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Developing a Curriculum Synchronisation Model to Increase the Effectiveness of Competency-Based Learning

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ABSTRACT: *This study aims to develop and evaluate a curriculum synchronisation model between formal and non-formal education to optimise competency-based learning at the secondary school level. The research was motivated by the need to bridge the gap between competencies taught in schools and the skills required in the labour market and society. A mixed-methods approach with a sequential explanatory design was employed. Quantitative data were collected using purposive sampling through questionnaires distributed to 220 respondents, consisting of secondary school teachers, non-formal education managers, and students involved in integrated learning programs. In contrast, qualitative data were obtained through in-depth semi-structured interviews and non-participant classroom observation. Data were analysed using descriptive-inferential statistics and thematic analysis, while the validity of findings was ensured through methodological and source triangulation supported by expert judgment. The findings indicate that the implementation of the synchronised curriculum model increased students' overall competencies by 17%, with the most significant improvement observed in the psychomotor domain. Furthermore, 87% of respondents agreed that collaboration between formal and non-formal education is essential to enhance the relevance of learning. The study concludes that curriculum synchronisation effectively integrates theoretical and practical learning, strengthens institutional collaboration, and supports the implementation of competency-based education. These findings contribute theoretically to the development of integrative curriculum design and offer practical implications for adaptive and sustainable national education policies. However, this study is limited by its relatively short implementation period and its focus on a specific regional context, which may affect the generalizability of the findings.*

Penelitian ini bertujuan untuk mengembangkan dan mengevaluasi model sinkronisasi kurikulum antara pendidikan formal dan nonformal untuk mengoptimalkan pembelajaran berbasis kompetensi di tingkat sekolah menengah. Penelitian ini dimotivasi oleh kebutuhan untuk menjembatani kesenjangan antara kompetensi yang diajarkan di sekolah dan keterampilan yang dibutuhkan di pasar tenaga kerja dan masyarakat. Pendekatan metode campuran dengan desain penjelasan sekuensial digunakan. Data kuantitatif dikumpulkan menggunakan purposive sampling melalui kuesioner yang dibagikan kepada 220 responden yang terdiri dari guru sekolah menengah, pengelola pendidikan non-formal, dan siswa yang terlibat dalam program

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pembelajaran terpadu. Sedangkan data kualitatif diperoleh melalui wawancara semi-terstruktur secara mendalam dan observasi kelas non partisipan. Data dianalisis menggunakan statistik deskriptif-inferensial dan analisis tematik, sedangkan validitas temuan dipastikan melalui triangulasi metodologis dan sumber yang didukung oleh penilaian ahli. Temuan menunjukkan bahwa penerapan model kurikulum sinkronisasi meningkatkan kompetensi keseluruhan siswa sebesar 17%, dengan peningkatan paling signifikan diamati pada domain psikomotorik. Lebih lanjut, 87% responden setuju bahwa kolaborasi antara pendidikan formal dan nonformal sangat penting untuk meningkatkan relevansi pembelajaran. Penelitian ini menyimpulkan bahwa sinkronisasi kurikulum secara efektif mengintegrasikan pembelajaran teoretis dan praktis, memperkuat kolaborasi kelembagaan, dan mendukung penerapan pendidikan berbasis kompetensi. Temuan ini memberikan kontribusi secara teoritis terhadap pengembangan desain kurikulum integratif dan menawarkan implikasi praktis bagi kebijakan pendidikan nasional yang adaptif dan berkelanjutan. Namun, penelitian ini terbatas oleh periode pelaksanaannya yang relatif singkat dan fokusnya pada konteks regional, yang mungkin mempengaruhi kemampuan generalisasi dari temuan tersebut.

Keywords: *Curriculum Synchronization, Formal Education, Non-Formal Education, Competency-Based Learning, Secondary Schools.*

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I. INTRODUCTION

The global transformation toward the Industrial Revolution 4.0 and Society 5.0 eras has fundamentally shifted educational paradigms worldwide. In this context, education is no longer viewed solely as a process of transferring knowledge from teachers to students, but rather as a strategic means of building adaptive competencies that enable individuals to participate productively and meaningfully amidst social, economic, and technological complexity (Sung et al., 2021; Zhao, 2020). This new paradigm emphasises that education systems must be able to prepare young people with 21st-century skills, such as critical thinking, collaboration, creativity, and digital and social-emotional literacy skills. In many countries, this shift in orientation has driven the emergence of competency-based education. This approach emphasises measurable, authentic learning outcomes that align with real needs in life and the workplace (Voorhees & Bedard-Voorhees, 2021).

