International Journalof Eductaion Learning and Development
Vol.2, No.1, pp.68-85, March 2014
Published by European Centre for Research Training and Development UK (www.ea-journals.org)

COOPERATIVE LEARNING STAD-PJBL: MOTIVATION, THINKING SKILLS, AND LEARNING OUTCOMES OF BIOLOGY DEPARTMENT STUDENTS

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ABSTRACT: *The study on the implementation of Cooperative STAD-PjBL aimed at: (1) improving learning motivation, (2) enhancing thinking skill, and (3) accelerating achievement of students. This study was conducted by means of Classroom Action Research with qualitative approach on Learning Sources and Media course in Department of Biology Education, University of Muhammadiyah Malang. This study was conducted within 2 cycles, referring to Spiral Model by Kemmis & Taggart (1988). Lesson Study was implemented in every meeting, based on Lewis (2002), by following the stages of plan, do, and see. The result of this study showed: (1) Cooperative STAD-PjBL improved students' motivation. All components of motivation were interconnected, influencing one another, and unified. The four components contributed equally towards motivation. (2) Cooperative STAD-PjBL enhanced thinking skill. When one component of thinking skill was low, the other components were proven to be low as well. Similarly, when one component of thinking skill was high, the other components were shown to be high. All components were interconnected and contributing equally towards thinking skill. (3) Cooperative STAD-PjBL accelerated students' achievement. Students' mastery was shown to increase up to 100% at the end of Cycle II.*

KEYWORDS: *STAD, project, motivation, thinking skills, learning source and media*

INTRODUCTION

One of the ways to produce professional prospective teachers in Department of Biology Education, Faculty of Teacher Training and Education, University of Muhammadiyah Malang, Indonesia, is by requiring the students to take one compulsory course: Learning Sources and Media. In accordance with the Academic Guide 2013, University of Muhammadiyah Malang, this course is worth for 3 credits, and offered in semester 5. This course is equipped with the standard of competence in which students, after completing this course, are able to apply the principles of learning sources and media in teaching, as well as to conduct research on learning sources and media. It is expected that students are capable of utilizing learning sources in their surrounding, as well as designing, developing, or modifying various media for teaching.

Preliminary observation on this course resulted in the pictures of classroom condition, students' condition, and also the recurrent problems faced by students during teaching-learning process. The observation was conducted to tap the preliminary information on students' competence by doing on-site observation, informal structured-interview, questionnaires on learning motivation, and questionnaires on thinking skill.

The result of analysis showed: (1) the materials were considered difficult as students were not only required to comprehend theories but be skillful in designing media both in groups and individually; (2) students were not exposed to challenging assignments or cases that

incorporate problem solving, decision making, skills, and reflection; (3) students were not given any chance to work autonomously to construct their knowledge and reach their top most ability to create the real product; (4) students were not challenged to link their knowledge into the learning materials they are about to deal with; (5) students did not evaluate their learning strategies; as a result, they did not plan to keep on improving their learning styles; and (6) students were low in motivation. It was proven by the average score of motivation components: *attention* accounting for 66%, *relevance* accounting for 66%, *confidence* accounting for 68%, *satisfaction* accounting for 66%; and (7) students' thinking skill was considered low and less-developed. It was shown by the average score of thinking skill components: *self-regulation thinking* accounting for 58% (fair category), *critical thinking* accounted for 61% (fair category), and *creative thinking* accounting for 58% (fair category).

In effort to solve the above problems, by considering the characteristics of materials and students' competence, Project Based Learning (PjBL) was implemented. The main steps of PjBL include: (1) Planning, incorporating project preparation and planning; (2) Creating, offering opportunities for students to design and conduct investigation; (3) Processing, students' presentation of the result of the project and evaluation (Mahanal, 2009a; Mahanal et al., 2009). Markham (2003), The George Lucas Educational Foundation (2005), and Ministry of Education and Culture of Indonesia (2013) recommend 6 steps of PjBL, namely: (1) start with the essential question, (2) design a plan for the project, (3) create a schedule, (4) monitor the students and the progress of the project, (5) assess the outcome, and 6) evaluate the experience.

Referring to the statement of Mahanal (2009), Markham (2003), The George Lucas Educational Foundation (2005), and Ministry of Education and Culture of Indonesia (2013), there is no step showing *lecturing* and *giving reward*. In fact, it is crucial that students, prior to independent learning, be exposed to explanation from lecturers/teachers. It aims at directing students, avoiding bias, misconception, and ambiguity (Slavin, 1995; Isroah & Sumarsih, 2010). It is also necessary that *rewards* be given to the well-achieved students or groups. This is for the purpose of improving motivation and confidence that will positively affect teaching-learning activities (Slavin, 1995; Istiadi, 2005).

With regards to the above reasons, the implemented PjBL should be integrated with cooperative learning that meets the above-mentioned characteristics. The suitable type would be Student Team Achievement Divisions (STAD). STAD emphasizes various characteristics of direct learning in which students, in small groups, learn and share information

Lesson Study (LS) was implemented in every meeting, based on Lewis (2002), by following the stages of plan, do, and see. The stages were intended to improve the quality of learning. LS, according to Lewis (2002), is considered highly effective as it enables lecturers/teachers to: (1) think in details about the purpose and materials to teach; (2) ponder thoroughly about the purpose of their teaching for the sake of students' future; (3) investigate the best ways to teach by continuously learning from colleagues (LS participants); (4) learn about the contents or materials of particular subjects from colleagues as a way to upgrade knowledge; (5) develop teaching skill, both during planning and teaching; (6) sharpen teaching skill through collegial learning; and (7) develop *"the eyes to see students"*, in which by inviting observers to class, the observations on learning behavior are conducted in a more detailed and clearer manner.

Combining Classroom Action Research (CAR) and Lesson Study (LS), based on Susilo (2009), is a way to shape teaching professionalism – CAR enables lecturers/teachers to solve problems

in classroom; while LS offers the opportunity to observe how students learn. In accordance with the above background, this current study aimed at the followings: (1) improving students' learning motivation through the implementation of Cooperative Learning STAD integrated with Project Based Learning; (2) enhancing thinking skill through the implementation of Cooperative Learning STAD integrated with Project Based Learning; and (3) accelerating achievement of students through the implementation of Cooperative Learning STAD integrated with Project Based Learning. This study was conducted by means of Classroom Action Research with qualitative approach on Learning Sources and Media course in Department of Biology Education, University of Muhammadiyah Malang.

LITERATURE REVIEW

The Importance of Students' Motivation

It is important that every student is equipped with both intrinsic and extrinsic learning motivations (Woolfolk, 1995; Ryan & Deci, 2000). Motivation sets students' starting point for learning, process and learning outcomes, and mindset on learning efforts to devote that may differ from one student to another. Learning motivation triggers or directs learning activities, enhances the courage to study, builds awareness on learning journey, and helps to work continuously to reach the goal (Luthans, 1981; Brown, 2000; Shih & Gamon, 2001; Al-Tamimi & Shuib, 2009).

