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Identification of Student Learning Style in Determining Learning Media Using Expert Systems

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Abstract: Student learning was motivated by various student learning styles in the classroom which made it difficult for teachers to identify learning strategies. The purpose of this study is to identify learning styles using a valid and practical expert system tool. Expert system application designed to help teachers to identify learning styles for students to determine the right strategies that can be used by teachers in teaching. The design of this study uses Borg and Gall development research methods. This type of data consists of primary data when data is obtained directly from the source, namely schools, teachers, experts and students. Data analysis techniques, namely descriptive techniques, describe the validity and practicality of the tools developed. The results obtained from this study are tools that will be used to study learning styles. Based on the results of this study, it can be concluded that the expert system developed is valid and practical to determine student learning styles. The results of this study can be used by teachers in the development of learning media for better learning. Teachers can use appropriate teaching methods based on student learning styles, which can bring benefits and understanding of student learning.

Keywords: Expert system, research and development, learning style, validity, practicality

INTRODUCTION

Information technology is currently developing very rapidly, this of course greatly affects the world of education. In connection with this technology, various kinds of innovations in the education sector also experienced changes. Each group or individual competes to develop education according to their respective abilities. Development is carried out not only in big cities, but also in regions according to the needs and environmental conditions of the place of study. Various kinds of regulations are made by the government as a guide in carrying out education, so that it can spur educators to make adjustments in terms of teaching methods and models. Change is not limited to learning methods or models, but also affects material and learning media. With the implementation of the 2013 Curriculum learning is no longer centered on the teacher (teacher center) but is more student-centered. Therefore, the creativity of a teacher is required to be able to accommodate all student learning needs so that in learning students are no longer dependent on the teacher.

There are so many methods or models offered in implementing effective learning. But teachers are required to be able to sort and choose the method that is most suitable for use in learning in accordance with the learning objectives. In choosing a method or model, the teacher must also pay attention to the media that can support the learning to be carried out. If the media used is not suitable, there will be miss communication or misperception so that what is conveyed becomes useless. So that the use of media must be adjusted to the material and learning objectives to be achieved.

By utilizing technology, learning today is more often used in developing learning media. Learning media is a tool in delivering learning material. By using good learning media, it is expected to improve good learning outcomes. According to Devi Anjarwati et al. (2016) in his journal said that there were quite high differences in the experimental class and control class and concluded that the learning media based on Adobe Flash Professional CS 5.5 was very useful and could improve student learning outcomes.

This proves that good media can improve student learning outcomes. Using good and proper learning media will certainly improve learning outcomes.

The author made observations at Pangkalpinang State Vocational High School 1, especially in the X (ten) class majoring in Multimedia. At the moment, SMK Negeri 1 Pangkalpinang has implemented the 2013 curriculum since the 2013/2014 school year. Learning activities that can be done in classrooms or in

laboratory rooms (practical learning). With a comfortable learning room and the teacher always gives motivation to start learning. In learning activities, teachers have tried to do interesting learning. By utilizing learning media which are generally in the form of presentations, the teacher always tries so that students can concentrate on learning. Teachers at school have tried to improve the quality of learning by preparing learning tools. In the preparation, the teacher has spent a lot of time and energy in the process. But student learning outcomes have not shown maximum results, this is indicated by the learning outcomes of students who still have not reached the minimum limit of completeness.

According to the teacher in the vocational field, Communication and Digital Simulation subjects are subjects with an average level of difficulty compared to other subjects such as Mathematics or Physics. Therefore, the teachers always try to make the material provided can be easily accepted by students. This is the teacher's job to improve learning outcomes better. For this reason the teacher always tries to find solutions to every problem that is happening so that learning outcomes can increase.