In the Indonesian context, this change was addressed through the implementation of the 2013 Curriculum and later the Independent Curriculum, which positions students as active subjects in the learning process. The government, through the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek, 2022), emphasised the importance of transforming learning from a teacher-centred to a student-centred model, with an emphasis on competency development. Through this approach, it is hoped that students will not only master factual and conceptual knowledge but also be able to internalise character values and apply practical skills in everyday life. However, while these policies demonstrate a progressive direction, various empirical studies indicate that a significant gap remains between what is taught in formal educational

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institutions and the competency needs actually required in society and the workplace (Rahmawati & Suryadi, 2022; Widiaty et al., 2023). Field findings further reveal that this gap manifests not only in the weak integration between conceptual and applied skills, but also in students limited opportunities to engage in real-world problem-solving, inadequate exposure to industry-relevant technologies, and inconsistent development of essential soft skills such as collaboration, adaptability, and communication. These discrepancies highlight a persistent misalignment between learning experiences and workplace expectations, making it urgent to conduct research that offers a more synchronised curriculum model for bridging formal and non-formal education pathways.

This phenomenon underscores the need to expand the scope of learning through synergy between formal and non-formal education. Non-formal education has distinct yet complementary characteristics. It encompasses various forms of learning, such as skills courses, technical training, vocational programs, and community-based activities, which are generally flexible, contextual, and adaptable to changing social and economic needs (Singh & Devi, 2021; Werquin, 2020). In many cases, non-formal education has proven more responsive in equipping students with practical competencies relevant to the industrial and entrepreneurial worlds. Recent studies further show that more than 60% of students participating in non-formal training programs demonstrate higher readiness for work-based tasks compared to those relying solely on formal schooling pathways, particularly in digital literacy, problem-solving, and technical skills (Arifin & Nurtanto, 2022; OECD, 2023). However, because it occurs outside of a structured formal system, the outcomes of non-formal learning often lack official recognition, as evidenced by reports that nearly 70% of non-formal skills certificates are not acknowledged in school credential systems or hiring processes (UNESCO, 2022), thus underutilising its potential contribution to improving the quality of human resources.

In Indonesia, efforts to synchronise the curriculum between formal and non-formal education still face various challenges. Although policies support the recognition of non-formal learning outcomes through mechanisms such as Recognition of Prior Learning (RPL), their implementation is uneven and often limited to the policy level without systematic practice on the ground (Duvekot et al., 2022). Furthermore, coordination between formal and non-formal educational institutions remains minimal, resulting in many programs running parallel without synergy in content and objectives (Pells, 2021; Sandri & Agostini, 2023). Differences in pedagogical approaches, evaluation systems, and social perceptions of non-formal education also pose significant obstacles. As a result, non-formal education is often viewed as a "second choice" or alternative solution for those unable to access formal education, rather than as an equal partner that can enrich the national education system.

Education experts have long expressed criticism of the dichotomy between formal and non-formal education. Lave and Wenger (1991), through their theory of situated learning, emphasised that effective learning occurs when individuals engage in real social practices, not simply through abstract cognitive activities in the classroom. They introduced the concept of legitimate peripheral participation, where learners acquire competencies through direct participation in communities of practice. This view is reinforced by Wenger-Trayner and Wenger-Trayner (2020), who state that the value of learning is measured not only by the transfer of knowledge but also by the social contributions generated by the interaction between individuals within the learning community. Thus, formal and non-formal education should not be positioned separately

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but rather integrated within a system that allows learners to develop competencies through contextual learning experiences.

Furthermore, Mulder (2019) emphasised that competency-based education requires a curriculum approach oriented toward learning outcomes, where each competency must be measurable and linked to the real needs of the workplace. In this context, synchronisation between formal and non-formal curricula is not simply about unifying content or learning structure, but also about aligning competency orientations and assessment standards. Allais (2022) added that the successful implementation of a competency-based curriculum is highly dependent on the existence of a national qualifications framework (NQF) capable of connecting various learning pathways. Therefore, curriculum synchronisation needs to be accompanied by policies that ensure the compatibility of learning outcomes across levels and types of education, so that students can move across pathways without losing recognition of their achievements.

The development of digital technology and the emergence of the metaverse concept in education also open up new opportunities to integrate formal and non-formal education in collaborative virtual spaces (Chen et al., 2022). Technology can be used to create immersive learning environments, where students can access practical learning experiences previously only available in non-formal contexts. In this way, the boundaries between formal and non-formal learning spaces are increasingly blurred, creating a more open and personalised education model. However, this innovation requires infrastructure readiness, increased teacher capacity, and a paradigm shift in the use of technology in learning.

