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Learning Style Tendency Analysis for Vocational Students

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Abstract. The use of e-Learning in education today is still conventional, which is still limited to the delivery of learning material and not yet fully managed as a learning management system (LMS) and assumes the characteristics of all students is homogeneous. In fact, every student has characteristics, especially different learning styles. Therefore, students who utilize e-Learning do not necessarily get the right material in learning, which results learning being less optimal. This research aimed to investigate the tendency of students’ learning style which will be used as the base in designing an adaptive e-Learning system with Visual, Auditory, and Kinaesthetic (VAK) oriented, as one of solutions to increase learning quality. Survey method was used in this study on vocational students in Buleleng Regency. The sample of the study was determined by using stratified random sampling technique to determine 4 vocational schools (SMK) which have Computer Technique and Network department where the amount of students in each school was 30 students with 2 teachers who responsible to the subject related. The variable of this study was students’ response to the questionnaire to identify the tendency of students’ learning style with VAK oriented. The data were obtained from questionnaire, interview, and observation of students’ learning process in classroom. The data was analysed descriptively. The result of the study showed that students’ learning style tendency in adaptive e-Learning system design with VAK oriented on vocational students in Buleleng Regency was students tend to learn with Kinaesthetic style.

1. Introduction

E-Learning trend is now growing rapidly and has managed to steal the attention of many parties both in education and industry. The benefits of eLearning have also been felt in the education world in Indonesia, as support of the implementation of the 2013 curriculum that requires students to always participate actively in learning [1]. E-Learning has been able to help teachers deliver not only cognitive values but also affective and psychomotor values. Until now, eLearning has grown to a more adaptive direction, where the existing e-Learning, is able to recognize the characteristics and personal needs of students. The term adaptive learning with eLearning is called adaptive or personalized e-Learning. Character recognition through learning styles of students is expected to facilitate teachers in providing learning materials in accordance with the required by students. In addition, students are also expected to spend the best effort in the learning process.

Adaptive e-Learning or often referred to personalization learning into a solution that is right against the limitations of learning that exist today. Adaptive e-Learning is a new approach that will become trends and fashion as an innovative e-Learning method in the years to come, as revealed by [2] that Adaptive e-Learning is a new approach that can make an eLearning system more effective by adapting the presentation. In line with [3], which states that the key to e-Learning tendency in the next
year are an automation, an augmented learning, big data, going for cloud, gamification, mlearning and personalization where, e-Learning becoming more personalized than ever and addressing the needs, preferences and requirements of individuals rather than groups [3]. All aspects of learning ranging from pedagogy and learning environments to learning tools and course curricula will be tailored to motivate, engage and inspire learners to achieve better results in a shorter period of time.

In the process of implementing adaptive e-Learning, it is not easy to do. This is because of the complexity of student characteristics. However, to obtain an optimal adaptive e-Learning system, not only the provision of content to be considered but also the learning style factor.

Some studies mention that the characteristic factors that influence students' success are learning style, motivation and knowledge ability [4] [5] [6]. These three characteristic factors (Triple-characteristic models) are inherent structures that can improve learning and outcomes in individual learning [5]. Therefore, in this research, an e-Learning system will be built that can encourage students to play an active role, emphasizing on personalization that includes adaptability (adaptive) oriented to learning styles, with VAK modality. This system can detect the characteristics and needs of individual students. The system has an algorithm that can determine the type of learning materials that can be in accordance with the VAK modality of the students and also equipped with a scoring system. This system is expected to make learning become meaningful and fun for students so that the learning objectives become more optimal. This is in line with [7] that the use of technology in education has promising potential in the internalization process. Then, this will form a model scheme in their minds, which will grow stronger and more sophisticated through two complementary processes of assimilation and accommodation [8].

Learning styles are the progress of cognitive styles that are used to differentiate a person's learning activities based on the way the person process the information. Furthermore, the learning style can be divided into two-dimensional poles where one dimension has two extremes [9]. Knowing the student's characteristics can be done through three ways, namely, 1) Direct question, this method by using the questionnaire as an instrument to get information from learners directly about the character of learning style; 2) Assumptions, using a learner’s model complement that information already obtained. Examples of assumptions are used to supplement a small piece of empty information in the filling of the questionnaire by students; 3) Learner-system interaction, information obtained from the learner's interaction with e-Learning system, so that obtained a learning style track record can be processed into a learning style recommendation.

2. Methodology
The Learning styles tendency analysis for vocational students use survey methods. Then the analysis results will be used as a basis for designing adaptive eLearning. The basis of learning style tendency analysis is derived from (1) students' responses to the questionnaire of determining learning style tendency, (2) observation of students’ learning processes in the classroom, and (3) interviews with related subject teachers.

