IS COGNITIVE MISFIT AN ISSUE FOR ACCOUNTING STUDENTS? A FIELD STUDY USING THE FELDER-SOLOMAN INDEX OF LEARNING STYLES

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ABSTRACT

This study aims at finding out whether or not students experience a cognitive misfit at financial accounting courses. For this purpose, it is questioned in this study if there is a significant relationship between students' learning styles and their learning strategies by means of the Felder-Soloman Index of Learning Styles (ILS). Also, it is examined to what extent students' learning styles affect their performance at financial accounting courses. In line with the purpose of the study, 159 students studying at Balikesir University have been asked to do a questionnaire. It has been planned to do some alterations about the current teaching style used at financial accounting courses in case any cognitive misfit is determined at the end of the research. The results of the study show that most of the students who have participated in the research experience a cognitive misfit and they do not have a specific preference related to learning strategies in terms of sequential and global dimensions of ILS.

Keywords: *Accounting education, learning styles, learning strategies, cognitive misfit, Felder-Soloman Index of Learning Styles (ILS).*

JEL Classification: M40, M41, I22.

ÖZET

MALİYET MUHASEBESİNİN TEMEL KONULARINI ÖĞRENEN ÖĞRENCİLERİN AKADEMİK BAŞARILARI ÜZERİNDE KAVRAM HARİTALAMASI VE GELENEKSEL YÖNTEMLERİN ETKİLERİ

Bu çalışmanın amacı, öğrencilerin muhasebe derslerinde bilişsel uyumsuzluk yaşayıp yaşamadığını araştırmaktır. Bu amaçla Felder-Soloman Öğrenme Stilleri İndeksi kullanılarak, öğrencilerin öğrenme stilleri ve öğrenme stratejileri arasında anlamlı bir ilişki olup olmadığı, bunun yanı sıra öğrencilerin muhasebe derslerindeki performansları üzerinde öğrenme stillerinin ne derece etkili olduğu araştırılmıştır. Çalışmanın amacı doğrultusunda Balıkesir Üniversitesi'nde 159 öğrenci ile

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bir anket yapılmıştır. Araştırma sonuçlarına göre herhangi bir bilişsel uyumsuzluk tespit edilmesi durumunda finansal muhasebe dersindeki mevcut öğretim stilinde değişiklik yapılması düşünülmüştür. Araştırma sonuçları, birçok öğrencinin bilişsel uyumsuzluk yaşadığını ve Öğrenme Stilleri İndeksinin ardışık (sıralı) ve bütüncül boyutlarına göre öğrenme stratejilerinin belirgin bir tercih göstermediğini ortaya çıkarmıştır.

Anahtar Kelimeler: *Muhasebe eğitimi, Öğrenme stilleri, Öğrenme stratejileri, Bilişsel uyumsuzluk, Felder-Soloman Öğrenme Stilleri İndeksi.*

JEL Sınıflandırması: M40, M41, I22.

Introduction

Learning and cognitive styles and their interactions have long taken the attentions of researchers; some of which (Edward 2001; Wolk and Nikolai 1997; Kovar *et al.* 2003; Tepehan 2004; Wynn-Williams, Whiting and Adler 2005; Cetin *et al.* 2013) focused on learning styles, while some others (Kai-Ming Au 1997; Bai *et al.* 2014; Bryant *et al.* 2009; Chan 1996; Cools *et al.* 2014; Cools et al. 2011; Davidson and Baldwin 2005; Duff 2004; Fuller and Kaplan 2004; Ramsay *et al.* 2000; Theuri, Greer and Turner 2011; Yen, Konold and McDermott 2004; Cools and Van den Broeck 2007; Corbett 2002; Stetson 2006) preferred to focus on cognitive styles. A group of researchers (Hwang *et al.* 2013; Scott *et al.* 2014; Yang *et al.* 2013; Graf *et al.* 2009; Filippidis and Tsoukalas 2009; Graf, Lin and Kinshuk 2008; Ultanir, Ultanir and Temel 2012; Eren 2003; Van Zwanenberg, Wilkinson and Anderson 2000; Arslan 2003; Samancı and Keskin 2007; Dias, Sauaia and Yoshizaki 2013; Graf, Viola, Leo and Kinshuk 2007) got interested in the use of Felder-Silverman learning style model in their studies.

Researchers used different cognitive models, such as Swassing-Barbe Model, Gardner's Theory of Multiple Intelligences (Eren, 2003) and Learning Models of Furnham and Ramsden (Duff, 2004), and different cognitive learning style instruments including Cognitive Style Indicator- CoSI (Cools and Van den Broeck 2007; Cools *et al.* 2011), Myers-Briggs Type Indicator-MBTI (Ramsay *et al.* 2000; Wolk and Nikolai 1997; Kovar *et al.* 2003; Stetson 2006; Raju and Venugopal 2014) and Honey & Mumford's Learning Style Questionnaire-LSQ (Van Zwanenberg, Wilkinson and Anderson 2000). Kai-Ming Au (1997) determined the cognitive styles of students by using two psychological tests, which were Lefevre and Ehri's Ambiguity Tolerance Test and Witkin *et al.*'s Group Embedded Figures Test. Granting all that there is about diversity in cognitive models and instruments in the literature, the most recognised ones in accounting education research are Myers-Briggs Type Indicator-MBTI, Kirton's Adaption-

Innovation Inventory-KAI, Kolb's Learning Style Inventory and Honey & Mumford's Learning Style Questionnaire-LSQ (Honn and Ugrin, 2012: 981).