The urgency of synchronising formal and non-formal education curricula at the secondary school level is inextricably linked to global demands for competency-based education, the reality of the gap between education and the workplace, and the need to create a sustainable and inclusive learning ecosystem. Through curriculum synchronisation, it is hoped that harmonisation will occur between theory and practice, between educational institutions and the community, and between policy and implementation. This research addresses these challenges by developing a curriculum synchronisation model that is adaptive, contextual, and oriented toward measurable learning outcomes.

Although previous studies have discussed the challenges of aligning formal and non-formal education (Pells, 2021; Sandri & Agostini, 2023) and the persistent skills gap in Indonesian secondary schools (Rahmawati & Suryadi, 2022; Widiaty et al., 2023), most of them stop at identifying problems without offering an operational model for implementation. Existing research primarily focuses on policy-level recommendations or conceptual analyses, leaving a gap in practical frameworks that can be applied directly in schools. This study fills that gap by developing a curriculum synchronisation model that integrates competency mapping, shared learning outcomes, and joint instructional strategies between formal and non-formal institutions. Unlike previous studies, this research provides empirical evidence of effectiveness, demonstrating a 17% increase in student competencies through a sequential approach.

This research focuses on answering three main questions. *First*, how can a model for synchronising formal and non-formal education curricula be designed and implemented effectively at the secondary school level. This question is crucial for identifying the principles and mechanisms that enable both educational pathways to work synergistically. *Second*, how effective is this synchronisation model in improving

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secondary school students' cognitive, affective, and psychomotor competencies. This question leads to an empirical evaluation of the impact of the developed model on student learning outcomes. *Third*, what factors support or hinder the successful implementation of curriculum synchronisation at the secondary school level. These questions are crucial for understanding the implementation context and formulating appropriate policy strategies.

The primary objective of this research is to develop a theoretical and operational model for contextual synchronisation of formal and non-formal education curricula for secondary schools in Indonesia. Furthermore, this research aims to test the model's effectiveness in improving student competencies through a measurable empirical study. Another objective is to identify supporting and inhibiting factors in the implementation of the synchronisation model, thereby generating comprehensive policy recommendations. Theoretically, this research is expected to contribute to the literature on competency-based education and curriculum integration, while practically, the results can serve as a basis for formulating more adaptive, relevant, and inclusive education policies.

Thus, this research holds a crucial position in the context of national and global education development. Integration between formal and non-formal education serves not only to expand access and equalise learning opportunities but also to strengthen the relevance of education to the real needs of society. With a strong theoretical foundation (Lave & Wenger, 1991; Mulder, 2019; Wenger-Trayner & Wenger-Trayner, 2020) and international policy support (UNESCO, 2012; Werquin, 2020), this research is expected to offer a conceptual model that has the potential for widespread implementation in Indonesia. Ultimately, the synchronisation of formal and non-formal curricula is expected to be a catalyst for the transformation of the education system to be more open, collaborative, and oriented towards developing superior competencies that are globally competitive and firmly rooted in humanitarian values.

II. METHOD

This study employed a mixed methods approach with an explanatory sequential design, combining quantitative and qualitative data sequentially to gain a comprehensive understanding of the curriculum synchronisation model for formal and non-formal education at the secondary school level. This design was chosen because it allows researchers to explain quantitative results in depth through qualitative data sourced from the experiences and perspectives of educational stakeholders (Creswell & Clark, 2018). The study subjects consisted of secondary school teachers, non-formal institution managers, and students involved in a competency-based learning integration program. The quantitative sample consisted of 220 respondents, comprising 120 secondary school teachers, 50 non-formal education managers, and 50 students participating in the integrated learning program. Sample selection was conducted using purposive sampling, based on predefined criteria relevant to the research objectives, including experience in competency-based learning implementation and involvement in formal-non-formal educational collaboration.

Quantitative data were collected using a four-choice Likert-scale questionnaire developed by the researchers based on competency-based learning indicators adapted from Mulder (2019) and validated through expert judgment and limited trials.

