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The Development Model of Project Based Learning Using Joyfull Learning on Vocational Chemistry in Increasing Entrepreneurial Creativity and Creative Thinking Ability of Vocational School Students

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Abstract
This research was carried out to look at students' entrepreneurial interests and creativity. The aim of this research is to find out in order to develop Model Development Project Based LearningBased Joyfull Learning on Vocational Chemistry in Increasing Entrepreneurial Creativity and Creative Thinking Ability of Vocational School Students. This research is development research using a Project Based Learning model based on Joyfull LearningdThis was carried out at Batang Onang Vocational School involving 2 classes. Sampling was carried out randomly. Data collection techniques were carried out using observation instruments, interviews, documentation, questionnaires and tests.The research results found: (1) The Project Based Learning learning model based on Joyfull Learning is valid. Ratings and Responses for Linguist Experts, Design Experts, Material Experts, and Validator Model Experts provide a value greater than or equal to ≥ 3.0 in the valid category; (2) The practicality results of the Project Based Learning learning model based on Joyfull Learning by the total teachers were 85.42%; (3) The level of achievement of the teacher's ability to manage learning is at least good enough, namely achieved if SR ≥ 80%, obtained 88.478%, based on individual completeness criteria it can be determined that students who have completed classical learning have reached 85.29%.

Keywords: *Project Based Learning, Joyfull Learning, vocational, creative thinking, entrepreneurship*

I. Introduction

Being in the 4.0 era and the era of globalization which is full of very rapid changes, the world of education in Indonesia currently and in the future is still facing increasingly difficult and complex challenges. Indonesia must be able to compete with other countries both in products, services and in preparing human resources (Mahfud & Novi, 2010).

Education is the institution most responsible for the future of a nation. Education is one of the government's main targets in order to improve people's welfare (Setyaningsih, 2016). The world of education is currently faced with the challenges of modern progress. Therefore, the educational paradigm and system must be adapted to the demands of the times. Of course, these changes are expected to lead to a better future education. Education today must be oriented towards the world of work, so that the emphasis is not solely on cognitive aspects, but also on other aspects of personality which are actually more important, such as affective and psychomotor aspects. Education must help develop students in life skills-oriented concepts that prepare students to have meaningful and useful life skills. Educational institutions are expected to be able to produce human resources (HR) that are academically qualified and morally qualified.

One of the schools where human resources are produced is vocational high schools (SMK) which are a sub-system of national education. These vocational school (SMK) graduates are equipped with certain special skills so that they become an attraction for job owners to recruit them. This is in accordance with the contents of the National Education System Law no. 20 of 2003 Article 3 concerning the objectives of national education and an explanation of Article 15 which states that vocational education is secondary education which specifically prepares students to be ready to work in certain fields.

However, in fact, based on case studies and according to the results of empirical observations carried out by the author at the agency based on data from the Central Statistics Agency (BPS), vocational school graduates have the highest open unemployment rate (TPT) in the workforce compared to graduates of other educational schools, whether elementary school, Middle School, up to University. Data from the Central Statistics Agency (BPS) shows that the Open Unemployment Rate (TPT) for Vocational High Schools (SMK) is still the highest. The figure reached 11.13% as of August 2021. Meanwhile, TPT for Senior High Schools (SMA) was recorded at 9.09% in second place. Following this, TPT for Junior High Schools (SMP) was 6.45%, University 5.98%, Diploma I/II/III 5.87%, and Elementary School (SD) 3.61%. TPT at each level of education was recorded to have decreased , except for elementary school graduates which were stagnant when compared to August 2020 (year-on-year). Elementary school TPT was recorded as remaining at 3.61% when compared to August 2020. The vocational school level recorded the largest decrease in TPT compared to other education levels. Vocational School TPT fell 2.42% from 13.55% to 11.13%. When compared to February 2021, the elementary to high school education category experienced an increase in TPT. The largest increase in TPT was recorded in the junior high school education category at 0.58%. On the other hand, the Vocational School, Diploma I/II/III and University education categories experienced a decline in TPT. The largest decline in TPT was recorded in the University education category at 0.99% compared to February 2021. In general, Indonesia's TPT was at 6.49% as of August 2021. This figure was down 0.58% from the August 2020 TPT. Men's TPT was recorded amounting to 6.74%, higher than the female TPT which was 6.11%.

The education sector is one of the priority sectors of the North Padang Lawas Regency government which continues to be maximized. Management of Vocational Schools in North Padang Lawas Regency until 2021 there are 9 SMKs recorded. Of the 9 schools, there are several areas of expertise/majors available, namely; Agribusiness of Plantation Crops 4 vocational schools, Accounting and Financial Institutions 3 vocational schools, Automotive Light Vehicle Engineering 1 vocational school, Agribusiness of Food Crops and Horticulture 2 vocational schools, Ruminant Livestock Agribusiness 1 vocational school, Motorcycle Engineering and Business 3 vocational schools, Computer and Network Engineering 2 vocational schools, Assistant Nursing 1 Vocational School, Sharia Banking 1 Vocational School, Office Automation and Management 1 Vocational School (North Padang Lawas Vocational School Education Data. 2022).

