LEARNING STYLES AND ACADEMIC ACHIEVEMENT AMONG BUILDING
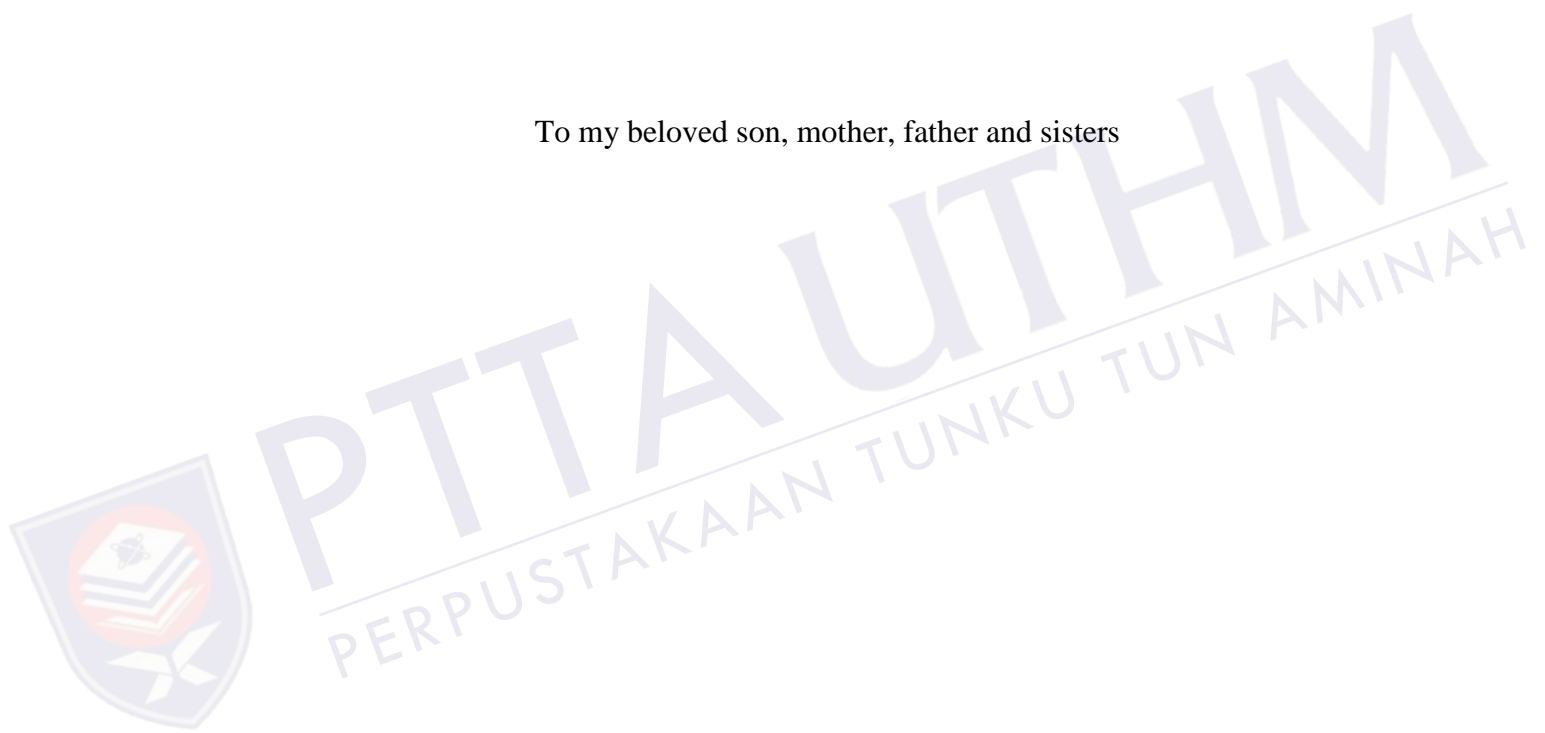CONSTRUCTION STUDENTS

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requirements for the award of the degree of
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To my beloved son, mother, father and sisters

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Thank you ALLAH for giving me strength, good health and guiding me through the PhD journey