Among these, Honn and Ugrin's (2012) study is one of the very first researches incorporating the Felder-Soloman ILS (based on the Felder-Silverman Learning Style Model) to the accounting education research. The subject matter of this study aroused from the observations of the authors of their students' orientations towards simultaneous problem solving, rather than a step-by-step approach. During the course of the lectures, authors noticed that students of the financial accounting course were more participating and successful in simultaneous oriented applications and solutions, while they relatively had difficulties in step-by-step oriented applications. The difference in students' simultaneous and step-by-step orientations set the authors thinking that there might be a possibility of cognitive misfit in students' learning process.

In this paper Honn and Ugrin's (2012) findings were further tested and extended by using the Felder-Soloman ILS and a different accounting task as to the financial accounting course. The current teaching style with regard to the related accounting course was intended to be changed if the research had revealed a statistically significant relationship between the variables. Since results demonstrated a significant relationship, the examples and applications used in financial accounting course were altered through a sequential dimension utilizing a step-by-step orientation in order to strengthen the students' sequential cognitive processing. Authors of this paper aimed to contribute to the literature by deepening the understanding of the relationship between student's accounting task performance and cognitive styles.

The paper begins by reviewing the relevant literature, followed by the development of the hypothesis and interpretation of the methodological approach. The fifth section presents and discusses the research and its results, while the final section provides the paper's conclusion.

Literature Review

Literature review consists of a wide range of studies concerning various aspects of learning styles, including the Felder-Soloman ILS, Myers-Briggs Type Indicator-MBTI, and cognitive studies consisting of styles, abilities and misfit.

Academics studied different aspects of learning styles. Cetin *et al.* (2013) aimed to identify the learning styles of the students and their research revealed that students were classified in a dissolving pattern in every aspect of learning, while

the discovery part showed certain aspects revealing polarization. In his paper Duff (2004) contrasted two cognitive learning style models, which of first was Furnham's[1] and second Ramsden's.[2] Furnham conceptualized the roles of cognitive learning style, while Ramsden examined the contextual model of student learning. Duff (2004) proposed five suggestions regarding ways that accounting educators could employ cognitive learning style and developed associated measures to help students 'learn how to learn'. Edward (2001) described an approach to induction in an engineering school with an aim to provide a flexible, supportive experience for all learners. Unfortunately no significant correlations between learning styles and perceptions were found. A master thesis conducted by Arslan (2003) studied the preferred learning styles of engineering students at METU, Turkey via Index of Learning Styles. Her findings demonstrated that most of the engineering students preferred visual learning and the number of students who were dominantly sensing and active learners were more than intuitive and reflective students. She also found that learning style preferences did not influence CGPA scores. Another master thesis conducted by Tepehan (2004) aimed to determine the relationships between type of the high school and undergraduate course groups, regarding the learning styles and academic successes of Turkish Naval Academy first year midshipmen. Results of his findings indicated that there was no significant difference among the various course groups' academic successes of the students belonging to a specific learning style group. There was also no significant difference among the specific course group's academic successes of the students belonging to different learning style groups. Wynn-Williams, Whiting and Adler (2005) extended the findings of Adler *et al* (2004) by repeating the Adler *et al.* (2004) survey in their study by changing the conditions. Prior to the survey, students had completed an entire semester of intermediate-level courses, including two accounting courses. The results of the second survey were affirming and enhancing those of the first (Adler *et al*, 2004), stating that a lack of active involvement in cases of results in less balanced learning styles. This meant that it was not only *how* the case studies were used but also when they were used was of vital importance. Dias, Sauaia and Yoshizaki (2013) studied the difference in learning among students of a Production Control and Planning (PCP) course. They aimed to describe and analyze the learning differences through learning styles. Findings illustrated that greater learning was observed among students with a reflective (active-reflective) or visual (visual-verbal) style.

[1] Furnham, A. (1995). The relationship between personality and intelligence to cognitive style and achievement.

[2] Ramsden, P. (1992). Learning to teach in higher education.

