



Sustainability Learning: Project Based Learning Integrated Chemo-Entrepreneurship Approach to Understanding Chemistry and Interest in Entrepreneurship

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ABSTRACT

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This research aims to re-analyze how much influence the PjBL learning model integrated with the CEP approach has on students' learning outcomes and interest in entrepreneurship. This research used a pre-experimental design method through one group pretest - posttest design, which was carried out on 10 students in the first semester of the Agribusiness Study Program at Deli University, Sumatra. The data analysis instruments used were learning outcomes tests and questionnaires conducted before and after learning. The research results show that the N-gain is 0.84 with an increase in learning outcomes of 29.3%, this is because students can understand the material directly through project activities. In the interest in entrepreneurship which was tested through a questionnaire instrument, it was found that there had been an increase in the high category from 10.2% to 84.6% because through the integrated PjBL Model the CEP approach in the material studied was linked directly to entrepreneurial products, so that students became active and felt happy participating in activities. learning. Based on the results of research on the influence of implementing the PjBL Model integrated with the Chemo-Entrepreneurship (CEP) approach on students' understanding of chemistry and interest in entrepreneurship to determine the increase in learning outcomes in general chemistry lessons and students' entrepreneurial interest, it can be concluded that the application of the PjBL Model integrated with the CEP approach in chemistry learning can increasing students' understanding of chemistry and entrepreneurial interest.

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INTRODUCTION

The Merdeka Belajar policy is to abandon the standard approach and choose an approach with a more complete variety or different types, thus enabling educators and students to explore an increasingly advanced scientific world. With an emphasis on student-centered education, the curriculum created with the freedom to learn regulations is characterized by being flexible, skills-based, centered on character development and non-technical skills, and responsive to DU/DI needs. (Republic of Indonesia Law No.20 of 2003).

In implementing the Independent Learning curriculum, a learning model is needed that can support these activities. The project-based learning model or Project Based Learning (PjBL) is a learning model where students work independently to develop the power of the mind, critical thinking, and overcome the problems they identify (Kholida & Suprianto, 2020).

The advantage of Project Based Learning is that this learning model is a very good learning model in developing various students' thinking skills, skills in making decisions, activity skills, problem solving abilities which can also develop students' self-confidence and self-management. (Umar, 2016). Project Based Learning is a learning model that emphasizes student activities in solving various open-ended problems and applying their knowledge in working on a project to produce certain products (Abidin, 2014).

Through a contextual approach in learning chemistry that will be applied in the PjBL model is the Chemo-Entrepreneurship (CEP) approach. According to Supartono (2010), through the CEP approach students are taught to relate directly to real objects or phenomena around human life, so that apart from educating, the CEP learning approach allows students to learn the process of processing a material into a product that is useful, has economic value and motivates students to become entrepreneurs. (Kamaludin et al., 2023). Apart from increasing students' understanding of the chemical concepts being studied, the application of CEP in learning activities can also make the learning atmosphere more active and enjoyable. (Wijayanti & Karanganyar, 2023). This is in accordance with what was explained by Sumarti, (2008), that with the CEP approach, learning chemistry is not boring and gives students the opportunity to optimize their potential in producing a product. If students are accustomed to such learning conditions, it is possible that their entrepreneurial spirit will grow. An entrepreneurial spirit supported by adequate thinking skills will increase the effectiveness of chemistry learning. (Rahmawanna et al., 2016)

The CEP approach also allows students to learn the process of processing a material into a product that is useful, has economic value, and motivates entrepreneurship. This learning approach makes chemistry lessons more interesting, fun and more meaningful (Supartono, 2007). One of the applications of CEP in the Chemistry course is to form life skills, meaning skills that are always needed by a person (student) wherever they are when navigating life, whether working or not working and whatever their profession. To make this happen, it is necessary to apply the principles of education with the CEP/entrepreneurship learning model which is not only oriented towards academic or vocational fields, but also puts it into practice to solve everyday life problems. (Kusuma, 2011).

Chemistry is a branch of science that is closely related to everyday life. According to Oxtoby, Gillis, and Nachtrieb (2001) in Wijayanti & Karanganyar (2023) that chemistry is not just a closed set of facts and formulas, chemistry is not just a theory, chemistry is a living method that continues to develop following changing times. Students can experiment or apply existing chemical theories to create a product that can develop knowledge and skills. Through the integrated PjBL Model, the CEP approach makes it possible for students to experiment in making a product, so it is very possible to increase their interest in entrepreneurship.