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ABSTRACT

This study is conducted to identify how learning styles (LS) influence the students' academic achievement based on cognitive mastery and vocational elements in Building Construction Subject (BCS) involving the students and teachers of Building Construction Course (BCC) from three secondary vocational schools in Johor. Descriptive case study was applied with quantitative and semi-structured interview as supporting components in this study. The quantitative data were gathered based on Felder and Silverman Learning Styles Model (FSLSM), Felder-Soloman Index of Learning Styles (ILS) and vocational cognitive elements which consist of the aspects of knowledge, skills and problem solving were taken into account in constructing the question items. Purposive sampling was used to select the schools and stratified sampling procedure was applied in the selection of 128 students as research respondents. Purposive sampling was also chosen to select teachers as respondents for interview. The quantitative data was analyzed in descriptive and inferential statistic involving parametric test; Chi Square and *Multivariate Analysis of Variance* (MANOVA). Kruskal-Wallis was used for non-parametric test for this study. The content analysis for interview was managed to analyze the narrative text from interview record. The study discovered that students in BCC tend to be visual learners. Visual learners represent the input dimension of FSLSM and the result showed there are significant differences between input dimension with skills and problem solving but not with knowledge. The discussions with teachers revealed that most teachers accommodate students learning styles with cognitive mastery by using visual approach to increase students' academic achievement. Research findings suggested a few framework of learning styles with vocational elements in BCS and concluded the need for a framework based on the dominant students' learning style through the cognitive mastery and vocational elements. In conclusion, the research proposed that the Cognitive Learning Styles Framework (C-LSF) could act as a guideline for teachers to facilitate students to learn more effectively and to boost the academic achievement in Building Construction Subject.

ABSTRAK

Kajian ini dijalankan untuk mengenal pasti bagaimana gaya pembelajaran mempengaruhi pencapaian akademik pelajar yang berasaskan kepada penguasaan elemen kognitif dan vokasional dalam mata pelajaran Binaan Bangunan bagi pelajar-pelajar dan guru-guru Kursus Binaan Bangunan di tiga buah Sekolah Menengah Vokasional di Johor. Reka bentuk kajian kes deskriptif dijalankan dengan menggunakan pendekatan kuantitatif dan temu bual semi-struktur sebagai komponen sokongan telah diaplikasikan dalam kajian ini. Model Gaya Pembelajaran Felder-Silverman, Indeks Gaya Pembelajaran Felder-Soloman dan elemen kognitif dan vokasional yang merangkumi pengetahuan, kemahiran dan penyelesaian masalah dalam mata pelajaran Binaan Bangunan digunakan untuk menghasilkan soal selidik. Teknik persampelan bertujuan digunakan dalam pemilihan sekolah-sekolah yang terlibat dan persampelan rawak berlapis dalam pemilihan 128 pelajar sebagai responden kajian manakala persampelan bertujuan juga digunakan dalam temu bual guru-guru. Data-data kuantitatif telah dianalisa secara deskriptif dan inferensi melibatkan ujian parametrik seperti Ujian Khi Kuasa Dua dan *Multivariate Analysis of Variance* (MANOVA) manakala ujian bukan parametrik menggunakan Kurskal-Wallis. Analisa kandungan telah digunakan untuk menganalisis teks naratif yang mewakili yang mewakili rekod sebenar temu bual. Kajian mendapati pelajar-pelajar Kursus Binaan Bangunan adalah cenderung kepada pendekatan gaya pembelajaran visual. Gaya pembelajaran visual ini mewakili dimensi input dalam Model Gaya Pembelajaran Felder-Silverman dan hasil kajian menunjukkan terdapat perbezaan signifikan dalam kemahiran dan penyelesaian masalah tetapi tidak terdapat perbezaan signifikan dalam pengetahuan. Hasil temu bual dengan guru merumuskan guru menyesuaikan gaya pembelajaran pelajar dengan penguasaan aras kesukaran kognitif melalui pendekatan visual bagi meningkatkan pencapaian akademik pelajar. Hasil daripada kajian, beberapa kerangka mengenai gaya pembelajaran dan penguasaan pelajar terhadap elemen-elemen vokasional dalam mata pelajaran Binaan Bangunan dicadangkan dan seterusnya satu kerangka yang berasaskan gaya pembelajaran paling dominan pelajar melalui penguasaan elemen kognitif dan vokasional dirumuskan. Kajian telah mencadangkan *Cognitive Learning Styles Framework* (*C*-LSF) sebagai panduan bagi guru dan pelajar bagi meningkatkan pencapaian akademik dalam mata pelajaran Binaan Bangunan.

