Vol 12(2), 2023, 334-342 DOI: 10.23960/jppk.v12.i2.2023.33
Jurnal Pendidikan dan Pembelajaran Kimia
e-ISSN: 2714-9595| p-ISSN 2302-1772
http://jurnal.fkip.unila.ac.id/index.php/JPK/index

The Effect of the Lectora Inspire Assisted Problem Based Learning (PBL) on Higher Order Thinking Skills (HOTS) and Student Learning Motivation in Redox Reaction Material

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Received: July 21st, 2023 Accepted: August 3rd, 2023 Online Published: August 13th

Abstract: The Effect of the Lectora Inspire Assisted Problem Based Learning (PBL) on Higher Order Thinking Skills (HOTS) and Student Learning Motivation in Redox Reaction Material. The goal of this study was to identify the impact of using the Lectora Inspire assisted PBL model on students' HOTS and learning motivation findings, as well as to identify a substantial and positive association between learning motivation and students' HOTS. The quantitative research approach was employed, as well as the purposive sampling strategy: the experimental class used a PBL learning model helped by Lectora Inspire, whereas the control class used a direct instruction approach assisted by Powerpoint. After performing the normality and homogeneity checks required for the t-test and correlation test, data were analyzed using the right tailed test. The findings of the t-test for HOTS were $t_{count}>t_{table}$ (3.84>1.667), signaling that H0 has been rejected and Ha has been approved and that the use of the PBL with assistance from Lectora Inspire has an impact on students' HOTS. The implementation of the Lectora Inspire supported PBL has an impact on student learning motivation, according to the results of the t-test of learning motivation, which shown that H0 is rejected whereas Ha is approved. In the use of the Lectora Inspire supported PBL, the findings of the correlation test showed that student learning motivation is positively and significantly connected with HOTS of students ($r_{count}>r_{table}$ [0.7179>0.329]).

Keywords: PBL Model, Lectora Inspire, Higher Order Thinking Skills, Learning Motivation, Redox Reaction.

Abstrak: Pengaruh Problem Based Learning (PBL) Berbantuan Lectora Inspire Terhadap Kemampuan Berfikir Tingkat Tinggi dan Motivasi Belajar Siswa Pada Materi Reaksi Redoks. *Tujuan dari penelitian ini yaitu untuk mendapati dampak penggunaan model PBL berbantuan Lectora Inspire terhadap kemampuan berpikir tingkat tinggi dan motivasi belajar siswa, serta untuk mengidentifikasi korelasi yang substansial dan positif antara motivasi belajar dengan kemampuan berpikir tingkat tinggi siswa. Metode penelitian yang dipakai yaitu penelitian kuantitatif dan pengutipan sampel dengan Teknik puprposive sampling, diperoleh; kelas eksperimen memakai model PBL berbantuan Lectora Inspire, sementara itu kelas kontrol memakai pendekatan direct instruction berbantuan Powerpoint. Setelah dilakukan pemeriksaan normalitas dan homogenitas yang diperlukan untuk uji t dan uji korelasi, data dianalisis dengan uji arah kanan. Hasil uji-t HOTS mengunjukan $t_{hitung}>t_{tabel}$ (3,84>1,667), yang berarti bahwa H0 ditolak dan Ha diterima serta penggunaan PBL dengan pendampingan Lectora Inspire berdampak pada HOTS siswa. Penerapan PBL berbantuan Lectora Inspire berdampak pada motivasi belajar siswa, sesuai dengan hasil uji t motivasi belajar menunjukkan bahwa H0 ditolak dan Ha diterima. Dalam penggunaan PBL berbantuan Lectora Inspire, temuan uji korelasi menunjukkan bahwa motivasi belajar siswa berhubungan positif dan signifikan dengan HOTS siswa ($r_{hitung}>r_{tabel}$ [0,7179>0,329]).*

Kata kunci: *Model PBL, Lectora Inspire, Kemampuan Berpikir Tingkat Tinggi, Motivasi Belajar, Reaksi Redoks.*

▪ INTRODUCTION

At the level of social life, where the world/global society is still developing, education is crucial in enhancing the quality of human resources. In this instance, the government is continuing its efforts to raise the caliber of public education, beginning with a revamp of the curricula and moving on to the implementation of cutting-edge learning models using a variety of techniques and culminating in the development of an information technology learning environment (Purwa Kusuma, 2021).