Motivation is an important quality that affects students' success in learning and performance (Popovich & Wongwiwatthanannukit, 2000). Students who are highly motivated have extra energies to study. Low and unstable motivation results in minimum effort to study. This affects students' performance in class and achievement (Pintrich & Groot, 1990; Hamzah & Ismail, 2009; Thosalis & Nakkula, 2012).

Universities, especially lecturers, are required to create various ways to motivate students in their learning stages (Weissman & Boning, 2003; Glynn et al., 2005). It is necessary that motivation from lecturers be given in effort to lead students to the success (Sardiman, 1992; Boekaerts, 2002; Brophy, 2004). In addition, as the students are prospective teachers, they are to be well trained to also be aware of how to motivate their future students. Some aspects of learning motivation, adapted from Keller's theory, are predominantly known as ARCS, standing for Attention, Relevance, Confidence, and Satisfaction (Keller, 1984; Keller, 1987; Keller, 2008).

The Importance of Thinking Skill

Another aspect to develop in students' learning is thinking skill (Pithers & Soden, 2000; White et al., 2011; Siregar & Sahyar; 2012). Thinking constitutes a cognitive process, which is a mental activity for gaining knowledge. Thinking process involves complex, reflective, and creative activities. Thinking skill can be developed by enriching students with meaningful experiences (Costa &Presseisen, 1985; Andrade, 1999). Thinking is a part of logic. Therefore, logical thinking correlates to thinking skill. In general, in Indonesia, logical thinking is not managed in a direct, planned, and deliberate way. This is in contrary to the fact that most lecturers are actually aware of the importance of logical thinking in learning and shaping human resources (Corebima, 2011).

Thinking skill is also known as the habit of mind, in which individual has intelligent character trait when facing problems or difficulties? It is in line with the idea that critical and intelligent attributes are not merely useful for gaining knowledge but for implementing the knowledge as

well (Costa& Presseisen, 1985; Costa, 2000; Costa & Kallick, 2000). Habit of mind is used as a response to unsolved questions and problems. In this case, it is possible that lecturers observe how students produce knowledge than just memorize knowledge (Marzano, 1992; Marzano et al., 1993; Marzano, 2000).

Marzano et al. (1993) classify habits of minds into three categories, namely: self-regulation, critical thinking, and creative thinking. Self-regulation includes: (A) being aware of self-thought, (B) making effective plans, (C) being aware of and utilizing required information sources, (D) being sensitive on feedback, and (E) evaluating the effectiveness of actions. Critical thinking covers: (F) accuracy and the search for accuracy, (G) clarity and the search for clarity, (H) openness, (I) refrain from impulsive behavior, (J) properly putting oneself in certain conditions, and (K) sensitivity and awareness on the ability of peers. Creative thinking includes: (L) ability to engage with assignments although the answers and solution do not appear yet, (M) doing an effort by devoting maximum ability and knowledge, (N) designing, utilizing, and revising self-designed evaluation standard, and (O) proposing new ways to view situations from various perspectives (Marzano, 1992; Marzano et al., 1993; Marzano, 2000). Costa & Kallick (2009) have investigated that habits of mind positively contribute to the success in studying.

Cooperative STAD-PjBL to improve Motivation, Thinking Skills, and Learning Outcomes

This current study integrated Cooperative STAD-PjBL. STAD motivated groups of students to encourage and help each other in mastering the lessons and raising awareness of the importance, the meaningfulness, and the excitement of learning (Slavin, 1995). It, eventually, was also to develop students' thinking skills and increase students' learning outcomes. In the teaching of STAD-PjBL, heterogeneous groups were formed after explaining the materials. The groups were formed with regards to students' gender, race, ethnicity and ability. The students were then expected to help each other in understanding the materials through discussion among the group members *(*Slavin, 1995; Nurhadi et al., 2004).

The main idea of STAD was to motivate students in order to support and help each other in mastering the lessons. In the case that the students wanted their teams to get reward, they had to support each other and learn the materials very well. They supported their team mates in doing their best (Slavin, 1993). They worked together and made sure themselves in understanding the lessons or teaching materials (Kindsvatter, 1996). Intensive interaction and positive interpersonal relationship among students during the learning process were able to increase motivation and provide stimulus for thinking. It surely was beneficial for the long term education, especially in achieving maximum learning outcomes. According to Munawaroh (2013), high motivation, self-confidence relating to self-thinking ability, and inquiry ability give positive influence in enhancing students' learning achievements.

STAD also affects students' thinking skills. According to Jhonson et al (1991), cooperative learning environment involves students' sense of responsibility, job division, students' interaction and communication, and mutual connection which are beneficial for each team member. Communication and interaction provide the possibility for exchanging information which helps students enhance their thinking skills and create new ideas. Lie (2002) states that thinking skill empowerment can occur because the small groups on the STAD learning consist of students with heterogeneous academic ability and background. Therefore, for the purpose of achieving successful learning process, students are indirectly required to have the willingness and skills to work together, as well as thinking skills.

PjBL is a complex task. It is based on challenging questions or problems. It involves students in designing, solving problem, making decision, or investigating activities. PjBL provides an opportunity to work autonomously within a certain period of time and eventually produces tangible products, reports or students' presentations (Thomas et al., 1999; Thomas, 2000).

PjBL supports the students' process of knowledge construction and the productive competence developments which actually appear in the forms of technical and employability skills needed in the real life (Kamdi, 2007). PjBL also requires learners to develop skills, such as collaboration and reflection (Sherman & Sherman, 2004). It helps the students to improve their self-skills, motivation, and learning outcomes (Susanti & Mochtar, 2007). Referring to the PjBL stages, this model supports thinking skill empowerment (Trowbridge et al., 2004; Wena, 2011).

The implementation of PjBL in a class increases the learning motivation and develops thinking skills (Barak, 2002; Doppelt, 2003; Yalcin et al., 2009). Those are possible to achieve because PjBL offers some advantages, namely (1) *authentic context* (goal-directed activities) which strengthens the relationship between activity and conceptual knowledge, (2) *promoting learning autonomy* (self-regulation) which develops thinking skills, (3) *collaborative learning* which enhances the understanding of conceptual and technical skills through the opportunities of mutual learning, (4) *realistic active-oriented learning in solving real problems* which contributes to the development of problem solving skills, and (5) *providing internal feedback* which sharpens thinking skills (Thomas, 2010).

In line with their research, Al-Atabi & Chin (2007), in specific, try to describe the relationship between PjBL and students' motivation. PjBL develops graduates' professionalism and effective communication skills which could be used in their prospective workplaces. The implementation of PjBL motivates students because they are required to have the ability to explain the design concept, the design process, and the constraints during the designing process. PjBL urges the students to work in teams; as a result, it encourages them to have proper communication techniques in communicating concepts & ideas, and presenting the effectively-done projects.

In addition, PjBL develops and empowers students' thinking skills (Perkin, 1992) because it contains some elements involving the activities of problem analysis, variable manipulation, designing and investigating, predicting, and interpreting investigation results in order to develop students' analytical thinking skills (Indriwati, 2007). Furthermore, PjBL is based on process, problems, and meaningful learning by integrating some knowledge concepts (Blumenfield et al., 1991; Mahanal, 2009b).