The teachers are always required to be able to deliver learning material effectively and efficiently but many things must be considered to realize this. In the learning process the teacher has used learning media but students often have difficulty receiving learning material. After analyzing the guidance and counseling teacher, it was found that students had different learning styles. So that the existing media usage is still not optimal. In a journal said that children's learning style preferences are an important consideration when deciding learning methods for student involvement in school (Richard Akplotsyi and Lamine Mahdjoubi, 2011). Which means that learning styles need to be considered in determining student learning methods. Grace Fayombo (2015) also said that the importance of utilizing different teaching strategies to accommodate different student learning styles and the promotion of academic achievement. So in utilizing learning strategies, it is important for teachers to consider learning styles.

At the time of developing a media the teachers were still not paying attention to students' learning styles so that the media used still could not provide material understanding to some students who had different learning styles. This learning style certainly has an effect on the speedy catching of students in understanding learning material. In a journal written by Arylien Ludji Bire, et al (2014) revealed that there was a significant influence between visual, auditory, and kinesthetic learning styles on learning achievement. Yasar Ibrahim K. (2009) said to provide the best way to learn to individuals, learning styles must be determined in advance by considering differences in personality, perception, ability and intelligence. Herman Dwi Surjono (2015) also said that students with multimedia preferences and learning styles that match the material presented have a higher score than those whose learning methods do not match their learning styles. So it can be concluded that learning styles have a role in increasing a student's knowledge in learning. Because it is very necessary for teachers to consider the learning style of students in making a learning medium.

In his journal Bernard (2017), said that knowing the description of learning style preferences can help improve the learning process. According to him in identifying student learning styles, special questionnaires can be used. Although valid and realible, the questionnaire has weaknesses, as questionnaires are sometimes wrong in identifying student learning styles. This is because a student feels important so that answering questions very quickly without much thought. Student answers can be biased due to students' misunderstandings and desired expectations. To overcome this weakness, a system capable of automatically identifying learning styles. Besides if the learning style changes from time to time, the results of the questionnaire will become obsolete. Therefore with a tool that can automatically identify learning styles quickly, students can immediately update information about student learning styles quickly and accurately. By knowing the learning styles of each student, the teacher can classify students in certain learning styles so that the media to be used can be adjusted. And from that the teacher can easily find out the weaknesses of each student in learning so that the teacher can provide learning recommendations to students. While for maximum results, the teacher with the school can make a special class or make a class based on student learning styles based on the characteristics of each student's learning style. This will certainly make it easier for teachers to treat students in the learning process. With the characteristics of the same learning style, the teacher can focus on one learning style and will certainly make it easier to develop a learning medium.

From the problems faced by teachers in the Digital Communication and Simulation subjects, it was concluded that the media used by the teacher was still not able to accommodate students' learning styles. This is because the media used is not based on students' learning style preferences in the classroom at that time. With the reason that it is not easy to identify students' learning styles appropriately. In general, teachers have difficulty in identifying student learning styles and only certain teachers can identify students' learning styles in this case are teachers of guidance and counseling. In addition to the large number of students, the time available to identify people's learning styles per student is very unlikely. So the teacher needs help in the form of a tool or device that is able to identify student learning styles.

Therefore, researchers feel the need to develop a tool / tool can later be used to identify the learning style of students, who are then able to take a decision in determining the most suitable media to be applied to

learning. The results of these decisions will be a reference for teachers in the form of recommendations for creating a learning medium. With the identification of students 'learning styles, it is expected that the teacher is able to develop various kinds of learning media that are appropriate to students' learning styles so that learning objectives can be achieved.

METHOD

Based on the stated research objectives, researchers want to produce a valid, practical and effective application product so researchers use suitable methods to create new products, create products and test the effectiveness of these products. For this reason, researchers use the Research and Development approach or commonly known as Research and Development (R & D). Research and development methods are research methods that are used to produce new product designs, test the effectiveness of existing products, and develop and create new products (Sugiyono, 2013).

There are many development models that can be used in research and development such as the Borg and Gall model with ten steps of research, the 4D (Define, Design, Development and Dissemination) model of Thiagarajan, the ADDIE model (Analysis, Design, Development, Implementation and Evaluation) which introduced by Robert Maribe Branch and PPE (Planning, Production, and Evaluation) models from Richey and Klein. From various existing research and development models, researchers will use research and development models from Borg and Gall.