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LIST OF ABBREVIATIONS

AC	-	Abstract Conceptualization
AE	-	Active Experimentation
ASSIST	-	Approaches and Study Skills Inventory for Students
BC	-	Building Construction
BCC	-	Building Construction Course
BCI	-	Building Construction Industry
BCS	-	Building Construction Subject
CDC	-	Curriculum Development Center
CE	-	Concrete Experience
C-LSF	-	Cognitive Learning Style Framework
CMAT	-	Cognitive Mastery Achievement Test
ELM	-	Experiential Learning Style Model
FSLSM	-	Felder Silverman Learning Style Model
ILS	-	Index of Learning Styles
LS	-	Learning Styles
LSQ	-	Learning Styles Questionnaires
MANOVA	-	Multivariate Analysis of Variance
MBTI	-	Myer-Briggs Type Indicator
MOE	-	Ministry of Education
PLSPQ	-	Perceptual Learning Styles Questionnaire
RO	-	Reflective Observation
SPM	-	Sijil Pelajaran Malaysia
TVE	-	Technical Vocational Education
TVED	-	Technical and Vocational Education Division
VAKT	-	Visual, Auditory, Kinesthetic and Tactile
VE	-	Vocational Education

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CHAPTER 1

INTRODUCTION

1.1   Introduction

Every year, the Malaysian Government spends a great deal of money on the improvement of the quality of education. Education is an expensive investment in the future of students, and much emphasis is placed on the curriculum and values of education to enable the students to meet the needs of the industry. Teaching and learning is the root of all advancement in all levels of education, namely, primary, secondary, college, and university. The difference between the levels is the level of difficulty that students face. The Taxonomy of Educational Objectives by Bloom (1956) classified learning into three major areas; cognitive, affective, and psychomotor.

The cognitive domain and level stated in educational settings help teachers understand and implement what they need to achieve in their teaching objectives. The structure of Bloom's Taxonomy contains knowledge, comprehension, application, analysis, synthesis, and evaluation. Anderson and Karthwolh (2001) revised Bloom's Taxonomy and changed the original number of categories by introducing the Four-Knowledge Dimension of Taxonomy: factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge. Splitter (1995), Caviglioli et al. (2004), and Tee et al. (2009), suggested that all educators should provide students with multiple skills and for teachers to cater their learning abilities with various teaching methods. Teachers, however, cannot assume that students will easily understand the learning content when they only sit in class

and follow instructions. An awareness of the interaction between students, teachers, and teaching materials must also be present.

Student learning is often taken for granted. Students are assumed academically capable of understanding lessons and assignments. The majority of them do pass, but for those who fail, the blame falls on the academic standards or teaching methods. Little consideration is given to the ways that students learn and the students' learning styles. Ideally, the way teachers teach should match the way students learn, as well as how they prefer to learn. Teachers must adapt their teaching approaches to suit the ways students learn and their learning styles.

The elements of learning styles (LS) appeared in the research literature as early as 1892 (Fatt, 2000). The term "learning styles" was probably first used by Thelen (Madeline et. al, 2003) who discovered group dynamics at work. LS may also be defined as the tendency to adopt a particular strategy of learning. Teachers, then, should have the ability to understand how students learn. According to Felder (1993), students and teachers may prefer one learning style in one subject but generally prefer one style for most subjects that they learn or teach. Therefore, teachers may use this information from Felder (1993) to make sure they utilize all different learning styles, and students can use this information by realizing how they like to receive information.

Schools, institutions, colleges, and universities should adopt a theory of learning based on the classroom approach. Various learning theories exist, and caution should be exercised during selection. The learning theories should suit the subjects' needs, such as cognitivism, behaviorism, and constructivism theories. The quality of teaching is measured by how effectively the learning approach the teacher selected functions to achieve the learning objectives in a particular subject. However, considering teachers usually do not know which approach will be the most effective, the measurement of a teacher's success is left to the students (Benke and Hermanson, 1988). The relationship between the teaching approach used and what the students learned, can be seen as a process where a teacher's beliefs will influence their teaching strategies, which will in turn influence student learning styles. A student's learning style represents the type of learner they become. Several

inventories that can identify what type of learner a student may be have been published. In a classroom where only one approach to learning is encouraged by a teacher, some students may possibly work and learn less effectively than others (Alan, 2009). For this reason, an awareness of learning styles is important for teachers.

