

EXAMPLE-BASED LEARNING FOR VOCATIONAL EDUCATION: ADOPTED FROM BALINESE HEURISTICS LEARNING

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Abstract


Vocational education has a very strategic role. Graduates produced are equipped with the competence to open new job opportunities or at least ready to enter the workforce. Therefore, vocational education development, such as training facilities, teacher development, and learning process improvement, must be intensified. This study tries to develop an example-based learning model for vocational education adopted from the learning model on cultural activities that surround Balinese people's daily life. A three-stage prototyping method was used: preliminary research, prototyping stage, and assessment stage. The syntax of example-based learning models consists of six phases: (1) conveying goals and motivating students, (2) organizing students into study groups and distributing worksheets, (3) guiding learning groups to do analogies, (4) drawing conclusions, (5) doing evaluation, and (6) giving awards. The social system that occurs is active students collaborate under the principle of democracy, while the teacher's role as a facilitator, counselor or consultant, and an adequate source of information becomes a support system. The learning model developed has been tested in small classes. The expert assessment provides content validity of 0.75 and the consistency coefficient of 0.78. The model's practicality from the teacher reaches 82% and 73% of students. During the trial, the new learning model's effectiveness reached 74%, while the efficiency was only 72%. These findings indicate that the learning model is feasible to be implemented with several recommendations, including the addition of a heuristic approach to work backward and create a hierarchy of similarity levels of examples and tasks in analogy.


Keywords: *example-based learning, cooperative learning, heuristic, analogy, prototyping*

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INTRODUCTION

If the state wants to achieve a competitive advantage through its massive workforce, there is no alternative to change human resources into human resources with the proper implementation of vocational education and training (Newaz, Faruquee, & Farha, 2013). Vocational education is intended to develop skills competencies needed in the world of work (European Centre for the Development of Vocational Training (Cedefop), 2017; Oliver, 2010). Business and industry require workers who are ready to use to support the progress of their business. Very large efficiency is obtained if the labor needed by the business and industry is ready to work. The company no longer needs to issue a budget to train new workers.

Vocational education is not only crucial in providing employment opportunities for individuals but also helps in increasing company productivity (Agrawal, 2013). Qualified graduates who become workers in the company actively support the progress of the company. Innovations born of vocational education can be used as superior products by companies. A good academic climate evokes work motivation among educators and learning motivation among students. High motivation from both parties will foster creativity to produce useful products.

Vocational education is recognized as a driving force that is vital for socio-economic growth and the technological development of nations (Agrawal, 2013). Vocational education produces human resources who master knowledge and skills. Skills and knowledge are the engines of economic growth and social development of any country (Goel, 2009). Various programs offered by vocational education, such as computers, electronics, automotive, and machinery are very spurring technological developments that are needed by the country. Young people have the potential to become developers or at least as technology operators. Agility supported by intelligence possessed by young people has the potential to be honed to create products or at least modify technology products. The skills possessed and the products will have economic value that is beneficial to themselves and others through the company.

The alignment of vocational education programs and the needs of workers in the busi-

ness world must be maintained. However, in reality, this is not always the case because both have dynamics of interests that are not always the same (PH, 2013). Many complaints come from graduate users because of their newly appointed workforce lack of skills at work (Bialik, Bogan, Fadel, & Horvathova, 2015). The availability of learning facilities, quantity and quality of teaching staff, and cooperation with companies or other users of graduates must be sought. The learning process must take place dynamically, not monotonously so that it can still align itself with the development of the outside world.

Learning facilities are generally sufficient because they are supported by the government or in collaboration with companies. Teachers are also generally adequate because they can work with other agencies. The effort that still needs to be done is the development of learning models. Some contemporary vocational education reformers find that the specificity of vocational education is in the competencies produced (Moodie, 2002). Vocational education requires a learning model that can produce competencies or expertise that are relevant to the needs of the workforce and able to develop according to change. For this reason, graduates not only have expertise but are also able to learn what to do (Bialik et al., 2015; Moodie, 2002). Thus, they no longer need to take part in training, which certainly requires energy, time, and costs.

The learning model developed for vocational education is still attempted to be in the frame of cooperative learning. In learning, small groups are formed, so that individuals can work together to improve productivity and achievement, both groups and individuals (Johnson & Johnson, 1991; Slavin, 2005). All students in the group must be involved in learning, both to gather information, analyze information, conduct experiments, observe and draw conclusions. If there are individuals in the group who do not feel involved or do not know how they contribute and play a role in the group, then they will not truly devote themselves to achieving goals (Sharan, 1999).