In this research and development, the trial will be carried out at SMK Negeri 1 Pangkalpinang. Before making a product, it will first be validated on the product design that will be made by the mentor. If a weakness is found, a product design will be revised, which is then followed by the manufacture of the product.

After the product is made, it will be conducted a limited trial (preliminary field testing) of the product that has been made. This limited trial will be conducted by the teacher, to find out about weaknesses, and continue with revisions. Then proceed with the main field trial (main field testing). The main field trial was conducted by teachers and students at SMK Negeri 1 Pangkalpinang by using 10-30 trial subjects. If a weakness is found, a revision is made before the next trial.

After a revision of all weaknesses and input, it was followed by the next trial phase, namely operational field testing (operational field testing). This operational field trial was conducted by students, involving almost all students of class X of SMK Negeri 1 Pangkalpinang which ranged around 200 students. The following is the formula for data analysis:

2.1 Validity Analysis

The results of questionnaire validation on application development will get validation results on all aspects assessed. Application validity is determined by drawing conclusions from the responses given by the validator to the statements displayed in the questionnaire. The formula used is Aiken's V, which is based on the results of the assessment of the expert panel as many as n people on an item regarding the extent to which the item represents the construct. The formulas used are as follows:

$$V = \sum s/[n(c-1)] \quad (1)$$

Information:
V = index of validity
s = r - lo
lo = lowest validity rating
c = highest validity rating
r = number given by a researcher
n = number of assessors

Data values for the range ≥ 0.60 can be interpreted as a fairly high coefficient, in this case the validity is categorized as "valid". If the validity value is <0.60 then it is categorized as "invalid".

2.2 Analysis of Practicality and Effectiveness

Practicality and effectiveness analysis is carried out by the teacher and students by giving a questionnaire to the application used. Practicality measurement in this instrument uses a Likert scale which consists of 4 alternative answers, namely very good value 4, good value 3, less good value 2 and very less valuable 1. Giving practicality value by adding and calculating how many percentages of practice with the formula:

$$\text{Nilai Akhir} = \frac{\sum Skor\ yang\ diperoleh}{\sum Skor\ Maksimum} x100\% \quad (2)$$

Table 1: Practical level category

No	Achievement Level (%)	Category
1	81-100	Very practical
2	61-80	Practical
3	41-60	Pretty practical
4	21-40	Less practical
5	0-20	Not practical

If the conclusion of the results of the teacher and student questionnaire is positive, then it can be interpreted that the application under study can be said to be Practical, but if the negative stated value in other words is Less Practical or Practical, then the application will be corrected until Practical or Very Practical .

Table 2: Effectiveness level category

No	Achievement Level (%)	Category
1	81-100	Very well
2	61-80	Well
3	41-60	Enough
4	21-40	Less
5	0-20	Very less

If the conclusions of the results of the teacher questionnaire and students state the results 60 or above or with the category of Good and Very Good, then it can be interpreted that the application studied can be said to be Effective, but if the value states less than 60 in other words Less Effective or Ineffective, it will improvements from the application to reach the Effective or Very Effective category.

RESULT AND DISCUSSION

Based on the analysis that has been carried out, the development of expert systems to determine learning media suitable for students through identification of learning styles can be seen that the media developed are valid, practical and effective so that they are suitable for use in determining learning media suitable for students. This is evidenced by the overall validity value of 0.89 with a valid interpretation, practicality value of 82.96 with a practical interpretation and effectiveness test value of 83.188 with effective interpretation.

This development is carried out because there is no expert system to know the learning media that is suitable for students, while the teacher has difficulty in matching learning strategies and learning media with student characteristics. Through the development of this expert system, it is expected to help the teacher in determining the right learning media.