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Qualitative data were obtained through in-depth semi-structured interviews conducted by the research team with key informants, consisting of school principals, teachers, non-formal institution instructors, and student representatives. In addition, non-participant classroom observation was carried out to document the implementation process and learning interactions relevant to the synchronisation model. The validity and reliability of the instruments were tested through limited trials and expert judgment to ensure suitability for the competency-based learning context (Mulder, 2019). The data collection procedure was carried out in three stages: a preliminary study to map the needs for curriculum synchronisation, the implementation stage of the model in schools and non-formal institutions, and the effectiveness evaluation stage using data triangulation methods to ensure the validity of the findings (Billett et al., 2020). Quantitative data were analysed using descriptive and inferential statistical techniques to identify differences in student competency achievement before and after the model's implementation, while qualitative data were analysed using thematic analysis to find meaningful patterns related to supporting and inhibiting factors for implementation (Braun & Clarke, 2022). With this research design, the results obtained are expected to be replicable by other researchers in secondary education contexts with similar social and institutional conditions.

III. RESULT AND DISCUSSION

The Synchronisation Model for Formal and Non-Formal Education Curriculum

This research was conducted in secondary schools and non-formal institutions across Lampung province, Indonesia. The research yielded empirical findings that describe the current state of curriculum synchronisation between formal and non-formal education at the secondary school level, stakeholders' perceptions of the developed synchronisation model, and the effectiveness of its implementation in improving student competencies. The research results were obtained from a combination of quantitative data from questionnaires and qualitative data from in-depth interviews and field observations. Quantitative respondents numbered 220 people, while in-depth interviews were also conducted with 18 key informants representing school principals, non-formal institution teachers, and student representatives.

The quantitative analysis revealed that respondents' perception of the urgency of curriculum synchronisation was high. Of the 220 respondents, 87% stated that integration between formal and non-formal education was necessary to increase learning relevance. In contrast, 9% stated that it was necessary, and only 4% considered it unnecessary to implement it systematically. Secondary school teachers demonstrated the highest level of awareness of the importance of cross-curricular collaboration (mean score of 4.51 on a scale of 5), followed by non-formal institution administrators (mean score of 4.32) and students (mean score of 4.12). This is in line with the results of interviews conducted by researchers with one of the teachers revealing that:

> "We see that non-formal training such as digital skills or graphic design courses can be invaluable for students to understand the application of the theories they learn in class, but the school curriculum does not yet explicitly address such collaboration."

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Table 1. Stakeholder perceptions of the urgency of curriculum synchronisation

Respondent Group	Total (n)	Average Score (1-5)	Category
Secondary School Teachers	120	4,51	Very High
Non-Formal Institution Managers	50	4,32	High
Program Participating Students	50	4,12	High
Average Total	220	4,32	High

In addition to general perceptions, the research findings indicate that institutional readiness to implement curriculum synchronisation remains diverse. Approximately 65% of schools stated they have established partnerships with non-formal institutions, although most are limited to extracurricular activities and short-term training. Only 28% of schools have formally integrated curriculums through long-term partnership programs. Conversely, non-formal institutions demonstrated a higher level of readiness, with 74% of respondents stating they are ready to integrate learning if there are clear regulations and technical guidelines. One non-formal institution manager stated:

> "We are used to creating training based on industry needs. If schools can adapt to our schedules and needs, this integration can proceed more quickly."

The findings of this study corroborate and extend previous research on curriculum integration between formal and non-formal education. Consistent with Mulder's (2019) competency-based education framework, the synchronisation model emphasises measurable learning outcomes aligned with real-world demands, demonstrating that competencies are more effectively developed when theoretical instruction is integrated with contextual practice.

Furthermore, the results align with Lave and Wenger's (1991) situated learning theory, which posits that meaningful learning occurs through active participation in authentic social practices. The involvement of students in non-formal learning environments such as vocational training and community-based projects supports the concept of legitimate peripheral participation, enabling learners to internalise competencies through real engagement rather than abstract instruction alone.

This finding is also supported by Billett et al. (2020), who argue that work-integrated and practice-based learning significantly enhances learners' psychomotor and affective competencies. The substantial improvement observed in the psychomotor domain in this study (20.9%) reinforces the argument that curriculum synchronisation serves as an effective bridge between academic knowledge and applied skills.

Compared to earlier studies that primarily focused on policy alignment without operational mechanisms (Pells, 2021; Sandri & Agostini, 2023), this study contributes a practical and empirically tested synchronisation model, demonstrating how formal and non-formal institutions can collaboratively design, implement, and evaluate competency-based learning.