Based on case studies and according to the results of observations and observations made by the author in North Padang Lawas Regency, it shows that the majority of vocational school graduates in North Padang Lawas Regency are not only less able to adapt to developments in science and technology, but also less able to develop themselves and their careers in their place. Work. According to the head of the job seekers section of the Manpower and Transmigration Department of North Sumatra Province, it is difficult to know the full number of unemployed because job seekers do not produce yellow cards as a sign of job seeking. Seeing symptoms of still high levels of unemployment for vocational high school graduates is truly very worrying.

To overcome the large TPT of vocational school graduates and prepare vocational school students for work readiness, many efforts have been made, one of which is to overcome internal problems by directing students to the world of work, teaching students more direct practice rather than theory in preparing intelligence (academic abilities), skills, skills, talents, interests, motivation, abilities and personality, ideals and goals in working by developing learning models.

A learning model is a conceptual framework that describes systematic procedures for organizing learning experiences to achieve learning goals (Hamalik, O. 2011). Teachers can carry out learning based on certain learning models or by following steps adapted to the situation and students in each school. The learning conditions expected in the 2013 Curriculum are learning that enriches students' learning experiences using a scientific/scientific based approach.

Teachers can apply various learning models with a science-based approach in order to develop three domains of competence, namely knowledge, skills and attitudes as a whole. As teachers and educators, teachers must be able to improve teaching and learning activities as teachers must innovate by implementing active and innovative learning models and media so that learning becomes more interesting and student activity increases. This includes applying the project based learning model and demonstration media as an alternative to improve students' attitudes (affective), knowledge (cognitive) and skills (psychomotor). Project based learning is a learning model that provides teachers with the opportunity to manage learning in the classroom by involving project work (Jhon. W. Thomas, 2000)

Based on the results of previous research, among others, by Yulistiana Pradita, et al (2013) with the title "Application of the project based learning model to improve student achievement and creativity in the main material of the colloid system for class which states that the research results show that the application of the project based learning model can improve learning achievement and creativity.

Meanwhile, the second research supported by Monchai Tiantong, et al (2013) with the title "the online project based learning model based on students multiple intelligence" states that PBL learning based projects have been found to be effective in improving student learning achievement, gaining knowledge through active learning, acquire interdisciplinary, and multidisciplinary knowledge, take responsibility for learning, acquire communication skills, and decision-making methods.

Furthermore, according to Johnson (2014), to determine the quality of the learning model, it must be seen from two aspects, namely process and product. The process aspect refers to learning that is able to create a pleasant learning situation (joyful learning) and encourages students to actively learn and think creatively. The product aspect refers to whether learning is able to achieve the goal, namely improving students' abilities according to specified ability and competency standards, in this case reflected in student learning outcomes. Sudjana (2015) explains that learning outcomes are the abilities that students have after receiving their learning experience.

Joyful learningcomes from the word joyfull which means fun while learning is learning. Joyful learning is actually a concept, strategy and practical learning which is a synergy of meaningful learning, contextual learning, constructivism theory and active learning (Putri Dian, 2016: 7). Joyful learning is a learning process in which there is a pattern of strong relationships between teachers and students, without feeling forced or pressured, so it is necessary to create a democratic atmosphere and there is no burden on both teachers and students in carrying out learning. In joyful learning, students are required to be more active and the teacher only acts as a facilitator (Permatasari, Mulyani, & Nurhayati, 2014: 120).

In order to create a fun and interesting learning atmosphere for students, a teacher must have the ability to design learning, apply learning models and provide teaching materials that attract students' interest in learning. In this regard, it is necessary to design a learning approach that can combine the process of obtaining information, both in the nature of basic exploration, deepening, enrichment and expansion, combined with face-to-face and using the internet.

Learning using the internet needs to be implemented in all subjects at secondary education level, including Natural Sciences (Science) subjects. Science learning is learning that links all areas of science study, namely Physics, Chemistry and Biology. Murpy (Surjono, 2012, p.15) stated that science learning in elementary to high school primarily aims to develop scientific process abilities, encourage understanding of concepts and develop a positive attitude towards science. A positive attitude towards science must be supported by a variety of learning sources and learning media.

In fact, learning resources and web-based learning media that can support chemistry learning activities are still very limited. The learning media used is based on a teacher questionnaire resulting from a needs analysis. New teachers are limited to using printed books, worksheets, OHPs, whiteboards and LCDs. Teachers have not implemented web-based chemistry learning media in teaching and learning activities, even though chemistry subjects, especially at the high school/vocational school level, contain quite a wide range of material. Problems related to limited learning resources and media are certainly not in line with increasingly modern and sophisticated technological developments. Sophisticated technology should make it easier for students to access quality resources. Developing quality and digital-based learning resources for learning has become the most

important part in building an information-based education system (Zhu, 2010, p.1). The urgency of this problem is not only found in a small number of schools but in almost the majority of schools.

