Voltaic Cell Learning Design Using the RADEC (Read, Answer, Discuss, Explain, and Create) Model Oriented toward the Pancasila Student Profile

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Abstract

This study aimed to describe the Voltaic Cell learning design using the RADEC (Read, Answer, Discuss, Explain, and Create) learning model based on the Pancasila Student Profile. The approach employed in this research was descriptive qualitative. The research instrument was a validation sheet in the form of a questionnaire administered to five validators, consisting of two Expert Lecturers in Chemistry Education at Universitas Pendidikan Indonesia and three Chemistry teachers who taught at Sekolah Penggerak in Bandung City, employing the Merdeka Curriculum. The data processing results demonstrated an average percentage of 96.7% for the alignment of the lesson plan across four aspects: Formulation of Competency Achievement Indicators and Learning Objectives, Presented Content, Language Usage, and Time Allocation. The findings also indicated a connection between the voltaic cell learning activities using the RADEC learning model and the manifestation of the Pancasila Student Profiles, including Faith in God Almighty, Noble Characters, Global Diversity, Mutual Cooperation, Independence, Critical Reasoning, and Creativity, producing an average percentage of 95.4% classified into the excellent category. Hence, this study signified that the voltaic cell learning design using the RADEC model could cultivate the Pancasila Student Profile.

Keywords: pancasila student profile; RADEC learning model; voltaic cell

Abstrak

Penelitian ini bertujuan untuk mendeskripsikan desain pembelajaran Sel Volta dengan menggunakan model pembelajaran RADEC (*Read, Answer, Discuss, Explain, and Create*) berbasis profil pelajar pancasila. Pendekatan yang digunakan dalam penelitian ini adalah deskriptif kualitatif. Instrumen penelitian berupa lembar validasi berupa angket yang diberikan kepada lima validator, terdiri dari dua orang Dosen Ahli Pendidikan Kimia Universitas Pendidikan Indonesia dan tiga orang guru Kimia yang mengajar di Sekolah Penggerak Kota Bandung dengan menerapkan Kurikulum Merdeka. Hasil pengolahan data menunjukkan persentase rata-rata sebesar 96,7% untuk keselarasan RPP pada empat aspek: Perumusan Indikator Pencapaian Kompetensi dan Tujuan Pembelajaran, Isi Penyajian, Penggunaan Bahasa, dan Alokasi Waktu. Temuan juga menunjukkan adanya keterkaitan antara kegiatan pembelajaran sel volta dengan model pembelajaran RADEC dengan perwujudan profil pelajar pancasila antara lain Ketuhanan Yang Maha Esa, Akhlak Mulia, Keberagaman Global, Gotong Royong, Kemandirian, Nalar Kritis, dan Kreatifitas, sehingga menghasilkan persentase rata-rata sebesar 95,4% tergolong dalam kategori sangat baik. Oleh karena itu, penelitian ini menunjukkan bahwa desain pembelajaran sel volta dengan model RADEC dapat menumbuhkan profil pelajar pancasila.

Keywords: profil pelajar pancasila; model pembelajaran RADEC; sel volta

Introduction

The rapid development of science, technology, and information in the globalization era has intensified competition between nations worldwide. To face this competition, it is crucial to enhance the quality of human resources in Indonesia through improvements in education. Unfortunately, this country's current state of education lags behind that of other nations. Therefore, education is crucial to the country's progress (Suardana, Redhana, Sudiatmika, & Selamat, 2018).

Since Indonesia's independence, education has undergone various changes and improvements to curriculum policies (Alhamuddin, 2014). Different principles have been employed in redesigning the curriculum in Indonesia, leading to the emergence of the Merdeka Curriculum. Its primary foundation is the Free Learning philosophy, which is also based on other educational policies outlined in the Ministry of Education and Culture Strategic Plan for 2020-2024 (Permendikbud No. 22 of 2020). It promotes Merdeka (Independent) Learning, which encourages paradigm shifts related to curriculum and learning (Kemendikbudristek, 2022). Correspondingly, chemistry learning is a vital component of the education system that can facilitate a paradigm shift through the learning process.