Cooperative learning is developed because educators are aware of the negative influence of competition in the classroom (Slavin, 2005). Competition tends to make children only focus on winning. Children can win even with poor performance because their

competitors have worse performance (Moodie, 2002). This condition is not favorable for achievement development. In addition, the desire to win the competition can only make the child nullify everything, even if it is detrimental to his development. To succeed in education, in a profession, and in living in a children's community, it is necessary to collaborate with colleagues. Cooperative learning, in this case, besides being able to improve learning achievement, also has several positive consequences, including developing intergroup relationships, acceptance of friends who are weak in the academic field, and increasing self-esteem (Slavin, 2005).

Education has a mission to preserve, develop, and utilize cultural heritage (Ministry of Education and Culture of Republic of Indonesia, 2015). Aside from being a material that must be studied, culture is sought to enter various school activities, including learning. The learning model is developed by paying attention to the elements of local culture to develop a character-based curriculum by adopting local wisdom. The hope is to make students comfortable learning because they feel in their own cultural environment. Besides, local area needs are easier to detect so that graduate competencies can be adjusted. Innovative learning that involves a learning community that supports the surrounding environment is able to design more effective collaborations (Squire, MaKinster, Barnett, Luehmann, & Barab, 2003).

The inclusion of cultural elements into the curriculum has been widely carried out (Lipka, Sharp, Brenner, Yanez, & Sharp, 2005; Reyhner, Gilbert, & Lockard, 2011). The selection of learning strategies also needs to consider the role of culture (Young, 2014). Especially for science education, the involvement of cultural elements in learning provides many benefits (Bang & Medin, 2010). Due to this fact, the involvement of cultural elements in vocational education is considered to provide many benefits. Students will feel comfortable learning because they are familiar with the local culture in the learning process. In addition, students are better able to see the competencies needed by the surrounding community, so that earlier they can prepare themselves to master these competencies. Thus, the hope that culture-based education gives pleasure and contributes to the overall sense of one's

well-being can be realized (National Centre of Expertise for Cultural Education and Amateur Arts (LKCA), 2017).

This study tries to develop an example-based learning model for vocational education adopted from an informal learning model of Balinese people. The effort to adopt culture-based learning is made because the informal learning model has been proven to be able to teach various skills from one generation to the next. Reyhner et al. (2011) stated that education must be sought to be in a compatible culture and a supportive environment because children's education must include social, emotional, and ethical competencies, as well as academic priorities. Students feel familiar because they are used to doing culture in their daily social life. Students will also not be deprived of their culture because both in society and in school, they always interact in a cultural context. The adoption of such learning models for vocational education can accelerate the integration of students, either in professional life or in the community, where they interact with others in daily life.

RESEARCH METHOD

The product developed from this development research is an example-based learning model. The development uses a three-stage approach, namely preliminary research, prototyping stage, and assessment stage (Plomp & Nieveen, 2007). Preliminary research was carried out through a review of the literature, observations on cultural activities, and interviews with community leaders and actors in cultural activities. The results obtained were the framework or design of the learning model. The design was evaluated formatively by learning experts. If the design had been declared valid, then it was proceeded to the prototype stage, while if there were still deficiencies, then the revision was made valid.

If the design was valid, it then proceeded with the development of the prototype. The prototype contains syntax, social system, reaction system, support system, and instructional effects as well as expected nurturant effects. Prototype development took place iteratively. The initial prototype was evaluated formatively to get information about the quality of the prototype. If formative evaluation stated that the prototype is feasible, then the develop-

ment continued to the assessment or evaluation step. If there were still parts that were lacking or wrong, then a revision was made. The revised results were evaluated formatively again until declared feasible. If the model had been declared feasible, an assessment stage was performed to assess the performance of the model.

The assessment stage was done by testing the model in a real class with limited students on subjects of basic work for mechanical engineering. The parameters used to assess the model are validity, consistency, practicality, efficiency, and effectiveness (Nieveen & Plomp, 2007). Experts assessed content validity and consistency of the learning models. Content validity was analyzed by the Gregory formula (Gregory, 2000), while the consistency of the model was analyzed by the Ebel formula (Ebel, 1951). Furthermore, the practicality of the model was assessed by either the teacher or students using user acceptance testing. Finally, the efficiency of the model was assessed based on the time needed to achieve competence, and the effectiveness of the model was assessed based on the competencies achieved by students.

