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Application of the Problem Based Learning (PBL) Assisted by Powtoon Video Media on Student Learning Activities and Outcomes on Periodic System of Elements Material

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Abstract: Application of the Problem Based Learning (PBL) Assited by Powtoon Video Media on Student learning Activities and Outcomes on Periodic System of Elements Material. This research design uses a form of pretest – posttest control group design.The population in this study was the entire class X IPA SMAS Dharmawangsa Medan. The samples in this study were 2 classes, namely class XI MIA 7 as an experiment and class XI MIA 4 as a control class. The instruments used in the from multiple-choice questions and non-test instruments in the form of observation. This research aims to (1) Knowing that the learning outcomes and learning activities of students who are taught with the help of PowerPoint animation video media are higher than the chemistry learning outcomes of students who are taught with the help of PowerPoint media. (2) Knowing that there is a correlation between activities and student learning outcomes. The results obtained are in (1) The learning results using the right-hand t test obtained tcount > ttable = 3.61 > 1.67, so the learning outcomes of students taught using the PBL model assisted by Powtoon Video Media are higher than the learning outcomes of students taught with the PBL model assisted by Powerpoint Media. (2) Learning activity data shows that the value of tcount > ttable = 1.80 > 1.67, so the learning activities of students taught using the PBL model assisted by Powtoon Video Media are higher than the learning outcomes of students taught using the PBL model assisted by Powerpoint Media in Periodic System of Elements material, (3) the results of the correlation test show that the value of rcount > rtable = 0.73 > 0.36, meaning there is a significant correlation between activities and student learning outcomes taught using the PBL model assisted by Powtoon Video Media in the Periodic System material Element with a coefficient of determination of 54%.

Keywords: Problem Based Learning, Powtoon, Learning Outcomes, Learning Activities, Periodic System Of Elements

Abstrak: Penerapan Problem Based Learning (PBL) Berbantuan Media Video Powtoon Terhadap Aktivitas dan Hasil Belajar Siswa Pada Materi Sistem Periodik Unsur. *Desain penelitian ini menggunakan pretest-postest control group design. Populasi dalam penelitian ini adalah seluruh kelas X IPA SMAS Dharmawangsa Medan. Sampel dalam penelitian ini adalah 2 kelas yaitu kelas XI MIA 7 sebagai eksperimen dan kelas XI MIA 4 sebagai kelas kontrol. Instrumen yang digunakan dalam penelitian ini adalah instrumen tes dan instrumen non tes. Penelitian ini bertujuan untuk (1) Mengetahui hasil belajar dan aktivitas belajar siswa yang dibelajarkan berbantuan media video animasi powtoon lebih tinggi dibandingkan hasil belajar kimia siswa yang dibelajarkan berbantuan media powerpoint. (2) Mengetahui ada korelasi antara aktivitas dengan hasil belajar siswa. Hasil yang diperoleh yaitu pada (1) Hasil belajar menggunakan uji t pihak kanan diperoleh $t_{hitung} > t_{tabel}$ = 3,61 > 1,67, maka hasil belajar siswa*

yang diajarkan dengan model pembelajaran PBL berbantuan Media Video Powtoon lebih tinggi daripada hasil belajar siswa yang diajarkan dengan model pembelajaran PBLberbantuan Media Powerpoint. (2) Data aktivitas belajar menunjukkan bahwa nilai $t_{hitung} > t_{tabel} = 1,80 > 1,67$, maka aktivitas belajar siswa yang diajarkan dengan model PBL berbantuan Media Video Powtoon lebih tinggi daripada hasil belajar siswa yang diajarkan dengan model pembelajaran PBL berbantuan Media Powerpoint pada materi Sistem Periodik Unsur, (3)hasil uji korelasi menununjukkan bahwa nilai $r_{hitung} > r_{tabel} = 0,73 > 0,36$, berarti ada korelasi yang signifikan antara aktivitas dengan hasil belajar siswa yang diajarkan dengan model PBL berbantuan Media Video Powtoon pada materi Sistem Periodik Unsur dengan koefisien determinasi sebesar 54%.