The Felder-Soloman-ILS also attracted academics such as Graf *et al.* (2007). They analyzed data in relation to Felder-Silverman Model of learning styles with an aim to provide a more detailed description of learning style dimensions. Their analyses displayed the most representative characteristics of each learning style dimension and also how representative these characteristics were. Graf *et al.* (2008) conducted a research as to the relationship between learning styles referred in the Felder–Silverman Model and working memory capacity as regarded in the Cognitive Trait Model. Their research illustrated learners with high working memory capacity to tend to prefer a reflective, intuitive, and sequential learning style, whereas learners with low working memory capacity to tend to prefer an active, sensing, visual, and global learning style. Graf *et al.* (2009) examined the benefits of incorporating learning and cognitive styles in web-based educational systems through the relationship between learning and cognitive styles. The Felder–Silverman Model was employed with regard to learning styles, while working memory capacity was used to determine the cognitive style. They executed an experiment with 297 students and the results indicated a relationship for the active/reflective, the sensing/intuitive, and the visual/verbal dimension, whereas no relationship was found for the sequential/global dimension. In a study conducted by Hwang *et al.* (2013), students' ability to choose the best-fit e-learning systems or content presentation styles for themselves were aimed to be investigated in terms of learning style perspective on the sequential/global dimension of the Felder-Silverman Model. The results showed that the choices made by the students were not related to their cognitive process or learning style, also the students who learned with learning style-fit versions showed significantly better learning achievement than those who learned with non-fit versions. In their research Scott *et al.* (2014) had a goal to discover the relationships between students' performance along a Scrum-based capstone project and their learning style in respect with the Felder–Silverman Model. They concluded that sequential students learn step-by-step and tend to perform tasks rapidly, whereas global students perform a thorough comprehension of the given information before starting to solve a problem. Their research results stated that the analysis of the association rules corroborated their hypothesis about the existence of a relationship between Scrum practices and learning styles. Yang *et al.* (2013) in their research, proposed a personalized presentation module to the end to develop an adaptive learning system through the field dependent/independent cognitive style model and the eight dimensions of Felder-Silverman Model. In their experiment, participants were randomly assigned to an experimental group, which learned with an adaptive learning system developed via personalized presentation module, and a control group, which learned with a learning system without personalized presentation.

The results illustrated that the experimental group students performed significantly better learning achievements than the control group students. Filippidis and Tsoukalas (2009) studied on an adaptive educational system based on the sequential/global dimension of Felder–Silverman Model using adaptive presentation. In as much as the learning styles of the students, students were found to be well balanced on the sequential/global dimensions of the 'understanding' scale, and had a slight preference for the sensing dimension of the 'perception' scale. Results indicated a weak correlation between sequential/global (understanding) and sensing/intuitive (perception) scales. Van Zwanenberg *et al.* (2000) compared the two instruments of Felder-Silverman's Index of Learning Styles and Honey and Mumford's Learning Styles Questionnaire and their achievement to predict academic performance. They found that the construct validity and internal reliability of alpha values of the ILS scales (5 0.41 to 0.65) were relatively low when compared to the alphas of the LSQ (0.59 to 0.74). They also found and discussed the general lack of significant correlations between learning style scores and performance. They concluded by demonstrating the activity-centered nature of learning styles and the advantages of viewing styles as a circumplex as well as their disappointment of the psychometric robustness of the measures. Samanci and Keskin (2007) examined the reliability and validity of the Felder-Soloman ILS and compared the learning styles of students from different faculties and also investigated the effect of gender on learning styles. The results did not reveal any significant difference between males and females. Students were also seen not to have a distinct preference for sequential and global learning styles. Ultanir, Ultanir and Temel (2012) examined the reliability and validity of the Index of Learning Styles (ILS) instrument of The Felder-Silverman Model at Mersin University, Turkey, through the differences among the learning styles according to students' fields of science. Results indicated that the preferred learning styles of the participants are different, meaning that Mersin University students are rather sequential, sensory and active learners. In the context of ILS, their results also demonstrated a significant difference in sequential/global learning styles according to science, health and social sciences. The goal of Eren (2003) was to develop a Learning Style Preferences Inventory through the learning models of Felder-Silverman and Swassing-Barbe, as well as Gardner's Theory of Multiple Intelligences. His analysis showed that t-statistics had significance at the $p<0.001$ level with 2.14 degrees of freedom. He also found out that the internal consistency measured both for the whole experimental scale and each dimension were reliable high enough.

Some academics studied learning styles using Myers-Briggs Type Indicator. Kovar *et al.* (2003) investigated the characteristics of accounting

students via Myers-Briggs Type Indicator through one of the original Accounting Education Change Commission (AECC) grant programs.[3] They concluded that the personality types attracted to and retained in the program had not become more diverse at the time the paper was released. The study conducted by Raju and Venugopal (2014) displayed the link between personality and learning by comparing the personality types via Myers-Briggs Type Indicators (MBTI) with Felder-Silverman's Index of Learning Styles (ILS). Comparative findings displayed some correlation between specific dichotomies of MBTI and ILS, be that as it may, no direct relationship was found between individual MBTI types and ILS types. With respect to the correlations between the extroverted/introverted personality characteristic of MBTI and the learning styles, the chi-square value of sequential/global dimension came out to be 1.01. Ramsay *et al.* (2000) examined whether or not an individual's cognitive style had an impact upon their preference for cooperative learning techniques through Myers-Brigss Type Indicator. They analyzed the association between the four dimensions of cognitive style and accounting students' preference for cooperative learning and found out the existence of a significant correlation between accounting students' preference for cooperative learning and extroversion/introversion and thinking/feeling dimensions. Wolk and Nikolai (1997), discussed the differences of undergraduate and graduate accounting students and also accounting faculty members as to the types (personality preferences) in Myers-Briggs Type Indicator (MBTI). Their findings indicated significant differences in certain MBTI types among the groups, which have implications for accounting programs having a tendency to make fundamental changes in order to fit into the profession's requirements. In her doctoral dissertation, Stetson (2006) measured the effect of cognitive style on accountants' judgment and decision making through the Myers-Briggs Type Indicator scales for perceiving mental function, judging mental function and judging-perceiving attitude. Her findings illustrated *thinking* accountants to be more willing than *feeling* accountants to approve an aggressive transaction under some conditions. The results also showed that this difference of attitude might be enhanced in case an accountant had a sensing and a judging cognitive style accompanying a thinking style.