The population of this study were students and vocational teachers who had Computer and Network Engineering (TKJ) study program in Buleleng district, SMK Negeri 3 Singaraja, SMK TI Bali Global Singaraja, SMK Negeri 1 Sukasada and SMK Negeri 2 Seririt. Research sampling was determined by stratified random sampling technique. Samples of vocational students and teachers were defined from all vocational school that have Computer and Network Engineering courses in Buleleng district. The number of students involved in each school was proportionally set by as many as 30 people as a sample of the study, so the number of students involved were 120 students. The number of teachers involved in each school was set by 2 teachers, so the number of teachers involved were 8 teachers.

The object variables in this study were (1) students' responses to the questionnaire measuring the learning style tendency, and (2) the teachers’ responses to the questionnaire measuring the students’ learning style tendency in the classroom. The research data were collected by questionnaire, interview, and observation. The questionnaire technique used to collect data of research variables. Interview
techniques conducted on teachers and students. The goal is to match the responses that have been poured in the questionnaire. The data to be matched were the student's response to the instrument selection questionnaire used in this study and the teacher's response data on the student's learning style tendency questionnaire.

The data collection instruments used in this study were (1) the questionnaire of students' responses to the determination of the learning style tendency consisted of 36 items with each 12-point Visual statements, 12 Auditory statements, 12 Kinesthetic statements. (2) questionnaire of teacher's response to learning styles tendency determination consisted of 36 items with 12 items of a Visual statement, 12 Auditory statements, and 12 Kinesthetic statements. Guidance material for teacher interviews, students, and observation of learning process using indicators adjusted with indicators on the questionnaire materials.

The descriptive technique was used to analyze the data obtained. The raw score is converted into percentages. The quality of each data is described based on the result of the conversion of raw scores to the absolute value 5 (five) scores conversion guide. The following scale ranges are categorized according to conversion guidelines i.e., 85-100 means very high, 70-84 means high, 55-69 mean sufficient, 40-54 means low, and 0-39 means very low.

3. Result and Discussion
The result of learning style analysis which will be the basis of designing adaptive e-Learning system obtained from student and teacher respondents. The results are presented in table 1.

| Learner data source | Learning style | Score (%) | category     |
|---------------------|----------------|-----------|--------------|
| SMK N 3 Singaraja    | Visual         | 57.08     | Sufficient   |
| SMK N 3 Singaraja    | Auditory       | 50.15     | Low          |
| SMK N 3 Singaraja    | Kinesthetic    | 86.14     | Very High    |
| SMK TI Bali Global   | Visual         | 67.26     | Sufficient   |
| SMK TI Bali Global   | Auditory       | 55.14     | Sufficient   |
| SMK TI Bali Global   | Kinesthetic    | 82.66     | High         |
| SMK N 1 Sukasada     | Visual         | 72.66     | High         |
| SMK N 1 Sukasada     | Auditory       | 46.87     | Low          |
| SMK N 1 Sukasada     | Kinesthetic    | 88.46     | Very high    |
| SMK N 2 Seririt      | Visual         | 55.28     | Sufficient   |
| SMK N 2 Seririt      | Auditory       | 60.18     | Sufficient   |
| SMK N 2 Seririt      | Kinesthetic    | 78.36     | High         |

Source: questionnaire result

Based on table 1 can be described findings that students' responses to the questionnaire of the student's learning style tendency for visual learning style obtained the average overall score of respondents of 63.25 and enough categorized, for auditory learning style obtained average score of all respondents of 53.08 and low category, and for kinaesthetic learning style obtained the average overall score of respondents amounted to 83.91 and categorized high. The result data of this student response indicate that vocational students of computer and network engineering department are generally more inclined to kinaesthetic learning style or practice or demonstrate directly during the learning process. This finding is supported by interview data conducted by teachers who say students tend to be happier when the material is delivered by direct practice, rather than learning by paying attention to the presentation or writing of the teacher in front of the class or learning by listening to the direction of the teacher alone without continuing with practice activities by students.

Learning styles are a habit of learning where one feels most effective at receiving, editing, storing and releasing something learned [10]. The most common learning style is the VAK model, where that learning style is very popular and simple in its implementation. The VAK model will identify students' learning style tendencies related to the visual aspects (e.g., images, charts, graphs, etc.), audio aspects (e.g., narration, sound effects, etc.) and kinaesthetic or motion aspects (e.g., holding) [11].
Learning styles become very important in a learning. Limitations of a learning support medium that does not involve learning styles, making the material not optimally accepted by students. Before designing a media that can adapt to the characteristics of a student's learning style, it is necessary first to know the learning styles tendency that each student has.

The availability of conventional e-Learning has the limitations of being able to provide only the same learning material presentation for all users. The limitations of conventional e-Learning systems are critical issue when e-Learning systems are applied to a wide range of users in terms of demographics, learning styles, and knowledge levels such as distance education, and student motivation.

In a hypermedia system that is adaptive, a learner can be given a presentation tailored to his or her level of knowledge, with his or her learning style and with other preferences [12]. The model of this e-Learning system has been developed, the learning presentation material is tailored to the student's learning style tendency as measured by the VAK learning style instrument. Thus each learner will get a presentation of learning materials in accordance with the tendency of learning styles. Besides, another advantage of adaptive e-Learning system is to overcome the problem of "cognitive overhead" and "lost in hyperspace" attached to conventional e-Learning system. The problem of "cognitive overhead" occurs because of additional effort and concentration in browsing activities on conventional e-Learning [13].