Kata kunci: *Problem Based Learning, Powtoon, Hasil Belajar, Aktivitas Belajar, Sistem Periodik Unsur.*

▪ INTRODUCTION

Sciences (IPA) field of study which discusses the composition, structure, properties and changes of matter. Chemistry is closely related to everyday life, but is not liked by most students because it is considered difficult and complicated to learn. This assumption is very influential because students become lazy about following subjects so that students have difficulty solving problems in chemistry lessons. This causes student learning outcomes to not reach completeness (Sangaji et al, 2023). Based on the results of direct interviews with chemistry teachers at SMA Dharmawangsa Medan, information was obtained from chemistry teachers that chemistry subjects were still considered difficult and abstract by students. Especially I n the material on the periodic system of elements, namely the relationship between electron configuration and the location of the element in the periodic table of elements, as well as the lack of enthusiasm among students in studying chemistry material.There are still many students who are not active in learning and this has an impact on their learning outcomes, there are 75% or 24 out of 32 students whose daily test scores on the periodic system of elements material are still below the minimum completeness criteria (KKM = 75).

In the learning process, teachers tend to use a lecture-based model, discussing and giving assignments using printed books Educators are expected to be able to design learning activities that are student-centred so that increased activity and learning outcomes in chemistry subjects can be realized. One learner-centered learning strategy is to use a problem-based learning model (Mulyanti, 2021). The PBL learning model is problem-based learning. The model is a learning model that involves students and is more student-centered so that it is suitable for the Periodic System of Elements (SPU) material where students' learning activities will be visible so that later it can make students' learning outcomes in chemistry learning better. The PBL model is good for use in the chemistry learning process, because in the PBL model students must learn to understand the material and knowledge, so that from understanding the material students can solve the problems given (Astuti et al, 2019). It is hoped that this PBL model will better improve student learning outcomes. The effectiveness of this model is that students are more active in thinking about real problems around them so that students get a deeper and more meaningful impression about what they are learning (Zakiyah & Ulfa, 2018).

The use of a learning model will be better if it is accompanied by media. The media used in learning can speed up and improve the quality of the teaching and learning process. In the teaching and learning process in schools, it is very necessary to have media to support the learning process to be used by students independently and can create enthusiasm for students' learning (Husna et al, 2021). Powtoon is an online service for creating presentations that has very interesting animation features including handwriting

animation, cartoon animation, and more lively transition effects as well as very easy timeline settings. The Powtoon program can load videos and flash animations and can be operated more smoothly than other media such as Powerpoint. The feasibility of learning media can be seen from several aspects, namely design aspects, pedagogical aspects, content aspects, ease of use aspects, appearance aspects and programming aspects (Juliana et.al., 2017). The research results of Latifa & Lazulva (2020) stated that the Powton animation media was very suitable for use at 88.35% and very practical at 86.54%.

▪ METHOD

The population of this study were all class X students at SMA Dharmawangsa Medan. The sample in this study used two classes, namely classes X MIPA 4 and X MIPA 7 with a total of 60 students and the sampling technique from this population was purposive sampling. The research design used was a pretest – posttest control group design.

The research instrument used by researchers is a test instrument using initial knowledge instruments (Pretest) and final knowledge instruments (Posttest).

As well as non-test instruments, namely student activity observation sheets. The data analysis method used is:

1. Calculated Chi Square normality (X^2) < Chi Square value of normally distributed data
2. In the homogeneity analysis for $F_{hit} \geq F_{table}$, the data is homogeneously distributed.
3. Correlation Test if $r_{hit} \geq r_{table}$. there is a correlation significant positive/negative between variable X and variable Y.
4. Hypothesis testing is carried out using the t-Test. If sig < α (0.05) then Ho is accepted, whereas if sig > α (0.05) then Ha is accepted. According to Silitonga (2014)

The procedures carried out in the study are: Conducting interview observations to grade 10 chemistry teachers of SMA Dharmawangsa Medan, conducting pretests to experimental classes and control classes, Applying problem based learning models assisted by powtoon animation videos in experimental classes and applying problem based learning models using power points in control classes, Observing student learning activities assisted by 2 observers, After learning, post-test is carried out to the experimental class and the Control class and analyze data.

▪ RESULTS AND DISCUSSION

Student learning outcomes

Before carrying out the instrument test, the questions are first validated by validating the items through testing the questions on class XI Science students. Trials were carried out to determine the reliability of the questions, the level of difficulty of the questions and the differentiating power of the questions. After carrying out all the tests, the question items used were 20 questions.

The pretest aims to determine students' initial cognitive abilities, while the posttest aims to determine students' final abilities after applying the problem-based learning model.

