

Difference Model *Problem Based Learning* (PBL) and *Discovery Learning* (DL) on Results Study and Motivation Study Students at Bonding Materials Chemistry in Senior High School

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Abstract This research aims to: (1) determine the differences in student learning outcomes taught using the *Problem Based Learning* (PBL) and *Discovery Learning* (DL) models on chemical bonding material. (2) determine the differences in students' learning motivation who are taught using the *Problem Based Learning* (PBL) and *Discovery Learning* (DL) models on chemical bond material. (3) there is a correlation between motivation and learning outcomes of students who are taught using the *Problem Based Learning* (PBL) and *Discovery Learning* (DL) models on chemical bond material. The results obtained: (1) There are differences in student learning outcomes taught using the *Problem Based Learning* and *Discovery Learning models* on chemical bonding material. The average student learning outcomes in experimental class I using *Problem Based Learning* was 74.8. Meanwhile, the average learning outcome for experimental class II using the *Discovery Learning model* was 79.6. (2) There were differences in the learning motivation of students who were taught using the *Problem Based Learning* and *Discovery Learning models* on chemical bond material. Meanwhile, the average learning motivation of students in experimental class I using *Problem Based Learning* is 67.6. Meanwhile, the average learning motivation in experimental class II which was taught using the *Discovery learning model* was 72.5. (3) There is a correlation between students and learning outcomes taught using the *Problem Based Learning* and *Discovery Learning models* on chemical bond material with a positive correlation value. In experimental class I obtained Sig. = 0.00 with *Pearson Correlation* = 0.795 and experimental class II Sig. = 0.000 with *Pearson Correlation* = 0.879..

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Introduction

One of things that improve life nation that is education . The role of education is very important For create more life Good . Update must always done For create quality education . National Education works For develop ability and form behavior as well as civilization dignified nation in frame enlighten life purposeful nation For development potential to become capable , creative , independent , and human become democratic and responsible citizens answer (Dikti , 2003).

Education is expected capable develop quality generation young nation in various aspects that can reduce and reduce reason problem culture and character . Efforts to increase quality can done Keep going continuously in a way creative and innovative . The low quality education reflected from low results Study participant learn at school . In the implementation of learning chemistry There is three aspect namely : product , process, and attitude scientific . In the learning process chemistry , participant educate No only receive and get information from the teacher but liveliness participant students are also involved in the process for find that and also must skilled in face problem life and technology (Assriyanto et al, 2014).

Learning process demand participant educate For more active in search , discover , and develop knowledge possessed For get draft lessons guided by teachers. Effective learning process is a learning process that provides chance participant educate For express knowledge gained during the learning process For reach objective learning . For reach results maximum learning required exists encouraging motivation participant educate in a way physical , mental, intellectual , etc emotional (Hamalik in Sinaga & Silaban , 2020). Variation learning is still carried out by teachers not enough varied and inclined nature informative Where only teacher- centered .

Knowledge chemistry as knowledge knowledge very important and necessary nature understood as well as learned by participants educate . Knowledge chemistry in essence learn about composition and structure matter , nature material , change matter , accompanying energy change material . This matter show that part big participant educate think that chemistry is difficult lesson (Arifin, 1995).

Chemistry teachers at school intermediate general often face Lots one of the challenges participant students who think that eye lesson chemistry is eye difficult lesson For understandable , no interesting , as well boring . This matter cause participant educate Already moreover formerly feel No capable study and finally become Afraid For learn chemistry (Lie, 2003). One of material considered chemistry difficult understood by participants educate is material bond chemistry . Bonding material chemistry related with concepts - concepts like charging electrons in atomic shells , determination electron valence , configuration electrons , stability electrons , nor depiction of the Lewis symbol (Shelawaty et al, 2016). Bonding material Chemistry is also a responsible physical process in interaction style pull interesting between two atoms or the molecule that causes it something compound diatomic or polyatomic become stable (Mamangkai et al, 2019)

Problem main thing found in the learning process formal education environment school is low Power absorb participant educate For understand the material taught . This matter looks of the average results Study participant educate others still very lacking Good . As for the low results Study participant educate influenced from the teacher- centered learning model which causes participant educate No follow involved active in the learning process teach . Lack of abilities and interests participant educate in activity Study so that motivation Study participant educate tend non - intellectual and not Spirit For study , p This make participant educate not enough interested with material taught .