While the problem of "lost in hyperspace" occurs because someone who is exposed to many links in non-linear documents tends to be lost direction. This learning-style oriented e-Learning system in which there are two levels of adaptation depends on who initiates to adapt in this regard whether the system or the user. This term leads to two kinds of adaptations: adaptively and adaptability. Adaptively refers to the ability of the system to adjust its presentation according to user characteristics [14]. While adaptability refers to the capacity of the system to support users who will make modifications [15]. In designing this e-Learning system, the problem to note is how to balance between the two adaptation levels.

The results of observation on the implementation of learning in the classroom tend to use the media that assume that students in the class have a homogeneous character. The reason this happens is that the teacher does not know what kind of learning style the students have in the classroom. The statement was supported by a survey of 120 students whose results stated that students do not have 1 type of learning style, but have different learning styles and different levels of tendency.

As explained by James and Blank [4], that learning style is a learning habit where a person feels most efficient and effective in receiving, processing, storing and removing something learned. To measure the tendency of student learning styles, a list of questions such as questionnaires on the system can be used. The learning style model that will be used in an adaptive learning system is visual-auditory-kinaesthetic (VAK). This VAK model is often used because it is quite simple in its implementation. The VAK model will identify tendency in student learning styles related to visual aspects such as pictures, diagrams, graphs, etc.; audio aspects like narration, sound effects, etc.; and kinaesthetic aspects such as holding, doing, etc.

Based on the above description, the tendency of vocational student learning style in Buleleng district is tend to have the kinaesthetic learning style. This statement is supported by data from interviews with subject teachers on student learning tendencies who are more interested in learning by practice than by observing the teacher's explanations in front of the class or listening to the teacher's direction while studying. The survey results show that students with visual, auditory, and kinaesthetic learning styles are categorized, moderately, low, and high. This result is reinforced by the observation that the subjects in SMK most of the learning use practice, so students tend to have kinaesthetic learning style, but not ignore other learning styles. Viewed from the survey results stated that students also tend to have visual and auditory learning styles but the tendency level is lower than the kinaesthetic learning style.

The expected scenario in the system that will be developed as a whole by referring to the results of the learning styles tendency analysis is, (i) the system displays a front page where users can log in and
get initial information; (ii) If the user is logged in as a student, the system will provide a list of questions to reveal the tendency of the learning style, (iii) the system will determine the tendency of the user's learning style based on the score obtained in answering the list of questions; (iv) Users with a majority score on the visual aspect, will be directed to learning modes that highlight visual elements. In this mode the system will display learning material accompanied by illustrations in the form of pictures, diagrams and graphs; (v) Users with a majority score on the auditory aspect will be directed to learning modes that highlight audio elements. In this mode the system will display learning material along with illustrations in the form of audio or verbal descriptions; (vi) Users with a kinaesthetic majority score will be directed to learning modes that highlight kinaesthetic elements. In this mode, the system will display learning material with illustrations that require hand movements (move, move, press, etc.). At the end of the lesson the system will display a test to evaluate students' understanding of comprehension. If the test results are less than the minimum limit, the system gives users the opportunity to fill in the questionnaire again, because there is a possibility that users will follow other learning modes. When the user is logged in as a teacher, the system will display an interface for editing and uploading learning material. When the user is logged in as admin, the system displays the interface to manage the system.

the functions and features that need to be designed based on the results of the analysis are; (i) Student actors: new users who act as students must register in advance so that their identity profiles are stored in the user model; registered students can log in to the system and continue to study the material using profiles already stored in the user model; students must fill out questionnaires so that the tendency of learning styles can be stored in the user model; students learn learning material in accordance with the mode determined by the system according to the score that has been obtained; students work on test questions at the end of the learning material; students can repeat filling out the questionnaire if the results of the test questions are less than the minimum. (ii) Teacher actors: teachers edit and upload learning material for all modes. (iii) Admin actor: admin can manage systems, teachers and students. (iv) Sub-system actors: adaptive eLearning systems are web-based applications and can be accessed by users through a variety of standard web browsers; the system utilizes user mode that is used to store user identities and profiles; the system provides an interface for users to log in; the system will present questionnaires to students; the system gives a score on the results of the questionnaire answers; the system directs students to one of the learning modes (V, A, or K) based on the scores obtained; the system presents learning material in accordance with the tendency of students' learning styles; and the system presents test questions.

4. Conclusion
The student learning styles tendency analysis has been conducted as a preliminary study in designing adaptive e-Learning oriented VAK modalities in vocational students in Buleleng district. The results of the analysis show that vocational students, especially majoring in computer and network engineering, have different learning style characteristics, and tendency to have high learning style of Kinaesthetic.

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