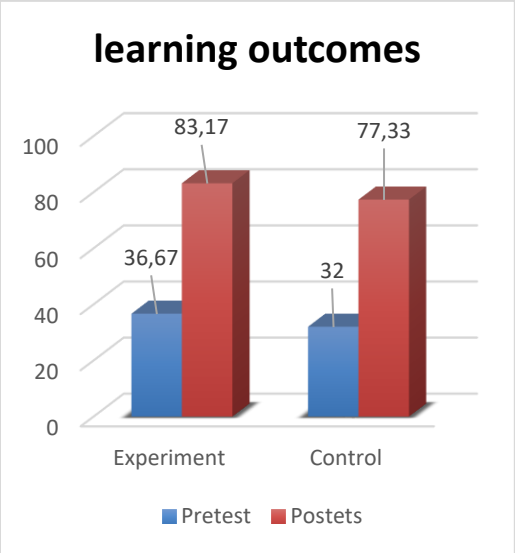

Figure 1. Student learning outcomes

It can be seen in the graph of the average learning outcomes between the two classes with different treatments. In the experimental class, before being taught using the Problem Based Learning (PBL) learning model with Powtoon videos, the students' pretest average was 36.67 and after being taught using the Problem Based Learning (PBL) learning model with Powtoon videos and being given a posttest, the students' posttest average was obtained. namely 83.17. Meanwhile, in the control class, before being taught using the Problem Based Learning (PBL) learning model using PowerPoint media, the students' pretest average was 32 and after being taught using the Problem Based Learning (PBL) learning model using PowerPoint media, the students' posttest average was 77. 33. So it can be concluded that the student results using the Problem Based Learning (PBL) learning model assisted by Powtoon video media are higher than the control class.

Table 1. Results of Student Activities

Class	Data Type	Results
Experiment	The number of students	30
	The highest score	96
	Lowest value	73
	Total value	2570.83
	Average	85.69
Control	The number of students	30
	The highest score	94
	Lowest value	71
	Total Value	2495.83

	Average	83.19

Based on the table above, it can be seen the average student learning activity between the two classes given different treatment. In the experimental class taught using the Problem Based Learning (PBL) learning model with Powtoon video media, the average student learning activity was 85.69. Meanwhile, in the control class which was taught using the Problem Based Learning (PBL) learning model using PowerPoint media, the average student learning activity was 83.19. So it can be concluded that activities using the Problem Based Learning (PBL) learning model assisted by Powtoon video media are higher than the control class

Normality test

Table 2. Normality Test

Class	Learning outcomes	Activity	X2 table	Note
Experiment	5.40	8.45	11.07	Normal
Control	6.20	10.25	11.07	Normal

It can be seen in the table above that the learning result data for the experimental class is X2 count < X2 table (5.40 < 11.07) and the control class X2 count < X2 table (6.20 < 11.07). So it can be concluded that the pretest and posttest data in the two classes are normally distributed at a significant level of $\alpha = 0.05$.

Based on the table above, it is found that the experimental class student learning activity data X2 count < X2 table (8.45 < 11.07) and the control class X2 count < in both classes it is normally distributed at the significance level $\alpha = 0.05$.

Homogeneity Test

Table 3. Homogeneity Test

Category	Fcount	Ftable	Note
Learning outcomes	1.08	1.86	Homogeneous
Activity	1.08	1.86	Homogeneous

Based on the table above, it is found that the data on learning outcomes and student learning activities in the experimental class and control class is Fcount < Ftable (1.08 < 1.86). So it can be concluded that the data on learning results and student learning activities in the two classes are homogeneous at the significant level $\alpha = 0.05$.

Correlation Test

Table 4. Correlation Test

Class	Class Data	rcount	rtable	Note
Experiment	∑X = 2570.834 ∑X2 = 221172.1 ∑Y = 2495 ∑Y2 = 208675 ∑XY = 214552.2 N = 30	0.738	0.361	Ho is rejected and Ha is accepted

Based on the table data above, it is obtainedrcount = 0.738 in the experimental class while rtable at α = 0.05 (N=30) is 0.361. Because rcount > rtable, it is stated that Ho is rejected and Ha is accepted.

The contribution of activities to learning outcomes can be determined through the Determinant Coefficient (CD) with the formula:

$$CD = r2$$

$$CD = (0.738)2 = 0.54$$

Then the CD presentation is 54%. This means that activities influence learning outcomes by 54%, and the rest is influenced by other factors.