The above phenomena were discovered at the time researcher do observation at SMA Negeri 11 Medan. Based on results interview with the chemistry teacher at SMA Negeri 11 Medan class X year lessons 2022/2023, delivered that understanding participant educate to material Chemical Bonding still low matter This addressed from average test score participant educate Still many have n't reach the KKM , namely 75 for eye lesson chemistry in class X Science at SMA Negeri 11 Medan. Average value results Study participant educate

on the material Chemical bonds are fragile value 40-70. From the observations made researcher at SMA Negeri 11 Medan, that the learning process chemistry Still tend to teacher centered. Knowledge participant educate only obtained from what the teacher says , the consequences participant educate not enough independent in matter search and improve knowledge . Still a learning process focuses on teachers as source information result participant educate difficult understand material with nature concept abstract . So , the learning process become No maximum and cause motivation Study participant educate decline and yield Study participant education that is not optimal. So it's necessary effort Keep going continuously For seek and find approach or learning model chemistry that can increase results learning and motivation Study participant educate .

Based on the problems that have been explained above , a learning model is needed in it can stimulating participant educate For involved active in the learning process so that can increase results Study as well as motivation Study participant educate . Several learning models are possible applied are the Problem Based Learning (PBL) learning model and the Discovery Learning (DL) model.

Problem Based Learning (PBL) is one learning model that can be used facilitate participant educate Study chemistry in a way contextual so that more easy understood . PBL delivers environment study closely connection with life daily so PBL can support achieved meaningful learning (Abanikannda , 2016). PBL is participant - centered learning empowering education participant educate For do research , integrating theory and practice , and apply knowledge and skills For develop feasible solution For specified problem (Gunter & Alpat , 2017). success of PBL in learning Where PBL implementation is proven can increase performance Study participant educate , train Skills communicate , analyze , collaborate , improve ability think creativity and skills solution problems , and improve motivation Study participant education (Priyani et al, 2019)

Study related to the Problem Based Learning (PBL) model ever conducted by Indah Langitsari et al, (2017) results showing that application of the Third model indicator liveliness participant educate namely : ability ask (78%), convey opinions (81%) and communicating results discussion (76%) measurable in category tall during the PBL process. This matter because PBL presents atmosphere participant - centered learning educate and provide space for participants educate For active put forward opinion in finish given problems (Desriyanti & Lazulva , 2016). Then , Haryanto, et al (2017) stated that research results show happen enhancement motivation and results Study draft equilibrium chemistry through the complete PBL learning model Study cycle II reached 94.11 % fulfil criteria Study . Study For increase motivation with the PBL model carried out by Sumiati (2018) stated that the Problem Based Learning learning model can increase motivation and achievement learn on the concept chemistry equilibrium average yield Study students in cycle I was 77.70, cycle II was 86.90. Cycle II showed 94.11% compliance criteria learn in a way comprehensive with mark more from or The same with 75 more from 85%. This matter in line with results research by Wulandari, et al (2011) which states that The applicability of the PBL model is proven increase mastery draft chemistry in matter solution buffer in a way significant , with an average Ngain = 0.61. Study Jayadiningrat (2018) also stated that implementation of PBL can increase Skills solve eye problems Chemistry lesson .

The Discovery Learning (DL) model is a learning model that directs participant educate For can find something he learned during an involved learning process in a way maximum all over ability participant educate For search and investigate in a way systematic ,

critical, and logical as well as can explained activity through discussion. So, the results obtained will long lasting inside memory or not easy forgotten by participants students (Apareng et al, 2019). The advantages of the DL model are: can make participant educate interested For learn, shape draft abstract become meaningful through experience done straight away in activity learning, learning more realistic and meaningful Because motivated by interaction direct participant educate with examples real, involving participant educate in a way direct in learning. And awakening motivation participant education (Ilahi in Khofiyah et al, 2019).

