The Design of Collaborative Learning for Teaching Physics in Vocational Secondary School

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Abstract. Vocational secondary school (Sekolah Menengah Kejuruan or SMK) is a vocational education that is based on the principle of human resource investment (human capital investment) referring to the quality of education and productivity to compete in the global job market. Therefore, vocational education relates directly to business world/industry which fulfills the needs of the skilled worker. According to the results of some researches, the work ethics of vocational graduates are still unsatisfying. Most of them are less able to perform their works, to adapt to the changes and development of technology and science, to be retrained, to develop themselves, to collaborate, and to argue. Meanwhile, the employers in the world of work and industries require their employees to have abilities to think creatively and working collaboratively. In addition, the students' abilities to adapt to the technology in working environment are greatly influenced by the learning process in their schools, especially in science learning. The process of science learning which can help the students to think and act scientifically should be implemented by teachers using a learning approach which is appropriate to the students' need and the material taught to the students. To master technology and industry needs science mastery. Physics, as a part of science, has an important role in the development of technology since the products of technology strongly support further development of science. In order to develop the abilities to think critically and working collaboratively, education should be given to the students through the learning process using learning model which refers to a collaborative group discussion system called Collaborative Learning. Moreover, Collaborative learning for teaching Physics in vocational secondary school should be designed in such a way that the goal of teaching and learning can be achieved. Collaborative Learning is advantageous to improve the students' creative thinking and collaborative working.

1. introduction

Vocational education plays an important role in creating qualified human resources. Accordingly, its education should be oriented to improve the quality of human resources so that it can fulfill the global needs of technology development and international market competition. The needs of improving human resource quality through vocational secondary school are expected to make the students be able to compete in the era of globalization. Vocational education is more suitable for Indonesian students to produce graduates who are ready to work and become a middle-level skilled worker. The development

of vocational education is oriented towards the fulfillment of job market demand in Indonesia, which refers to the principle of demand driven.

On the other hand, there are some problems related to the quality of vocational graduates. Some results of studies and researchers reveal that the work ethics of vocational graduates are still not satisfying. Most of them are less able to perform their works, to adapt to the changes and development of technology and science, to be retrained, to develop themselves, to collaborate, and to argue. This fact surely raises concerns that vocational graduates can be defeated by foreign workers in Indonesia (Ismayati, 2009; Ratnata, 2010). In general, employers in the world of work/industry require their employees to have the ability to think creatively and work in collaboration.

Based on the Guidelines of the Vocational Guidance Program in 2012, that the government's top priority in the development of education in 2009-2014 is "improving the access of education which is qualified, affordable, relevant, and efficient for the enhancement of public welfare, independence, nobility of character, and a strong national character. The development of education is to achieve economic growth supported by the alignment of the availability of trained personnel and the ability to create jobs or entrepreneurship and meet the challenges of worker requirements.

The government launched a program of "Yes, SMK Can" by developing skill program which is relevant to job market needs in the business/industry. This skill program aims to enhance the relevance of the program to the needs of vocational skills in the world of work and to create the link and match between education and the world of work.

It is important to know that to master the technology need the mastery of science and industry, and Physics as a part of science plays a vital role in the development of technology; because it strongly supports the development of technological products for further science (Poedjiadi, 2005). Teaching science contributes significantly to the formation of graduates' performance in primary and secondary education and provides students with the prerequisite knowledge to learn in further education.

In fact, students' science knowledge in further education is still low as a result of the learning process which only teaches facts instead of scientific methods (Karhami, 1997). In line with this statement, several students and Physics teachers in SMK of Technology & Industry (Ismayati, 2009) state that students are generally less interested and motivated in learning Physics so that the students' average learning outcomes are low. This is due to some factors that are: 1) the teacher presents Physics material using the same and monotonous method such as giving explanation, questioning and answering, as well as doing assignments, 2) the learning activities are "teacher-centered" and do not provide opportunities for students to develop their creativity and critical thinking. In other words, students still become the object.

In Physics learning, students are required to use the power of reason to enable a way of what to think and how their thinking processes are, through the learning methods of inquiry, discovery, collaborative, and other methods to teach students to think critically. According to Poedjiadi (2005), students, in studying science, are exposed to a variety of facts, and then develop the exploration of the material being studied and put forward predictions. Furthermore, they, with the development of their cognitive, perform experiments to learn a concept through their experiments or verify a concept that has been presented by the teacher. This science learning process teaches students to think and act scientifically so that it should be practiced by teachers through learning approach which is appropriate to the needs of the material being taught and the students' needs.