Discussion

Learning outcomes

Testing hypothesis I in this study uses the right-hand t test. Before calculating the t test, the pretest and posttest data are first normalized and tested for homogeneity as a prerequisite for carrying out the t test. In the calculations that have been carried out, the value of tcount = 3.61 and ttable = 1.67 is obtained with the criteria in the hypothesis test showing that the value of tcount is in the critical area, so that Ha is accepted and Ho is rejected because it is at a significant level of 5% (α = 0.05). So it can be concluded that the learning outcomes of students taught using the problem based learning model assisted by PowerPoint video media are higher than the learning outcomes of students taught using the problem based learning model assisted by PowerPoint media.

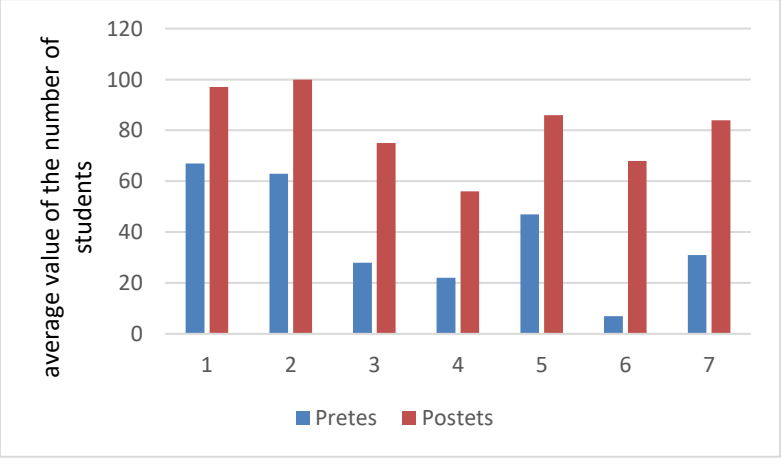

Figure 2. Graph of distribution of learning outcome scores based on learning indicators

It can be seen that the application of the Problem Based Learning model assisted by Powtoon Video Media has a positive impact on student learning outcomes. This can be seen from the increase in students' pretest and posttest scores for each indicator. The higher average score for the experimental class is because the learning media used by Powtoon is more interesting than PowerPoint because it has an audio feature and can then create animated shows containing sound as an explanation of the animation, so that students can remember the lessons they have received.

This statement is in line with research (Sutisna et al., 2019) which states that learning through animation can improve students' understanding because the text displays together with the animation. Using Powtoon also causes the majority of students to often answer the teacher's questions correctly about the material being taught. This is confirmed by researchers (Semaan & Ismail, 2018) who say, students can stay focused during the entire session when using Powtoon videos and then they can create their own Powtoon video learning media.

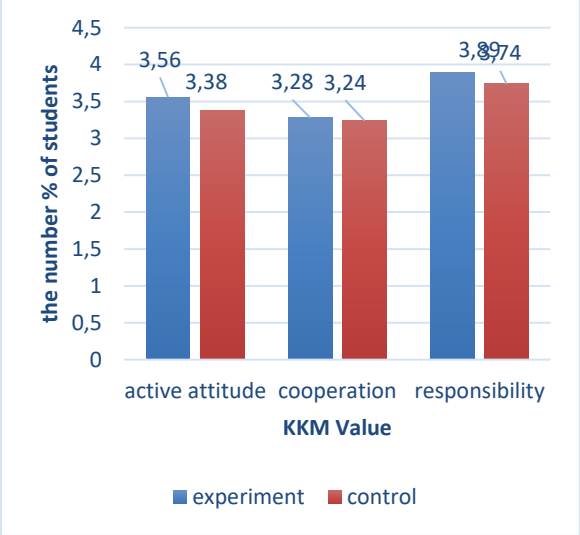

Figure 3. Distribution of student scores based on KKM score attainment

Based on the graphic results above, it can be seen from the research data that the percentage of students in the experimental class has 80% of students whose scores exceed the KKM score, while in the control class only 40% of students whose scores exceed the KKM score. According to research conducted by Sangaji et al., (2023), it is stated that there is an influence with the problem-based learning model on student learning outcomes in the material on the periodic system of elements with the obtained value, namely tcount > ttable or 10.056 > 1.729, so that H0 is rejected and Ha is accepted. According to previous research conducted by (Ariyanto et al., 2018; Febriani, 2021; Qurrotaini et al., 2020; Tiwow et al., 2022) stated that powtoon learning media has a positive influence on student learning outcomes, namely student learning outcomes. The experimental class taught using PowToon animation media was better, with an average percentage score of 78.29% compared to the control class which was only 64.84%.