Web-based learning media is a web-based educational service that allows edutainment to be realized using internet media. Web-based learning media can connect learning between educators and students in an online learning space. The problems of conventional learning compared to web-based learning can be viewed in terms of limited interactivity of educators and students, flexibility in terms of providing time, place and teaching materials as well as accessibility of learning material sources. Web-based learning media was created to overcome these problems.

The development of web-based learning media is very appropriate because with a learning system that involves various media (multi-media) such as text, images, audio, video, animation and digital e-books in learning, teachers can present lesson material that is more interesting, not monotonous. and facilitate delivery to students. Students have alternative learning resources that can be used for independent study and help them to better understand the material being taught. Maran, Selvaraj & Ravikumar (2011, p.92) state that the use of multimedia in learning resources provides benefits for students and teachers. This research clearly shows that multimedia technology has great potential to help students learn and visualize learning in understanding material concepts.

Based on the description of the problem above, the development of a project based learning model based on joyful learning in vocational school as an effort to increase entrepreneurial interest and creativity in vocational school students can develop entrepreneurial interest and creativity in vocational school students which will be useful for producing entrepreneurs in vocational school graduates as an alternative to reducing the level of open unemployment (TPT) at vocational school level.

II. Review Of Literature

2.1 Cognitive Development According to Jean Pieget

Piaget put forward a cognitive structural explanation of how children develop concepts of the world around them. (Loward s. Friedman and Miriam. W. Schustack. 2006: 59). Piaget's theory is often called genetic epistemology because this theory tries to trace the development of intellectual abilities that genetics refers to developmental growth, not biological inheritance (heredity). (BR Hergenhahn & Matthew H. Olson, 2010: 325). According to Piaget, children are born with several sensorimotor schemata, which provide a framework for the child's early interactions with their environment. The child's early experiences will be determined by these sensorimotor schemata.

2.2 Project Based Learning (PjBL) Model

Project Based Learning`is a learning model that focuses on the main concepts and principles of a discipline, involves students in problem solving activities and other meaningful tasks, provides opportunities for students to work autonomously to construct their own learning, and culminates in producing valuable and realistic student work products . In contrast to traditional learning models which are generally characterized by short, isolated classroom practices and teacher-centered learning activities; The PBL model emphasizes learning activities that are relatively long duration, holistic-interdisciplinary, student-centered, and integrated with real-world practices and issues. (Ngalimun, 2012)

Project-based learning focuses on active learning in which students explore authentic questions or tasks, develop plans, reflect, evaluate solutions, and produce multiple representations of ideas. Blumenfed positions Project Based Learning as a comprehensive instructional approach that can motivate children to think about what they are doing, not just focus on getting it. (Sharma Smith, 2016).

2.3 Project Based Learning Based on Joyful Learning

Learning strategy is a way of organizing lesson content, delivering lessons and managing learning activities using various sources. In Wina Senjaya (2008), Kemp stated that learning strategies are learning activities that teachers and students must carry out so that learning objectives can be achieved effectively and efficiently. Furthermore, citing the thoughts of J. R David, Wina Senjaya (2008) stated that learning strategy

contains the meaning of planning, meaning that strategy is basically still conceptual about the decisions that will be taken in a learning implementation.

In Heppy (2011) Dave Meier stated that joyful learning is a learning system that seeks to arouse interest, full involvement, and create meaning, understanding and happy values in students. In Darmansyah (2011) Bobbi DePorter stated that joyful learning strategies are strategies used to create an effective learning environment, implement the curriculum, deliver material, facilitate the learning process which results in student learning achievement improving. This is also supported by Berk (Darmansyah, 2011) that Joyful Learning is a pattern of thinking and direction created by the teacher to condition the delivery of material that is easily accepted by students.

2.4 Vocational Education

Vocational Education or Vocational Education is education for the world of work (Education for Vocation) (Sudira, 2015: 4). Pavlova stated her opinion about vocational education, namely:

"Traditionally, direct preparation for work was the main goal of vocational education. It was perceived as providing specific training that was reproductive and based on teacher's instruction, with the intention to develop understanding of a particular industry, consisting of the specific skills or tricks of the trade. Student's motivation was seen to be influenced by the economic benefits to them, in the future. Competency-based training was chosen by most governments in Western scocieties as a model for vocational education (VE) (Pavlova, 2009:7)."

The vocational education tradition aims to prepare graduates for work, so that they are ready to work, vocational education contains special training which tends to be reproductive according to the orders of the teacher or instructor with a focus on developing industrial needs, containing special skills or market tricks. The main motivation for vocational education lies in economic benefits for the future. Competency-based training was chosen as the vocational education model. Vocational education prepares trained workers with high skills who are subject to employers (Rojewski, 2009: 21).