The 2013 curriculum was put into place by the government using the Higher Order Thinking Skills (HOTS) learning approach. In order to learn, kids should be encouraged to think critically, logically, methodically, and with HOTS (Umami et al., 2021). Learning is more than simply reading, listening, writing, doing homework, and taking tests; it also includes behavioral changes as a result of the educational process, comprehending learning ideas, and implementing them. But a lot of high schoolers have trouble grasping the idea of learning, particularly in chemistry. This lowers student motivation to learn and affects the results of learning,so that chemistry learning outcomes become less good (Situmeang & Simorangkir, 2023).

HOTS is not just a question model, but also includes a learning model. The teaching model must include thinking skills, whereas the HOTS assessment technique needs students to be unfamiliar with the questions or assignments presented (Sofyan, 2019). The government expects pupils to use HOTS, or higher-order thinking skills, to attain a variety of competences, one of which is in chemistry studies. An evaluation that measures a person's higher-order thinking capacity is used to determine a person's ability to think at a higher level (Ayumniyya & Setyarsih, 2021).

Since chemistry is an abstract subject, students must actively participate in finding solutions to a variety of chemistry-related issues, both within and outside the classroom and in daily life. Consider the topic of reduction and oxidation processes (redox reactions), for example. Redox is a substance that is frequently found in daily life, such in the rusting of iron, photosynthesis, and the burning of petroleum (Palari et al., 2019).

The motivation to study is the component that affects pupils' critical thinking abilities. According to Siregar & Panggabean (2020), one of the internal elements that also affects students' thinking skills is motivation for learning. A student who is not well motivated to learn will engage in more passive learning activities than a student who is well driven to study. Students who have high motivation to learn will be better at accepting lessons and the attitudes elicited by students will be more positive in learning (Budiariawan, 2019).

Depending on how well a student can comprehend, take in, and arrange the information he receives, each student has his own motivation, which can come from both within and from outside sources. Students have difficulty connecting understanding of the submicro level (particle model) and the symbolic level (chemical notation). So higher-order thinking skills are needed to connect levels in learning chemistry (Pohan et al., 2023). Learning motivation is a psychological component that influences whether or not an individual receives support from inside to reach objectives that are characterized by awareness in learning, strong excitement, and attention to the learning process (Syachtiyani & Trisnawati, 2021).

The chemistry course's minimum completion requirement for the 2020–2021 academic year is 75 percent. According to the observations made in class X MIA SMA Negeri 15 Medan, pupils had a hard time accepting and understanding learning. This is due to the fact that teaching still takes priority. Students are bored because of the teacher's usage of lectures, discussions, and question-and-answer sessions, as well as the poor quality and lack of variety of the learning medium. Teachers frequently limit the talents they are measuring in their questions to Lower Order Thinking Skills (LOTS), and the questions are not contextual. In contrast to research Fajriani (2021), where it is necessary to use HOTS to solve learning challenges, most questions generated today just test memory 21st century learning students are required to be able to think HOTS in solving learning problems.

The Problem Based Learning (PBL) learning paradigm is one that can aid in boosting student learning motivation and students' higher-order thinking skills based on these issuesStudents learn about creative thinking and problem-solving skills in the context of real-world situations under the PBL paradigm, while also obtaining critical topic knowledge (Elizabeth & Sigahitong, 2018). According to Yulianti (2019), The PBL paradigm requires students to discover their own solutions to the problems in question by using students' thinking skills so that a concept is formed within students about the material being studied, so that during learning activities, students will use critical thinking skills.