Jayadiningrat et al, (2019) stated that application of the discovery learning learning model can increase motivation Study participant education and results Study participant educate on the eyes lesson chemistry, p This seen exists enhancement average percentage of motivation Study participant students in cycle II improvement compared to cycle I. Next study Herita (2022), shows that application of the Discovery Learning learning model to the material rate reaction can increase motivation Study participant education and results Study participant educate with percentage motivation participant students in cycles I, II, II experience enhancement. Bere et al, (2023) in his research show that application of the Discovery Learning learning model to the material colloid can increase results Study participant educate with average completion score whole participant educate amounting to 86. From the statement put forward in study on can concluded that application of the Discovery Learning learning model can increase motivation and results Study participant educate.

Research Methods

This research was carried out at SMAN 11 MEDAN in January – February FY 2023/2024 with a population of nine classes in class X. Class samples were obtained by purposive sampling so that class X-3 was selected as experimental class I which was taught using the Problem Based Learning model and class

This research began by giving a pretest to the two experimental classes, namely experimental class I and experimental class II. The pretest was given to determine students' initial abilities before being given treatment as well as the normal distribution of the homogeneity of the student samples in the two experimental classes. After carrying out the pretest, pretest data analysis was then carried out to determine the student sample through the normality test and homogeneity test. The sample of students taken in experimental class I and experimental class II was 30 students. Next, different treatments were carried out for each experimental class, where in experimental class I it was taught using the Problem Based Learning model and in experimental class II it was taught using the Discovery Learning model.

This research was carried out in three meetings to conduct learning and then this research ended by providing an evaluation of learning outcomes (posttest) with the same questions in the pretest and after giving the posttest it was continued with giving a learning motivation questionnaire to measure students' learning motivation. Based on the learning outcome data obtained in this research, in experimental class I which was taught using the Problem Based Learning model before being given treatment, the average pretest score was 49.88 and after being taught using the Problem Based Learning model, the average value of student learning outcomes was obtained. amounting to 74.83. In the experimental class II,

which was taught using the Discovery Learning model before being given treatment, the average pretest score was 43.5 and after learning using the Discovery Learning model, the average student learning outcome score was 79.66. Meanwhile, the average value of student learning motivation obtained in experimental class I was 67.6 and in experimental class II was 72.5. The learning outcomes of students taught using the Discovery Learning model are higher than the learning outcomes of students taught using the Problem Based Learning model.

Research Results and Discussion

This research was carried out at SMAN 11 MEDAN in January – February FY 2023/2024 with a population of nine classes in class X. Class samples were obtained by *purposive sampling* so that class X-3 was selected as experimental class I which was taught using the *Problem Based Learning model* and class. This research began by giving a pretest to the two experimental classes, namely experimental class I and experimental class II. The pretest was given to determine students' initial abilities before being given treatment as well as the normal distribution of the homogeneity of the student samples in the two experimental classes. After carrying out the pretest, pretest data analysis was then carried out to determine the student sample through the normality test and homogeneity test. The sample of students taken in experimental class I and experimental class II was 30 students. Next, different treatments were carried out for each experimental class, where in experimental class I it was taught using the *Problem Based Learning model* and in experimental class II it was taught using the *Discovery Learning model*.

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In the results of testing the first hypothesis using the *Independent Sample T-Test* at a significance level of 0.05 where if the Sig. > 0.05 then H_0 is accepted, meanwhile if Sig. < 0.05 then H_a is accepted. From the results of this research, it was found that the Sig. = 0.038 < 0.05 . Because the significance value obtained is smaller than 0.05, H_a is accepted. Thus, there are differences in student learning outcomes taught using the *Problem Based Learning model* and the *Discovery Learning model* on Chemical Bonding material.

In the results of testing the second hypothesis using the *Independent Sample T-Test* at Sig. = 0.05 where if the value of Sig. > 0.05 then H_0 is accepted, meanwhile if Sig. < 0.05 maka H_a accepted. From the results of this research, it was found that the Sig. = 0.038 < 0.05. Because the significance value obtained is smaller than 0.05, H_a is accepted. Thus, there are differences in students' learning motivation who are taught using *the Problem Based Learning* and *Discovery Learning models* on Chemical Bonding material.