2.5 Entrepreneurial Interest

Entrepreneurship Interest is a business that works on aspects of entrepreneurship as an important part in providing students with competencies. With this aspect, we hope that students can live their lives. It is hoped that this interest in entrepreneurship can be an added value for students regarding their role in life. Added value in life is an important aspect because in every life activity we are faced with tasks and responsibilities. Every task and responsibility in life is to solve problems that grow and develop in life. (Mohammad Saroni, 2012: 45)

Entrepreneurial interests enable the process of collaboration between many parties involved in the process. In the end, the education and learning process provides positive conditions for students. Students are not only intellectually capable, but also have the ability to carry out life activities. We don't need to worry about our children's lives post-education. They can face life only with the entrepreneurial skills that we provide in the education and learning process and training in the school environment. (Mohammad Saroni, 2012: 46)

2.6 Creativity Concept

Gardner (2004) states that creativity is the ability to solve problems, create something different (new and unique) from other people in general. Creativity is also the ability to find new problems that others have not previously thought of and also being able to find solutions to these problems.

Rhodes said that creativity is built based on 4 basic aspects of creativity (4Ps), namely: creative people (person), creative idea products (product), creative thinking process (process), and creative environment (press). Creative people refer to personality, intelligence, temperament, physique, traits, habits, attitudes, self-concept, value systems, mechanisms and behavior. Munandar (2009) explains several indicators of the traits that characterize creativity as follows.

Table 1. Indicators of Creativity

Creativity	Student Behavior (Indicators)
Fluent Thinking (Fluency)	Produce lots of relevant ideas/answers The flow of thoughts is smooth
Flexible Thinking (Flexibility)	Produce uniform ideas Able to change methods or approaches Different directions of thought
Original Thinking (Originality)	Gives answers that are unusual, different from the others, that most people rarely give
Detailed Thinking (Elaboration)	Developing, adding, enriching an idea Detailing the details Expanding an idea

III. Research Method

3.1 Types of Research

This research is experimental in nature using 2 classes, namely the first experimental class (E1) taught using a Project Based Learning model based on Joyfull Learning. The second experimental class (E2) was taught using the conventional model without using conventional models.

This research aims to determine the entrepreneurial interest and creativity of students in these two classes. In the initial stage, the four classes were given a pretest to measure students' initial abilities as well as data to carry out homogeneity tests in the four research classes. Then each class is given a different learning treatment. Student learning activities are measured during the learning process, and then a posttest is given to measure student learning outcomes after being given treatment.

This research uses two types of independent variables (learning methods and learning media), one dependent variable (Entrepreneurial Interest) and one moderate variable (student creativity), so the analysis uses Two-Way ANOVA.

3.2 Place and Time of Research

This research will be carried out at Batang Onang Vocational School, Batang Onang District, North Padang Lawas Regency, North Sumatra Province, in class XI, semester II of the 2021/2022 Academic Year. This research was carried out from November to May 2022 after obtaining permission from the Postgraduate Program Director and the Principal of Batang Onang Vocational School. This time interval includes preliminary survey activities, instrument testing, data collection, data analysis, and writing the final research report.

3.3 Research Subjects and Objects

The research subjects in this study were Batang Onang Vocational School with 2 classes. Meanwhile, the object in this research is a Project Based Learning model based on Joyfull Learning, the result of development using Website media and a Conventional model without using Website media.

3.4 Data Collection Techniques

The research was carried out in two stages, namely before the research was conducted and during the research. The research sample consisted of 2 classes divided into two experimental classes. Each sample class is an experimental class. namely the first experimental class (E1) was taught using a Project Based Learning model based on Joyfull Learning which was developed using website media. The second experimental class (E2) was taught using a conventional model without using website media. Develop and validate the Project Based Learning learning model based on Joyfull Learning as a result of development and then use it in research;

Procedures during the research included (1) Giving a pretest to the four experimental classes using a learning outcomes test instrument, then the results were analyzed using a normality test and homogeneity test with the SPSS-25 program; (2) Providing treatment to the four experimental classes in accordance with the

Learning Implementation Plan that has been prepared; (3) Observers observe students' creativity during the learning process, using the learning Creativity observation sheet; (4) Providing a posttest using the Entrepreneurial Interest test instrument to measure student learning outcomes after being given treatment and carrying out data tabulation; (5) Carrying out hypothesis testing using the SPSS-25 program; (6) Drawing conclusions.

3.5 Data Analysis Techniques

Data processing was carried out on quantitative data obtained from student entrepreneurial creativity data and student creativity data in the four experimental classes. These data will be analyzed using normality tests, homogeneity tests and hypothesis tests.

IV. Results and Discussion

4.1 Data Normality testing for creative thinking abilities in learning model groups

To test the normality of learning group data for creative thinking abilities taught withThe Project Based Learning learning model based on Joyfull Learning and taught using conventional teaching is carried out using SPSS Version 25. The following are the results of data normality calculations shown in table 2 below.

Table 2.Results of Data Normality Testing for Learning Model Creative Thinking Ability

Tests of Normality						
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
PBL_JL	,133	34	,132	,938	34	,053
CONVENTIONAL	,093	34	,200*	,962	34	,281
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

In Table 2 above, it shows the results of normality test calculations for the creative thinking ability data of students who were taught using the learning approach. It was found that all groups had Asymp.Sig.(2-tailed)= 0.132 and 0.200 respectively for the Kolmogorov-Smirnov Normality Test. All of these groups have values greater than the value α= 0.05 so that H0 is accepted which states that the data distribution is normally distributed.