Education should not solely focus on learners' knowledge; it must encompass their overall potential, including knowledge, attitude, and skill competencies. Hence, this comprehensive approach aims to foster character development within learners (Merdekawati, 2015). Surprisingly, only 46.6% of teachers consistently integrate character education into their teaching methods. Although they recognize the urgency of character education, many struggle to incorporate it into Chemistry lessons (Merdekawati, 2015). Additionally, teachers rarely receive character education training during their education and teaching careers. Consequently, integrating character education into Chemistry lessons becomes challenging, as observed from the analysis of

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learning designs in the lesson plans created by teachers (Nasrudin et al., 2018). The new curriculum significantly emphasizes character education to shape a Pancasila student profile (Juliani & Bastian, 2021).

The profile in question aligns with the vision and mission of the Ministry of Education and Culture of the Republic of Indonesia, as outlined in Policy Number 20 of 2020. The objectives of this profile are detailed in the 2020-2024 Strategic Plan. The Pancasila student embodies the concept of a lifelong learner with global competence, guided by the values of Pancasila. This concept encompasses six main characteristics: faith in God Almighty and noble morals, global diversity, mutual cooperation, independence, critical reasoning, and creativity (Kemendikbudristek, 2021).

The six characteristics of the Pancasila Student Profile can be found in chemistry learning, especially in the innovative one. Those traits are synonymous with openness, student-centeredness, cooperative learning, and teaching strategies based on group work, referring to project work and learning opportunities outside the laboratory or school environment (Kind & Kind, 2007). In several studies regarding the improvement of one of the characteristics of the Pancasila student profile, namely creativity, innovative learning has been previously explored. It includes implementing learning models such as Problem-Based Learning (PBL), Project-Based Learning, and Problem-Solving learning model. However, they do not directly improve the quality of classroom learning. Teachers still encounter challenges in implementing the models and often face difficulty memorizing the stages in the classroom (Sopandi, 2017).

One of the innovative learning models that can enhance the quality of education and develop students' potential to embody the Pancasila Student Profile is the RADEC (Read, Answer, Discuss, Explain, and Create) learning model. The model's name is aligned with the sequence of learning stages (syntax) and is established based on national education goals (Sopandi, 2017). The RADEC

is easy to understand and highly beneficial for character development, as learners are encouraged to start by reading to explore knowledge, then answering based on thinking skills, followed by collaborative discussions, presentations, and finally, creating something (Sopandi, 2019; Pratama et al., 2019). Building upon this description, the present study delved into the findings regarding the design of voltaic cell learning using the RADEC learning model, focusing on fostering the Pancasila Student Profile.

Method

This study employed a descriptive method incorporating a qualitative approach. This method was used to explain and analyze research results. Its primary objective was to provide a detailed and in-depth description of students' and teachers' learning activities within the voltaic cell learning design, using the RADEC learning model oriented towards the Pancasila Student Profile. The research process encompassed the following steps (Huberman, 2014):

Table 1.
Aspects of Pancasila Student Profile

Number	Aspects of Pancasila Student Profile	Key Element	Emerged Element
1	Faith and fear or God Almigthy and noble morals	• Religiuos morality • Personal morality • Moral to nature • State morality • Morals to humans	• Religious morality
2	Global diversity	• Recognize and appreciate culture • Intercultural communication skill in interacting with other	• Recognize and appreciate culture
3	Mutual cooperation	• Collaboration • Concern • Share	• Collaboration • Share
4	Independent	• Awareness of oneself and the situation at hand • Self regulation	• Awareness of oneself and the situation at ha
5	Critical reasoning	• Obtain and process information and ideas • Analyze and evaluate reasoning • Reflecting thoughts and thought processes • Make decisions	• Obtain and process information and ideas • Analyze and evaluate reasoning •
6	Creative	• Generate original ideas • Produce original works and actions	• Generate original ideas • Produce original works and actions

a. Developing a Conceptual Framework: It involved analyzing the RADEC learning model, reviewing journals related to character education, and studying sources concerning the Pancasila Student Profile.
b. Formulating the Research Problem: The central research question was "How can the design of voltaic cell learning be enhanced using the RADEC learning model aligned with the Pancasila Student Profile?"
c. Research Limitations: The study's scope was confined to specific aspects within the Pancasila Student Profile. These aspects have been outlined in the Ministry of Education and Culture of the Republic of Indonesia's Vision and Mission, as stipulated in Policy Number 20 of 2020.