The development procedure used in this study is the Borg and Gall development model, for more details can be seen in the following description: 1) Research and Information Colletion (research and data collection). In the research and information colletion step or research and data collection, there are several activities including needs analysis, literature study / literature study, small scale research and standard reports according to needs. In conducting a needs analysis there are several things that must be considered related to the importance of product development, including the availability of competent human resources and the time needed. Literature studies or literature studies are carried out to collect information on other research findings related to planned product development. And small-scale research is needed to find out things related to the product being developed. 2) Planning (planning), in this planning step the writer draws up a research plan starting from the skills needed to carry out research, formulating the objectives to be achieved, making product designs and research steps, and conducting product testing. 3) Develop Preliminary Form of Product (development of the initial product draft). The next step to Develop Preliminary Form of Product or the development of the initial product draft is to determine the product design that will be developed. Then determine the need for facilities and infrastructure during the study. Followed by determining the stages of testing and the parties involved in the study. At this stage the researcher formulates what is needed and the researcher tests the relevant parties such as: validators, practitioners and students as users.

The next step is Preliminary Field Testing (initial field trial). The Preliminary Field Testing research step is a limited trial on the first time in the field. This trial is to test the product design that is done in a limited way both in terms of substance and parties involved. This trial involves a range of 3-6 trial subjects (teachers) which will produce a level of validity of the product being developed. During the trial observations, interviews and questionnaires were held. Collecting data with questionnaires and observations which are then analyzed. This stage is carried out through interviews and observations to the object of

research. The fifth step is Play Product Revision (revised trial results) The next step is Main Product Revision or revision of the results of the trial which is a product improvement (design) based on the initial field trial. In this step the improvement of the initial product is carried out more to qualitative improvement, and improvements are made in an internal improvement.

The next step is Main Field Testing (main product field test). The Main Field Testing step, also known as the main product field test, is a wider trial of the product. In this step product trials include testing the effectiveness of product design to obtain results in the form of effective designs. The trial was conducted involving 32 trial subjects (students) who came from the population but not the research sample. Collecting data from the trial results on the level of effectiveness before using and after using the product in the form of quantitative data through a questionnaire that has been distributed. Data collection results that will be compared are data before product use with data after product use. And the results obtained will be used to repair the next product.The seventh step is Operational Product Revision (product revision). The next step is Operational Product Revision is a product revision based on the results of the main product field test. In this step the product enhancements to strengthen the product to be developed because the test subjects are broader and varied. This product revision stage can be skipped if the main product has a good trial result in the field test, so the results of the trial conclude that there is no need for revision. Thus the research can be immediately proceed to the next stage, namely Operational Field Testing.

The eighth step is Operational Field Testing (wide scale field testing / feasibility test). In the Operational Field Testing step, it is carried out on a larger scale. This test is a product feasibility test to determine the level of effectiveness and practicality of the product being developed. The test was conducted by involving as many as 200 test subjects, namely class X students who were the research sample. Collecting test data through questionnaires and observations which are then analyzed. If there are still deficiencies, the product will go through a revision of the final product or Final Product Revision.

The nineth step is Final Product Revision (final product revision). The next step is Final Product Revision or revision of the final product which is an improvement to the product being developed. This improvement step is deemed necessary in order to increase the effectiveness and practicality of the product being developed so that the results can be accounted for. The results of this revision will have reliable "generalization" values. The revision is a final improvement based on input and analysis results from Operational Field Testing or wide scale field trials.

The last step is Disemination and Implementation (Dissemination and implementation). The final step of the Borg and Gall research and development model is Disemination and Implementation. Activities at this stage are conveying research products to professional forums in the form of journals. Another activity is the implementation of products to the world of education. Products can be distributed both commercially and non-commercially to be used by the public in the world of education in particular. Distribution can be done after going through quality control and still must be monitored for product use in order to obtain inputs that can later be used to improve product quality.

CONCLUSIONS

Based on the results of research and development of expert systems in determining learning media through identification of learning styles, it can be concluded that:

1. Expert system to identify student learning styles in order to assist teachers in developing learning media successfully developed, which is produced in the form of applications.
2. The expert system that has been developed has been validally used in identifying student learning styles.
3. The expert system developed has been practically used in identifying student learning styles.
4. The expert system developed has been effectively used in identifying student learning styles.

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