Students in vocational education (VE) are exposed to an educational system that is oriented more towards getting a job, and their learning styles are different from students in academic fields. Thus, VE is possibly an educational pursuit oriented to provide the necessary knowledge and skills to perform a particular job, occupation, or professional activity in the labor market (International Labour Organization, 1995). VE is also connected to technology transfer, innovation, and development. In vocational teaching, as in many knowledge areas, identifying and understanding learner differences to adapt the institute's needs to best suit the learning conditions and aptitudes of the students is important. The need to adapt teaching strategies to student learning styles and preferences is a reality in the classroom, which can be observed in real situations or in virtual approaches. However, these findings do not suggest that individual methods should be created for each student in a classroom. The best form of interaction for each of them should be identified by building groups of learners with common characteristics (Luciana et al., 2008).

1.2 Background of the Problem

The cognitive processes that contribute to student learning require that the student have the ability to manipulate information and ideas to solve problems and produce new knowledge. Many features of current cognitive theories on teaching and learning reflect earlier models of teaching such as Bruner's, Taba's, and various group-based and student-centered teaching models (Ruth, 1992). In VE, the importance of the cognitive process is based on a few factors, namely, the cognitive abilities needed in the current work environment, the ability to adapt to changing VE

requirements in a global context, and the demands of cognitive development (Tee et al., 2009). In their cognitive research, Johnson and Thomas (1992) summarized that learning does not automatically change and that understanding the learning content is difficult. Cognitive processes are not encouraged by passive learning.

VE students have their own learning preferences, considering they rely less on their cognitive abilities and more on their psychomotor talents, including physical movement, coordination, and use of motor skills (Bloom, 1956). They need to increase their cognitive abilities with a suitable approach so that they can be creative and innovative workers in order to do well in their work situation. The suitable approach in this case is perhaps the identification of the students' learning styles that equal to VE characteristics to produce suggestions on overcoming the problems. Bloom (1989) also states that the ability of students to learn basic principles and their ability to apply knowledge or explained what they learned.

A student's learning is influenced by a few factors. The basic issues of student learning as explored by Muhammed et al. (2008) include home background, learning environment, and government policies. Martins et al. (2007) stated that family background factors determined academic performance, and Azizi et al. (2003) claimed that learning styles influenced a student's academic performance. Francis and Segun (2008) concluded that the school environment and teacher-related factors were the dominant factors influencing achievements, especially if the student was highly self-motivated. Learning in VE is defined as the transition from using basic problem-solving strategies towards using expert problem-solving strategies (Ruth, 1992). Learners in VE must observe and experience the required cognitive processes to learn them and know how, where, and when to use them. One of the factors debated over the last few decades was the relationship between student achievement and learning styles. Proponents of learning styles maintain that adapting classroom teaching methods to suit students' preferred styles of learning improves the educative process (Felder, 1993). However, opponents of learning style theories maintain that little empirical evidence is available to support this proposition LS involved strategies that students tend to apply to a given teaching situation. Each individual can fit into different styles that can result in students adopting attitudes and behaviors that are repeated in different situations.

1.2.1   Identifying Learning Styles

Learning styles can be classified into various categories, for example, sensory, auditory, visual, and tactile. Dunn and Dunn (1992) reported that learning styles is an individual reaction to several environmental, emotional, psychological, and sociological factors. In vocational schools, the VE students have their own characteristics, according to Brennan (2003). They are verbal learners who watch and see rather than read and listen. They are hands-on and learn by doing and practicing. They learn in groups and are dependent learners who need instructor guidance for clear understanding. Considering that the characteristics of students in VE are more hands-on, and that they learn by doing, an understanding of this type of LS will help teachers provide a teaching delivery method that matches their students' needs.

"Students' needs" is a term described by Posner et.al (1992) as a description of how students deal with curricular tasks by employing relevant learning structures. The goal in teaching VE students is to gain experience and to apply existing knowledge to new situations. The role of the teacher is to create learning environments for students handling the presented tasks. Figure 1.1 shows how a VE student's learning ability is influenced by various factors (John, 1995).