RESEARCH METHOD

This current study employed Classroom Action Research with qualitative approach. This study was conducted in two cycles of action. Each cycle consisted of two meetings which took 3 periods of lesson for each meeting (3x50 minutes). Each cycle was referred to the Spiral Model of Kemmis & Taggart (1988) which consisted of four phases namely, planning, implementing, observing, and reflecting. Lesson Study was implemented in every meeting, both in Cycle I and Cycle II, based on Lewis (2002), by following the stages of plan, do, and see.

Classroom Action Research was conducted in Department of Biology Education, University of Muhammadiyah Malang, Indonesia on Learning Sources and Media course. This study was conducted from October to November 2013. The subjects of this study were 40 students (11 male and 29 female students) in semester 5. The data, sources, and instrument of the study were presented in Table 1.

Table 1. Matrix of Types of Data, Data Sources, and Instrument the Study

Types of Data	Data Sources	Instrument
Motivation	Students' activities	ARCS motivation questionnaire (Keller, 1984, 1987, 2008)
Thinking Skill	Students' activities	Marzano thinking skill questionnaire (2000)
Learning Outcomes	1. Test result 2. Project design 3. Product	1. Test: in the form of short essay 2. Project design Assessment Sheet 3. Product Assessment Sheet

Data analysis was carried out from the beginning to the end of the data collection activities. The collected data were then processed and analyzed qualitatively. Therefore, comparative descriptive technique and critical analysis were applied. Comparative descriptive technique was used for quantitative data particularly by comparing the results of each cycle. The data were in the form of scores/questionnaire scores obtained from the first and second cycles, presented in tables and diagrams and analyzed using descriptive comparative analysis. The data could be read descriptively; therefore, critical analysis was used to reveal the weaknesses and strengths of the performance in the learning process.

FINDINGS AND DISCUSSION

Cooperative STAD-PjBL on Students' Learning Motivation

The results of preliminary observations indicated that students' learning motivation in the Department of Biology Education, University of Muhammadiyah Malang, on the Learning Source and Media course was still considered low. Students' learning motivation increased in Cycle I and Cycle II. The per cycle score percentage of the students learning motivation could be seen in Table 2 and illustrated clearly in Figure 1.

Table 2. Per Cycle Score Percentage of the Students' Learning Motivation

Learning Motivation Component	Per Cycle Score Percentage of the Students' Learning Motivation (%)			Total Improvement
	Pre-Observation	Cycle I	Cycle II	
Attention	66	80	86	20
Relevance	66	78	87	21
Self-Confidence	68	81	88	20
Satisfaction	66	79	86	20

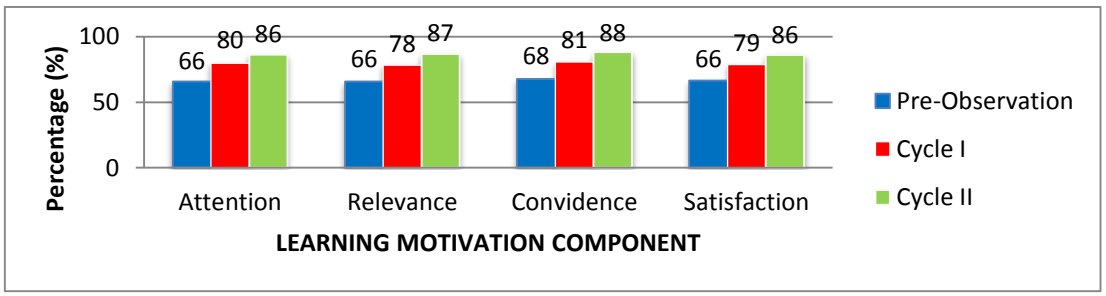

Figure 1. The Improvement of Per Cycle Score Percentage of the Students' Learning Motivation

Table 2 and Figure 1 showed some unique trends. The score percentage of each motivation component in the preliminary study was around 66-68%. Its improvement for each component in each cycle was relatively similar. Attention increased 14% in Cycle I and 6% in Cycle II; the total increase accounted for 20%. Relevance increased 12% in Cycle I and 9% in Cycle II which made the total increase 21%. Next, Confidence also increased 13% in Cycle I and 7% in Cycle II which consequently made the total increase 20%. Last, Satisfaction increased 13% in Cycle I and 7% in Cycle II, and made the total increase 20%. In conclusion, the total of score percentage of each motivation component was around 20-21%.

Based on these trends, it could be said that one of the findings of this study was that if one of the motivation component was low, then the other components would also be low. Conversely, if one of the motivation components increased, other components would also increase. In case that one of the motivation components met the criteria of excellence, the other motivation components would also meet those similar criteria. All components of motivation were interrelated, interconnected, and became a single unit of system. This was in line with Small (2000) and Ubaidullah (2011) that *ARCS* model of motivation was an interrelated and systematic model.

The four components, the ARCS model of motivation, have the same contribution to the students' motivation (Keller, 1987; Mills, 2004). Attention is a fundamental component of learning, so it is fundamental to the success in any academic task (Stroud, 2006). Gaining learners' attention by incorporating strategies that maintained curiosity and interest is essential to effective learning (Kupritz & Laszlo, 2003). Meanwhile, Driscoll (2000) and Ubaidullah (2011) state the importance of relevance component. This concept is important, considering that a research indicated that the more familiar something is, the more relevant the learners perceive it to be. Therefore, the given examples and concepts are suggested to be related to the students' experiences. Materials that met the elements of relevance were the successful motivators in learning.

Further, Driscoll (2000) explained that students' confidence appeared when they were able to complete a challenging task or work. Building and encouraging their confidence would increase their motivation. According to Mills (2004), free learning strategies, through practices and exercises, gradually built the students' self-confidence. Meanwhile, the students' motivation could last long if the learning aligned with their goals and purposes. According to Small (2000) and Ubaidullah (2011), satisfaction could be divided into three aspects that affected motivation, namely the intrinsic strengthening, extrinsic rewards, and equity.

The data in Table 2 and Figure 1 also showed that the implementation of the integrated cooperative learning STAD-PjBL could improve students' learning motivation. These research findings were certainly in line with theories and expert opinions. According to Slavin (1995), STAD could motivate students in a group to encourage and help each other in mastering the presented materials, as well as to grow awareness that learning is important, meaningful, and fun. In STAD, after the class presentation or material explanation, groups of 4-6 people were formed by considering the heterogeneity, such as gender, race, ethnicity or ability. The students helped each other in mastering the teaching materials through questioning or discussion among team members. This condition motivated the students.

PjBL is a learning model that grew learners' motivation. The motivation is expected to appear naturally in the atmosphere of learning in the class. Projects are assigned in the form of structured tasks in which students are to create interesting products based on their point of

views (Borich, 2007). Moursund et al (1997) examined a number of articles about class project which were possibly considered as a testimonial for the educators, especially about how educators used project and about their perception of its success. One advantage of PjBL is to improve motivation. Written reports on the project said much that learners became diligent in studying and they even worked overtime and harder to complete the project. Educators also reported progress on the reduction of the learners' absence and late coming. Learners reported that they were enjoying learning through projects more than others.