According to Limbong & Silaban Research (2023), PBL results show that there is an increase in test scores. Where the average pre-test score is only 62.94 while the average post-test score is 80.42. Based on this, learning using the Problem Based Learning model is able to increase knowledge of buffer solution material in class XI MIPA SMA Negeri 5 Medan students.

Learning activity

TestingThe second hypothesis was carried out using the right-tailed t test. Before calculating the t test, the pretest and posttest data are first normalized and tested for homogeneity as a prerequisite for carrying out the t test. Based on the calculations that have been carried out, the value of tcount = 1.80 and ttable = 1.67 is obtained with the criteria in the hypothesis test showing that the value of tcount is in the critical area, so that Ha is accepted and Ho is rejected because it is at a significance level of 5% ($\alpha = 0.05$) . So it can be concluded that the learning activities of students taught using the problem based learning model assisted by PowerPoint video media are higher than the learning activities of students taught using the problem based learning model assisted by Power Point media. Based on research conducted by Siregar (2022), it can be seen that student activities carried out during learning activities using the PBL learning model have increased from cycle I to cycle II by 9.16%. In cycle I the percentage obtained was 86.67% and then in cycle II the percentage obtained was 95.83.

According to Astuti et al, (2019) who stated that tThere is a significant difference in students' learning activities on the periodic system of elements material between students who have high or active learning activities and students who have low or inactive learning activities. With the average value of student learning outcomes with learning activities (Active) in experimental class 1 (PBL Model) and experimental 2 (TAI Model) (respectively 65,625 and 65.25.

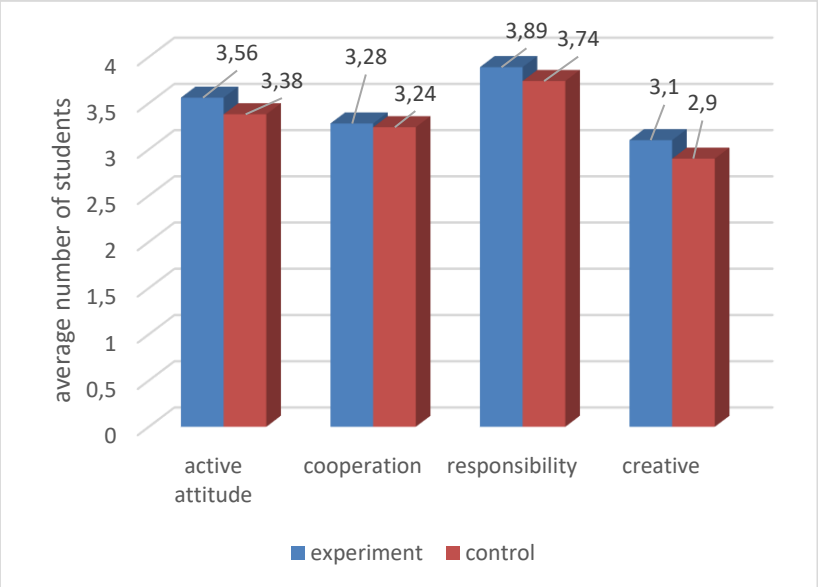

Figure 4. Distribution of average activity values based on indicators

Based on the graph above, the average value of peripheral activity in the experimental class and control class has a value that is not much significant because animation can undoubtedly attract student activity, helping them maintain concentration while studying (Awalia et al., 2019). The powtoon application can be opened by anyone,

including educators or students (Kholilurrohmi, 2017). Based on research by Arumningtyas (2020), using Powtoon provides greater attention and participates more actively in learning and question and answer sessions when the learning process becomes less boring.