Cognitive aspects of learning also attracted attention of researchers. Cognitive styles were discussed by researchers like Corbett (2002), who investigated the relationship between an individual's learning mode, cognitive

[3] Accounting Education Change Commission granted a $3 million support for curricular innovation as to creativity and experimentation in accounting education in the early 1990s, 13 schools received such grants.

style, human capital and his or her ability to recognize new opportunities. His results provided empirical evidence suggesting learning mode and cognitive style of assimilating and processing information had a significant effect on an individual's ability to recognize opportunities. Kai-Ming Au (1997) focused on the role of cognitive style as a moderating variable in students' performance across a variety of assessment methods. His research results indicated that in general, field-independent (articulated) students were performing better than field-dependent (global) students. The effects of cognitive style and feedback type on auditors' ability to identify internal control cues via ICQs were investigated by Bryant *et al.* (2009). Their results illustrated that while cognitive styles did not have a significant effect on performance where there was no feedback, the presence of feedback indicated an association between cognitive style and task performance. Regarding data analysis, Cools *et al.* (2014) suggested the use of more advanced and novel approaches rather than the traditional approaches, which have been mainly used in the cognitive style field. The cross-cultural validity of the Cognitive Style Indicator (CoSI) was examined by Cools *et al.* (2011), resulting in their conclusion that the relationships among the scales showed equivalence across cultures. Cools and Van den Broeck (2007) described the development and validation of the Cognitive Style Indicator (CoSI) through three cognitive styles: Knowing, planning, and creating. They incorporated other cognitive style instruments with personality and academic performance measures in the validation process and found evidence supporting the instrument's convergent and discriminant validity.

Cognitive abilities formed another sub-title under cognitive styles. Bai *et al.* (2014) investigated individual differences in cognitive ability and their relationship with the ability to recover from interruptions during multitasking performance. The findings suggested that training individuals to use consistent strategies facilitates interruption recovery by alleviating working memory load when interrupted, especially for low ability individuals. Davidson and Baldwin (2005) focused on the effects of the end-of-chapter materials (questions, exercises, problems, and cases) in accounting text books on the cognitive skills of students. They concluded that if low-level learning skills are intensely incorporated into end-of-chapter material, there would be substantial risk that mostly low-level learning will occur, and vice versa. Theuri, Greer and Turner (2011) conducted an experiment on the effects of a Multimedia Based Instructional Supplement (MBIS) on learners' cognitive skills. Their experiment resulted that such a MBIS can be useful both for enhancing students' overall performance, and *understanding*, *applying*, and *analyzing* levels of cognitive skills. Yen, Konold and McDermott (2004) studied student learning behaviors in the context of cognitive ability and

academic achievement. Results of their study indicated a relationship between learning behavior and academic achievement, beyond cognitive ability.

Another sub-title under cognitive styles could be cognitive misfit. In his study Chan (1996) examined the relationships among cognitive misfit, job performance, and actual individual turnover after 3 years in a sample of 253 engineers. The conclusion showed that cognitive misfit had no correlation with job performance. Fuller and Kaplan (2004) examined cognitive misfit's effect on auditor task performance and found a significant interaction between cognitive style of the auditor and the type of the task. Their results illustrated that analytic auditors performed better on the analytic task, while intuitive auditors performed better on the intuitive task.

Development of Hypothesis

During the practices of the lectures, the authors observed that students taking the financial accounting course did not have any difficulties in making the mathematical calculations related to the examples and applications necessary for the course. However they found it hard to explain how and why they did the related calculations and also failed to make correct accounting records and bookings of the related transactions.

Considering students' attitudes and tendencies towards problem solving with regard to accounting transactions and applications, they seemed to have difficulties in gradual and contiguous transactions requiring a reasonable order, in other words recording and booking of accounting transactions. On the other hand, they found it easier and were more successful when they were required to find the solution using mathematical calculations for the same accounting transactions.

This noted the question of whether accounting students' cognitive style is an issue regarding their accounting task performances or not. It additionally formed the following research question: "*Do students have a cognitive misfit with regard to the financial accounting course?*"

Cognitive style can be defined as: The model, in which a person organizes and classifies his/her perceptions of the environment in order to impose order on a confusing series of events, or as the difference in manner of thinking and information processing of different people (Au, 1997: 244).

When putted this way, it is possible to state that cognitive style refers to the preferred methods when performing intellectual actions. Cognitive style can be classified in different models such as follows:

- active versus reflective;
- concrete versus abstract;
- spontaneous versus systematic;
- internal versus external;
- field dependence versus independence; and
- linear versus creative (Au, 1997: 244).