RESULTS AND DISCUSSION

Preliminary research found that Balinese social life is full of mutual cooperation activities. Mutual cooperation is done both to help fellow community members and to do public works for the benefit of all community members. Mutual assistance activities involve community members from various backgrounds, both in terms of age, experience, and skills. During mutual activities, the informal learning process takes place. Some skilled community members will teach members of the community who are not yet skilled or even newly involved. Culture-based learning, as previously mentioned, has been proven to be able to teach various skills from one generation to the next.

Learning takes place cooperatively. A senior citizen who has become an expert in one area, called the teacher, accompanies some juniors called students. At the beginning of the activity, the teacher gives an example of the product to be produced. The product is placed in the middle of the students. The teacher also put some products that have not finished yet that must be continued. Students observe and

ask the teacher what needs to be asked. Then, the students, in each way, try to make products according to the examples given. Some continue the products that have not been finished, and some are starting from the beginning to make products. They work according to the heuristic strategy, which is rules of thumb for making progress on challenging problems (Polya, 1973). The method applied is an analogy, namely a cognitive mechanism, which allows the transfer of knowledge and inferences across different concepts or contexts (Boteanu & Chernova, 2015; Gentner, 1998).

Cooperatively, students look at examples and identify existing concepts. In groups, students discuss and complement each other to understand the concept. Next, they try to apply these concepts to create similar products or solve similar problems. Even though they are in groups, concepts are understood by students in a heuristic manner with their respective procedures. In the group, there is also agreement about the concept. However, the procedure for understanding the concept varies according to the wishes and style of each student. Conditions like this make their understanding more optimal and more contextual. The teacher only facilitates learning while observing the learning process.

During the learning process, the evaluation also takes place. Evaluation is carried out without instruments; it is carried out only based on observations of the way it works and the products produced. If the results obtained by the students are good, then the teacher gives verbal feedback, for example, good, suitable, or quite talented. Conversely, if students make mistakes in the way they work or products that do not meet the requirements, the teacher gives remedial advice or work instructions. After that, the students continue their work with the group. There is no specific time for evaluating. The evaluation takes place sporadically during the work process, once or twice, depending on the progress of student learning. Thus, the evaluation is only formative evaluation.

The learning model above was adopted for vocational education designed in the form of an example-based learning model. Learning is arranged in cooperative settings by the process of analogy as the main activity. Cooperative models are chosen with very effective considerations to improve learning achievement. The almost always use of cooperative learning

improves affective outcomes (Slavin, 2010). A meta-analysis of 164 studies that examined eight cooperative learning methods found that the eight cooperative learning models had a positive influence on learning achievement (Johnson, Johnson, & Stanne, 2000). The analogy process is maintained because it is able to help the teacher to provide a better explanation (Forišek & Steinová, 2012). In addition, the analogy is considered capable of helping students to understand invisible concepts (Genç, 2013). Therefore, the application of concepts learned is much faster.

Referring to the learning model elements of Joyce, Weil, and Calhoun (Joyce, Weill, & Calhoun, 2009), the example-based learning model contains syntax, social systems, reaction principles, support systems, as well as the impact of learning and the accompanying effects. The syntax is a sequence of activities in learning, namely the activity of teacher teaching and student learning activities. The social system includes the relationship between students and teachers and their respective roles. The reaction principle explains how the teacher views and responds to students about what is being done. The support system is the requirements and support needed so that learning can take place optimally. The instructional effect is the direct effect of the model resulting from learning content and activities, while the nurturant effect is the indirect or implied effect of the model derived from the experience generated by the model.

The syntax of example-based learning models consists of six phases, namely: (1) conveying goals and motivating students, (2) organizing students into study groups and distributing worksheets, (3) guiding the learning groups to do analogies, (4) drawing conclusions, (5) doing evaluation, and (6) giving awards. Cooperative learning groups consist of three to five students. The worksheet contains examples of problems and their solutions and tasks that students must complete with analogies from the example. The analogy is made by understanding the concepts in the examples and identifying concepts in the task, then modifying the concepts in the task based on the concepts in the examples to get the solution. Evaluation is done using performance assessments.

The social system that occurs in learning is that students actively cooperate, help, and

share among members of the group with the principle of democracy under the supervision of the teacher. The principle of the reaction that occurs is that the teacher acts as a facilitator and sometimes as a counselor or consultant. Student activities are driven by examples and assignments given by the teacher. The teacher guides the group experience to identify concepts and apply them to different situations. The support system needed in learning is an adequate source of information, both stored in the library and accessible online. Job sheets guide the use of relevant information systems and expand access through connections in learning plans. The instructional impact that occurs is group management in carrying out the tasks contained in the job sheet, insight to construct knowledge, and self-discipline in collaborating. The accompanying impact that can arise from the learning model is personal responsibility, respect for others, and the formation of a mutual cooperation culture.