4.2 Testing Homogeneity of Group Variance Learning Model

Meanwhile, to test the homogeneity of group variances, the data is tested using the F test. To test whether the data variances are homogeneous, if the significance level is greater (>) the data is declared homogeneous. To determine the homogeneity of students' creative thinking abilities taught using the Joyfull Learning-based Project Based Learning learning model and conventional learning models, it was carried out using SPSS 25. A summary of the testing can be seen in Table 3 below:

Table 3. Summary of Results of Homogeneity of Variance Testing between Learning Model Sample Groups

Test of Homogeneity of Variances			
SCORE			
Levene Statistics	df1	df2	Sig.
2,830	1	66	,097

From Table 3 above, it can be seen that the creative thinking abilities of the student group were taught using the Project Based Learning learning model based on Joyfull Learning and conventional learning models.

Based on the table above, it can be seen that the statistical significance of the sig test is 0.097. This value is greater than the significance level α=0.05, so H0 which states that there is no difference in variance between pairs of groups can be accepted. So it can be concluded that the pairs of data groups have homogeneous variance.

4.3 Two Way Anova Test Testing

Before testing the hypothesis, first calculate the total score and average score for each treatment group according to the F test table, which can then be used as a basis for statistical decisions for testing the hypothesis, which can be seen in Table 4 below:

Table 4. AverageIndependent Samples Test

Group Statistics					
TREATMENT		N	Mean	Std. Deviation	Std. Error Mean
SCORE	1	34	13,18	2,022	,347
	2	34	10.18	2,599	,446

Based on the results of data calculations, it can be seen that students taught using the Joyfull Learning-based Project Based Learning learning model obtained an average score = 13.18, while the creative thinking abilities of students taught using the conventional learning model obtained an average score = 10.18 . Furthermore, to determine the differences in students' creative thinking abilities between students taught using the Joyfull Learning-based Project Based Learning learning model and the conventional learning model, a Two-Way Anova test was carried out as shown in Table 5 below.

Table 5. Two Way ANOVA

Tests of Between-Subjects Effects					
Dependent Variable:	SCORE				
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	584.436a	3	194,812	6,923	,001
Intercept	28036,198	1	28036,198	996,309	,000
MODEL	362,672	1	362,672	12,888	,001
CREATIVITY	236,008	1	236,008	8,387	,005
MODEL * CREATIVITY	,028	1	,028	,001	,975
Error	1519,564	64	28,140		
Total	30176,000	68			
Corrected Total	2104,000	67			
a. R Squared = .278 (Adjusted R Squared = .238)					

4.4 Validation Of The Project Based Learning Model Using Joyful Learning

Based on data analysis from the validity sheet of language experts, the Project Based Learning learning model based on Joyfull Learning by lecturers and teachers, the Project Based Learning learning model based on Joyfull Learning is said to be very valid. The validity value of the Joyfull Learning-based Project Based Learning learning model for the Colloid Material lessons developed is the average score for each assessment aspect of the Assessment and Response for Language Experts. The validator gives a value greater than or equal

to 3.428 (≥ 3.0) in the "valid" category. ", and the overall average score for the assessments and responses for Linguist Experts is in the category above four with the "valid" criteria. So it can be concluded that the Assessment and Response for Linguist Experts can be used with minor revisions.

Based on the analysis carried out on the validation instrument of the Joyfull Learning-based Project Based Learning learning model design expert on the content feasibility aspect, the Joyfull Learning-based Project Based Learning learning model for Colloid Material lessons developed averages the scores for each assessment aspect of the Assessment and Response for Validator Design Experts give a score greater than or equal to 3.467 (≥ 3.0) in the "valid" category, and the overall average score for assessments and responses for design experts is in the category above four with the "valid" criteria. So it can be concluded that the Assessment and Response for Design Experts can be used with minor revisions. Based on the validity category of the Project Based Learning learning model based on Joyfull Learning, the LKPD is categorized as very valid.

Based on the analysis carried out on the material expert validation instrument for the Joyfull Learning-based Project Based Learning learning model in the presentation aspect of the Joyfull Learning-based Project Based Learning learning model, the Joyfull Learning-based Project Based Learning learning model for the Colloid Material lessons developed is categorized as very valid reaching an average The score for each assessment aspect of the Assessment and Response for Material Experts is that the validator provides a value greater than or equal to 3.529 (≥ 3.0) in the "valid" category, and the overall average score for the Assessment and Response for Design Experts is in the category above four with "valid" criteria. So it can be concluded that the Assessment and Responses for Material Experts can be used with minor revisions. This means that the Joyfull Learning-based Project Based Learning learning model developed is appropriate, easy for students to understand, and increases student enthusiasm. Basic competencies have been presented clearly. The presentation of the material has explained the ideas to be conveyed. The presentation of the images is appropriate to the context.