This study was also in line with the results of Thomas (2000) that the PjBL successfully improved academic achievement, with a deep understanding on the teaching materials, and increased motivation in learning. Consistently, the research results of the U.S. Department of Education (ED) in SSME (2006) also revealed that PjBL tasks positively influenced learners' learning motivation. In addition, Dopplet (2003) reported that PjBL were able to increase the motivation of learners and provide an overview of all levels.

Cooperative STAD-PjBL on Students' Thinking Skill

Based on the data from the initial observation, it was found that the students' thinking skills of Department of Biology Education, University of Muhammadiyah Malang, in Learning Source and Media course were still low. Students' thinking skills increased in Cycle I and Cycle II. In details, per cycle score percentage of the students' thinking skills can be seen in following Table 3 and Figure 2.

Table 3. Per Cycle Score Percentage of Students' Thinking Skill

Activities	Self Regulation					Critical Thinking						Creative Thinking			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
PRELIMINARY OBSERVATION	53	58	60	58	60	61	62	61	63	63	59	58	57	59	59
The mean of per component	58 (low)					61 (low)						58 (low)			
CYCLE I	68	69	71	68	69	69	68	71	68	68	71	71	68	66	67
Improvement	14	11	11	10	8.8	8.8	6.3	11	4.4	5	12	14	11	6.9	7.5
The mean of per component	69 (fair)					69 (fair)						68 (fair)			
CYCLE II	88	81	86	82	81	79	83	86	80	78	88	86	85	83	78
Improvement	21	13	14	14	12	10	14	14	13	11	18	14	18	18	11
The mean of per component	84 (very good)					82 (very good)						83 (very good)			

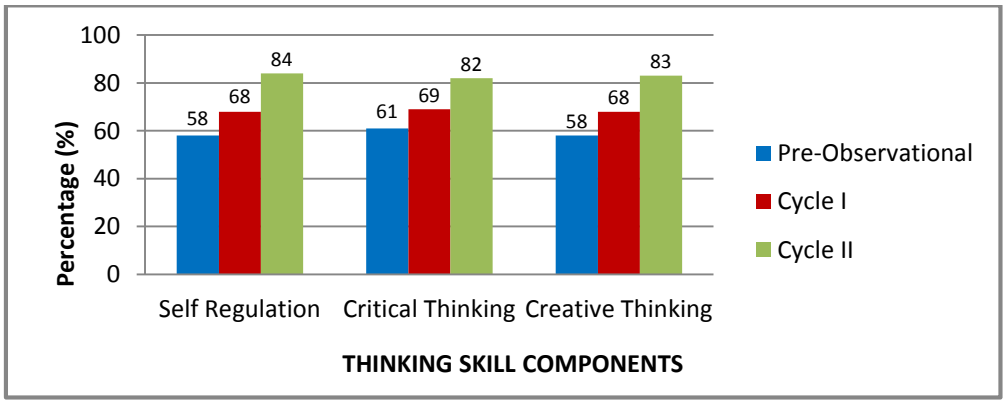

Figure 2. The Improvement of Per Cycle Score Percentage of Students' Thinking Skill

The score percentage of each component or aspect of thinking skills had increased from the initial observation to Cycle I and from Cycle I to Cycle II. The percentage of self regulation increased 11% in Cycle I and 15% in Cycle II; thus the total increase was 26%. The percentage of critical thinking increased 8% in the first cycle and 13% in the second cycle, with the total increase of 21%. Percentage of creative thinking increased 10% in the first cycle and 15% in the second cycle, with the total increase of 25%. The total increase in the percentage scores for each thinking skill component ranged from 21-26%.

Based on the data trend of the thinking skill, as presented in Table 3 and Figure 2, it could be said that the subsequent finding of this study was that if one of the thinking skill components was low, then the other components would also be low. This could be seen when the self-regulation was low (58%), the critical thinking and creative thinking were also low (respectively 61% and 58%). In case that one of the components increased, the other thinking skill components would also increase (when self-regulation increased up to 68%, the critical thinking became 69% and creative thinking became 68%). If one of the components met the criteria to be very good, then the other components also met the criteria to be very good (when self regulation reached 84%, critical thinking became 83%, and creative thinking became 82%). In other words, all components of thinking skills were interrelated, influencing one another, and unified.

According Rustaman (2008a), self-regulation, critical thinking, and creative thinking worked together to build habits of mind or someone's thinking skills. Each component worked like a concert, inseparable from each other because they formed like a framework that could be used to organize thinking skills. Further, Rustaman (2008b) and Marzano et al (1993) stated that the slices of those three thinking skills also determined the level of someone's self-confidence and personality in facing problems. Thinking skills could be developed together with the learning so that its performance could be observed during the learning.

For the self-regulation skill of students who were active meta-cognitively, their motivation and behavior were reflected as their effort in achieving success in the learning process. Self-regulation was also considered as a meta-cognitively active individual ability which initiated eagerness and active participation in the learning process. According to Woolfolk (1995), self-regulation in learning was an individual effort to achieve the goal of learning by activating and maintaining the mind, behavior and emotions. Meanwhile, according to Kristiyani & Lestyarini (2011), students' critical and creative character traits were reflected through four aspects or components of critical thinking and creative thinking skills, which engaged the following abilities: building ideas, conducting reflective assessment, conducting self-regulation, and recognizing the trait and behavior.

Self-regulation is a proactive process by which individuals consistently organize and manage thoughts, emotions, behavior, and environment to achieve academic goals (Zimmerman, 2000; Boekaerts & Corno, 2005). Self-regulation is seen as the interaction between personal, behavioral, and environmental processes (Bandura, 1993). Anderson et al (2004) stated when critical thinking is developed, a person will tend to seek the truth, be open-minded, and be tolerant to new ideas. The person would be able to analyze the problem properly, think systematically, be inquisitive, be mature in thinking (the definition of self-regulation), and think critically and independently. While according to the Learning and Teaching Scotland (LTS, 2004), when someone's creative thinking skill develops, the person will be able to manage the mind, generate new ideas, make a lot of connections, have a lot of perspective on things (self-regulation), create and imagine, and be result-oriented.

Creative thinking style preference is believed to be associated with the right brain dominance (Kim & Michael, 1995); while critical thinking style preference was related to the left brain; and the two styles (creative and critical thinking) are not thought to be closely related (Baker et al., 2001). Left brain style was characterized by information processing in a conceptual and analytical way, and right brain style was characterized by information processing in a direct and synthesis way (Torrance et al., 1977).

Based on the presented data, it could be said that the application of integrated cooperative learning STAD PjBL could improve students' thinking ability. The findings of this study were supported by SSME opinion (2006) that PjBL was beneficial for students in the following areas: 1) helping learners to improve their integrating skill in understanding content and process, 2) encouraging learners to be more responsible for and aware of the importance of independent/autonomous learning, 3) training learners to solve problem and discover answer from a case with team through idea sharing and discussion, and 4) training learners to actively share responsibility in a variety of tasks.