Degeng (1998) states that the improvement of teaching quality is based on not only rational studies but also empirical studies. Related to the experience of teaching Physics at the vocational secondary school expressed by Ismayati (2009), it is proved that students in vocational secondary school generally prefer to learn Physics carried out by discussion and group cooperation using appropriate learning media.

Vocational education purposes to prepare students for entering the working world. Today the leaders of business/industry generally require their employees to have the ability to work collaboratively in order to achieve the success of its business (Asrori, 2001; Asia Bizz Technology, 2000). For the development of the ability to work collaboratively, the learning process needs to be

developed. According to Schrage (in Malek, 2004), collaborative learning activity exceeds cooperative activities because it involves the incorporation of the findings and the results obtained from the new learning. By having collaborative learning activities, communicative skills will indirectly be learned by the students.

Collaborative learning has certain advantages that are to teach students not only to work in collaboration but also improve students' skills of critical thinking. According to Sazally (2003) and Panitz (1996), collaborative learning is a method which aims to improve critical thinking skills. Its main value lies in the development of all knowledge and ideas through dialogue with friends, comments posting, discussion, cooperation, and conceptualization. Its main characteristic is the presence of an active interaction by the exchange of ideas that leads to individual learning (through a group process), peer learning and group learning.

To develop the ability to work in collaboration, students must be trained and nurtured by school education through the process of learning using learning models which refer to a group discussion system which is collaborative among friends called Collaborative Learning.

2. Collaborative Learning

Collaborative learning was introduced by George Jardine, a professor of logic and philosophy at the University of Glasgow (Galliet, 1994). Jardine devised a method of learning which was called as peer-assessment to help in preparing students learning to participate in communities in the UK. Nowadays, collaborative learning is widely used in the education community, as well as in Indonesia.

Collaborative learning creates an environment that can revive and enrich the learning process. Placing the interactive partner into an educational system would create a more realistic social context; thereby it can enhance the system effectiveness. This kind of environment will be useful to maintain student interest and provide a natural learning habitat (Kumar, 1996).

Collaborative learning has many advantages, especially for students of vocational secondary school which expect their students to have great knowledge and insight. Wiserma (2000) argues that if different people learn to work together in a class, then they will become better population in the world. It will be easier for them to interact positively with people who have different ideas, not just on a local scale but also on an international scale. Similarly, in the field of international business, we can see that the multinational company must cooperate in order to survive, no matter how powerful they are; educational institutions work together to make the students can have a preparation in the future. As well as the European Union would be a strong contender for the U.S. Collaborative.

3. The Definition of Collaborative Learning

Pannen, et al (2001) argues that collaboration is defined as "to work with another or others on a joint project", and collaborative means to work together as strategic alliances (intellectual appreciation of the difference). Wieserma (2000) supports the opinion that collaborative learning is a philosophy of teaching, working, building, learning, changing, and grow together. It is a philosophy that is appropriate to today's global world. Similarly, Panitz (1996) reveals that collaborative learning is a philosophy of interaction and personal lifestyle, not just a classroom technique. In any situation, where people gather in groups, collaborative learning is a way to connect with others respectfully and demonstrate the ability and contribution of the group members.

Collaborative learning is an educational approach to teaching and learning that involves groups of students to work together for resolving problems, completing a task or creating a product. Collaborative learning is based on the idea that learning is a natural social activity in which participants talk among themselves; learning process appears through the discussion (Srinivas, NICE, 1997). Similarly, Sazally (2003) argues that collaborative learning is a philosophy of learning that can be applied in various situations of interaction. It aims to achieve synergy through group and individual ideas for the group and encourages students' way of thinking that can improve critical thinking skills. Its main value lies in the development of prior knowledge and ideas through dialogue with friends,

comments, discussions, associations, and the initial conceptualization. Its main characteristic is the active interaction by the exchange of ideas that leads to individual learning (through group process), peers learning and group learning.