The Relationship Between Learning Outcomes and Learning Activities

In this research, researchers observed student learning activities in the teaching and learning process to determine the relationship between student activities and improving student learning outcomesin the learning process using experimental class data which is carried out using correlation tests. In the correlation test calculation, the experimental class data resulted in rcount = 0.738, while the rtable at $\alpha = 0.05$ (N=30) was 0.361, so it was stated that Ho was rejected and Ha was accepted. The results of this research show that there is a significant correlation between activities and student learning outcomes taught using the PBL model assisted by Powtoon media on the Periodic System of Elements material at 54%. From the coefficient of determination it can be seen that 54% of activity influences chemistry learning outcomes.

There is a correlation test calculation for control class data which produces rcount = 0.547, while the rtable at $\alpha = 0.05$ (N=30) is 0.361, so it is stated that Ho is rejected and Ha is accepted. The results of this research show that there is a significant correlation between activities and student learning outcomes taught using the PBL model assisted by Powerpoint media on the Periodic System of Elements material by 30%. From the coefficient of determination it can be seen that 30% activity influences chemistry learning outcomes. The results of this research are in line with previous research, namely according to Pasaribu & Tarigan (2023) which states that there is an influence on student learning outcomes and activities with a variety of media taught using the Problem Based Learning model and the influence of Powtoon animation videos using Powtoon animation video media is higher than PowerPoint media. According to Nainggolan & Sihombing Research (2023), there is a correlation between the activities and learning outcomes of students who are learned using learning videos of 0.577 are in the medium category and using PowerPoint of 0.495 are in the medium category.

▪ CONCLUSION

After data processing, hypothesis testing, and analysis of research findings, the researcher came to the following conclusions: The learning outcomes and activities of students taught using the problem based learning model assisted by PowerPoint video media are higher than the learning outcomes of students taught using the problem based learning model assisted by PowerPoint media. This can be seen from the average scores obtained by students when studying material on the periodic system of elements. Then it can be seen that there is a relationship between learning outcomes and student learning activities taught using the problem based learning model assisted by Powtoon video media on the material of the periodic system of elements.

▪ REFERENCES

Ariyanto, R., Kantun, S., & Sukidin, S. (2018). Penggunaan Media Powtoon Untuk Meningkatkan Minat Dan Hasil Belajar Siswa Pada Kompetensi Dasar Mendeskripsikan Pelaku-Pelaku Ekonomi Dalam Sistem Perekonomian

Indonesia. Jurnal Pendidikan Ekonomi: Jurnal Ilmiah Ilmu Pendidikan, Ilmu Ekonomi Dan Ilmu Sosial, 12(1), 122. https://doi.org/10.19184/jpe.v12i1.7622

Arumningtyas, D. P., Ekonomi, F., Surabaya, U. N., Studi, P., Tata, P., Ekonomi, F., Surabaya, U. N., Pembelajaran, M., Powtoon, A., & Produk, P. (2020). Pengembangan Media Pembelajaran Dengan Aplikasi Powtoon. Pendidikan Tata Niaga (JPTN), 08(01), 667–673.

Astuti, A. D., Larasati, C. N., & Parubak, A. S. (2019). Perbandingan Model Pemelajaran Dan Aktivitas Belajar Terhadap Hasil Belajar Kognitif Peserta Didik Kelas X Ipa Sma Negeri 2 Manokwari Pada Materi Sistem Periodik Unsur. Arfak Chem: Chemistry Education Journal, 2(2), 142-147

Awalia, I., Pamungkas, A. S., & Alamsyah, T. P. (2019). Pengembangan Media Pembelajaran Animasi Powtoon pada Mata Pelajaran Matematika di Kelas IV SD. Kreano, Jurnal Matematika Kreatif-Inovatif, 10(1), 49–56. https://doi.org/10.15294/kreano.v10i1.18534

Febriani Putri, E. (2021). Media Pembelajaran Powtoon untuk Meningkatkan Hasil Belajar Peserta Didik pada Mata Pelajaran Ekonomi. Jurnal Penelitian Dan Pengembangan Pendidikan, 5(2), 198–205. https://ejournal.undiksha.ac.id/index.php/JJL/index

Husna, K., Rusmansyah, Kusasi, M., Syahmani, & Zuwida, H. (2021). Development of flipbook e-module problem-based learning (PBL) learning model to increase students' learning outcomes in oxidation-reduction reaction material. Journal of Physics: Conference Series, 2104(1). https://doi.org/10.1088/1742-6596/2104/1/012024

Juliana, Evriyenni, & Rini. (2020). The Development of Learning Media Based Powtoon in Atomic Structure Subject in First Grade Powtoon Pada Pokok Bahasan Struktur Atom. Jurnal Pendidikan Kimia, 1, 1–10.