Among 101 reasons of the use of cooperative learning proposed by Lord (2001), and on the basis of the reviews on the studies, there has been a reason stating that cooperative learning improves learners' thinking skills and that cooperative learning improves learners' reasoning ability (Johnson & Johnson, 1989); likewise, that cooperative learning develops scientific problem-solving ability. According to Corebima (2011), from the various types of cooperative learning, it is possible that there are other types which potentially could empower higher thinking skills than others, for example STAD.

Furthermore, Corebima (2011) stated that PjBL was designed to enable learners to investigate or do other tasks independently in the project pattern. This kind of learning allows the learners to have flexibility in designing and implementing their learning plans. The learners are constantly required to think highly, and also creatively. Accordingly, Karyana (2013) explained that developing thinking skills could not be done just through a lecture or explanation, but it needs a lot of trainings and practices through active learning, e.g., PjBL, and cooperative learning (in this case STAD).

Referring to the previous reasons, it is clear that learners' critical thinking skills are essential to be developed. Therefore, it is suggested that lecturers review and improve teaching practices that have been carried out, which are probably just as a routine. Ironically, Maulana (2008) stated that students' critical thinking skills, on the one hand, were very important to be mastered and developed; but on the other hand, it turned out that the students' thinking skills were still poor. Meanwhile, Cabrera (1992) revealed that critical thinking was a fundamental process of a dynamic state that enabled students to tackle and reduce the uncertainty of the future. Therefore, it is very naive when the teaching of thinking skills was ignored by the lecturers.

Cooperative STAD-PjBL on the Students' Learning Outcomes

Learning outcomes are an explicit description of what a learner should know, understand and be able to do as a result of learning (Bingham, 1999). A learning outcome is a statement of what the learner is expected to know, understand and/or be able to do at the end of a period of learning (Donnelly & Fitzmaurice, 2005). A learning outcome is a statement of what a learner is expected to know, understand and be able to do at the end of a period of learning and on how the learning is demonstrated (Moon, 2002). A learning outcome is a written statement of what the successful student/learner is expected to be able to do at the end of the module/course unit

or qualification (Adam, 2004). Based on the data analysis, it could be said that the students learning outcomes increased, by comparing Cycle I and Cycle II. The detailed per cycle percentage of the students' learning outcomes can be seen in Table 4.

Table 4. Per Cycle Percentage of the Students' Learning Outcomes

Range of Mastery Level	SCORE	CYCLE I		CYCLE II	%
		TOTAL	%	TOTAL	
>80,0	A	7	17.5	10	25
75.0-80.0	B+	14	35	19	47.5
70.0-74.9	B	14	35	11	27.5
60.0-69.9	C+	5	12.5	0	0
55.0-59.9	C	0	0	0	0
40.0-54.9	D	0	0	0	0
<40.00	E	0	0	0	0
∑		40	100	40	100

Based on Table 4 above, it can be noted that the learning mastery increased from 87.5% in Cycle I to 100% in Cycle II, with an increase of 12.5%. Students who earned an A increased from 17.5% in Cycle I to 25% in Cycle II. Students who received grade B+ increased from 35% in Cycle I to 47.5% in Cycle II. In that regard, the percentage of students who received grade B decreased from 35% in Cycle I to 27.5% in Cycle II, and the students who got C decreased too, from 12.5% in Cycle I to 0% in Cycle II.

To make it easier, the improvement of the students' learning outcomes in each cycle is depicted in the bar chart in Figure 3 below.

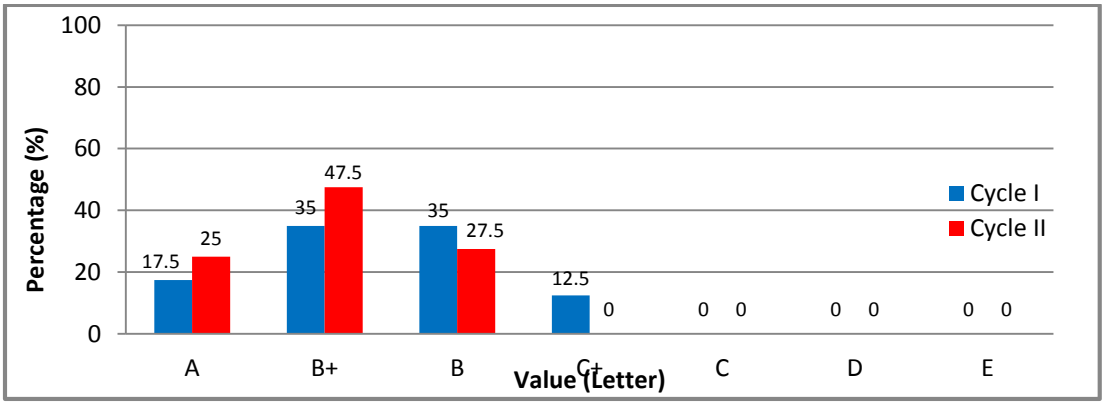

Figure 3. The Improvement of Per Cycle Percentage of the Students' Learning Outcomes

Based on the result in Table 4 and Figure 3, it was clearly seen that all of the students reached the learning goals. Therefore, it was clear that the implementation of cooperative STAD PjBL successfully improved students' learning outcomes.

The results of this study were consistent with several other studies in Indonesia which showed that cooperative learning STAD could improve the quality of the learning, including the activity, motivation, thinking skills, scientific work, and learning outcomes. The research results of Hutasuhut (2010) showed that the implementation of PjBL on Introduction to Developmental Economics course in Management Department FE UNIMED improved

students' learning outcomes in Cycle II (a two-cycle research) as planned. Next, Gangga (2013) described that the implementation of PjBL could improve motivation and learning outcomes. Other studies on similar case were conducted by Purwanti (2003) and Zubaidi (2007). The study results of Thomas (2000) suggested that students' learning outcomes increased almost 26% compared to the control school because of PjBL; and there was a significant increase in the students' ability to solve a problem, observed from the pretest and the posttest results of an experimental class. PjBL could improve students' learning outcomes, activity and engagement, as well as encourage students' creativity and work. It was also considered to be more fun, useful, and meaningful.

Considering on the attribute theory, Crow *et al* (1997) declared that the cause of individual's success and failure is attributed by the ability, effort, hurdles, and luck. Moreover, it is also influenced by his/her motivation. Good & Brophy (1990) suggested that one of the dimensions of Attribute theory (success) was locus of casualty which differentiated the causes into two: internal and external. The internal cause covers ability (intelligence) and effort; while the external one covers the difficulty level of the task and luck. Ability and effort are categorized into intrinsic dimension; meanwhile, difficulty level of the task and luck were categorized into extrinsic dimension. Therefore, those four factors of success and failure are considered as motivation indicators or sub-indicators.