CEP-oriented chemistry learning also provides opportunities for students to be able to think and act on something (Paristiowatia et al., 2015). The application of CEP-oriented chemistry learning can make students remember more of the chemical concepts or processes being studied. It is hoped that CEP-oriented chemistry learning can make students more creative so they can apply the knowledge they have learned in their daily lives (Wibowo & Ariyatun, 2018). The concept of the CEP approach can increase students' entrepreneurial spirit, so that using the CEP approach in chemistry subjects will be more fun and give students the opportunity to optimize their potential to produce a product (Kusuma & Siadi, 2010). Using the CEP approach does not mean forming students into entrepreneurs or traders, but learning using the CEP approach is expected to foster an entrepreneurial spirit/spirit (Rohmadi, 2011).

METHODS

This research was carried out using a pre-experimental design method through a one group pretest-posttest design, namely a research design that provides treatment to the experimental group without comparing it to the control group. The effect of the treatment given can be seen from the differences in the pretest and posttest. This research was carried out in three stages, namely: (1) giving an initial test (pretest) before learning using the PjBL Model integrated with the CEP approach, (2) implementing learning through the PjBL Model integrated with the CEP approach, and (3) giving a final test (posttest) after learning through the PjBL Model integrated with the CEP approach.

The population in this study were students from the Agribusiness Study Program at Deli Sumatra University, while the samples in this study were students in the first semester of the Agribusiness Study Program at Deli Sumatra University in the General Chemistry course. The sampling technique was carried out by purposive sampling. The instrument used in this research is a non-test instrument in the form of a questionnaire to determine changes in students' attitudes towards general chemistry lessons and interest in entrepreneurship before and after learning through the integrated PjBL Model with the CEP approach. Data processing was continued with statistical testing in the form of a normality test to determine whether the data before and after learning was normally distributed or not using the Kolmogorov-Smirnov test. Then the hypothesis test was carried out using the Wilcoxon test using SPSS version 20 software with a significance level of 0.05.

RESULTS AND DISCUSSION

The data used in this research are: (1) Increased learning outcomes in general chemistry courses for first semester students of the Agribusiness Study Program; (2) Increasing students' interest in entrepreneurship. Next, the data is processed by summarizing the research results and described using quantitative and qualitative descriptions. The results of the learning analysis related to the integrated PjBL model with the CEP approach can be seen in table 1.

Table 1. Percentage of Improvement in General Chemistry Learning Outcomes using the CEP Integrated PjBL Model

No	Student name	Percentage (%)		
		Pretest	Posttest	Enhancement
1	HRS	50	90	40
2	ENA	59	85	26
3	NAZ	54	86	32
4	NAE	67	91	24

5	PPE	70	84	14
6	MFR	45	90	45
7	MHI	56	93	37
8	YFD	65	93	28
9	MR	73	87	14
10	AGN	57	90	33
Average		59.6	88.9	29.3

In this study the lowest score was 14% and the highest increase in learning outcomes was 45% with an average increase in learning outcomes of 29.3%. The pretest results had an average score of 59.6%, while the posttest results experienced a significant increase with an average posttest result of 88.9%. The increase in general chemistry learning outcomes can be seen in Figure 1.

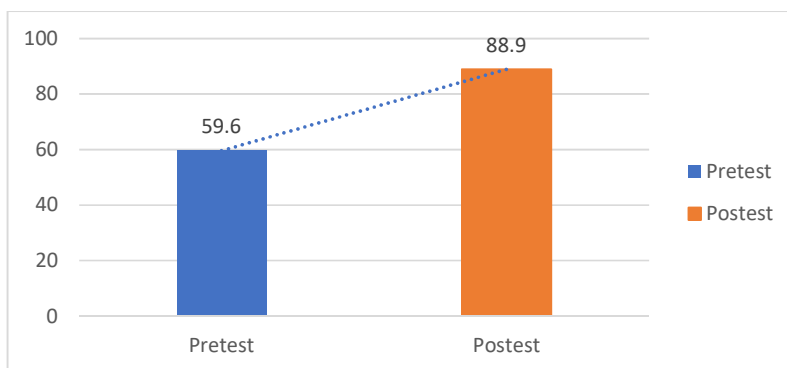


Figure 1. Improvement in General Chemistry Learning Outcomes

Based on this data, the Gain value can be calculated through Test N-gain scoring is done by meanscountthe difference betweenmarkpretest and posttest. The N-gain value can be seen in table 2.