4. Characteristics of Collaborative Classroom

According to Tinzmann, et al (1990), collaborative classes have four common characteristics, that is: a) the knowledge shared between teachers and students, b) the authority shared between teachers and students, c) the teacher as a mediator, and d) heterogeneous students grouping.

1. The Joint Knowledge among Teachers and Students

In a collaborative classroom, science is shared knowledge. Collaborative teachers assess and develop the knowledge, personal experiences, language, strategies, and culture brought by students into the learning situation.

When students do not have the relevant experience in the learning process, students are given the opportunity to share their knowledge that the whole class will get extra knowledge. In addition, when students see that their experience and knowledge are assessed, they will be motivated to listen and learn new ways and will tend to make important connections between their own learning and learning at school so that they will be more developed.

2. Authority Joint between Teachers and Students

In a collaborative classroom, the teachers split the authority with students in ways that are very special. Collaborative teachers invite students to set learning goals on the subject matter taught, provide an appropriate choice of activities and tasks of different interests and goals of the students, and encourage students to assess their learning. The collaborative teacher encourages students to use their own knowledge, ensure that students share knowledge and learning strategies, treat each person respectfully, and focus on high-level understanding. Moreover, the collaborative teacher helps students listen to various opinions, support knowledge accompanied by evidence, involve creative and critical thinking, as well as participate in an open and meaningful dialogue.

3. Teachers as Mediators

Teachers, as learning mediators, will help students connect new information with the experiences they have in their environment, understand what they should do when they are confused, and learn the ways of learning well. The teacher role of as a mediator can maximize the students' abilities to demonstrate their responsibilities towards learning.

4. Heterogeneous Grouping Students

In a collaborative classroom, students are engaged in a scope of thinking, where every people learn from other people. Each student is given the opportunity to contribute and appreciate the contributions of other students. Thus, students, in a collaborative classroom, are not grouped based on ability, achievement, interests or other characteristics. Thereby, the students categorized as failed students in the classroom can learn from clever students. Similarly, clever students can learn from most students.

5. The Roles of Teachers and Students in Collaborative Learning

In general, the role of teachers in collaborative learning are (1) to encourage collaborative teaching in the classroom, (2) have specific objectives in a collaborative context, (3) as a facilitator, (4) as a model, and (5) to provide exercises. While the main roles of students in the learning are as collaborators and active participators. These new roles affect the processes and activities of the students before, during and after learning.

In collaborative learning, the roles of teachers and students are much related. Based on Wiserma study (2000), first, the teacher should be a guide for the students. Teachers should clearly explain the objectives of collaborative learning because collaborative learning is perhaps a new learning system for students and they may need time to get used to the new system.

Second, the teacher should explain the use of roles within the group and emphasize the positive linkages. Some group members may feel doubt for the first time but are expected, through positive relationship, to be more open-minded to that philosophy. Other members of the group have important roles, which are to guide doubt students and help them become more participative that they can get a more complete and satisfying group result. Another element that appears in the collaborative learning is the effective interpersonal communication. Effective interpersonal communication means that members of the group keep in touch on a regular basis and ensure that their communication is clear and focused enough.

6. Designing and Monitoring Learning Tasks

When teachers plan common learning tasks, for example, in order to produce a product in describing the concept, historical sequence, personal experience, and so on; student has a greater responsibility in a collaborative classroom that is to plan their own learning activities. Ideally, these plans are partly derived from the goals set by the students themselves, within the parameters set by the teacher (Tinzmann, et al, 1990). Students tend to engage in these tasks with purpose and greater interest than in a traditional classroom.

Astleitner (2001) states that self-regulated learning is very important in collaborative classes. Students learn to have responsibility for the supervision (monitoring), adjustment, self-determination of questions and asking questions between students. Monitoring is checking one's progress toward achieving the goals. Adjustments are changes made by the students, which are based on the monitoring of what they do to achieve the goal.

7. Assessment and Evaluation

Wiserma (2000) reveals the ways of student assessment through evaluation. There are two techniques that can be used to evaluate collaborative students' in the classroom, which are:

1. Group Evaluation (Inter-Co)

This technique is used for partial and final exams, as well as the encouragement of student engagement. At the beginning of the meeting, the students discuss in collaborative groups, and then a representative member of a team presents his ideas to the class and the teacher. This evaluation technique is based on the class and teacher comments. Giving the percentage of participation is done by the teacher, 10% is not too high, but this should be done in the earlier parts. It would be better if the teacher adds the percentage so that students feel more involved.