Motivation influences students' learning, behavior, and learning outcomes. Based on Ormord (2008), 1) motivation would drive the behavior to a particular destination; 2) motivation increases effort and energy; 3) motivation increases initiative (initiation) and the persistence in various activities; 4) motivation affects cognitive processes; 5) motivation determines which consequences give reinforcements and punishments; and 6) motivation improves performance.

Thinking is an individual's mental ability. Basically, thinking skill is a skill in optimally using our mind and rationale. Thinking skill is an essential and vital issue in the modern era of education (Shafersman, 1991). Likewise, Sunarya et al (2001) agree and state that thinking skill is suggested to be applied in the class aiming at training problem-solving skill and improving learners' learning outcomes.

Students with high thinking skills tend to achieve better learning outcomes. It is in line with Filsaime's (2008) and Adair's (2007) opinion that people with thinking skills would be sensitive on or aware of problems, deficiencies, and the gaps of knowledge which have no solution for being studied. They would bring the information from their warehouse of memory or external sources; define the difficulty or identify the missing elements; find solutions; suspect, create alternatives to solve the problem, re-examine the alternatives; refine and ultimately communicate the results.

CONCLUSION

Based on this current study, it could be concluded as the followings: (1) the implementation of cooperative learning STAD Project Based Learning improved students' motivation. The study revealed that all of motivation components were interrelated, influencing one another, and unified. The four components, the ARCS model of motivation, had the same contribution to the students' motivation. (2) The implementation of cooperative learning STAD Project Based Learning improved students' thinking skill. Based on the trend of the thinking skill data, it could be said that if one of the thinking skill components was low, then the other components were also low. If the self regulation was low, the critical and creative thinking skills were also

low, and vice versa. It showed how each component was interrelated, influencing one another, and had the same contribution on the thinking skills. (3) The implementation of cooperative learning STAD Project Based Learning improved students' learning outcomes. The students' learning mastery reached 100% in Cycle II. The percentage of the students achieving grade A was 25%, grade B+ was 47.5%, and grade B was 27.5%.

REFERENCES

Adair, J. (2007). *The Art of Creative Thinking*. Britain: The Kogan Page Limited.

Adam, S. (2004). *Using Learning Outcomes: A Consideration of the Nature, Role, Application and Implications for European Education of Employing Learning Outcomes at the Local, National and International Levels*. Report on United Kingdom Bologna Seminar, July 2004, Herriot-Watt University.

Al-Atabi, M. & Chin, S. B. (2007). A Case Study in Project-based Learning Using Flow Visualization. *Journal of Engineering Science and Technology*, 2(3): 290-297.

Al-Tamimi, A. & Shuib, M. (2009). Motivation and Attitudes towards Learning English: A study of Petroleum Engineering Undergraduates at Hadhramout University of Sciences and Technology. *GEMA Online Journal of Language Studies,* 9(2): 29-55.

Anderson, T., Garrison, D. R., & Archer, W. (2004). Critical Thinking, Cognitive Presence, Computer Conferencing in Distance Learning. (Online). (http://communityofinquiry.com/files/CogPres_Final.pdf; accessed on December 2, 2013).

Andrade, A. (1999). *The Thinking Classroom*. Cambridge, MA: Harvard Project Zero.

Appellbaum, P. (2003). *Mathematics Education Excerpt from the International Encyclopedia of Critical Thinking. Arcadia University* [Online]. (http://www.gargoyle.arcadia.edu/appellbaum/8points.htm, accessed on December 2, 2013).

Baker, M., Rudd, R. & Pomeroy, C. (2001). Relationship between Critical and Creative Thinking. *Journal of Southern Agricultural Education Research,* 51(1), 173-188.

Bandura, A. (1993). Perceived Self-efficacy in Cognitive Development and Functioning. *Educational Psychologist, 28:* 117–148.

Barak, M. (2002). Learning Good Electronics or Coping with Challenging Tasks: The Priorities of Excellent Students. *Journal of Technology Education*, 14(1): 20-34.

Bingham, J. (1999). *Guide to Developing Learning Outcomes*. The Learning and Teaching Institute Sheffield Hallam University, Sheffield: Sheffield Hallam University.

Blumenfeld, P., Soloway, E., Marx, R., Krajcik, J., Guzdial, M., & Palincsar, A. (1991). Motivating Project-based Learning: Sustaining the Doing, Supporting the Learning. *Educational Psychologist,* 26 (3 & 4): 369-398.

Boekaerts, M. (2002). *Motivation to Learn.* Educational Practises Series-10. Geneva, Switzerland: International Academy of Education (IAE) & International Bureau of Education (IBE).

Boekaerts, M. & Corno, L. 2005. Self-regulation in the Classroom: A Perspective on Assessment and Intervention. *Applied Psychology: An International Review, 54:*199–231.

Borich, G. D. (2007). *Effective Teaching Methods: Research-based Practice. Sixth Edition.* New Jersey, US: Pearson Merrill Prentice Hall.

Brophy, J. (2004). *Motivating Students to Learn.* Second Edition. New Jersey, US: Lawrence Erlbaum Associates, Publishers.

Brown, H. (2000). *Principles of Language Learning and Teaching*. New Jersey, US: Prentice Hall.

Cabrera, G.A. (1992). A Framework for Evaluating the Teaching of Critical Thinking. In R.N. Cassel (ed). *Education,* 113(1): 59-63.

Corebima, A. D. (2011). *Empower Thinking and Meta-cognitive Skills in Learning.* Makalah Seminar (Paper). Malang, Indonesia: State University of Malang.

Costa, A. L. (2000). Habits of Mind. In A. L. Costa, (Ed.), *Developing Minds: A Resource Book for Teaching Thinking*. Alexandria, VA: Association for Supervision and Curiculum Development.

Costa, A. L. & Kallick. (2000). *Describing Sixteen Habits of Mind.* Alexandria, VA: Association for Supervision and Curriculum Development.

Costa, A. L. & Presseisen, B. Z. (1985). Glossary of Thinking Skill, in A.L. Costa (ed). (1985). *Developing Minds: A Resource Book for Teaching Thinking*. Alexandria, VA: Association for Supervision and Curiculum Development.

Crowl, T. K., Kaminsky, S.& Podell, D. M. (1997). *Educational Psychology Windows on Teaching.* London: Brown & Benchmark Publishing.

Donnelly, R & Fitzmaurice, M. (2005). *Designing Modules for Learning*. In: *Emerging Issues in the Practice of University Learning and Teaching*, O'Neill, G et al. Dublin : AISHE.

Doppelt, Y. (2003). Implementation and Assessment of Project-based Learning in a Flexible Environment. *International Journal of Technology and Design Education, 13: 255-272.*

Driscoll, M. (2000). *Psychology of Learning for Instruction.* Needham Heights, MA: Allyn & Bacon.

Filsaime, D. (2008). *Menguak Rahasia Berpikir Kritis dan Kreatif (Revealing the Secret of Critical and Creative Thinking).* Jakarta: Prestasi Pustaka.

Gangga, A. (2013). *The Implementation of PjBL in Improving Motivation and Achievement.* Research Report. Padang, Indonesia: State University of Padang.