The media, in addition to the learning model, is a crucial element since it appeals to students, making it a part of the learning model. Application of learning media is supposed to speed up the learning process, accomplish learning goals to raise student accomplishment, and arouse interest in the subject matter. It is a wise decision to create learning materials in schools using information and communication technology (ICT), especially if the materials are computer-based interactive media (Simorangkir et al., 2019).

The Lectora Inspire media is one example of interactive learning materials that might make it simpler for teachers to impart abstract knowledge. Software called Lectora Inspire can be used to make interactive learning materials (Hikmi et al., 2020). Lectora Inspire has many programs to be able to support the needs of full service authoring tools, which are widely used to develop digital content for teaching modules and modules that are built into dynamic, easy-to-use and quality multimedia without having to have special skills in the field of art design and graphic design (Silalahi et al., 2022).

According to research (Lumban Gaol & Darmana, 2022), Lectora Inspire multimedia had an impact on PBL learning's learning outcomes for thermochemistry. It was clarified that student responses were rated as good and had a percentage yield of 76.04%. According to the findings of research Irfani (2020), the Lectora media received good results and might be an effective learning medium to enhance student learning activities.

Based on this, it is anticipated that using the PBL learning approach, which is backed by Lectora Inspire media, will help teachers improve the quality of learning by increasing students' enthusiasm to learn and higher order thinking skills. Learning becomes more engaging and enjoyable because it is more participatory, teaches students to study on their own, requires them to locate material on their own as a source, and sharpens their thinking abilities because problem-solving requires foresight.

▪ METHOD

The location of this study will be SMAN 15 Medan, which is at Development School Road, No. 7, Sunggal, Medan Selayang District, Medan City, North Sumatra 20128. The research will take place in the even semester of the 2022–2023 school year, from January 2022 to March 2023. All students of SMAN 15 Medan class X IPA in the odd semester of the 2022/2023 academic year who acquired redox reaction material consisting of 8 classes were included in this study. Purposive sampling was used to collect samples from two classes. Lectora Inspire material is used to support the Problem Based Learning (PBL) methodology in Class X IPA 4, which is the experimental class. Using Powerpoint media and the Direct Instruction approach, Class X IPA 5 served as the control group.

Tests and nontes were used as data gathering methods in this study. The test is composed of 20 multiple-choice questions, each with 5 response options (a, b, c, d, and e). nontes as a questionnaire with 30 statement items on a Likert scale that assesses learning motivation. The right-side t-test and correlation test were used to statistically assess the research data. As a requirement for the t-test, normality and homogeneity were first evaluated before evaluating the hypothesis.

▪ RESULT AND DISCUSSION

The PBL learning model, which Lectora Inspire supports, has steps that must be followed when conducting research, including first providing students with a problem orientation by the instructor (researcher) outlining learning objectives, describing, and persuading students to participate in problem-solving activities. Second, The instructor assists pupils in defining and organizing their learning activities pertaining to challenges by structuring students' research in this manner. Third, encourage kids to perform independent or group investigations, gather accurate information, do out tests and seek explanations and solutions. Fourth, the teacher helps students plan and prepare suitable results by helping them produce and present their work in the form of reports and models that help them communicate with others. The teacher then invites the class to study the trends in their findings and provide some conclusions. With the teacher's assistance, the students can now record the activity's strengths and faults so that they can be methodically fixed.

Data on assessments of HOTS abilities (post-test) and information on students' motivation for learning were gathered for this study. The data was measured both before and after the experimental class applied the PBL approach with help from Lectora Inspire media and the direct instruction model with help from Powerpoint media.

1. Higher Order Thinking Skills

The average, standard deviation, and Based on the outcomes of the students' HOTS developed in this study, the variance of the post-test data from the experimental and control groups was determined, as shown in Table 1 below:

Table 1 : The Posttest Data's Mean, Standard Deviation, and Variance.

