

Appraisal of Felder - Silverman Learning Style Model with Discrete Data Sets

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Abstract

Objectives: E-learning is adapted to suit the different heterogeneous learners with different leaning styles. Felder and Silverman have given a catalogue of learning styles (FSLs). This paper is indented to analyze the reliability of their recommended learning styles. **Method:** Personalization is the latest improvement in E-learning system. Personalized E-learning system (PES) is suggested as the next generation of E-learning system. Various factors are analyzed to address the prediction of user's preferences. Learning styles is main deciding factor of personalizing E-leaning system. Most of the personalized models personalizing on learning styles have used FSLs. Previous research works performs the analysis of FSLs with single set of data. In this paper, the model is tested with two distinct of data using Karl's Pearson Coefficient method. To carry out analysis, adaption model is developed with FSLs using JAVA language. **Findings:** The observation of Appraisal of FSLs/Model states that it is strongly accepted by one set of data and there is small divergence in another set of data. **Applications/Improvement:** The study can be expanded with larger set of data and more than two distinct set of data.

Keywords: Learning Styles, Learning Style Preferences, Pearson Correlation Coefficient, Technology-Enhanced Learning

1. Introduction

E-learning is mostly associated with activities concerning computers and interactive networks concurrently. The computer does not need to be the central element of the activity or offer learning content. However, the computer and the network must hold a significant contribution in the learning activity. Web-based learning is associated with learning materials delivered in a Web browser, including when the materials are packaged on CD-ROM or other media. Online learning is associated with content readily accessible on a computer. The content may be on the Web or the Internet, or simply installed on a CD-ROM or the computer hard disk. Distance learning involves interaction at a distance between instructor and learners, and enables timely instructor reaction to learners. Simply posting or broadcasting learning materials to learners is not distance learning. Instructors must be involved in receiving feedback from learners.

Larger admittance of the learning management system by wider learner community has raised exigent

issues with respect to providing adequate experiences to different learners; because computer assisted learning system could not acclimatize to suit individual learner needs¹. Learning systems are classified into two categories on the root of mode of learning. 1. Adaptive Learning - It aims to individualize the learning process by tailoring content and teaching strategies to learner's specific needs, preferences, knowledge or learning goals². 2. Collaborate Learning - It has been shown to provide learner with a rich and engaging environment that overcomes many of the issues experienced with self - paced learning. Collaborative activities are inherently more difficult to track and adapt³. The process of applying the adaptability mechanism to attain goals of individualization in the e-Learning systems is called as Personalization. In recent years, there are lots of developments in the field of personalization in e-Learning system. Web services and Semantic web plays vital role to personalize E-learning systems.

⁴Suggested a model to extract semantic knowledge in Social Web Sources. ⁵Has proposed a quality based web service composition algorithm for the integration of

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emergency web services. Many authors have recommended the personalization in learning management System (LMS).⁶ Developed a recommendation system for personalized technology-enhanced learning to make the e-learning environment more suitable to the learners.⁷ Suggested Adaptive Privacy Policy Prediction (A3P) system to help users compose privacy settings for their images in E-Learning Systems.⁸ Suggested an e-Learning system with prefetching technique using decision tree induction to reduce the access delay in the web mining.⁹ Recommended fuzzy knowledge management system to personalize erudition by taking into consideration the factors such as learner's profile, learning material and learning distinctiveness.¹⁰ Suggested an interface for personalizing e-Learning system which defines heterogeneity factors of the student group and describes how it enables the diverse student views/access to learning objects and learning behaviors.¹¹ Developed an Ontology Situation based and Custom-made e-Learning system which gives diverse encouragement and obliging entertainment for learning activities according to the different emotions of the learners.¹² Suggested knowledge based system design for personalizing e-Learning system which chooses the unsurpassed material for the learner and best time to do learning process.

¹³ Presented architecture of a multi - agent e-Learning system that supports predefined learning styles and re-estimating them during the course for a better personalization.¹⁴ Presented a paper which premeditated the learner's emotion during the learning process by the learner facial expression and biometric signals such as pulse rate, breathing rate and finger temperature.¹⁵ Suggested a personalized model for learning a course of Object oriented programming using Prefix Span Algorithm.