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Hence, the researchers deliberately limited the focus to these elements for the current study.

d. Instrumentation: Research instruments took the form of:
   1) Lesson Plan (RPP) Guide Instrument: It evaluated four aspects for suitability through a yes-or-no checklist, including Formulation of Competency Achievement Indicators and Learning Objectives, Presented Content, Language Usage, and Time Allocation.
   2) Observation Sheet Instrument for the Incorporation of Pancasila Student Profiles: It assessed the alignment of learning activities with the preferred Pancasila student profile through a yes-or-no checklist.

e. Data Collection: The validation of the learning design involved a Lesson Plan (RPP) created by five validators. This panel comprised two Expert Lecturers and three Chemistry Teachers who taught using the Merdeka Curriculum.

f. Data Analysis: This phrase encompassed the analysis and interpretation of collected data

Result and Discussion

The Merdeka curriculum policy affects various aspects of the learning process. One of the orientations in this curriculum is to promote learning that aligns with the development of the Pancasila Student Profile. In the present study, a lesson plan (RPP) was developed to focus on cultivating the Pancasila Student Profile. The lesson plan was implemented in the voltaic cell learning design context, utilizing the RADEC learning model. This model was compiled by researchers and validated by five experts, including two lecturers and three Chemistry teachers experienced in teaching using the Merdeka Curriculum. The results of the validators' assessments are presented in graphical, tabular, or descriptive formats. The presentation of findings and subsequent discussions are integral components of this study are detailed below Table 2.

Based on the validation results from five validators, an average suitability percentage of 96.7% was obtained for the lesson plan across all aspects. Hence, it was categorized as "highly valid" (Mundilarto, 2012). This result was consistent with other research, specifically highlighting that the RADEC learning model could be an alternative to teachers' instruction due to its easily understandable and applicable syntax (Chairunisa et al., 2022). Regarding the accuracy of incorporating Basic Competencies into Competency Achievement Indicators, one validator suggested adding Competency Achievement Indicators, specifically related to writing reactions at the cathode and anode and memorizing the voltaic series along with their sequences. However, it is worth noting that "Memorizing the Voltaic series with own creations" was already present in Skill indicator 4.4.2, which involved creating relevant song lyrics or mnemonics.

Subsequently, the validators assessed the suitability of the voltaic cell learning activities using the RADEC model with the expected Pancasila Student Profile. The Voltaic cell learning module consisted of four sessions, each closely following the steps of the learning activities. The only variation was found in the presented materials, the results are detailed below Table 3.

Based on the data processing results, the average percentage for all meetings was 95.4%. This percentage was categorized as 'Highly Valid' (Muldirato, 2012). The following table provides a more detailed description of each Pancasila Student Profile to be incorporated into every learning activity employing the RADEC learning model for the Voltaic Cell topic.

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Table 2.
The validity of lesson plan in the implementation of Chemistry learning using the RADEC model

Number	Rated Aspect	Information	Percentage	Average each Aspect
I	Formulation of competency achievement indicators and learning objectives			
	1. Clarity of basic competence		100%	
	2. Compatibility of basic competencies and learning objectives		100%	
	3. The accuracy of the translation of basoc competencies into competency achievement indicators	• Added an indicator regarding writing reactions at the cathode and anode • Memorize the voltaic series with your own creations	80%	96%
	4. Conformity of competency achievement indicators with learning objectivies		100%	
	5. Conformity of competency achievement indicators with the level of student development		100%	
II	Contents Provided			
	1. Systematics of RPP preparation		100%	
	2. The suitability of the sequence of learning activities using the RADEC learning model		100%	100%
III	Language			
	1. Use og language according to EYD		100%	
	2. The language used is commucative		100%	
	3. Simplicity of senetence structure	There are some sentences that need to be simplified	80%	93.33%
IV	Time			
	1. Appropriateness of the allocation used		100%	100%
	2. Detailed time for each learning stage		100%	
	% Validation		**96.7%**	
	Category		**Very Valid**	

