classes of first secondary school taught at the same time of the day on the basis of (15) levellers and (15) sharpeners per class. Present researcher had expressed a preference for a successive presentation method of teaching (experimental group) in one class, while the other class, the present researcher had expressed a preference for a simultaneous presentation method of teaching (control group).

2- Procedure:

There were (3) experimental problems all presenting positive instances of the concept. Each problem consisted of (16) cards using a standard board. After each card, the subject offered his best guess about the correct attribute, (16) guesses for each problem. The correct concept in each problem was a single attribute. The single attribute "Red" card was the correct answer and the single attribute "Green" card was the incorrect answer. In each problem of the successive condition only one instance, the current instance, was presented on and removed after (20) seconds and the next instance, also containing one instance, was shown on blackboard. Each problem in the simultaneous condition showed the new instance together with all previous instances, the first instance plus the second instance plus the third instance were shown on blackboard. At the end of (4) weeks of course work, each student in all two classes was given an intelligence test (APIS, 2005) and an achievement test on physics on the classroom interaction system. Achievement test contained (6) factual items and (10) conceptual – generalization items. Experimental concepts were (electric current, different potential energy and electric conductivity).Achievement test

has (correlation coefficient 0.89) reliability by inter – scorer and high validity by teachers` assessments on content.

3- Experimental Design:

The present study employed a (2X2) factorial design with concept attainment strategies (successive presentation – simultaneous presentation) as one variable and cognitive style (Levelling vs. Sharpening) as the other. [See table (1)]

Table (1)

(2X2) Experimental Design

Cognitive style / Concept attainment strategies	Levelling	Sharpening
Successive Presentation	1	2
Simultaneous Presentation	3	4

Results:

A (2X2) analysis – of variance factorial design was used to analyze data obtained from the study. By using the equation:

$$1- \quad SS_1=\Sigma\left[\frac{(\text{Total of each column})^2}{(\text{N in each column})}\right]-\frac{(\Sigma X)^2}{N}$$

$$2- \quad SS_2=\Sigma\left[\frac{(\text{Total of each row})^2}{(\text{N in each row})}\right]-\frac{(\Sigma X)^2}{N}$$

Table (2) presents the cell means and standard deviations for each dependent measure in the study.

Table (2)

Cell Means and Standard Deviations on Each

Dependent Variable

Cell	Dependant Variable					
	Factual		Conceptual		Total	
	M	SD	M	SD	M	SD
Levelling – Successive Presentation	3.00	1.19	5.06	1.94	8.06	2.60
Levelling – Simultaneous Presentation	2.66	0.82	3.00	1.00	5.66	1.11
Sharpening – Successive Presentation	3.20	1.20	6.06	1.27	9.13	1.88
Sharpening -Simultaneous Presentation	2.46	1.12	4.60	1.18	7.06	1.48

Note (n = 15) for each cell

Table (3)

ANOVA to test the Factual content Achievement

Source of Variance	Sum of Squires	dF	Mean of Squares	"F" Value	P.
Cognitive style (A)	11.23	1	11.23	9.35	<.01
Concept attainment (B)	15.50	1	15.50	12.90	<.01
(A)X(B)	00.00	1	00.00	00.00	
Error (inside groups)	67.60	56	1.20		
Total	16.73	59			

Table (3) presents the result of the analysis of variance to test the factual content achievement test that there was no a significant interaction between cognitive style and concept attainment strategies.

Table (4)

ANOVA to test the Conceptual – Generalization content Achievement

Source of Variance	Sum of Squires	dF	Mean of Squares	"F" Value	P.
Cognitive style (A)	25.00	1	25.00	12.75	<.01
Concept attainment (B)	48.00	1	48.00	24.48	<.01
(A)X(B)	00.00	1	00.00	00.00	
Error (inside groups)	110.00	56	1.96		
Total	73.00	59			

Table (4) presents the result of the analysis of variance to test the conceptual – generalization content achievement test that there was no a significant interaction between cognitive style and concept attainment strategies.

Table (5)

ANOVA to test the total content Achievement

Source of Variance	Sum of Squires	dF	Mean of Squares	"F" Value	P.
Cognitive style (A)	7.83	1	7.83	2.27	<.01
Concept attainment (B)	59.83	1	59.83	17.39	<.01
(A)X(B)	15.40	1	15.40	4.47	
Error (inside groups)	192.94	56	3.44		
Total	83.06	59			

Table (5) presents the result of analysis of variance to test the total content achievement test that there was no a significant interaction between cognitive style and concept attainment strategies.

Discussion:

There is one conclusion can be drawn from the results of this study. This conclusion is that there is no significant interaction between cognitive style (Levelling vs. Sharpening) and concept attainment strategies (Successive Presentation – simultaneous Presentation) in regard to factual content, achievement, conceptual – generalization content achievement and total content achievement. This finding may have resulted, in part, from the inability of the experimenter to design teaching methods which were specifically Levelling or specifically Sharpening in the manner Mc Murray and Klausmeier (1977) did. The two memory conditions (teaching methods) did not specifically relate to a particular cognitive style nor were they primarily designed to facilitate a specific cognitive style. The methods were designed to teach the content and skills of a particular knowledge of physics to a relatively heterogeneous student population, cognitively speaking. In the interest of the students in the classes, very little modification of the two teaching methods could be made. It may also be relevant that the methods involved were geared to teaching large groups of students whereas Mc Murray and Klausmeier`s study involved more individualized

instructional processes. It may also be that the cognitive style test (Wechsler Adult Intelligence Scale – Visual Reproduction I) represents a more perceptual stimulus situation which calls for less complex mediational processes on the part of the students. Another possible source of error which may have influenced this finding could have occurred when the conceptually set person of Wechsler (1997) was considered analogous with Shipman (1985) relational style. Although the verbal definition given by Shipman of his leveller sharpener set person is almost identical to the description of the relational style proposed by Wechsler's test, there may be a significant operational difference between the two. It would appear that the conceptual set overlaps both the levelling and sharpening cognitive styles. A final suggestion is that the cognitive styles of younger students were not able and adept than those of college students with whom Mc Murray and Klausmeier worked. Younger students were not very adept at acquiescing their perceptual preferences depending on the instructional press in which they find themselves. Since the younger students used in this study were tested for cognitive style preferences before the semester began, it is conceivable that they could have adjusted their cognitive styles to fit the course objectives of their instructor. The present study suggests that younger students who have the acquisition of factual content or conceptual – generalization content as their primary objective would do well to use the successive presentation method of teaching as opposed to the simultaneous presentation method of instruction. The cognitive style of younger students does not appear to interact with either teaching methods nor does it predispose the students toward learning a particular type of subject mater content. According to Gestalt, there are two different types of ways of retrieving information over time. They are sharpening and levelling. The process of sharpening a memory is when a person recalls the memory and

exaggerates selected characteristics of the original memory. This sharpening may occur to create emotions, avoid embarrassment or avoid a certain topic. The other type of retrieval is the levelling of a memory. Levelling is weakening or downplaying details or selected characteristics of an event, different from the actual original event. Levelling also occurs for the same reasons that sharpening does. A person may be trying to avoid a sensitive subject or trying to avoid embarrassment. The reasons why some details of an event are either sharpened or levelled are up to the individual. It is important to know that because of a person's ability to sharpen or level details of an event, the person's account of what actually happened may not be the same as what actually did occur.

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