Grade	Mean ($\bar{X}$)	Standard deviation (S)	Variance (S^2)
Experiment	80,14	6,91	47,743
Control	74,58	7,02	49,286

a) Normality Test

Table 2 below provides the results of the normalcy test, which is a need for the t test for data involving HOTS or post-test information in the experimental class and control class.:

Table 2: Posttest Data Normality Test

Grade	X^2_{count}	X^2_{tabel}	α	Desc
Experiment	5,578	11,07	0,05	Normal
Control	9,27	11,07	0,05	Normal

Table 2 is used to determine that $X^2_{count}<X^2_{Table}$. The data on the learning motivation of students in the experimental class and the control class passed the normality test and the findings are normally distributed..

b) Homogeneity Test

As a requirement for the t-test data on students' higher-order thinking abilities, the homogeneity test results are shown in Table 3 below:

Table 3: Data From the Posttest Homogeneity Test

Grade	Variance	F_{count}	F_{table}	Desc
Experiment	47,743	1,106	1,757	Homogeneus
Control	49,286			

Table 3 yields the result that $F_{count} > F_{table}$, demonstrating the homogeneity of the data on students' high-level thinking abilities.

c) Hypothesis Test

The right side t-test statistical test was used to analyze the findings of the hypothesis test for HOTS Table 4 below abilities. The information from the outcomes of the hypothesis test is shown in:

Table 4: Test The Data Hypothesis of Students' Higher Order Thinking Skills

Grade	$\bar{X}$	t_{count}	t_{table}	Desc
Experiment	80,14	3,84	1,667	Ha is accepted
Control	74,58			

According to Table 4's hypothesis test results, H0 is refused but Ha is accepted., indicating that using the Lectora Inspire-assisted PBL approach has an impact on students' high-level thinking abilities when studying redox reaction material.

2. Learning Motivation

The study's findings regarding student learning motivation were tabulated in order to determine the mean, SD, and V of the post-test data from the experimental class and control class, as shown in Table 5 below:

Tabel 5: Data on learning motivation have a mean, standard deviation, and variance.

Grade	Mean ($\bar{X}$)	Standard deviation (S)	Variance (S^2)
Experiment	75,49	7,34	53, 87
Control	70,8	7,35	54,12

a) Normality Test

Table 6 below provides the results of the normalcy test, which is a requirement for the t test, for information on students' motivation for learning in the experimental class and the control class:

Table 6: Normality Test of Learning Motivation

Grade	X^2_{count}	X^2_{table}	α	Desc
Experiment	4,51	11,07	0,05	Normal
Control	4,547	11,07	0,05	Normal

Table 6 shows $X^2_{count} < X^2_{Table}$, which means that the learning motivation data of the experimental class and control class students are normally distributed..

b) Homogeneity Test

As a requirement for the t-test data on students' high-level thinking abilities, the homogeneity test results are shown in Table 7 below:

Table 7: Learning Motivation Homogeneity Test

Grade	Variance	F_{count}	F_{table}	Desc
Experiment	53,87	1,004	1,757	Homoge neus
Control	54,12			

Table 7 yields the result that $F_{count} > F_{table}$, demonstrating the homogeneity of the data on students' high-level thinking abilities.

c) Hyphothesis Test

The right side t-test statistical test was used to analyze the findings of the hypothesis test on student learning motivation. In the table below, Table 8, the data from the hypothesis are displayed:

Table 8 : Hyphothesis Test of Learning Motivation

Grade	X	t_{count}	t_{table}	Desc
Experiment	75,49	2,707	1,667	Ha is accepted
Control	70,8			

The value of $t_{count}>t_{table}$ (2.707>1.667) obtained from the results of the hypothesis test in Table 8 indicates that H0 is rejected and Ha is accepted, i.e., the use of the Lectora Inspire assisted PBL has an impact on student learning motivation in redox reaction material.

3. Correlation Test

Product moment correlation test analysis is used to determine the connection between students' learning motivation and the outcomes of HOTS. The results are shown in Table 9 below:

Table 9: Correlation Test of Learning Motivation with Student's HOTS

Data	N	r_{xy}	r_{table}	Desc
Post test results and student learning motivation	36	0,7179	0,329	Ha is accepted

Learning motivation students are positively and significantly correlated with students' HOTS, according to the results of data processing using the product moment formula. For the correlation between learning motivation students and students' high-level thinking skills in the experimental class, the price is obtained $r_{xy} > r_{table}$ (0.7179> 0.329), and the coefficient of determination (CD) is 51,55%..