Peer evaluation should really be kept secretly to avoid bias that they can really show his feelings about the members of the group.

2. Evaluation of inter-colleague in the classroom

This technique can be used for group presentations in class (using a video or through a direct role). When the group makes a presentation to the class, the teacher could ask three or four students who are not members of the collaborative group to do a presentation to evaluate the presentation. The teacher should set the standards for the evaluation so that evaluators really understand it. For example, the teacher can ask them to evaluate the following points on a scale of 1 to 10: fluency, body language, sentence structure (grammar), vocabulary, information, confidence, teamwork. The teacher can give a table with the elements (or other elements) and enough columns to write the scores. And the most important activity is to provide justification.

Justification of the scores of the co-evaluation is very important. Students should not deviate in their assessment and base his judgment on the quality of the presentation, not the presenter.

Collaborative learning is an excellent process for students and teachers. The role of teachers in collaborative learning groups is a mentor, not as an authoritarian ruler (traditional teaching). In a collaborative group, students will feel much appreciated because students learn on their own; learn more about interpersonal/social skills; feel more engaged, useful, and confident; enjoy classes; teach each other and the teachers; become an independent student, and be better residents in this world. Teachers should always reinforce the collaborative learning process, otherwise, the student will tend to return to the cooperative learning, and just do what they can do to get good scores.

8. Interaction in Collaborative Learning

In collaborative learning, the communication goes through the form of a two-way dialogue. The main goal for teachers is to maintain dialogues between students.

According to Tinzmann, et al (1990) and Wiersema (2000), teachers who teach collaborative classes maintain high-level talks and similar interactions when the entire class gets involved in discussions. They avoid presentations commonly consist of assessment, exercises, and quizzes asking questions to which the answer is known by teachers and there is only one correct answer. In a real discussion, students talk to his friends and also to teachers, showing various angles of view, and accept question without focusing on the right and wrong aspects. Sometimes both students and teachers change their views about an idea, so the interaction in the whole group discussions reflects what happens in small groups.

Class discussion of the student in the collaborative learning affects the class tends to be crowded and noisy. But on the other hand, students need opportunities to move, speak, ask questions, etc. So Tinzmann, et al (1990) argues that the noise in a collaborative classroom running smoothly indicates that an active learning is running. However, students should be taught about the parameters they use when making a choice, where rules and standards should be emphasized since the beginning before the collaboration is performed and studied in the whole range of the school year.

Interaction among students will provide many opportunities for students to act, learn, and understand the need to work in groups; thus it helps students to understand each other. In addition to collaborative learning, students learn to work collaboratively in a team which is a new way to work for students.

9. Learning and Working in Groups

A collaborative learning system focuses on the improvement and integration of learning process and student knowledge with the help of collaborative partners. Collaborative learning can provide opportunities for students to perform learning through realistic learning context, motivation and social learning contexts (Kumar, 1996). Mann (2005) states that collaborative working or learning is a process that is supported by group members, where there is a dependency with one another to achieve an agreed goal.

The success of collaborative learning requires the implementation of student groups which are effective and appropriate. Although students generally like the idea of a group or in collaboration with others, they may have a bad experience of working together in a group so that it results in rejection from the student. But this should be solved by teacher's various ways in its management to better facilitate the learning process in the classroom. Therefore, Srinivas & NICE (1997) offer three types of groups that need to be observed and can be used in a collaborative learning process, which includes: informal groups, formal groups, and group basis.

Informal groups, which have a short lifespan of a few minutes until the class period, generally accepted quickly or taken for granted, a structure or small format and a new group members with a new class for each time, are very useful for face-to-face because this method can break the lessons into small face-to-face (mini-lectures), and can encourage quick evaluation to students' understanding.

Formal groups, which last for several days or weeks requiring larger size and composition of the group and a larger structure, have specific purposes (eg, specific tasks that must be completed), and get the same group members in the group existence.

Elementary groups, which serve a broader purpose. These groups take place fully in one semester (or even in some semesters), meet regularly, require planning in determining the size and composition of the group, personalize the task by providing support, encouragement and assistance among the members of the group that have a specific purpose (eg, a specific task to be completed), and have a constant membership

Each type of group has its own purpose, advantages, and disadvantages. Thus, a competent teacher will choose the right type of group, for the ongoing success of the learning process.

