A Novel Learning Model, Integration of Challenge-Based and Differentiated Learning: A Preliminary Study

Anak Agung Inten Paraniti³, I Wayan Redhana²*, I Nyoman Suardana², Ketut Suma²

1 Doctoral Program, Educational Science Study Program, Postgraduate, Universitas Pendidikan Ganesha, Singaraja, Indonesia.  
2 Postgraduate, Universitas Pendidikan Ganesha, Singaraja, Indonesia.

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Corresponding Author:  
I Wayan Redhana  
wayan.redhana@undiksha.ac.id

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Abstract: This research aims to explore the need to design a challenge-based learning model (CBLM) integrated with differentiated learning strategies (DLS). The result of this integration is called a differentiated challenge-based learning model (DCBLM). A descriptive research design (survey) was applied in this study. A total of 46 high school teachers who taught science classes (biology, chemistry, and physics) throughout Bali participated in this study. The research results showed that high school teachers have attempted to implement various innovative learning models. Five innovative learning models and their implementation problems were also found and discussed in this study. Teachers fervently hope that DCBLM will exist to enhance and maximize CBLM's assets. Regarding 21st-century learning, DCBLM is highly pertinent, and the Merdeka Curriculum is implemented in Indonesia to shape students' character according to the Pancasila students' profile.

Keywords: Challenge-based learning; Differentiated learning; Merdeka Curriculum; 21st century learning

Introduction

The Indonesian Minister of Education introduced a policy regarding the use of a new curriculum called the Merdeka Curriculum (MC) as an alternative to restore the state of education in Indonesia until early 2022, following the COVID-19 pandemic that required all activities, including the learning process, to be carried out online. Because of its increased flexibility and emphasis on the needs of the individual students, the MC enables learners to pursue their interests and learn at their speed.

The introduction of a new curriculum into the Indonesian educational system would undoubtedly require fresh research, especially for academic institutions. This is because it will undoubtedly have an immediate effect on how education is conducted in classrooms (Rizaldi et al., 2021; Setiawati, 2022). One of the government's initiatives to enhance learning circumstances in Indonesia, particularly during the COVID-19 pandemic, is the socialization process, which is part of an accelerated rollout of the MC. Around the globe, especially in Indonesia, this epidemic has had a noticeable effect on schooling (Siahaan, 2020). The way that education is delivered has evolved dramatically, with all educational processes now being conducted online or through "learning from home" initiatives. This is why educators need to adjust to new technologies and get students comfortable with project-based learning at home (Nurhayati et al., 2020). This abrupt adaptation process makes it impossible for teachers and students to continue the learning process and effectively meet the previously established goals. The government aims to introduce and familiarize educators and students with these systems to ensure that they do not just rely on one-way learning systems and are used in classrooms. This was one of the concepts for creating the MC for education following the COVID-19 pandemic.

The MC incorporates a variety of intracurricular learning experiences and prioritizes content to allow students to explore ideas and hone their skills (Purnawanto, 2022; Rahimah, 2022). To tailor instruction to each student's interests and learning

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needs, teachers are free to select from various instructional aids (Martati, 2022). Implementation of the MC has essentially started in all education levels. Hasim (2020) lends credence to this, saying that the government's decision to develop and implement the MC was seen as an excellent way to address issues with education that arose during Indonesia's COVID-19 pandemic. Furthermore, Priantini et al. (2022) underscore that the implementation of the MC aligns with endeavors to establish a superior educational environment, hence enabling the production of a future generation capable of adjusting to contemporary advancements.

Simply said, this curriculum hasn't been used extensively in madrasas or schools. According to government targets, the MC will be fully implemented in Indonesian schools by 2024, beginning with primary and secondary education (Barlian et al., 2022). According to Jojor et al. (2022), one of the things that is supported and prioritized in the MC is giving project-based learning—which students can do outside of the classroom—more of a priority. This is corroborated by Marisa (2021), who claims that the idea of autonomous learning is highly appropriate in today's world because civilization 5.0 seeks to integrate the social needs of individual life with the advancements in technology that can help solve problems.