Table 2. N-gain of general chemistry learning outcomes

Descriptive Statistics					
	N	Minimu m	Maximu m	Mean	Std. Deviation
Ngain	10	.47	.84	.7069	.12926
NGain_percent	10	46.67	84.09	70.6879	12.92615
Valid N (listwise)	10				

N-gain score The resulting mean value is 0.84, this value is greater than 0.7, so the category obtained is high, which means the effectiveness is high or there is an increase in learning outcomes.

Students' interest in entrepreneurship is tested through a questionnaire instrument before and after learning through the CEP integrated PjBL Model. It is known that students' interest in

entrepreneurship has increased in the "high" category from 10.2% to 84.6%. The difference in students' entrepreneurial interest before and after learning is clearly visible in Figure 1.

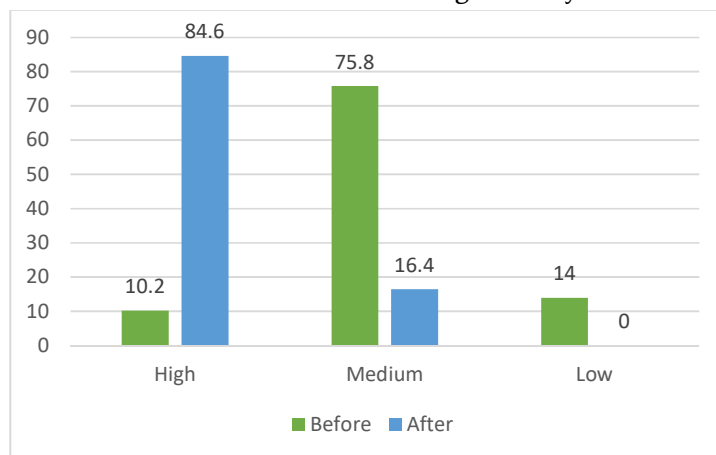


Figure 2. Student Entrepreneurial Interest

The increasing demand for student entrepreneurship is a positive impact of the PjBL learning model integrated with the CEP approach, because through the PjBL Model integrated with the CEP approach the material studied is directly linked to making aromatherapy candles based on natural ingredients, so that students become active and feel happy participating in learning activities. In this research, through hydrocarbon practicum activities by making aromatherapy candles based on natural ingredients, students will increase their knowledge about hydrocarbon compounds.

This is supported by research Ersanghono et al., (2011), that the application of CEP in learning makes learning activities more meaningful because this learning invites students to study chemistry in groups and relate the material to everyday life, so as to increase students' interest and attitude towards chemistry lessons which will ultimately improve learning outcomes student.

After following learning using the PjBL model integrated with the CEP approach, students' interest in entrepreneurship in the "high" category increased from 10.2% to 84.6%, interest in entrepreneurship in the "medium" category from 75.8% to 16.4%, while students with "low" entrepreneurial interest further decreased from 14% to 0.0%. This is because learning using the PjBL model integrated with the CEP approach allows students to learn the process of processing a chemical into a product that is useful and has economic value. In accordance with research results Kusuma & Kusoro (2010), learning using CEP-oriented teaching materials can improve student learning outcomes, increase entrepreneurial spirit, and improve students' special life skills. This is reinforced by the research results Mulyani (2011) which states that the success of an entrepreneurship education program is through the achievement of students who have high entrepreneurial character and behavior.

CONCLUSION

Based on the results of research on the effect of implementing the PjBL Model integrated with the Chemo-Entrepreneurship (CEP) approach on students' understanding of chemistry and interest in entrepreneurship to determine the increase in students' positive attitudes towards general chemistry lessons and student entrepreneurial interest, it can be concluded that, the application of the PjBL Model integrated with the CEP approach in learning chemistry can increase students' understanding of chemistry and entrepreneurial interest.