10. The Design for Collaborative Learning
In this article, the design of collaborative learning is adopted from Conductive Learning which is the result of the author's own research. Conductive Learning emphasizes more on the process and outcomes of competency-based learning, where the resulted product is more likely on the skills relevant to the job market for learners. Accordingly, the design of a Collaborative Learning has similarities with the design of Conductive Learning.

In learning Physics for students of the vocational secondary school, the material taught should be oriented to competency-based skills because individuals created are outcomes that should be ready to use. Collaborative learning is enriched by a student group discussion that can create an interactive environment in which students have greater responsibilities towards their own learning and themes. For this purpose, a proper design of teaching is necessary to be implemented in teaching Physics at vocational secondary school that is Collaborative Learning.
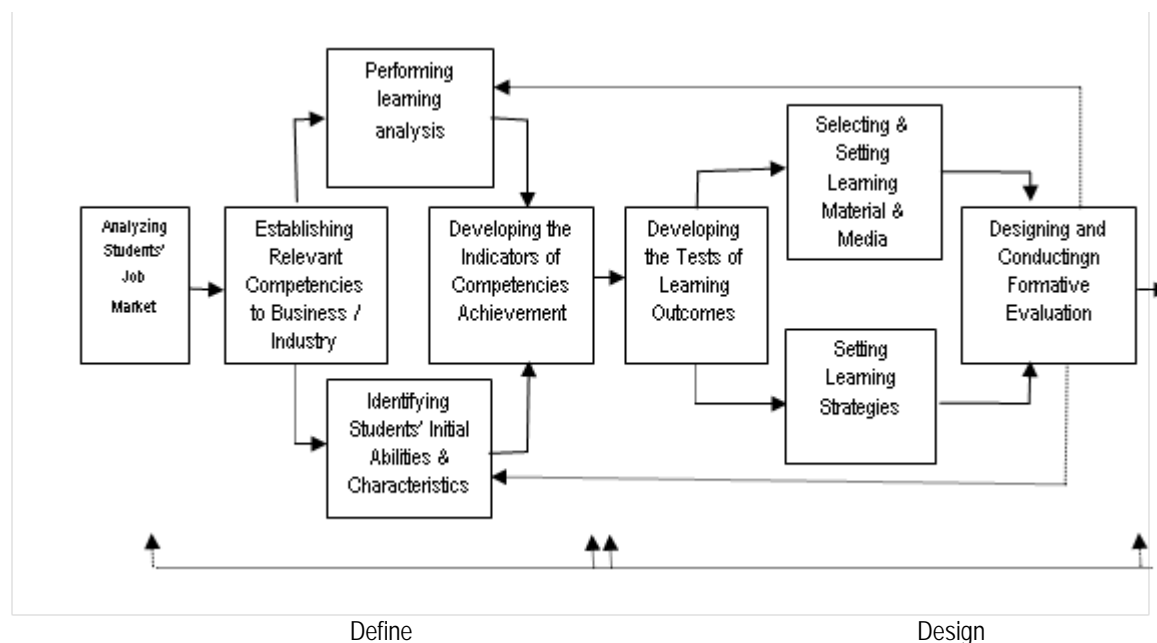
Fig 1. The Design for Collaborative Learning

11. The Steps to Designing Collaborative Learning
The steps of designing collaborative learning include define and design stages. The steps are as follows:

The Stages of Defining

The Analysis of Job Market for Students

The documentation of job type can be done by surveys, questionnaires, administrative data, or interviews with various parties related to the field of work. From the collected data, the arrangement can be carried out by organizing these types of job.

Establishing Competencies Relevant to the Business / Industry

The organized job types are analyzed generally and then more specifically analyzed in a logical and systematic arrangement. From this analysis, the job types that require specific competencies can be obtained. Furthermore, the competencies required to do these job types can be determined, so that the designer can specify the general purpose of the competencies that must be mastered by learners. In determining the learning objectives Bloom, et al (1956; 1981) classifies learning objectives into three domains that are cognitive, affective, and psychomotor.