Kholilurrohmi, I. (2017). Efektivitas Penerapan Media Pembelajaran Video Powtoon Pada Mata Pembelajarn Kimia Terhadap Motivasi dan Prestasi Belajar Peserta Didik Kelas X Semester I SMAN 1 Pleret. Universitas Negeri Yogyakarta

Latifah, N., & Lazulva. (2020). Desain Dan Uji Coba Media Pembelajaran Berbasis Video Animasi Powtoon Sebagai Sumber Belajar Pada Materi Sistem Periodik Unsur. JEDCHEM (Journal Education and Chemistry), 2(1), 26–31.

Limbong & Silaban (2023). The Effect of Problem Based Learning (PBL) Learning Model on Students' Learning Outcomes in Buffer Solution Materials. Jurnal Pendidikan dan Pembelajaran Kimia. Vol 12(3).

Mulyanti, J. S. (2021). Meningkatkan Keaktifan Dan Hasil Belajar Materi Redoks Dan Elektrokimia Melalui Model Problem Based Learning. Jurnal Lingkar Mutu Pendidikan, 18(1), 123–133. https://doi.org/10.54124/jlmp.v18i1.24

Nainggolan & Sihombing (2023). Differences of Motivation and Learning Outcomes of Students Taught Using Learning Videos and PowerPoint on the Material of Acid and Base Solutions. Jurnal Pendidikan dan Pembelajaran Kimia. Vol.12(2).

Pasaribu, F. S., & Tarigan S. (2023). Pengaruh Variasi Media Menggunakan Model Problem Based Learning Terhadap Hasil Belajar Dan Aktivitas Siswa Pada Materi Asam Basa. Pediaqu: Jurnal Pendidikan Sosial dan Humaniora. Vol.2, No.3

Qurrotaini, L. dkk. (2020). Efektivitas Penggunaan Media Video Berbasis Powtoon dalam Pembelajaran Daring. Seminar Nasional Penelitian LPMM UMJ, 1–7. http://jurnal.umj.ac.id/index.php/semnaslit

Sangaji, R. A., Amin, M., -, M., Liestianty, D., & Sugrah, N. (2023). Pengaruh Model Pembelajaran Berbasis Masalah Terhadap Hasil Belajar Siswa Kelas X SMA Negeri 2 Halmahera Selatan Pada Materi Sistem Periodik Unsur. Jurnal Pendidikan Kimia Unkhair (JPKU), 3(1), 10–14. https://doi.org/10.33387/jpku.v3i1.6404

Semaan, C., & Ismail, N. (2018). The effect of using Powtoon on learning English as a foreign language. International Journal of Current Research, 10(5), 69262- 69265.

Silitonga, P., M. (2014). Statistika Teori dan Aplikasi dalam Penelitian. Medan: FMIPA UNIMED.

Siregar, S. M. (2022). Penerapan Model Pembelajaran Problem Based Learning (PBL) untuk Meningkatkan Hasil Belajar Siswa Kelas X MIPA 6 SMA Negeri 1 Matauli Pandan Pada Materi Ikatan Kimia. Jurnal Edu Talenta, 1(1), 16–27. https://doi.org/10.56129/jet.v1i1.8

Sutisna, E., Vonti, L. H., & Tresnady, S. A. (2019). the Use of Powtoon Software Program in Teaching and Learning Process: the Students' Perception and Challenges. Jhss (Journal of Humanities and Social Studies), 3(2), 81–85. https://doi.org/10.33751/jhss.v3i2.1461

Tiwow, D., Wongkar, V., Mangelep, N. O., & Lomban, E. A. (2022). Pengaruh Media Pembelajaran Animasi Powtoon Terhadap Hasil Belajar Ditinjau dari Minat Belajar Peserta Didik. Journal Focus Action of Research Mathematic (Factor M), 4(2), 107–122. https://doi.org/10.30762/factor_m.v4i2.4219

Zakiyah, H., & Ulfa, N. (2018). Pengaruh Model Pembelajaran Pbl (Problem Based Learning) Terhadap Hasil Belajar Siswa Pada Materi Bahan Kimia Dalam Kehidupan Sehari-Hari. Lantanida Journal, 5(2), 106. https://doi.org/10.22373/lj.v5i2.2833