The MC in Indonesia incorporates a problem-based learning model (PBLM) and a project-based learning model (PJBLM), integrated with differentiated learning strategies. These strategies are designed to pay attention to students' individual learning needs and interests. The curriculum emphasizes learner-centered approaches, where students actively and constructively engage in real and relevant problems, allowing teachers to interpret the curriculum and create a learning atmosphere that is free, comfortable, and tailored to students' natural talents and interests (Retnaningrum et al., 2023). The MC provides flexibility for schools, local governments, and teachers to plan, implement, and evaluate educational programs while adhering to the curriculum's principles, allowing for the formation of student character in accordance with global diversity, independence, cooperation, critical thinking, and creativity, and the application of differentiated learning (Rizaldi et al., 2022). This approach aims to encourage creativity and innovation among teachers, allowing them to develop learning materials and methods that suit the needs and interests of their students (Asfiati, 2023).

Students who participate in PBLM, a student-centered method of instruction, collaborate to find solutions to real-world issues. Although PBL offers numerous benefits, like fostering critical thinking, creative thinking, problem-solving, and teamwork abilities (Ali, 2019; Razak et al., 2022), there are certain restrictions or drawbacks to this methodology. PBLM's primary disadvantage is that it can be labor-intensive and necessitates a large amount of teacher preparation time (Zhao et al., 2020). Furthermore, not every student is a good fit for PBLM because some may find the open-ended nature of the tasks difficult to solve or may find group work uncomfortable (Abraham et al., 2019). PBLM may not be appropriate for all subjects or topics since some may need more direct instruction or may not lend themselves well to problem-solving exercises (Yew & Goh, 2016). Finally, because PBLM may require access to resources or technology that not all schools or classrooms have, it might not be appropriate for all learning situations (Ghufron & Ermawati, 2018; Juver & Prasetya, 2023).

On the other hand, there are benefits to PJBLM as well. These include encouraging students to be creative in their projects since learning occurs best when an artefact is created that has personal meaning for them (Illahi et al., 2022), PJBLM is a hands-on instruction model that can enhance learning over traditional lectures (Hafeez, 2021). PJBLM involves students in the creative process rather than viewing them as passive recipients of knowledge, which increases engagement and promotes active learning (Yamin et al., 2020), and PJBLM clarifies the practical applications of the knowledge and skills they are learning (Shraideh et al., 2018). In addition to its benefits, PJBLM has drawbacks and restrictions. These include PJBLM can be time-consuming to implement, and students might not immediately embrace this different style of learning (Almulla, 2020; Maros et al., 2023), and PJBLM may not be appropriate for all subjects or topics, as some subjects may require more direct instruction and may not lend themselves easily to a project-based approach (Schaddelee & McConnell, 2018).

To overcome the limitations of PBLM and PJBLM, it is necessary to look for new. The challenge-based learning model (CBLM) is a learning model that is considered to be more powerful than the two previous learning models (Ambrosi & Hermsen, 2023).

To optimize the implementation of CBLM in the MC, this learning model needs to be integrated with differentiated learning strategies (DLS). Therefore, this research aims to explore needs analysis to develop CBLM design that is integrated with DLS so that it can be applied to achieve the learning objectives in the MC.

The results of this research will contribute to new learning models that can be applied in the MC. This learning model is expected to achieve learning outcomes in the MC, namely, students with...
competence and character, especially the Pancasila Student Profile.

Method

This study used a descriptive (survey) method to obtain an overview of teachers' experiences in implementing CBLM, CBLM-like, or DLS, as well as teachers' perceptions of DCBLM at the senior high school level. This crucial data was gathered to create a DCBLM conceptual design, namely as a design for a new learning framework that will be applied in science learning.

Questionnaires were used as an instrument in this study and distributed online via Google Forms. This questionnaire consisted of three dimensions related to teachers' experience in implementing innovative learning models, teachers' experiences in implementing CBLM or CBLM-like, types of innovative learning models implemented by teachers, and challenges educators confront when putting new learning methods into practice.

The research sample was high school teachers in Bali who are members of the science field groups, namely biology, chemistry, and physics. Geographically, the respondents (teachers) are spread across nine districts in the province of Bali. A total of 46 high school teachers from public and private schools participated in filling out the research questionnaire. A method known as purposive sampling was used to choose this sample. This sample was selected based on the teacher's knowledge of CBLM or CBLM-like and DLS. The survey research flow can be seen in Figure 1.

Descriptive data analysis was performed by tabulating the opinions of each respondent and determining the percentage using the following formula:

$$P = \frac{x}{n} \times 100\%$$

with: $P$ = percentage (%), $x$ = number of opinions, $n$ = number of respondents

Result and Discussion

Result

The experiences and opinions of teachers in implementing innovative learning, especially CBLM or CBLM-like, DLS, and DCBLM, are presented in Figure...
This figure shows that the learning models/strategies that teachers most and least applied were DLS and CBLM, respectively.