3. Performing Learning Analysis

The learning analysis is a process describing common behaviors of competences to be specific behaviors arranged logically and systematically (Supaman, 2001). The arrangement illustrates the position of specific behaviors performed earlier than other behaviors. Other behaviors such as precondition behavior, behavior that psychologically come first or chronologically occur earlier. The analysis of this study is closely related to the behavior as the students' learning outcomes. Each analyzed material is related to the achieved behavior.

Identifying Student Initial Abilities and Characteristics

One important element in the process of developing an instructional design is to consider the student initial abilities and characteristics. This program is developed for students who will be trained, and the measurement of the teaching plan success is by the achievement level of students involved. The students' population consists of a wide range of education and different experience. It is therefore important to know the abilities and characteristics of early learners to be considered in the teaching design.

Develop Competency Achievement Indicators

The indicators of competencies achievement are characterized by behavioral changes that can be measured and include the realm of knowledge, attitudes, and skills. The indicators are defined in the operational verb which can be measured and observed so that the indicator can be used to develop evaluation instruments.

The indicators are compiled based on the basic competencies to be achieved that all indicators arranged can be used as a benchmark to rearrange the test as a result of learning. Therefore, the indicator must contain the elements that give a hint that the test to be performed can actually measure the behavior contained in the material.

To have the indicator exactly measure the existing behaviors, the formulation must consider the four elements known as ABCD:

A = Audience (students / learners)

B = Behavior (behavior that would be raised by the student after completing the lesson)

C = Condition (condition imposed on the student, or the instruments used by the student during the test. Example: the use of formulas in multiple-choice questions)

D = Degree (level of student success in achieving behavioral) success rates are indicated by the appearance of a minimum threshold of acceptable behavior. For example: In working on the test, students can correctly work on at least 80%

12. The Stages of Designing

Developing The Test of Learning Outcomes

Tests on a learning program are used to determine whether students have mastered certain competencies taught or not. The tests used are commonly grouped into two groups, namely test, and

non-test. Test instruments are used to assess cognitive abilities or skills, while non-test instruments are used to assess attitudes / effective.

Formal test is a test done in a special, separated or outside of time for learning activities. While, non-formal tests are performed at the same time with the learning activities, or executed outside the test atmosphere.

In collaborative learning, formal tests are carried out during the Mid-term test and Final test (UAS). Yet, the non-formal test can be done at the time of the group discussions. Teacher arranges the assessment format for formal and informal tests.

Setting Learning Strategies

In the implementation of collaborative learning, the strategy used is a collaborative discussion with reference to the requirements of collaborative learning. Students in one class are divided into heterogeneous groups of students, each group consisting of 4-5 students. Each member of the group of students is given the task and responsibility to maintain the integrity of their knowledge and cooperation within the group.

In collaborative learning, group discussions can be combined with other methods which are appropriate to the needs of the subject matter, for example, by simulation, demonstration, or project.

The collaborative discussion is an interaction among student, and students with teachers in order to analyze, explore, or debate certain topics or issues. Students can give their opinions on an issue. Teachers motivate and assess students' courage in giving opinions. Every opinion is accommodated without rejection.

Setting and Selecting Learning Materials and Media

When establishing a learning strategy, the designer establishes the content of the subject matter to be provided, the instruments required, and the media used in the learning process. The subject matter is analyzed to arrange the achievement indicators at an early stage which produces the behaviors required by learners. The behaviors are organized by the conceptual structure. Organizing these behaviors will result in a material study to be developed as teaching materials.

Similarly, in the selection of instructional media, the teacher must consider what media should be used so that learning can take place effectively and efficiently. This means that learning can enhance the understanding, knowledge, and skills of the students. Teachers have to be really careful in the selection of instructional media used.

Designing and Conducting Formative Evaluation

Formative evaluation in the design of teaching aims to determine and revise learning products that have been made. Formative evaluation can be defined as the process of holding information relating the improvement of the learning quality.

13. Conclusion

Collaborative learning is a definition of learning that embraces the ideology of togetherness and positive dependence between individual students in the group. Groups of students who interact collaboratively have advantages both individually and group, as both can understand each other and distribute knowledge mutually. Students who are 'weak' will get a boost from students who are regarded 'strong' in knowledge.

Some empirical researches show that students who experience collaborative learning will gain increased knowledge and significant learning outcomes. Thus, collaborative learning needs to get attention from educators, particularly in its studies which are appropriate to the subject matter taught.