Based on the expert instrument analysis of the Project Based Learning learning model based on Joyfull Learning, the results obtained were that the Project Based Learning learning model based on Joyfull Learning that was developed was categorized as very valid, reaching the level of validity of the average score for each assessment aspect of the Assessment and Response for Experts. The validator model provides a value greater than or equal to 3.475 (≥ 3.0) is in the "valid" category, and the overall average score for the Assessment and Response for Model Experts is in the category above four with the "valid" criteria. So it can be concluded that the Assessment and Response for Model Experts can be used with minor revisions. This means that the sentences used in the Joyfull Learning-based Project Based Learning learning model are in accordance with the rules, easy to understand by students, and the language used is appropriate to the students' development.

Based on the discussion of the four aspects above, it can be concluded that the Project Based Learning learning model based on Joyfull Learning on Vocational Chemistry material for class In this way, the Project Based Learning learning model based on Joyfull Learning can be tested on students to see the practicality and effectiveness of the Project Based Learning learning model based on Joyfull Learning that has been designed.

4.4 Practicality of the Project Based Learning Learning Model Based on Joyful Learning

The practicality of the Project Based Learning learning model based on Joyfull Learning that was developed was known from the implementation of trials. Field trials were carried out after the Project Based Learning learning model based on Joyfull Learning was validated by expert validators and practitioners. Practicality tests are carried out by teachers and students. Practicality data was obtained from the practicality of the Project Based Learning learning model based on Joyfull Learning for teachers and the practicality of the Project Based Learning learning model based on Joyfull Learning for students. The author will explain the practicality of using the Project Based Learning learning model based on Joyfull Learning by teachers and students below.

a. Practicality by the Teacher

The results of the teacher practicality questionnaire analysis of the Project Based Learning learning model based on Joyfull Learning show that the assessment for the four aspects is categorized as very practical.

The aspects assessed are aspects of ease of use, aspects of time required, aspects that are easy to interpret, and aspects of having the same equivalence. These two aspects will be explained below.

This can be seen from the aspects of ease of use, aspects of the attractiveness of the dish, and usefulness. The assessment of the ease of use aspect is generally in the practical category. Based on Table 4.11. It can be seen that the results of the practicality of the Project Based Learning learning model based on Joyfull Learning by teachers are 85.42% overall in the very practical category. Thus, the results of the practicality questionnaire by teachers generally show that the Project Based Learning learning model based on Joyfull Learning is categorized as very practical.

The aspect of ease of use in general is categorized as very practical. The achievement of the very practical category is reflected in the results of the teacher's assessment of the ease of use aspect. It can be concluded that the Joyfull Learning-based Project Based Learning learning model is easy for teachers to use because the instructions in the Joyfull Learning-based Project Based Learning learning model are easy to understand and the Project Based Learning learning model Based on Joyfull Learning, it can be used by teachers.

The time aspect required for use is generally categorized as very practical. The results of the teacher's assessment of this aspect can be concluded that the Joyfull Learning-based Project Based Learning learning model that has been developed can make learning time more effective and can save time in the learning process.

Aspects that are easy to interpret are generally categorized as very practical. The results of the teacher's assessment of this aspect can be concluded that the Project Based Learning learning model based on Joyfull Learning has been able to help improve understanding of the material presented. Apart from that, the images displayed are clear and the presentation of the material in the Project Based Learning learning model based on Joyfull Learning is more practical to use.

Aspects that have the same equivalence are generally categorized as very practical. The results of the teacher's assessment of this aspect can be concluded that the Project Based Learning learning model based on Joyfull Learning can be used as accompanying teaching material in the learning process.

Based on the results of the teacher's assessment of these four aspects, it can be concluded that the Joyfull Learning-based Project Based Learning learning model designed is in accordance with the time specified in the Syllabus. Analysis of the practicality test questionnaire for the Project Based Learning learning model based on Joyfull Learning by teachers shows that the Project Based Learning learning model based on Joyfull Learning has a very practical category with a practicality value of 85.42%. The teacher stated that in general the Project Based Learning learning model based on Joyfull Learning was in accordance with basic competencies and could be applied.

b. Practicality by students

Judging from the results of the analysis on the practicality instrument sheet by students, the Project Based Learning learning model based on Joyfull Learning has reached a level of practicality that the assessment of the practicality of the Project Based Learning learning model based on Joyfull Learning for students which is generally developed overall is 85.37 in the very category. practical. Assessment of aspects of suitability for time is generally categorized as practical. Therefore, the Project Based Learning learning model based on Joyfull Learning that was developed can be used to support the practicality of learning for students. This means that the Project Based Learning learning model based on Joyfull Learning is easy for students to use in learning.

Based on the results of the analysis of the practicality of the Joyfull Learning-based Project Based Learning learning model by students, it can be concluded that the Joyfull Learning-based Project Based Learning learning model developed can be used by students in the learning process. This is based on the results of practicality analysis by students who are categorized as very practical. Thus, the Project Based Learning learning model based on Joyfull Learning is easy for students to use.