Glynn, S. M., Aultman, L. P. & Owens, A. M. (2005). Motivation to Learn in General Education Programs. *The Journal of General Education, 54(2): 150-170.*

Good, T. L. & Brophy, J. E. 1990. *Educational Psychology: A Realistic Approach*. NewYork: Longman.

Hamzah, M. & Ismail. (2009). The Influence of Environtment and Students' Learning Motivation on the Achievement in Mathematics Subject in Kejar Paket C PKBM Sultan Agung Kesambi Cirebon. *EduMa,* 1(2): 101 - 112

Handayani, R. (2011). *The Implementation of Copperative STAD to Improve Students' Achievement on Biodiversity Materials in VII-C Class in SMP Muhammadiyah 6 Dau Malang.* Unpublished Thesis. Malang, Indonesia: University of Muhammadiyah Malang.

Hutasuhut, S. (2010). The Implementation of PjBL to Improve Motivation and Achievement on Introduction to Developmental Economics in Management Department FE UNIMED. *Pekbis Journal*, 2(1): 196-207.

Indriwati, S. E. (2007). *The Influence of Teaching Strategies and Academic Competence on Cognitive Outcomes and Proficiency of Students in Biology Department Faculty of Natural Science State University of Malang*. Unpublished Dissertation. Malang, Indonesia: State University of Malang.

Isroah & Sumarsih. (2010). *An Analysis on Study Independence of Students in Accounting Department Faculty of Social Science and Economics State University of Yogyakarta.* Research Report. Yogyakarta, Indonesia: State University Yogyakarta

Istiadi, I. (2005). *Agar Hadiah dan Hukuman Efektif (To Make Reward and Punishment Effective).* Jakarta, Indonesia: Pustaka Inti.

Johnson, D.W., & Johnson, R.T. (1989). Social Skills for Successful Gorup Work. *Educational Leadership,* 47(4): 29-33.

Johnson, D.W., Johnson, R.T., & Smith, K.A. (1991). *Active Learning: Cooperative Learning in the College Classroom.* Edina, MN: Interaction Book Company.

Kamdi, W. (2007). *PjBL: Potential Model for Improving the Quality of Learning.* (Online), (http://waraskhamdi.com/, accessed Pebruary 10th, 2014).

Karyana, N. (2013). *Improving Critical Thinking through Case Study Method.* Bandung, Indonesia: Widyaiswara LPMP Jawa Barat.

Keller, J. M. (1984). The Use of the ARCS Model of Motivation in Teacher Training. In K.S.A.J. Trott (Ed.), *Aspects of Educational Technology: Volume XVII: Staff Development and Career Updating* (pp. 140–145). London: Kogan Page.

Keller, J. M. (1987). Development and Use of the ARCS Model of Motivational Design. *Journal of Instructional Development, 10(3): 2–10.*

Keller, J. M.(2008). First Principles of Motivation to Learn and E-Learning. *Distance Education*, 29(2): 175–185.

Kemmis, S. & Taggart R. M. (1988). *The Action Research Planner* (Rev. ed.). Victoria: Deakin University Press.

Kim. J., & Michael, W. B. (1995). The Relationship of Creativity Measures to School Achievement and to Preferred Learning and Thinking Style in a Sample of Korea High School Students. *Educational and Psychological Measurement, 55(1), 71-87.*

Kindsvatter, R. (1996). *Dynamic of Effective Teaching*. Third Edition. Toronto, US: Longman Publisher.

Kristiyani, A. & Lestyarini, B. (2011). *Survey on Indicators of Critical and Creative Thinking of Prospective Teachers in State University of Yogyakarta*. Research Report. Yogyakarta: Universitas Negeri Yogyakarta.

Kupritz, V. W. & Laszlo, F. (2003). The Identification of Online Learning Motives in Use by Undergraduate Students. *Delta Pi Epsilon Journal 45(1): 63-72*.

Lewis, C. C. (2002). *Lesson study: A Handbook of Teacher-led Instructional Change.* Philadelphia, PA: Research for Better Schools, Inc.

Lie, A. (2002). *Cooperative Learning: Implementing Cooperative Learning in the classroom.* Jakarta: PT Gramedia Widiasarana Indonesia.

Lord, T.R. (2001).101 Reasons for Using Cooperative Learning in Biology Teaching. *The American Teacher,* 63(1):30-36.

LTS. (2004). *Learning Thinking*. Scotland: Learning and Teaching Scotland.

Luthans, F. (1981). *Organizational Psychological Research*. NewYork, US: John Wiley & Sons Inc.

Mahanal, S. (2009a). *The Development of Instructional Media for River Quality Detection by Biological Indicators based on Constructivism to Empower Critical Thinking and Behavior of Senior High School Students on River Ecosystem in Malang*. Unpublished Dissertation. Malang, Indonesia: State University of Malang.

Mahanal, S. (2009b). *Instructional Strategies for Biology, Gender, and their Influences on Critical Thinking*. Paper presentation. Seminar Nasional IX Pendidikan Biologi FKIP UNS.

Mahanal, S., Darmawan, E., Corebima, A.D. & Zubaidah, S. (2009). *The Influence of PjBL on Ecosystem Materials on Students' Behavior and Achievement in SMAN 2 Malang.* Research Report. Malang, Indonesia: State University of Malang.

Markham, T. (2003). *Project-based Learning Handbook.* Second edition. Novato, CA: Buck Institute for Education.

Marzano, R. (1992). *A Different Kind of Classroom: Teaching with Dimensions of Learning.* Pittsburgh: ASCD.

Marzano, R. J., D. J. Pickering, & J. McTighe. (1993). *Assessing Student Outcomes: Performance Assessment Using the Dimensions of Learning Model.* Alexandria, VA: ASCD.

Marzano, R. (2000). *Designing a New Taxonomy of Educational Objectives.* Thousand Oaks, CA: Corwin Press, a Sage Publications Company.

Maulana. (2008). Meta-cognitive Approach as an Alternative on the Teaching of Mathematics to Improve Critical Thinking Skill of Students in Elementary School Teacher Education Department. *Jurnal Pendidikan Dasar*, Number 10 - Oktober.

Mills, R. J. (2004). *Kids College^{TM} 2004: An Implementation of the ARCS Model of Motivational Design.*Utah, US: Utah State University.

Ministry of Education and Culture. 2013. *Project Based Learning Model.* Jakarta, Indonesia: Ministry of Education and Culture.

Moon, J. (2002) *The Module and Programme Development Handbook.* London: Kogan Page Limited.

Moursund, D., Bielefeldt, T., Ricketts, R. & Underwood, S. (1995). *Effect Practice: Computer Technology in Education.* Eugene, OR: ISTE.

Muhibbuddin. (2008). *Guru sebagai Jabatan Profesional (Teacher as Professional Profession): Handout*. Banda Aceh: FKIP Unsyiah.

Munawaroh, R., Subali, B. & Sopyan, A. (2012). The Implementation of PjBL to Develop Four Pillars of Education among Junior High School Students. *Unnes Physics Education Journal (UPEJ),* 1(1): 33-37.