Designing learning is an effort to enhance and improve the learning quality expected. Therefore, a teacher as a learning agent should be able to design a learning to achieve the desired results in accordance with the learning purposes. The design of collaborative learning for teaching Physics in vocational secondary school requires special attention to the areas of competence as the vocational curriculum has a link and match with the job world. Thus, the purposes of learning Physics must be able to support the quality of graduates in the job world.

References

[1]   Asrori. 2001. Collaborative Teamwork Learning: Suatu Model Pembelajaran untuk Mengembangkan Kemampuan Mahasiswa Bekerja secara Kolaboratif dalam Tim. BALITBANGDEPDIKNAS.http://www.depdiknas.go.id/Jurnal/40/COLLABORATIVE%20 TEAMWORK..

[2]   EBizz Asia Tecknology. 2004. Bagaimana di Indonesia?. Jurnal: eBizz Asia Technology. http://ebizzasia.com/0221-204/fokus,0221,05.htm Download 31-10-2005

[3]   Degeng. Sudana. I Nyoman. 1998. Pengorganisasian Pengajaran Berdasarkan Teori Elaborasi dan Pengaruhnya terhadap Perolehan Belajar Informasi Verbal dan Retensi. Disertasi tidak diterbitkan. Malang: Program Pasca Sarjana, Universitas Negeri Malang.

[4]   Fowler, Barbara. 2004. Critical Thinking Across the Curriculum Project. Jurnal: Longview Community College.   http://www.kcmetro.cc.mo.us/longview/ctac/definitions.htm

[5]   Ismayati, E. 2009. Pengembangan Model Pengajaran Conductive untuk Meningkatkan Kemampuan Siswa Berpikir Kritis dan Bekerja Berkolaborasi pada Pembelajaran Fisika di SMK (SMK Kelompok Teknologi dan Industri Bidang Keahlian Teknik Listrik). Disertasi tidak dipublikasikan. Universitas Negeri Malang.

[6]   Karhami, S, K. 1997. Kontribusi Pendidikan IPA dalam Pembentukan Kinerja Lulusan Sekolah: Suatu Kajian dari Kurikulum Kelompok Mata Pelajaran IPA di Pendidikan Dasar dan Menengah. Jurnal: Kajian Dikbud No. 010. Hal 22-28.

[7]   Kirschner, Paul. 2004. Design, Development, and Implementation of Electronic Learning Environments for Collaborative Learning. Jurnal: ETR & D. Vol.52, No. 3. Hal 39-46.

[8]   Malek, Zarina. A. 2004. Kemampuan Mengajar Guru: Teori, Strategi dan Perkaedahan dalam Pendidikan Komputer. Malaysia: Artikel Khusus Guru .

[9]   Moallem, Mahnaz.. An Interactive Online Course: A Collaborative Design Model. Jurnal: ETR & D. 2003. Volume 51, No. 4.

[10]   Nartani, Retno. 2005. Bagaimana Profil Lulusan SMK menurut Industri?. Info Profil. Dikmenjur. http://www.dikmenjur.freehosting.net/profil.htm

[11]   Panitz, Ted. A Definition of Collaborative vs Cooperative Learning. Jurnal: http://chiron.valdostra.edu/whuitt/col/instruct/intevm.html. 1996.

[12]   Pannen, Paulina. Dkk. 2001. Konstruktivisme dalam Pembelajaran. Ditjen Dikti: PAU.

[13]   Poedjiadi, Anna. 2005. Sains Teknologi Masyarakat. Bandung: Remaja Rosdakarya.

[14]   Sazally, A.A. Hussein. Individu dalam Organisasi. Artikel: Selangkah Di Hadapan. Institut Tadbiran Awam Negara Kampus Wilayah Utara Sungai Petani Kedah. Malaysia. http://www.geocities.com/psmintura/artikel/individu_dalam_organisasi.htm

[15]   Tinzmann, M B. et.all. What Is the Collaborative Classroom ?. Jurnal: NCREL. Oak Brook. 1990.

[16]   Wiersema, Nico. How does Collaborative Learning Actually Work in a Classroom and How do Students React to it? A Brief reflection. Jurnal: http://www.law.byu.edu/Lawyering- Skills/Section 9/Mexico City.2000.