2. Appraisal of Felder and Silverman Learning Style Methodology

With the great advancement in information technology, online learning/Electronic learning/Technology - enhanced learning is personalized with various adaptation mechanisms to make it suitable for heterogeneous learning styles of the learners with different preferences. Learner's satisfaction in learning process is greatly improved if the course delivery is delivered according to his/her learning style. Felder and Silverman have categorized the styles of leaning into four proportions as Auditory, Reading, Tactile and Visual. There are lots of developments in supporting

their categorization. Learning style is one of the deciding factors to make an e-learning management system more successful. Various experimentations focused on the applicability of with the application of Felder and Silverman learning styles on the leaning management systems. These learning styles are followed in most of the personalized learning systems. The reliability of this methodology is analyzed by¹⁶ and ¹⁷ with a single set of data.

In our work, experimentation is performed to analyze the behavior of the Felder and Silverman learning style methodology with two discrete sets of inputs. The distinct input data sets are the data collected from the learners with two different mode of learning) the students who were the software professionals in a reputed software organization and did their course in distance learning programme. The analysis is intended to investigate the degree to which the learning styles suggested by Felder and Silverman contribute to the learner's satisfaction in personalized online learning settings. To accomplish the examination, a new model (Felder Silverman Learning style Model, FSLSM) is developed.

2.1. Working Style of FSLSM

Felder-Silverman learning style model (FSLSM) is a custom-made e-Learning system developed in Java language with Felder and Silverman Learning style Application. To make the learning management system more adaptive to the learner on the origin of appropriateness on cognitive style of the learner, it is enhanced by recommending the suitable content format for the learners. The developed model is tailored to fulfill the individual preferences and characters. This tool is developed with the commendation of model for information search process for e-Learning system suggested by¹⁸. The model has recommended exhibits student's information behavior in incorporated learning environment. To accomplish the personalization of LMS, the course material to be delivered to the learner is stored in a Data base in different formats such as text file, picture file and wave file. The model conducts a test with questionnaires set by Felder and Silverman to identify the learning style of the learner and delivers the adaptive course content according to the learning style. The structural design of personalized e-learning system based on the learning style is represented in the Figure 1. The comparison study is performed with Karl Pearson's Coefficient method.

2.2 Application of Karl Pearson's Coefficient Method

The degree of relationship between the variables under consideration is gauged through the

Correlation analysis. The assess of correlation called the correlation coefficient. The measure of relationship is articulated by coefficient which range from correlation $(-1 \leq r \leq +1)$. The course of change is indicated by a sign. In our study the two variables are fulfilment levels (Scores) of the different learning styles in the respective internal students of an institution and external working professionals.

Correlation denotes the interdependency amid the variables for correlating two facts, it is decisive that the two occurrences should have cause-effect relationship, & if such relationship does not exist then the two phenomenons cannot be correlated. The coefficient of correlation 'r' measure the scale of linear relationship between two variables say x & y. The Karl Pearson's Coefficient 'r' is calculated with the formula:

$$r = \frac{\text{COV}(X,Y)}{\sigma_X \sigma_Y} \text{ or } \frac{N \sum dx dy - \sum dx \sum dy}{\sqrt{N \sum dx^2 - (\sum dx)^2} \sqrt{N \sum dy^2 - (\sum dy)^2}}$$

2.3 Statistical Analysis

This section describes the experimental evaluation of the reliability of the model. The study is performed for 25 students from the full time and part time students with different learning styles. The diverse sets of students are tested with the Felder Silverman Learning style model. The testing process stores the learning style and score which is used to identify the learning style of the learner is stored in the profile data base when he/she logs in for the first time. The personalized course material is provided to the learner in the future of learning. After the content is delivered, the learner is asked to give the rating of the course material. In our work, the scores of the pre-test and post-test are compared to know the reliability of Felder and Silverman learning styles classes. The table (Table 1) represents the data analysis performed for the discrete data sets collected from the learners of different groups.