4.5 EffectivenessProject Based Learning Learning Model Based on Joyfull Learning

a. Teacher's ability to manage learning

When viewed from data analysis on teachers' ability to manage learning, there is an increase in teachers' ability to manage learning, namely in trial I, the value of teachers' ability to manage learning was at the "fairly

good" criteria. In trial III, the teacher's ability to manage learning was at the "good" criteria. Judging from the results of research conducted, the ability to manage learning has increased in trials II and III. The teacher's ability to manage learning is considered quite effective, the teacher is very capable of implementing the syntax in the Joyfull Learning-based Project Based Learning learning model.

If linked to theories that examine the Joyfull Learning-based Project Based Learning learning model, the results of the research above are very reasonable, as stated by Vygotsky (2004: 47) that a good learning model places emphasis on scaffolding, namely providing a large amount of assistance. in the form of questions when there is a bottleneck (stagnation of thinking), then reducing the assistance gradually and giving the student the opportunity to take over increasingly large responsibilities as soon as he is able to do so. Vygotsky also emphasized the role of the teacher at the stage of giving guiding and active questions when there are difficulties experienced by students through direction, encouragement, helping them when thinking occurs and the next process emphasizes student activity.

From the explanation above, the teacher provides direction to help students to dig up information and overcome incorrect or meaningless information, the teacher encourages interaction and cooperation between students, and the role of the teacher is to create a learning climate/environment that respects each other between teachers and students, between students. with fellow students. Parkay (2011: 243) believes that the teacher's role in the Joyfull Learning-based Project Based Learning learning model is only as a facilitator and organizer, namely only managing student learning activities, providing direction so that the material studied is easy for students to understand and interpret. The teacher's role as a facilitator is to facilitate and accommodate the diversity of students' abilities.

Learning using the Project Based Learning learning model based on Joyfull Learning can be used as a reference for the effectiveness of the teacher. This can also be seen from the results of research conducted by Jasmaniah et al (2014), namely: This research uses research and development methods. The results obtained so far in the first year are that 5 (five) steps of the 6 (six) planned steps have been implemented, namely; 1) collect information regarding the Colloid Material learning process in the problem solving aspect that has been carried out by teachers in vocational schools and in lectures, 2) design teaching materials for Project Based Learning based on Joyfull Learning, 3) design validation aims to assess the design of teaching materials by presenting 2 experts (material experts and media experts) to find out the weaknesses of the designed teaching materials, 4) improve the design resulting from validation, 5) trial the Joyfull Learning-based Project Based Learning teaching materials, both limited and extensive trials, and 6) revision teaching materials based on limited and extensive trials.

Sanjaya (2008:1) states that one of the problems facing our world of education is the problem of weak learning processes. In the learning process, children are not encouraged to develop thinking skills. The learning process in the classroom is directed at the child's ability to memorize information, the child's brain to remember and store various information without being required to understand the information he remembers in order to relate it to everyday life. This is because the level of student intelligence varies, so the level of student difficulty in solving very diverse problems too. Teachers can overcome this by dividing students into working groups consisting of four to five students. So that students can interact and collaborate, share ideas in solving problems.

Teachers have competence in managing learning, especially in creating an interesting learning atmosphere in accordance with their role. Sanjaya (2006: 21) says that the role of the teacher is: (1) teacher as a learning resource (2) teacher as guide, (3) teacher as facilitator, (4) teacher as administrator, (5) teacher as demonstrator, (6) teacher as a motivator, (7) teacher as an evaluator. Based on the description above, it is very natural that the Project Based Learning learning model based on Joyfull Learning can improve teachers' abilities in managing learning.

b. Student Interests

Success in learning is determined by how the interest or learning process takes place. Good input and a good learning process can improve learning achievement. Furthermore, if poor input is given good treatment in the learning process, it will produce good output.When viewed from student interest, there was an increase in the level of student interest where in trial III all categories of the student interest questionnaire were within the specified tolerance limits. Student interest in the learning process will lead to interaction between the teacher

and students or fellow students, resulting in a conducive classroom atmosphere, each student involving their abilities to the maximum.

When it is related to student interest in the application processProject Based Learning learning model based on Joyfull LearningPiaget's theory (Gredler, 2011: 318) states that social interaction in learning activities, both with friends in the same group and outside the group, has a big influence on children's thinking. Through this interaction, children will be able to compare the thoughts and knowledge they have formed with the thoughts and knowledge of other people. In another part, John Dewey (Trianto, 2009: 91) explains learningProject Based Learning learning model based on Joyfull Learningis the interaction between stimulus and response, is a relationship between two directions of learning and the environment. The environment provides input to students in the form of help and problems, while the brain's nervous system functions to interpret that help effectively so that the problem is investigated, analyzed and a solution is found well.