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┌─────────────────┐
│     Teacher     │
└─────────────────┘
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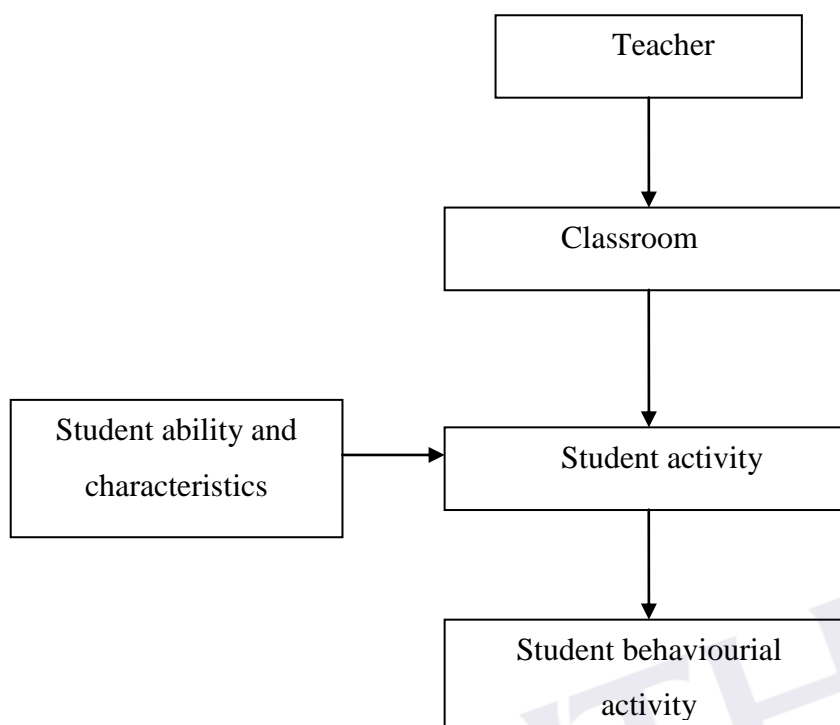
(Source: John, 1995)

Figure 1.1 : Adapting to students learning

VE encompasses a wide range of courses or skills that help students prepare to enter an occupational-based employment or workplace (International Labour Organization, 2000). The concept behind VE is to bridge theory and practical components, such as lab- and workshop-oriented knowledge to workplace knowledge, with specific skills. As a result, vocational students have their own LS. In here research on learning strategies among vocational students, Briggs (2000) concluded that vocational students benefited from three types of courses, namely, "hands-on courses," "mixed-courses," and "paper-based courses." She also classified the analysis of LS into visual, auditory, and kinesthetic (VAK) to create a basis for innovation in teaching and learning strategies.

A visual style relies on seeing and reading, auditory depends on listening and speaking, and a kinesthetic style focuses on touching and doing. Figure 1.2 shows the use of LS in hands-on courses. Hands-on courses refer to hairdressing, plumbing, professional craft catering, and painting. This group showed that their preference was for visual strategies. The figure illustrated three categories of students' score as

indicating strong, medium, and weak use of visual, auditory, and kinesthetic learning style strategies. The results show that the students most preferred visual learning strategies The results show that the highest number of students scored in visual strategies. This means that the students scored strongly in a range of visual strategies. Meanwhile, 20 students strongly used auditory learning strategies, and only 18 students strongly applied the kinesthetic approach to learning.

	Visual	Auditory	Kinaesthetic
■ Strong	30	20	18
■ Medium	10	15	10
□ Weak	15	10	27
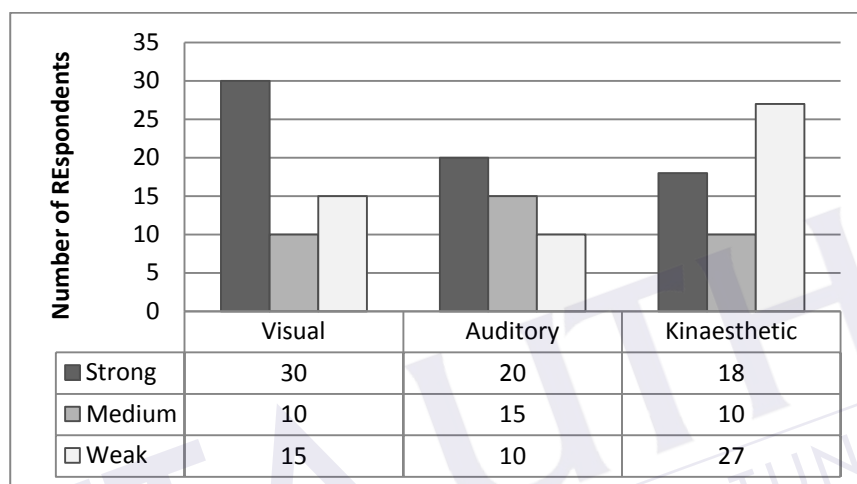
(Source: Briggs,2000)

Figure 1.2: Students' Learning Styles in Hands-on Courses

Briggs (2000) used the same method of using learning strategies for "mixed" courses. Mixed courses refer to courses that involve a mixture of paper-based and hands-on materials. Mixed courses represent the course related to engineering education and performing arts. The result showed that this group preferred visual strategies the most and kinesthetic strategies the least. Figure 1.3 shows that the students preferred visual learning styles (17 students) over both auditory (12 students) and kinesthetic styles (3 students).