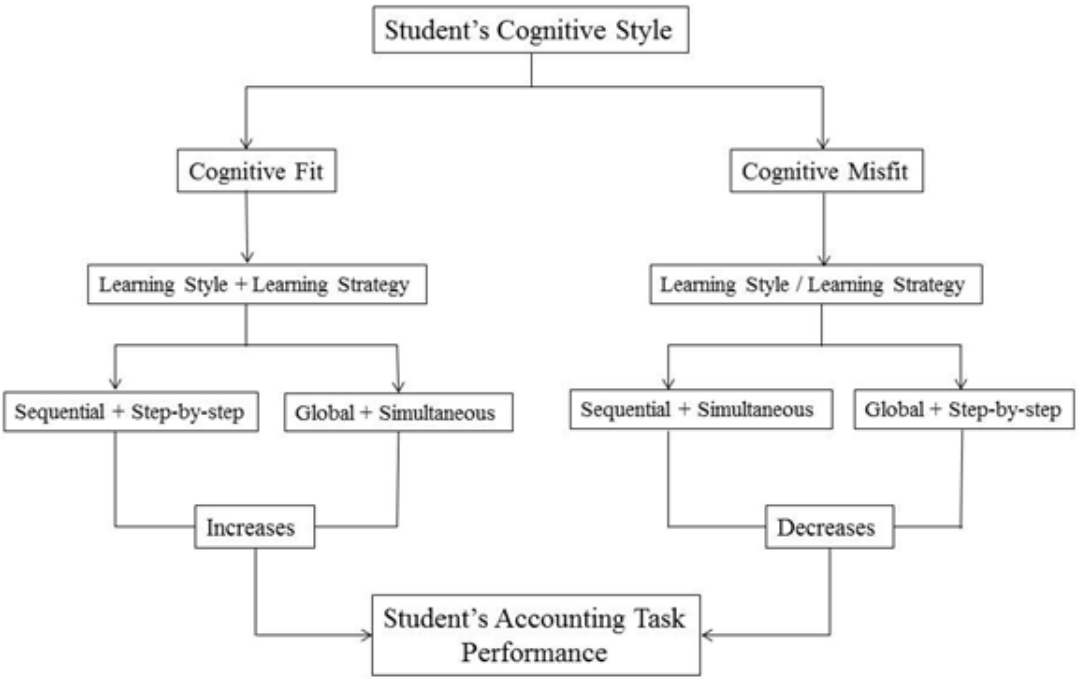
With respect to the fundamental research question mentioned above, the most related and suitable classification of cognitive style is the one stated by Witkin *et al.* (1977), noting a field dependent cognitive style versus a field independent cognitive style. According to this model, field dependent individuals have a tendency to perceive *globally*, in other words rely more on external reference frames, while field independent individuals have a tendency to perceive *analytically*, in other words rely more on internal reference frames. The *global* and *analytical* differentiation of Witkin *et al.* (1977) inspired authors of the current paper to utilize the Felder-Soloman ILS, since it incorporates *global* and *sequential* (analytical) dimensions of learning styles, in this case cognitive styles. Although mentioned by Henry (2004), Van Swanenberg and Wilkinson (2000) and Honn and Ugrin (2012), ILS is yet a rare tool used in accounting research and this acted as an additional motive for the subject matter.

Cognitive misfit theory predicts that a mismatch between an individual's cognitive style of problem solving and the style demands of the work context will cause a decrease in job performance (Honn and Ugrin, 2012: 985).

In respect of the current study, cognitive styles imply learning styles as *global* and *sequential* dimensions of ILS, and style demands of the work context imply learning strategies as *simultaneous* and *step-by-step* orientations regarding the Felder-Silverman model, which assumes that: students cognitively process information either step-by-step or simultaneously depending on their respective learning styles. Sequential students prefer to use step-by-step learning strategies and global students prefer to use simultaneous learning strategies (Honn and

Ugrin, 2012: 986).

Figure 1. Research Model



As shown in Figure 1 above, current study suggested that accounting students would perform better in accounting tasks if they had a cognitive fit regarding learning styles and strategies. In other words, students would perform better if they had sequential style paired with step-by-step strategy, or global style paired with simultaneous strategy.

Subsequently, students would perform worse in accounting tasks if they had a cognitive misfit regarding learning styles and strategies, meaning that students would perform worse if they had sequential style paired with simultaneous strategy, or global style paired with step-by-step strategy. These learning styles and strategies together form student's mental process of problem solving about accounting tasks.

Research question of the current study predicts that there is a cognitive misfit for accounting students, indicating that learning styles and learning strategies of participating students do not match. This prediction aroused the following fundamental hypothesis of the study; accounting students have a cognitive misfit as to financial

accounting.

Two collateral hypotheses are developed for answering the research question:

H_A: There is not any statistically significant correlation between students' learning styles and strategies.

H_B : There is a statistically significant difference between students' learning styles and strategies.

Research Methodology

In this study, students' accounting task performances were evaluated through learning styles and learning strategies for 159 participants. In controlled group sessions at Balikesir University 2014 Summer School, each participant was first submitted the Felder-Soloman ILS online[4], and then completed an accounting task as to the financial accounting course requiring both a step-by-step and a simultaneous strategy.