Table 3.
Average Percentage for Each Meeting

Meeting 1	Meeting 2	Meeting 3	Meeting 4	Average	Category
95.4%	95.4%	95.4%	95.4%	95.4%	Highly Valid

Based on the assessment by the validators of the lesson plan that incorporated the RADEC learning model, oriented towards the Pancasila Student Profile, nearly all validators agreed on the alignment of learning activities within each phase and the use of RADEC syntax with the intended Pancasila Student Profile. However, during the initial greeting activities, one validator recommended the inclusion of aspects from other Pancasila Student Profiles, such as Faith in God Almighty, along with Noble Morals. This suggestion was meant to encompass a broader range of Pancasila Student Profiles rather than solely focusing on those related to Global Diversity. Furthermore, regarding the Creativity aspect, one validator suggested emphasizing it within the "Creation" phase, following the appropriate syntax.

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Table 4.
Percentage of the Incorporation of Pancasila Student Profile in the Implementation of the RADEC Learning Model

Number	RADEC Suyntax	Pancasila Student Profile	Element of Pancasila Student Profile	Percentage	Catergory
1	Introductoty and closing activities	Faith and fear of God almighty and noble morals	Religious morality	100%	Very Valid
2	Introductory activities	Global diversity	Recognize and appreciate culture	80%	Quite Valid
3	Discuss, explain, and create	Mutual cooperation	Collaboration	100%	Very Valid
4	Read and answer	Independent	• Share	100%	Very Valid
			• Awareness of oneself and the situation at hand	100%	Very Valid
5	Answer and discuss	Critical reasoning	• Obtain and process information and ideas	100%	Very Valid
			• Analyze and evaluate reasoning	100%	Very Valid
6	Answer and create	Creative	• Generate original ideas	80%	Quite Valid
			• Produce original works and actions	100%	Very Valid

The researchers also highlighted the integration of this "Creativity" aspect during the "Answer" phase, when students responded to pre-learning questions before engaging in face-to-face activities. Overall, the Voltaic Cell learning design presented through the RADEC model implementation plan developed by the researchers was highly valid. It consistently aligned with the principles of the Pancasila Student Profile. The findings of this study were consistent with other research indicating that the RADEC learning model enhanced students' critical thinking (Pratama et al., 2019) and creative thinking skills (Lyesmaya et al., 2018). Both of these skills were integral to the Pancasila Student Profile. This conclusion was in line with similar research results suggesting that the RADEC learning model could foster students' creative character (Maruf et al., 2020). Moreover, other studies also highlighted that the RADEC learning model cultivated attitudes of religiosity, nationalism, independence, and mutual cooperation among students during learning activities (Sukmawati et al., 2021). These attributes resonated with the elements of the Pancasila Student Profile, encompassing faith in God Almighty, noble character, global diversity, independence, and mutual cooperation.

Conclusion

Based on the validation results provided by five validators, including two Chemistry Education expert lecturers and three Chemistry teachers who utilized the Merdeka curriculum, the voltaic cell learning design presented in the lesson plan incorporating the RADEC learning model demonstrated a high validity rate of 96.7%, classified in the "highly valid" category. This conclusion was drawn from the evaluation of four key aspects: formulation of competency achievement indicators and learning objectives, content presentation, language and timing, and alignment of voltaic cell learning activities with the RADEC model and intended Pancasila Student Profile. In the context of the Pancasila Student Profile, which aimed to foster attributes such as faith in God Almighty, noble character, global diversity, mutual cooperation, independence,

critical reasoning, and creativity, the alignment of Voltaic Cell learning activities with the RADEC model was highlighted. This alignment achieved an average percentage of 95.4%, classified within the "highly valid" category. These findings indicated that the utilization of the voltaic cell learning design in conjunction with the RADEC model effectively cultivated the preferred Pancasila Student Profile attributes. To further enhance the validity and applicability of the RADEC model in promoting the Pancasila Student Profile, it is recommended that future research endeavors explore similar model designs within diverse educational content areas.