REFERENCES

- Abidin, Y. (2014). *Desain Pembelajaran dalam Konteks Kurikulum 2013*. Refika Aditama. Direktorat Jenderal Peraturan Perundangundangan. Undang-Undang Republik Indonesia No.20 Tahun 2003 Tentang Sistem Pendidikan Nasional. Ditjen PP. Jakarta. (n.d.).
- Ersanghono, Nanik, W., & Kusoro, S. (2011). Peningkatan Life Skill Mahasiswa Kimia Berorientasi Chemoentrepreneurship (CEP) melalui Pembelajaran Kooperatif STAD. *Jurnal Penelitian Pendidikan*, 29(2), 113–120.
- Kamaludin, A., Nahadi, & Anwar, S. (2023). Axiological View of Chemo-Entrepreneurship in Supporting The Pancasila Student Profile. *Jurnal Cakrawala Ilmiah*, 3(2), 625–632. <https://bajangjournal.com/index.php/JCI/article/view/6733/5171>
- Kholida, S. I., & Suprianto, S. (2020). Ketercapaian hasil belajar mahasiswa pada mata kuliah strategi pembelajaran melalui model Pjbl dengan berbantuan aplikasi zoom dan di whatsapp messenger. *In Prosiding Seminar Pendidikan Fisika FITK UNSIQ*.
- Kusuma, E. (2011). Pengembangan Bahan Ajar Kimia Berorientasi Chemo-Entrepreneurship Untuk Meningkatkan Hasil Belajar Dan Life Skill Mahasiwa. *Jurnal Inovasi Pendidikan Kimia*, 4(1), 544–551.
- Kusuma, E., & Kusoro, S. (2010). Pengembangan Bahan Ajar Kimia Berorientasi ChemoEntrepreneurship untuk Meningkatkan Hasil Belajar dan Life Skill Mahasiswa. *Jurnal Inovasi Pendidikan Kimia*, 4(1), 544–551.
- Kusuma, E., & Siadi, K. (2010). Pengembangan Bahan Ajar Kimia Berorientasi Chemo-Entrepreneurship untuk Meningkatkan Hasil Belajar dan Life Skill Mahasiwa. *Jurnal Inovasi Pendidikan Kimia*, 4(1), 544–551.
- Mulyani, E. (2011). Model Pendidikan Kewirausahaan di Pendidikan Dasar dan Menengah. *Jurnal Ekonomi Dan Pendidikan*, 8((1), 1–18.
- Paristiowatia, M., Slameta, R., & Sebastianana, R. (2015). Chemo-Entrepreneurship: Learning Approach for Improving Student's Cooperation and Communication (Case Study at Secondary School, Jakarta). *INTE 2014; Procedia - Social and Behavioral Sciences (Elsevier)*, 174, 1723 – 1730.
- Rahmawanna, Adlim, & Halim, A. (2016). Pengaruh Penerapan Pendekatan Chemo-Entrepreneurship (Cep) Terhadap Sikap Siswa Pada Pelajaran Kimia Dan Minat Berwirausaha. *Jurnal Pendidikan Sains Indonesia*, 04(20), 113–117.
- Rohmadi, M. (2011). Pembelajaran Dengan Pendekatan CEP (ChemoEntrepreneurship) yang Bervisi SETS (Science, Environment, Technology and Society) Guna Meningkatkan Kualitas Pembelajaran. *Jurnal Education*, 6(1), 17–37.
- Sumarti, S. . (2008). Peningkatan Jiwa Kewirausahaan Mahasiswa Calon Guru Kimia dengan Pembelajaran Praktikum Kimia Dasar Berorientasi Chemo-Entrepreneurship. *Jurnal Inovasi Pendidikan Kimia*, 2(2), 305–311.
- Supartono. (2007). Upaya Peningkatan dan Kreativitas Siswa SMA melalui Pembelajaran Kimia dengan Pendekatan Chemoentrepreneurship (CEP), Proceeding Seminar Nasional Kimia dan Pendidikan Kimia. *Jurusan Kimia FMIPA UNNES*, 66–74.
- Supartono, Saptorini, & Dian, S. (2010). Pembelajaran Kimia Menggunakan Kolaborasi Konstruktif dan Inkuiri Berorientasi Chemo-Entrepreneurship. *Jurnal Inovasi Pendidikan Kimia*, 3(2), 476–483.
- Umar, M. A. (2016). Penerapan Pendekatan Saintifik dengan Metode Pembelajaran Berbasis Proyek (Project-Based Learning) pada Mata Pelajaran Kimia. *Jurnal Entropi*, 11(2), 132–138. <https://ejournal.stkipbbm.ac.id/index.php/bio/article/view/194>
- Wibowo, T., & Ariyatun, A. (2018). Penerapan pembelajaran berorientasi chemoentrepreneurship (CEP) terhadap kreativitas siswa SMA modern pondok selamat

pada materi kelarutan dan ksp (translation: The application of chemoentrepreneurship-oriented learning (CEP) to the creativity of modern hi. *JTK (Jurnal Tadris Kimiya)*, 3(1), 62–72.

Wijayanti, E., & Karanganyar, M. M. H. (2023). Chemo Enterpreunership Pemanfaatan Limbah Jelantah untuk Pembuatan Lilin Aromaterapi pada Siswa Kelas XI SMA Mazro'atul Huda Karanganyar. *Jurnal Cakrawala Ilmiah*, 2, 3949–3957.
<https://www.bajangjournal.com/index.php/JCI/article/view/5857/4410>