Participants

The participants performed an accounting task for the financial accounting course, which is a mandatory third semester course. Participants were the students attending summer school who had completed at least foundational accounting courses at first and second semesters, but failed from the so-called financial accounting course during regular third semester in fall. Only one of the participants was a freshman, while thirteen were senior, forty-five were sophomore and the remaining ones were junior class students. For participating in the experiment students earned up to 30% additional exam points for their grades.

Assessment of Learning Style

In the experiment, as an independent grouping variable, learning styles of the participants were assessed through the online Felder-Soloman ILS. Participants' scores on the sequential/global scale of this index were used.

The Felder-Soloman ILS assesses students' learning styles along the sequential/global dimension with an interval scale of odd numbers ranging from -11 meaning highly sequential to +11 meaning highly global. Participants noting scores

[4]http://www.engr.ncsu.edu/learningstyles/ilsweb.html

ranging from -11 to -3 were classified as sequential, and those who noted scores ranging from +3 to +11 were classified as global. In the study, 82 students (58.1 %) were classified as sequential and 59 students (41.8 %) were classified as global.

A total of 159 participants completed the experiment. Eighteen cases were removed because the participants did not complete the tasks properly. This resulted in 141 convenient cases in the data set.

Assessment of Learning Strategy: The Accounting Tasks

The other grouping variable used in the experiment was learning strategy assessed through the accounting tasks. Two different tasks were conducted in the experiment; one requiring a step-by-step learning strategy and the other a simultaneous learning strategy. Two different tests were preferred in order to prevent participants to intentionally or unintentionally convey the calculations or numbers of one test to the other.

At the first task, which required a step-by-step learning strategy, participants were asked to compute the related ending account balances using a debit/credit posting strategy via journal and ledger recordings.

At the second task, which required a simultaneous strategy, participants were asked to calculate the costs of goods of sold and the gross profit/loss using a free-form strategy in which only addition and subtraction were used for calculation. The two tasks and related instructions are provided in Appendices A and B of this study. These two embedded learning strategies; step-by-step and simultaneous, are consistent with those that would be preferred by sequential/global students as described in the Felder-Silverman Model.

Measuring Performance

Participants got up to 20 points in a maximum duration of 20 minutes from the step-by-step oriented task, since it requires more effort and time compared to the simultaneous oriented second task, which provided up to 10 points within a 15 minutes of maximum duration. For the step-by-step oriented task, points were awarded for pertinent journal entries and debit/credit postings in the ledger accounts. For the simultaneous oriented task, points were awarded for accurate mathematical calculations of the costs of goods of sold and the gross profit/loss.

Inherent task qualities grounding on two different tasks might have affected the

performance of participants during the conduct of tasks. In order to defect the effects of inherent task qualities, participants' task scores were averaged by converting them to z-scores.

A number of additional variables such as participants' gender, department, grade, accounting points mean, GPA and duration of effort (measured in minutes) were also collected to be used as an aid for deepening the interpretation of the research results. Letter grade scores of accounting courses and GPA were gathered from participants' most recent academic transcripts as of Summer 2014. Subsequently, accounting points mean was calculated by averaging each participant's scores taken from the accounting related courses in order to make them comparable with GPA. Accounting points mean and GPA were distributed into four groups, which were constructed by one point intervals beginning from 0 and ending with 4; *0-1, 1-2, 2-3, 3-4.*

Research

Participants' learning styles were determined via online Felder-Soloman ILS and learning strategies were determined via accounting task performance.

The fundamentals of the study is consistent with the Felder-Silverman Model, which states that sequential style students prefer step-by-step strategy and global style students prefer simultaneous strategy. In this conceptual frame, with respect to the research question it is expected that sequential style participants had high simultaneous scores and global style participants had high step-by-step scores.

In keeping with the results of the online Felder-Soloman ILS, participants were grouped as either *sequential* or *global*. Following this grouping with respect to learning style, participants within each learning style group were then distributed to sub-groups of *step-by-step* and *simultaneous* with respect to learning strategy. Distribution to sub-groups of step-by-step and simultaneous was conducted according to the accounting task scores of participants.

In order to defect the potential masking effect of inherent task quality difference (participants' possibility of finding one task easier/harder than the other), and performance evaluation difference (maximum points given from each task) participants' accounting task scores were averaged by converting to z-scores separately.

Scores of step-by-step oriented accounting task ranged from 0 to 20 points maximum. These points were converted to z-scores and named Z-SBS. If a sequential style

participant's Z-SBS score is greater than zero (Z-SBS > 0) that participant was accepted as non-affirming the fundamental hypothesis and vice versa.

Scores of simultaneous oriented accounting task ranged from 0 to 10 points maximum. These points were also converted to z-scores and named Z-SIM. If a global style participant's Z-SIM score is greater than zero (Z-SIM > 0) that participant was accepted as non-affirming the fundamental hypothesis and vice versa.

Preparation of the Research Data for Analysis

SPSS Version 22 was used in analysing the survey data. The data used in research were converted to nominal values in order to suit the requirements of statistical analysis.