References

Alhamuddin. 2014. Sejarah Kurikulum di Indonesia (Studi Analisis Kebijakan Pengembangan Kurikulum). *Nur El-Islam*, 1(2), 48–58.

Chairunnisa, C. C., Prihantini, & Sukardi, R. R. 2022. Model Read, Answer, Discuss, Explain, and Create untuk Meningkatkan Hasil Belajar IPS Siswa Pada Pembelajaran Daring. *Jurnal Educatio FKIP UNMA*, 8(1), 151–156.

Huberman, A. M. & Miles, B. M. 2014. *Qualitative Data Analysis.* 3rd ed. SAGE: Singapore.

Juliani, A. J., & Bastian, A. 2021. Pendidikan Karakter sebagai Upaya Wujudkan Pelajar Pancasila. *Prosiding Seminar Nasional Pendidikan Program Pascasarjana Universitas PGRI Palembang*, 257–265.

Kemendikbudristek. 2021. *Panduan Pengembangan Projek Penguatan Profil Pelajar Pancasila*. Jakarta: Kementerian Pendidikan Dan Kebudayaan.

Kemendikbudristek. 2022. *Kurikulum untuk Pemulihan Pembelajaran*. Jakarta: Pusat Kurikulum dan Pembelajaran Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

Kind, P. M., & Kind, V. 2007. Creativity in Science Education: Perspectives and Challenges for Developing School Science. *Studies in Science Education*, 43(1), 1-37.

Lyesmaya, D., Sopandi, W., Handayani, H., Suryana, N., Satria, E., Jumanto, Adi, Y. K., & Imran, M. E. 2018. R-A-D-E-C : a Learning Language Perspective in Elementary School. *ICEE 2018 International Conference on Elementary Education Universitas Pendidikan*, July 2019, 514–518.

Merdekawati, K. 2015. Implementation of Character Education in Chemistry Learning. *Proceding The 1ˢᵗ International Seminar on Chemical Education 2015*, 54-66.

Mundilarto. 2012. *Penilaian Hasil Belajar Fisika*. Yogyakarta: UNY Press.

Nasrudin, D., Rochman, C., Hidayat, A., & Kariadinata, R. 2018. How to Integrate Character Education in Science Learning?. *The 2ⁿᵈ International Conference on Sociology Education (ICSE 2017)*, 215–219.

Pratama, Y. A., Sopandi, W., & Hidayah, Y. 2019. RADEC Learning Model (Read-Answer-Discuss-Explain And Create): The Importance of Building Critical Thinking Skills In Indonesian Context. *International Journal for Educational and Vocational Studies*, 1(2), 109–115.

Sopandi, W. 2017. The Quality Improvement of Learning Processes and Achievements Through The Read-Answer-Discuss-Explain-and Create Learning Model Implementation. *Proceeding 8th Pedagogy International Seminar 2017: Enhancement of Pedagogy in Cultural Diversity Toward Excellence in Education*, 8(229), 132–139.

Sopandi, W. 2019. Sosialisasi dan Workshop Implementasi Model Pembelajaran RADEC Bagi Guru-Guru Pendidikan Dasar dan Menengah. *PEDAGOGIA: Jurnal Pendidikan*, 8(1), 19-34.

Sukmawati, D., Sopandi, W., Sujana, A., & Muharam, A. 2021. Kemunculan Aspek Karakter Siswa SD melalui Pembelajaran RADEC dengan

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Menggunakan WhatsApp pada Materi Siklus Air. *Jurnal Basicedu*, 5(2), 1787–1798.

Maruf, A. S., Wahyu, W., & Sopandi, W. 2020. Colloidal Learning Design using Radec Model with STEM. *Journal of Educational Sciences*, 4(4), 758–765.

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