3. Results and Discussion

Data which are analyzed using Karl's Pearson Correlation Coefficient method of the regular student from an institution and part - time students working in organization as professionals are indicated in the following comparison chart (Figure 2). It embodies the comparison report which examined the application of the learning styles of Felder and Silverman methodology for

the distinct group of learners. The result shows the three interpretations. The interpretations are

Interpretation 1: It is superlative suited for the full time students having all types of learning styles

Interpretation 2: It is also apt for the part time students with Auditory and Visual learning styles

Interpretation 3: It is not so much apposite for the part time students with Reading and tactile learning styles because of the less significant negative correlation.

4. Conclusion

Though Felder and Silverman's learning styles catalogue is applied to construct many e-learning systems to make the system personalized. Experiments validating the effectiveness of the model show that the application of the FSL enhances the satisfaction of the most of learners and there is a small divergence for few types of learners also.

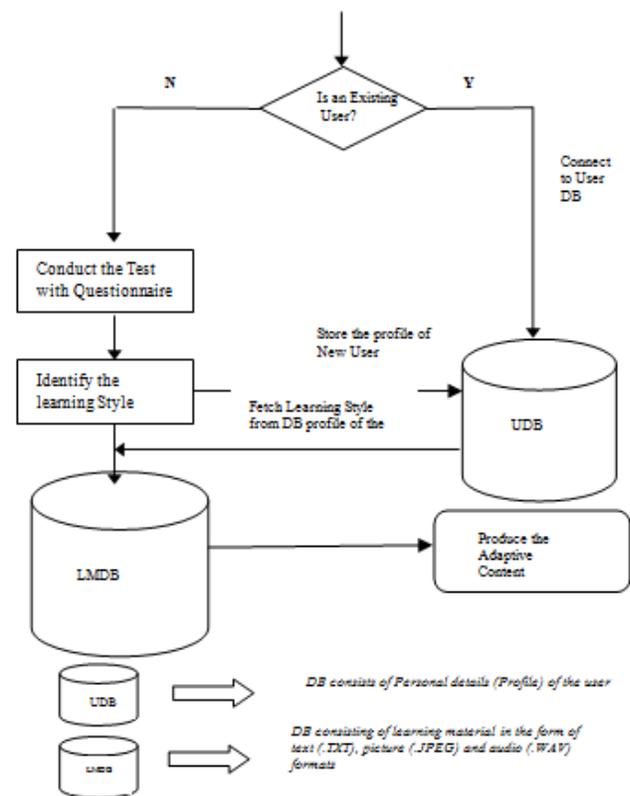
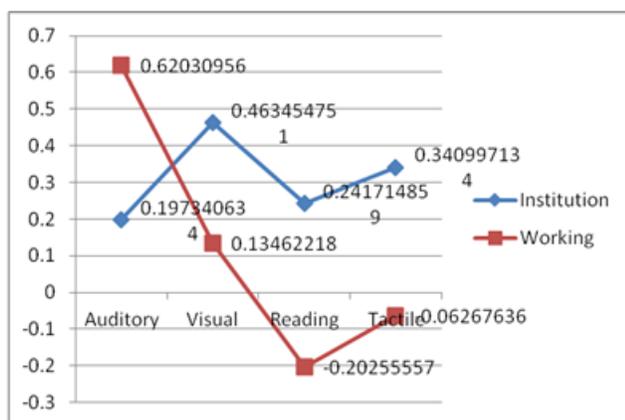


Figure 1. Architecture of Personalized e-Learning System.

Table 1. Comparison data of the heterogeneous group of students

Learning Styles	r (Karl Pearson Correlation Coefficient)	
	Institution(n=25)	Working Professional (n=25)
1.Auditory	0.197340634 +ve Correlation	0.62030956 +ve Correlation
2.Visual	0.463454751 +ve Correlation	0.13462218 +ve Correlation
3.Reading	0.241714859 +ve Correlation	-0.20255557 -ve Correlation
4.Tactile	0.340997134 +ve Correlation	-0.06267636 -ve Correlation

**Figure 2.** Comparison Chart for the Learning Styles of the discrete sets (X and Y axis represent the Learning Styles and the correlation Coefficient values respectively).

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