While assessing learning style along the sequential/global dimensions, participants' scores were converted to a new scale for the sake of SPSS and sequential and global scales were then rank ordered within each group of sequential and global participants.

In order to prepare the learning strategy scores assessed by accounting task scores for analysis, these scores first were averaged by converting them to z-scores separately both for step-by-step and simultaneous students. Z-scores of step-by-step oriented participants (Z-SBS) were scaled along a range starting from -0,78 to +2,5, while z-scores of simultaneous oriented participants (Z-SIM) were scaled along a range from -1,08 to +1,2. Afterwards, the scaled z-scores within each separated group of step-by-step and simultaneous participants were rank ordered also separately within each group. By this process learning strategy scores of participants were converted and grouped into two separate groups of averaged z-scores and named as *Z-SBS* and *Z-SIM* respectively.

Converted values of learning styles and learning strategies were then distributed into eight groups, which of two were regarded as non-affirming the fundamental hypothesis of the study, while the other six groups were regarded as affirming. These groupings resulted with a 2x4 between-subjects design. The said eight groups end the frequencies of participants in each group are illustrated below in Table 1 and 2:

Table 1. Grouping of Participants and Group Frequencies

Learning style	Learning strategy				
	ZSBS>0	ZSBS<0	ZSIM>0	ZSIM<0	Total
Sequential	Group1(37)	Group2(45)	Group3 (0)	Group4(0)	82
Global	Group5(0)	Group6(2)	Group7(29)	Group8(28)	59
Total	37	47	29	28	141

Table 2 was developed from the frequency distributions in Table 1. Affirming six of the eight different groups in Table 2 seemed to contrast with the assumptions of the Felder-Soloman ILS, simply stating that global students tended to have higher step-by-step scores, while sequential students tended to have higher simultaneous scores.

Distribution of the affirming and non-affirming groups in Table 2 was rendered as to the participants' scores of learning style (ILS) and learning strategy (accounting task) questionnaires. In order to be rendered as non-affirming, participant should have a sequential tendency (ILS) together with a z-score (step-by-step accounting task) higher than zero (ZSBS>0) or a global tendency (ILS) together with a z-score (simultaneous accounting task) higher than zero (ZSIM>0). Group 1, Group 4, Group 6 and Group 7 came out as non-affirming, the other groups were rendered as affirming. Affirming participants were 51.7% and non-affirming participants were 48.2% of the total participants.

Table 2. Affirmation of Fundamental Hypothesis

	Grouping	Learning style	Learning strategy	Frequency of participant	Total number of participant
Non-affirming	Group 1	Sequential	ZSBS>0	37	68
	Group 4	Sequential	ZSIM<0	0	
	Group 6	Global	ZSBS<0	2	
	Group 7	Global	ZSIM>0	29	
Affirming	Group 2	Sequential	ZSBS<0	45	73
	Group 3	Sequential	ZSIM>0	0	
	Group 5	Global	ZSBS>0	0	
	Group 8	Global	ZSIM<0	28	

Research Results

This section features results of the statistical analysis of the research data including

tests of normality, reliability, Spearman's Rank Order and Wilcoxon Signed Rank Order.

Tests of Normality: Normality test was conducted through learning styles, simultaneous and step-by-step test scores of participants. Results are illustrated below in Table 3.

Table 3. Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Learning styles	.208	141	.000	.875	141	.000
Sim	.235	141	.000	.795	141	.000
Sbs	.229	141	.000	.781	141	.000
a. Lilliefors significance correction						

Since the Kolmogorov-Smirnov value is 0.000 at the 0.05 level (2-tailed), it was concluded that the survey data were not normally distributed. Therefore non-parametric tests were conducted.

Tests of Reliability: Reliability test of learning styles (ILS) ended up with a low level of reliability indicated by Cronbach's Alpha Coefficient in Table 4 below:

Table 4. Reliability Statistics

Cronbach's alpha	Cronbach's alpha based on standardized items	N of items
.543	.553	43

Sample Size : 159
Total Number of Items : 43
Cronbach's Alpha Coefficient: $\alpha = 0.553 < 1.00$
: $0.40 \leq \alpha \leq 0.60$ sample has a low reliability

Non-parametric Tests of Hypothesis: In order to execute correlation analysis, Spearman's Rank Order was used incorporating participating students' scores of Felder-Solomon ILS and z-scores of accounting tasks. In accordance with the authors' expectations, results illustrated weak correlations.

Hypothesis for correlation analysis are:

H_{A0} : There is not any statistically significant correlation between learning styles and learning strategies.

H_{A1} : There is a statistically significant correlation between learning styles and learning strategies.

As shown in Table 5, since correlation coefficient is -.769 < 0.05, there is a strong negative relationship between learning styles and learning strategies. This means that participants with a *global* learning style tended not to have a *simultaneous* oriented learning strategy, where participants with a *sequential* learning style tended not to have a *step-by-step* oriented learning strategy. Acceptance of H_{A0} means that there is not any statistically significant positive correlation between learning styles and learning strategies. This result favors the fundamental hypothesis of the study.