Once the data has been collected, it is next examined as a preliminary test for the statistical test. The post-test data and learning motivation were subjected to normality and homogeneity testing. According to the computations, post-test data for the experimental class were normally distributed, showing $X^2_{count} < X^2_{table}$ (5.578<11.07), whereas post-

test data for the control class showed $X^2_{count}<X^2_{table}$ (9.27<11.07). Additionally, $X^2_{count} < X^2_{table}$ (4.51<11.07) displays the normally distributed experimental class learning motivation data, while $X^2_{count}<X^2_{table}$ (4.547<11.07) displays the normally distributed control class learning motivation data.

The homogeneity test using post-test data and student enthusiasm for learning will be the following test. The post-test data and learning motivation data were deemed homogeneous based on the computation results. The findings of computing $F_{count} < F_{table}$ for the post-test data (1.06<1.757) and the learning motivation data (1.004<1.757) support this. The first hypothesis test, which used a right-tailed test to determine whether the PBL paradigm, supported by Lectora Inspire media, had an impact on students' higher-order thinking skills, was then conducted. It was known that $t_{count}>t_{table}$ (3.84>1.667). The use of the PBL approach, helped by Lectora Inspire, has an impact on students' HOTS. As a result, the null hypothesis (H0) is rejected and the alternative hypothesis (Ha) is accepted.

In line with research Nuraini (2019), the Lectora Inspire-assisted PBL model gave a positive response to carbohydrate material, the developed Lectora Inspire media helped students learn carbohydrate material and made learning more enjoyable, so that student achievement increased. Research by Irwandani (2019) that the use of interactive media in problem-based learning may inspire students to think critically and grasp learning ideas since they take an active part during learning. PBL learning that is simulated in interactive media adds to students' knowledge. There are also images and videos to help understand the material's theme.

In order to determine whether adopting the PBL paradigm with assistance from Lectora Inspire media had any impact on student learning motivation, a second hypothesis test was conducted. It is known that $t_{count}>t_{table}$ (2.707>1.667). The null hypothesis (H0) is subsequently rejected, and the alternative hypothesis (Ha) is accepted, and it states that the use of the PBL paradigm with the help of Lectora Inspire media affects students' motivation to learn about redox reactions.

The product moment formula was used to calculate the correlation test, which produced the results $r_{count} > r_{table}$ (0.7179 > 0.329). A high correlation is included in the correlation coefficient, r = 0.7179. According to the coefficient of determination (CD), students' motivation contributes 51.55% to higher order thinking skills, whilst other factors are responsible for 48.45% of the variance. As a result, the null hypothesis (H0) is rejected and the alternative hypothesis (Ha) is accepted. As a result, it can be stated that while utilizing the Lectora Inspire media-assisted PBL approach, student learning motivation has a positive and significant link with students' HOTS.

▪ CONCLUSION

The study's findings indicate that students' HOTS in redox reaction material are influenced by the PBL methodology with assistance from Lectora Inspire media. While learning with the Direct instruction model aided by Powerpoint media was more common in the control class, learning with the PBL model assisted by Lectora Inspire media was higher with an average value of 80.14. The Problem Based Learning approach and Lectora Inspire media have an impact on students' motivation to learn redox reaction information. Whereas learning in the PBL model in the experimental class was more advanced with an average value of 75.49, learning in the direct instruction model with the help of Powerpoint material in the control class was lower at 70.8. When using Lectora Inspire media-assisted Problem Based Learning, there is a favorable and significant

association between students' HOTS and their enthusiasm to study. This is demonstrated by the fact that $r_{count} > r_{table}$ with $r_{count} = 0.7179$ and $r_{table} = 0.329$.

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