In the results of testing the third hypothesis using *bivariate correlation analysis* at Sig = 0.05 where if the value of Sig. > 0.05 then H_a is accepted. From the results of this research in experimental class I, it was found that the Sig value = 0.000 < 0.05. And *Person Correlation* is 0.795. Meanwhile, in experimental class II, it was found that the Sig value = 0.000 < 0.05, with a *Pearson Correlation value* of 0.879. Because the significance value obtained in both experimental classes was smaller than 0.05, H_a was accepted. Thus, there is a correlation between learning motivation and student learning outcomes taught using the *Problem Based Learning* and *Discovery Learning models* on chemical bond material with a positive correlation. This is in line with Suja et al., (2021) who state that there is a positive and significant relationship between learning motivation and students' chemistry learning outcomes with the application of learning strategies adapted to chemistry. Learning motivation has a big role in a person's success in learning. High motivation will make students always seek knowledge that can develop effective learning skills. Motivated students will show more positive behavior and thinking than other students to achieve the desired results.

When the learning process takes place, students in experimental class I are taught using the *Problem Based Learning model*, students only learn through the process, solving problems, and evaluating problem solving which causes student learning outcomes to be low because students have the belief that the problems being studied are difficult to solve, thus making students feel reluctant to try. Meanwhile, in experimental class II, which is taught using the *Discovery Learning model*, students actively learn independently, train students' reasoning abilities, improve and enhance cognitive skills and processes so that this class has higher learning outcomes.

When conducting research in experimental class I, it was found that students in experimental class I lacked discipline in terms of the learning process. In the learning process, many students lack concentration on studying. Student activity in this class was also less visible when the researcher explained chemical bonding material, most students were less responsive and didn't care. Judging from the attitude in this class, there is a lack of motivation to learn which refers to low student learning outcomes. Student learning motivation is very influential on student learning outcomes, because if a student has high motivation then the learning outcomes they receive will also be better. Likewise, if student motivation is high, student learning outcomes will also be better.

Meanwhile, when the researchers conducted research in the experimental class II, the researchers found that the students in the class were conducive and responsive in terms of the learning process. During the learning process the students were actively asking and answering questions. When carrying out the learning process, students focus and listen to the researcher. In this class, students work together well and help each other when working on LKPD as a group. This class is taught using a *discovery learning model* which requires students to be independent in searching. This *discovery learning model* directs students to create hypotheses about what they learn, so that from the hypotheses that arise, students are

able to prove the hypotheses they have created for themselves. In this class, you will find strong learning motivation, which is proven by better learning outcomes in experimental class II. The presence of high motivation influences learning outcomes, where in this class student learning outcomes are high.

The roles of teachers and students in the two experimental classes are different, but both require students to be active in the learning process. In experimental class I, which is taught using the *Problem Based Learning model*, the teacher's role in implementing this model is to guide students to be able to solve each problem that has been determined (Fauzi., et al, 2022). The role of students is required to be active, independent, cooperative in the problem solving process (Junaidi, 2020). Meanwhile, in the experimental class II which is taught using the *Discovery Learning model*, the teacher's role is to guide students in searching, discovering and formulating concepts. Students also provide their opinions in the form of hypotheses and seek the truth in processing and carrying out verification and discussions to obtain concepts of learning material (Khofiyah, et al. 2019).

Conclusion

the following conclusions were obtained: 1) There are differences in student learning outcomes taught using the *Problem Based Learning* and *Discovery Learning models* on chemical bonding material. The average student learning outcomes in experimental class I using *Problem Based Learning* was 74.8. Meanwhile, the average learning outcome for experimental class II using the *Discovery Learning model* was 79.6. 2) There are differences in students' learning motivation who are taught using the *Problem Based Learning* and *Discovery Learning models* on chemical bonding material. Meanwhile, the average learning motivation of students in experimental class I using *Problem Based Learning* is 67.6. Meanwhile, the average learning motivation in experimental class II which was taught using the *Discovery learning model* was 72.5. 3). There is a correlation between students and learning outcomes taught using the *Problem Based Learning* and *Discovery Learning models* on chemical bond material.

Suggestion

After conducting research, processing and interpreting the data, the researcher suggests:

- 1) For teachers and prospective teachers who want to teach material on chemical bonds, they can apply the *Problem Based Learning* and *Discovery Learning models* because both support improving student learning outcomes, but teachers or prospective teachers must be able to master the class and manage the class well so that the desired learning can be implemented more optimally.
- 2) For future researchers, to further increase creativity and knowledge in increasing students' motivation to learn and have good preparation for teaching students.

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