Table 5. Correlations[c]

			Learning style	Z learning strategy	AGPA	GPA	Grade	Department	Gender
Spearman's rho	Learning style	Correlation coefficient	1.000	-.769**	-.026	.040	.070	-.217**	-.001
		Sig.(2-tailed)	.	.000	.764	.638	.407	.010	.987
	Z learning strategy	Correlation Coefficient	-.769**	1.000	.174*	.178*	.028	.290**	.070
		Sig.(2-tailed)	.000	.	.039	.035	.739	.000	.408
	AGPA	Correlation coefficient	-.026	.174*	1.000	.472**	.155	.092	-.016
		Sig.(2-tailed)	.764	.039	.	.000	.067	.276	.853
	GPA	Correlation coefficient	.040	.178*	.472**	1.000	.202*	.124	.198*
		Sig.(2-tailed)	.638	.035	.000	.	.016	.144	.018
	Grade	Correlation coefficient	.070	.028	.155	.202*	1.000	.157	.115
		Sig.(2-tailed)	.407	.739	.067	.016	.	.063	.175
	Department	Correlation coefficient	-.217**	.290**	.092	.124	.157	1.000	.084
		Sig.(2-tailed)	.010	.000	.276	.144	.063	.	.324
	Gender	Correlation coefficient	-.001	.070	-.016	.198*	.115	.084	1.000
		Sig.(2-tailed)	.987	.408	.853	.018	.175	.324	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

c. Listwise N = 141

Wilcoxon Signed Rank Order was conducted in order to find out if there is any statistical difference between learning styles and learning strategies. A couple of prerequisites are necessary in order to execute Wilcoxon Singed Rank Order: Data have to be paired and come from the same population, each pair has to be

chosen randomly and independently and the data have to be measured on an ordinal scale at least. Since Wilcoxon test required ordinal scaled data, data were rank ordered before the execution of the test. Learning styles (ILS) consists of global and sequential dimensions.

Hypothesis for differentiation analysis are:

H_{B0}: There is not any statistically significant difference between learning styles and learning strategies.

H_{B1}: There is a statistically significant difference between learning styles and learning strategies.

Table 6- Test Statistics[a]

	Z learning strategy – learning style
Z	-10.306[b]
Asymp. Sig. (2-tailed)	.000
a. Wilcoxon signed ranks test	
b. Based on negative ranks.	

Table 6 illustrates that asymp. Sig. (2-tailed) 0.000 < 0.05 so H_{B0} is rejected, learning styles and learning strategies are different. Results indicate that there is a statistically significant difference between learning styles and learning strategies.

Similar to the result of the correlation test, this result also supports the fundamental hypothesis. According to ILS, the vector consisting of sequential and global dimensions should turn out mutually coherent results with the vector consisting simultaneous and step-by-step dimensions. However, Wilcoxon test ended up with adverse consequences.

Conclusion

Granting that ILS helps investigating the difference and variety of students' learning process, it also gives hints to researchers as to how students meet their demand of knowledge. Determining students' learning style is important for both consistency and detecting his/her strengths and weaknesses in learning process. These aspects of Felder-Soloman ILS have long been drawing the attention of academics, constituting a wide literature especially in engineering and education

fields. ILS was then applied to social sciences and yielded notable results. Be that as it may, the most important drawback of ILS while adapting to social sciences is the low level of reliability.

In this study, in order to determine which statistical tests to execute, test of normality was conducted via Kolmogorov-Smirnov test. Results indicated that data were not normally distributed. Additionally Cronbach's alpha coefficient illustrated a low level of reliability in accordance with related literature in social sciences. Sample data were then tested with non-parametric tests of Spearman's Rank Order and Wilcoxon Signed Rank Order to the end to determine if there is any significant relation between students' learning styles and learning strategies. In accordance with the authors' expectations, tests resulted with the acceptance of the fundamental research hypothesis meaning that learning styles and learning strategies are independent of each other.

The effects of learning styles on students' accounting task performance were also investigated in the context of the research. A relation was detected between the learning styles and learning strategies of participating students' who were successful in the accounting task (z-score>0). This illustrated that these students did not affirm the fundamental research hypothesis. On the contrary, students who failed in the accounting task (z-score<0) affirmed the fundamental research hypothesis and this might be the reason why the reliability of ILS came out to be so low. In consequence of this, statistical tests executed in the research did not result with significant p values (Sig.) or strong correlation coefficients favoring the fundamental research hypothesis and in accordance with the related literature. This result also noted a cognitive misfit or inconsistency in participating students' learning process.

As a conclusion, results of the research noted that in accounting education, students' perceptions and preferences of learning styles and learning strategies did not have a significant contribution to students' success. Sequential and global dimensions of ILS were not rewarding with respect to accounting task performances of students. It was intended to change the current teaching style with regard to the related accounting course and since the research revealed a cognitive misfit between the variables, a change became necessary. In respect of the research findings, the examples and applications used in financial accounting course were altered through a sequential dimension utilizing a step-by-step orientation in order to strengthen the students' sequential cognitive processing. For future studies, adapting learning indexes or methods would be helpful in understanding and developing students' learning and cognitive processes on accounting courses.

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