Munawaroh. (2013). The Effect of STAD Cooperative Learning Model, The Way of Learning, and Learning Motivation toward Enterpreneurial Attitudes (A Case Study in SMKN I Jombang). *IOSR Journal of Research & Method in Education,* 3(5): 38-44.

Nurhadi, Yasin, B., & Senduk, A. G. (2003). *Contextual Learning and its Implementation in Competence-based Curriculum*. Malang, Indonesia: State University of Malang.

Ormord, E. J. (2008). *Educational Psychology*. Colorado: Person (Merrill Prenctice Hall).

Perkins, D. N. (1992). *Technology Meets Constructivism: Do they make a Marriage?* In T. M. Duffy & D. H. Jonassen (Eds.), Constructivism and the technology of instruction: A conversation (pp. 45- 55). Hillsdale, NJ: Lawrence Erlbaum Associates.

Pintrich, P. R. & Groot, E. V. D. (1990). Motivational and Self-regulated Learning Components of Classroom Academic Performance. *Journal of Educational Psychology,* 82(1): 33-40.

Pithers, R. T. & Soden. R. (2000). Critical Thinking in Education: A Review. *Educational Research,* 42(3): 237–249.

Popovich, N. G. & Wongwiwatthanannukit, S. (2000). Applying the ARCS Model of Motivational Design to Pharmaceutical Education. *American Journal of Pharmaceutical Education* 64, 188-196.

Rais, M. (2010). PjBL Model in Effort to Improve Academic Achievement of College Students. *Jurnal Pendidikan dan Pengajaran, 43(3): 246-252.*

Rustaman, R. Y. (2008a). Scientific Education and Research in Developing Higher Thinking Skill for Character Building. Keynote speaker's paper, Seminar Nasional VIII Pendidikan Biologi UNS.

Rustaman, R. Y. (2008b). *Habits of Mind in Learning Science and Its Asessment*. Bandung: Indonesia University of Education.

Ryan, R. M. & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, 25: 54–67.

Sardiman, A. M. (2003). *Interaction and Teaching-Learning Motivation*. Bandung, Indonesia: CV. Remadja.

Schafersman, S. D. 1991. *An Introduction to Critical Thinking*. (Online). (http://www.freeinquary.com/critical-thinking.html., accessed on November 30, 2013)

Sherman, S.& Sherman, R. S. (2004). *Science and Science Teaching: Methods for Integrating Technology in Elementary and Middle Schools.* Second Edition.Boston, US: Houghton Mifflin Company.

Shih, C. C. & Gamin, J. (2001). Web-based Learning: Relationships among Students' Motivation, Attitude, Learning Styles, and Achievement. *Journal of Agricultural Education*, 42(4): 12-20.

Siregar, F. A. & Sahyar. (2012). Critical Thinking Skills Analysis of Physics and Independence Learning Students in Cooperative Learning Model Type Numbered Head. *Online Journal of Physics Education*, 1(2): 29-36.

Slavin. R. E. 1995. *Cooperative Learning Theory, Research, and Practice.* Second Edition. Massachusetts, US: Allyn & Bacon.

SSME, (2006). *Project-based Learning*. (Online). (http://ssme.fedu.metu.edu.tr/ ssme/index2.php. accessed 30 November 30th, 2013).

Stroud, K. C. (2006). *Development of the School Motivation and Learning Strategy Inventory.* Unpublished Dissertation. US: Texas A & M University.

Subaidi, A. (2007). *The Implementation of Cooperative STAD with Contextual Approach to Improve Students' Activities and Achievement in Biology Subject Grade X SMAN 1 Pademawu Pamekasan.* Unpublished thesis. Malang: State University of Malang.

Sunarya,Y., Rohman, I., & Anwar, B. 2001. The Development of Instructional Model of Chemistry Subject to Improve Critical Thinking and Scientific Skill of Senior High School Students. *Jurnal Pengajaran MIPA-UPI*, 2(2): 139-152.

Susilo, H. (2009). Combining Lesson Study (LS) and Classroom Action Research (CAR) for Teacher Professional Development. *CoSMEd 2009 Proceedings*: 77-84.

The George Lucas Educational Foundation. (2005). *Instructional Module Project Based Learning*. (Online). (http://www.edutopia.org/modules/PBL/whatpbl. php., accessed on November 25, 2013).

Thomas, J.W. (2000). *A Review of Research on Project-based Learning*. California, US: The Autodesk Foundation. (Online), (http://www.autodesk.com/foundation, accessed on November 13, 2013).

Thomas, J.W., Margendoller, J.R., & Michaelson, A. (1999). *Project-based Learning: A Handbook for Middle and High School Teachers.* (Online). (http://www.bgsu.edu/organizations/ctl/proj.html., accessed on November 25, 2013).

Torrance, E. P., Reynolds, C. R & Ball, O. E. (1997). Your Style of Learning and Thinking, Forms A and B: Preliminary Norms, Abbreviated Technical Notes, Scoring Keys, and Selected References. *Gifted Child Quarterly*, 21: 563- 573.

Toshalis, E. & Nakkula, M. J. (2012). *Motivation, Engagement, and Student Voice: The Students at the Center Series*. Boston, US: Jobs for the Future and the Nellie Mae Education Foundation.

Trowbridge, L. W., Bybee, R. & Powell, J. C. (2004). *Teaching Secondary School Science: Strategies for Developing Scientific Literacy.* Eight Edition.New Jersey, USA: Pearson Merrill Prentice Hall.

Ubaidullah, N.H. (2011). The Integration of Motivation Element ARCS in Mathematics to Motivate Mathematical Literacy among Children with Dyslexia. *Jurnal Teknologi Pendidikan Malaysia*, *1*(3): 31-46.

University of Muhammadiyah Malang. (2013). *Academic Guide 2013.* Malang, Indonesia: University of Muhammadiyah Malang.

Weissman, J. & Boning, K. J. (2003). Five Features of Effective Core Courses. *Journal of General Education*, 52: 150-74.

White, B., Stains, M., Escriu-Sune, M., Medaglia, E., Rostamnjad, L., Chinn, C. & Sevian, H. (2011). A Novel Instrument for Assessing Students' Critical Thinking Abilities. *Journal of College Science Teaching*, 40(5): 102-107.

Wena, M. (2011). *Innovative Contemporary Instructional Strategies: A Conceptual Operational Overview*. Jakarta, Indonesia: Bumi Aksara.

Woolfolk, A. E. (1995). *Educational Psychology*. Sixth Edition. Boston, USA: Allyn and Bacon.

Yalcin. S. A., Turgut, U. & Buyukkasap, E. (2009). The Effect of Project Based Learning on Science Undergraduates' Learning of Electricity, Attitude towards Physics and Scientific Process Skills. *International Online Journal of Educational Sciences,* 1 (1): 81-105.

Zimmerman, B. J. (2000). Attaining Self-Regulation: A Social Cognitive Perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). San Diego, CA: Academic Press.

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