![Percentage Chart](chart.png)

**Figure 5.** Teachers’ experiences in implementing various innovative learning models

Subsequently, Figure 6 delineates the quintessential innovative learning models implemented by educators: PjBLM, PjBLM, inquiry learning model (ILM), discovery learning model (DLM), and scientific learning model. In the meantime, the MC's DLS feature was combined with the five learning models mentioned before.

![Number of Learning Models](chart2.png)

**Figure 6.** The top five creative learning models

This study also outlined the common issues teachers encountered while putting DLS and creative learning models into practice. Table 1 provides a summary of these issues.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty in adapting content to learning models</td>
<td>97.78</td>
</tr>
<tr>
<td>Difficulty in designing the core activities of the learning models</td>
<td></td>
</tr>
<tr>
<td>Difficulty in establishing initial diagnostic tests and selecting</td>
<td></td>
</tr>
<tr>
<td>appropriate methods</td>
<td></td>
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<tr>
<td>Difficulty in adjusting the assessment to the learning models</td>
<td></td>
</tr>
<tr>
<td>Difficulty in designing learning models that consider differences in</td>
<td></td>
</tr>
<tr>
<td>students’ abilities</td>
<td></td>
</tr>
<tr>
<td>Difficulty in designing Learning models that consider the characteristics among students</td>
<td></td>
</tr>
<tr>
<td>Difficulty in taking time off in PjBLM</td>
<td></td>
</tr>
<tr>
<td>Incompatibility of the planned learning phases with the learning stages implemented</td>
<td></td>
</tr>
<tr>
<td>Difficulty in finding relevant ideas to foster critical thinking</td>
<td></td>
</tr>
<tr>
<td>Insufficient time in implementing differentiated learning, specifically process differentiation</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1. Problems in Implementing Innovative Learning Models and DLS**

Discussion

In collecting data related to CBLM or CBLM-like and DLS, teachers were given descriptions and examples of implementing CBLM and DLS. This was intended so that teachers understand CBLM and DLS; perhaps some do not know it yet but have implemented it fully, partially, or not at all. Based on the DLS description, more than 90% of teachers stated that they had implemented DLS. This makes sense because currently schools in Indonesia, including high schools, the MC is being implemented (Muaziyah et al., 2023; Rosmiati et al., 2022; Swandana & Tindangen, 2023). The MC's implementation of the DLS is one of its features (Butsiani, 2023; Marlina et al., 2022; Mukhibat, 2023). DLS is a learning strategy that considers the differences in students’ needs (Smets et al., 2022; Suprayogi et al., 2017). Learning that is tailored to the needs of the students will help them absorb the information more fully (Barata et al., 2016; Bondie et al., 2019; Smale-Jacobs et al., 2019; Vialiandes & Neophyto, 2017), developing critical thinking skills (Bondie et al., 2019) and creative thinking skills (Anggareni & Hidayat, 2022). Apart from that, DLS can also improve learning outcomes (Smale-Jacobs et al., 2019), independent learning (Bondie et al., 2019), interest, motivation, and persistence in learning (Kieran & Anderson, 2019).

DLS is a learning strategy that can be integrated with various innovative learning models, for example PjBLM (Anazifa & Djukri, 2017; Z. Anwar & Sukiman, 2023; Seechaliao, 2017; Yustina et al., 2020), PjBLM (Anzifza & Djukri, 2017; Khairiyah et al., 2023; Kwangmuang et al., 2021; Serdyukov, 2017), and ILM (Lai, 2018; Onyema et al., 2019; Serdyukov, 2017;
Zubaidah et al., 2017). Nonetheless, out of the various learning models that can be utilized to apply DLS in the MC, the Ministry of Education, Culture, Research, and Technology, Republic of Indonesia, recommends PjBLM (Kementerian Pendidikan, Kebudayaan, 2022)

Regarding CBLM, the teachers do not understand and have never implemented CBLM. Teachers' misunderstandings of the CBLM syntax—which consists of key ideas, crucial issues, challenges (including learning materials, leading questions, and activities), tests, and publications—make evident (Nichols & Cator, 2008). PBLM syntax, on the other hand, consists of giving students an overview of the issue, setting up a learning environment, directing individual or group research, creating and presenting findings, and assessing the problem-solving procedure (Arends, 2012). Another reason is that no teacher wrote down CBLM when teachers were asked about what innovative learning models had been implemented. This clearly confirms that not a single teacher understands CBLM.