Sanjaya (2006: 174) states that interest in learning is any action that is deliberately designed by the teacher to facilitate student learning activities such as discussions, demonstrations, simulations, conducting experiments, and so on. The activities carried out by teachers are controlling, leading and directing the learning process, while students as learners are required to be active in learning.With the above conditions and learning processes and activities, it is hoped that this will provide opportunities and make students independent learners.

c. Achievement of Students' Creative Thinking Abilities

Students' creative thinking abilities after learning can be seen from the results of students' work in completing the tests given. This creative thinking ability is in the form of scores obtained by students from the tests given. The students' test results in trial III were very good judging from the scores obtained. Of the 34 students, only 4 students have not achieved learning completion. From the tests given, students generally did not make any more mistakes in solving the questions.

Based on the data above, classical completeness has reached 85.29%. So that classical creative thinking skills are complete.The conclusions from the results of the third trial data analysis are as follows: (1) there is an increase in students' creative thinking abilities; (2)comprehension abilityby using Joyfull Learning-based Project Based Learning learning tools.

This is in line with the view expressed by the Education Science Development Team (2009: 176), in order for Colloid Material to have human value, learning must be linked to reality, close to children's experiences and relevant to people's lives. Apart from that, Freudenthal also believes that colloidal material should not be viewed as teaching material that must be transferred directly as ready-to-use colloidal material, but should be viewed as a human activity. Learning Colloid Materials should be done by giving children as wide an opportunity as possible to try to discover it for themselves through specific assistance from the teacher.

This learning is not designed to help teachers provide as much information as possible to students. Project Based Learning was developed to help students develop creative thinking abilities and intellectual skills; learn various adult roles through their involvement in real or simulated experiences; and become autonomous and independent learning.

In this learning, students are placed as the main focus in learning activities and students are encouraged to be more creative in solving the problems they face. These problems are of course related to the material taught and the daily lives of students. Apart from that, the teacher as a facilitator is fully responsible for identifying learning objectives, material structure and basic skills to be taught. Then help students to be more creative in implementing and applying realistic colloid material learning.

Same focus betweenProject Based Learning learning model based on Joyfull Learningand situated creative thinking on the development of ideas, making researchers assume that learning with Project Based Learning learning model based on Joyfull Learningwill influence students' creative thinking abilities and do research on this. The ability to think creatively itself is measured in three components, namely fluency, flexibility and novelty (novelty). Yasa (2008:1) defines the ability to think creatively that a person acquires after experiencing a learning process over a certain period of time. This is in line with what Abidin (2014: 158) stated that "a learning model is presented as naturally as possible and then students work with problems that require students to apply their knowledge and abilities according to their level of psychological maturity and learning abilities.

Differences in creative thinking abilities were not visible at the first meeting. This is because learning using the PMRI approach has only been implemented for the first time. However, there are already several groups in the experimental class that show indicators of creative thinking abilities. whereas in the experimental class only a few students showed indicators of creative thinking abilities. At the second meeting, students had begun to experience improvement. Students in the experimental class and in the control class were able to produce indicators of novelty.

This is in line with the opinion of Istarani and Ridwan (2014:61) Project Based Learning is learning that combines theoretical concepts that must be the same or balanced with the realities of life. In other words, the concept must be able to be realized in life and life as a real fact of life itself. With this learning approach, students will be more focused on thinking, where they not only know about basic theories, but students will also relate these problems to their daily lives.

With the Project Based Learning approach based on Joyfull Learning, it will influence the level of student creativity in the teaching and learning process because here students will play more of a role in the learning process and students will show or give examples that they have linked to their daily life experiences. . So with this approach, students not only focus on the explanation given by the teacher, but students can also think or express opinions about what they know.

V. Conclusion

Based on the results of the analysis and discussion in this research, several conclusions are put forward as follows:

1. There is a valid Joyfull Learning-based Project Based Learning learning model. Ratings and Responses for Validator Language Experts provide a value greater than or equal to 3.428 (≥ 3.0) in the valid category. Ratings and Responses for Validator Design Experts provide a value greater than or equal to 3.467 (≥ 3.0) in the valid category. Assessment and Responses for Validator Material Experts provide a value greater than or equal to 3.529 (≥ 3.0) in the valid category. Assessment and Response for Experts The validator model provides a value greater than or equal to 3.475 (≥ 3.0) in the valid category.
2. The results of the practicality of the Project Based Learning learning model based on Joyfull Learning by teachers were 85.42%, overall in the very practical category. Thus, the results of the practicality questionnaire by teachers generally show that the Project Based Learning learning model based on Joyfull Learning is categorized as very practical.
3. The teacher's ability to manage learning is already at the limit of learning success, namely the criteria stating that the teacher is able to manage learning. Project Based Learning based on Joyfull Learning is the level of achievement of the teacher's ability to manage learning which is at least good enough, namely achieved if SR ≥ 80%, obtained 88.478%, so it can be concluded that The teacher's level of ability to manage learning is in the very good category.
4. Based on individual completion criteria, students can be determined who have completed individual learning. Based on the data, it is known that classical completeness has reached 85.29%. So that classical creative thinking skills are complete. In other words, it can be stated that the creative thinking abilities of students taught using the Project Based Learning learning model based on Joyfull Learning are higher than the creative thinking abilities of students taught using conventional learning models.

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