Validity test by three experts analyzed quantitatively using the Gregory formula resulted in a coefficient of content validity (CV) of 0.75. The three experts also gave a qualitative assessment, which stated that the model of example-based learning was appropriate for vocational education. The cooperative model chosen is considered very positive to foster cooperation, responsibility, tolerance, and appreciation. The cultural approach is considered positive to introduce culture to students. The recommendations given are, among others, to provide more opportunities for students to do heuristic activities, for example, working backward.

Three experts assessed the consistency of the learning model. The assessment results were analyzed by the Ebel formula and gave a consistency coefficient of 0.78. These results indicate that the consistency of the model is sufficient. The effect of applying the learning model at one time is not much different from the application of the model at another time. Some variables that can affect the implementation of learning, such as the condition of students, the condition of the classroom environment, or other variables have no effect on the application of the developed learning model. Thus, the teacher is no longer burdened with a heavy task to control the learning situation.

The practicality test by the teacher, both the implementing teacher and the observer

teacher, gave the practicality value of the learning model of 82%. On the other hand, students involved in the trial assessed that the practicality of the learning model reached 73%. These results indicate that the practicality of the example-based learning model developed is adequate. An important note given by the teacher is that there needs to be a hierarchy of levels of similarity between examples and assignments. This note is given for the consideration that in general, the more features are shared, the better the analogy (Glynn, 2008). At the beginning of learning, the level of similarity between examples and assignments is highest. Next, slowly, the level of similarity is reduced. One day students are expected to complete the task without the presence of an example. Reducing the level of similarity between examples and assignments must consider the conditions of students. The recommendation of the majority of students requires teacher involvement in facilitating learning.

During the trial, the average student learning completeness had reached 74%. Minimum learning completeness is achieved by an average of 72% of students at the end of learning. That is, the effectiveness of the learning model has only reached 74%, while efficiency has only reached 72%. Both the effectiveness and efficiency of learning models still need improvement efforts. This result is certainly not satisfactory, but it is good enough as a first step. Various improvements are still necessary and can be done to improve student learning completeness. One of the obvious obstacles to observation and justified by teachers is that our students are not familiar with the learning process that demands student activity. Teachers are still required to provide more information, not just become facilitators.

Teacher and student perceptions are very positive towards example-based learning models for vocational education. Students feel familiar because they are accustomed to doing mutual cooperation activities in their daily social life. Thus, other goals of vocational education can be achieved, namely helping to get acquainted with the codes of social values, cultural integration through professional socialization, and the creation of behavior, which is professional deontology (Mortaki, 2012). Students will also not be deprived of their culture because both in society and in school, they always interact in a cultural context. Learning

also becomes more meaningful because social and cultural values are encouraged and supported through the use of context or personal recognition (Derderian-Aghajanian, 2010).

Example-based learning was adopted using an analogy heuristic strategy that departed from the example. An example-based heuristic strategy has been tested for its benefits in mathematics learning, among others, reviewed by Novotná, Eisenmann, Příbyl, Ondrušová, and Břehovský (2014), Reiss and Renkl (2002), and Tandiseru (2015). The adoption of local culture in the model can increase appreciation and appreciation for the noble values of local culture. Learning this way contributes to knowledge transfer, personal development and participation in society, makes students aware of aesthetics and ethics to express their feelings and give meaning, and helps them find ways of learning and communicating in their own way, thus complementing the domain of knowledge and disciplines other (Bang & Medin, 2010). These conditions can accelerate the achievement of the objectives of vocational education, namely, to foster the integration of students in professional life (Mortaki, 2012).

CONCLUSION

An example-based learning model for vocational education has been successfully developed. The learning model is declared feasible for vocational education, with the addition of a heuristic strategy working backward. The empirical test in the small class found that the practicality of the model is good.

An important recommendation from the teacher is that there needs to be a hierarchy of levels of similarity between examples and assignments. As a first step, the learning model is good enough but still needs improvement efforts.

Teachers and students perceive that the example-based learning model is suitable for vocational education that emphasizes skills development. The heuristic strategy can help students to construct their own knowledge and skills. Student collaboration with students and students with teachers occurs in warm situations because every day, they are familiar with mutual cooperation activities. Students are helped to get acquainted with socio-cultural values, so students are not deprived of their culture. In addition to contributing to the trans-

fer of knowledge and skills, the learning model developed also contributes to personal development and participation in society. All of this helps students to give meaning to their knowledge and skills so that they are useful for themselves, the workplace, and society.

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