The five learning models that instructors use—from most frequently to least frequently—are PBLM, PjBLM, ILM, DLM, and the scientific learning models. These are based on their experiences adopting innovative learning models. Among these five educational frameworks, the teacher believes there is one error: despite scientific learning being a technique, it is perceived as a learning paradigm. Through scientific stages such as observation, problem-solving, formulation of hypotheses, data collection, analysis, conclusion-making, and communication, students actively develop concepts, methods, laws, or principles through the scientific learning methodology (Inayah et al., 2020; Pahrudin & Pratiwi, 2019; Paraniti & Noviyanti, 2019). In implementing this learning approach, learning models are needed, for example, PBLM, PjBLM, ILM, and DLM.

Given that these five learning models were suggested in both the 2013 Curriculum (C-13) and the Education Unit Level Curriculum (EULC), the top five learning models used by instructors (Figure 5). In EULC, it is recommended to use learning cycles, including exploration, elaboration, and confirmation (Permendiknas, 2007). In C-13, the scientific learning approach is recommended that can be applied to learning models, such as PBLM, PjBLM, ILM, and DLM (Permendikbud, 2013). Meanwhile, the MC recommends PjBLM (Kementerian Pendidikan, Kebudayaan, 2022). These innovative learning models have the same principle, namely student-centered learning. PBL and PjBL are more often chosen because these two models can hone 21st-century skills, such as critical and creative thinking in group learning processes that lead students to take responsibility and organize learning independently (Anggraini et al., 2023; Aryulina & Riyanto, 2016; Redhana, 2012). Similarities exist between PBL and PBL stages in terms of leading individual investigations and producing and presenting results, as well as between PjBLM and PBLM stages in terms of critical and creative student activities related to project design and product evaluation (Suradika et al., 2023).

CBLM is an amalgam innovative learning model that is more powerful than PBLM and PjBLM. This is because the problems presented are more contextual, global, and related to sustainable development goals, namely quality learning. The findings of the study demonstrate that CBLM can enhance learning outcomes (Farizi et al., 2023; Legaki et al., 2020), critical thinking skills (Farizi et al., 2023), creative thinking skills (Nufus et al., 2018), higher order-thinking skills (Santos et al., 2015; Torres-Barreto et al., 2020) and learning interest (Ifenthaler et al., 2020; Nufus et al., 2018).

Concerning the MC, CBLM is integrated with DLS to produce DCBLM. With this integration, Students can reach their learning objectives more quickly and simply by optimizing their learning process with the help of DCBLM. Additionally, DCBLM helps students’ acquire social skills and higher-order thinking necessary for the twenty-first century. Students will be able to achieve learning competency according to their learning speed.

In implementing innovative learning models, teachers face several difficulties, such as difficulties in determining the core activities of the learning models, making initial diagnostic tests, choosing the right methods, designing learning models that pay attention to differences in students’ abilities, and creating an assessment rubrics related to product differentiation. Teachers should not be surprised by this challenge; it stems from their inability to comprehend and effectively implement novel learning paradigms. These results concur with the published research findings reported by Azizah et al. (2017) and Susila and Aryasuari (2023) that there are some obstacles in implementing innovative learning.

There are still gaps in this research. When applying learning models, research has not taken into account the impact of gender, field of study, teaching experiences, or teachers' certification status. In addition, the number of samples that returned online questionnaires was still limited.

Conclusion

Based on the research findings, the following conclusion can be drawn. Teachers think they have
implemented CBLM, even though what is implemented is PBLM. This can be seen from the learning syntax put forward by the teachers. PBL and PjBLM are two popular creative learning models that science teachers use in their lessons. CBLM is a flexible learning model rooted in the PBLM and PjBLM models. CBLM integrated with DLS can overcome the problems of implementing other innovative learning models, such as PBLM and PjBLM.

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Author Contributions
Anak Agung Inten Paraniti developed questionnaires, collected and analyzed data, and wrote a manuscript. I Wayan Redhana conceptualized a research idea, and reviewed and edited the manuscript. Ketut Suma provided sources and reviewed the manuscript. I Nyoman Suardana analyzed the data and reviewed the manuscript. All authors have read and approved the published version of the manuscript.

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