Figure 1.3 chart data:

	Visual	Auditory	Kinaesthetic
■ Strong	17	12	3
■ Medium	5	5	7
□ Weak	3	8	15
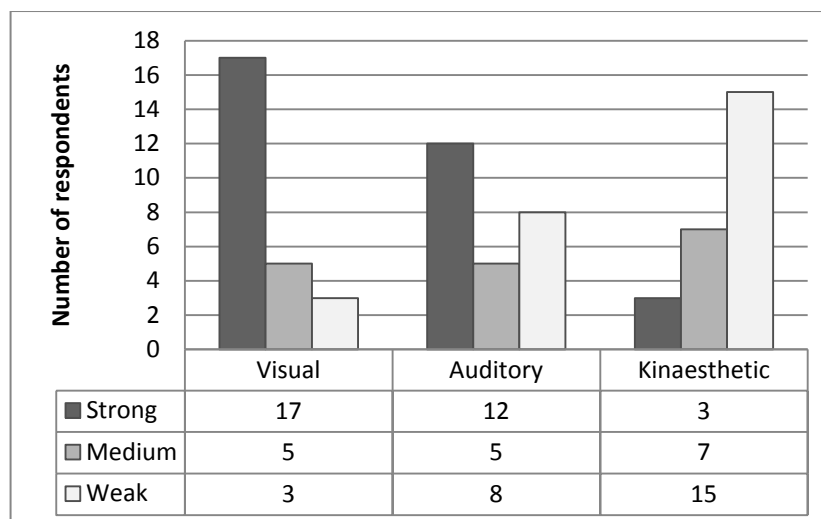
(Source: Briggs,2000)

Figure 1.3: Students' Learning Styles in Mixed Courses

Figure 1.4 shows the profiles of LS for students in a paper-based course. The students investigated were involved in business, public service, and health science courses. The results showed a strong use of visual strategies among students in "paper-based" courses. Forty-five students preferred visual study approaches, 20 who preferred auditory, and 19 students who preferred kinesthetic. Generalizing course groups is difficult, even when they are aggregated. However, students in paper-based courses appeared to choose visual and auditory strategies more than students did in hands-on courses.

Figure 1.4 chart data:

	Visual	Auditory	Kinaesthetic
■ Strong	45	20	19
■ Medium	10	25	21
□ Weak	5	15	20
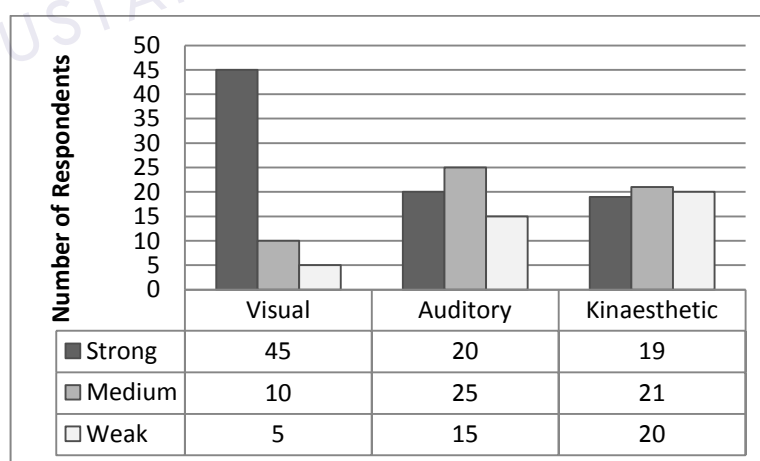
(Source: Briggs,2000)

Figure 1.4: Students' Learning Styles in Paper-Based Courses

The concept of LS is understood by VE teachers as a legitimate way of expressing individual differences in the way their students learn. However, the

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