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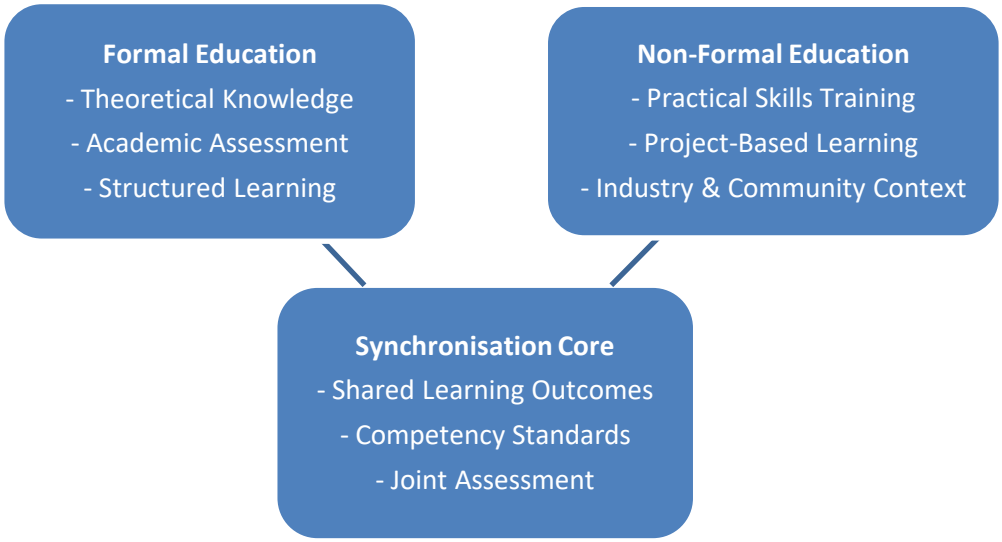

Figure 1. *Synchronisation model of formal and non-formal education curriculum for competency-based learning*

Effectiveness of Synchronisation Model in Student Competency Development

Regarding implementation effectiveness, evaluation results showed a significant increase in student competency after the implementation of the curriculum synchronisation model. Based on a comparison of pre- and post-intervention scores for 50 students participating in the integration program, the average competency score increased from 72.4 to 84.7 (a 17% increase). The competency component that experienced the most significant increase was psychomotor skills (from 70.5 to 85.3), followed by affective skills (from 73.1 to 84.0), and cognitive competency (from 73.7 to 84.9). These data indicate that learning that combines formal and informal elements is more effective in strengthening students' practical and collaborative skills.

Table 2. Comparison of student competency scores before and after model implementation

Competency Dimensions	(Mean)	(Mean)	Percetage
Kognitif	73,7	84,9	15,2%
Afektif	73,1	84,0	14,9%
Psychomotor	70,5	85,3	20,9%
Average Total	72,4	84,7	17,0%

The results of the study indicate that the curriculum synchronisation model between formal and non-formal education at the secondary school level has a positive impact on improving student competency across the cognitive, affective, and psychomotor dimensions. This finding aligns with the competency-based education theory proposed

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by Mulder (2019), which emphasises that effective learning must be directed at achieving learning outcomes that reflect real-world capabilities in work and social contexts. The 17% increase in student competency after implementing the synchronisation model reinforces the argument that learning that combines academic and practical contexts can create more meaningful learning experiences. This also supports the concept of work-integrated learning proposed by Billett et al. (2020), which emphasises the importance of student engagement in real-world work situations to deepen conceptual understanding and application skills. Thus, the results of this study not only confirm the effectiveness of an integrative approach in improving student competency but also demonstrate that synchronisation between formal and non-formal education can be a concrete strategy for realising competency-based education in Indonesia.

From a theoretical perspective, the results of this study reinforce Lave and Wenger's (1991) view of situated learning, namely that the learning process occurs optimally when students are directly involved in social practices relevant to their life context. Student participation in non-formal activities such as digital skills training, community-based projects, and industry collaborations provides opportunities for them to acquire contextualised and applicable knowledge. In this context, learning takes place not only in the classroom but also through social interactions and professional activities that reflect the realities of the workplace. This aligns with the Communities of Practice theory proposed by Wenger-Trayner & Wenger-Trayner (2020), where meaningful learning occurs within communities of shared goals and experiences. Therefore, the curriculum synchronisation proposed in this study serves as a bridge between formal, academic-oriented learning spaces and non-formal, social practice-based learning spaces, creating a more comprehensive learning experience.

These findings also align with the research by Haatainen et al. (2021), which showed that project-based learning can enhance students' perceptions of their own competency development. In this study, students reported increased motivation, self-confidence, and collaborative skills after participating in integrative activities between schools and non-formal institutions. This suggests that a student-centred learning approach involving real-world contexts can enhance engagement and learning outcomes. Thus, curriculum synchronisation that integrates formal and non-formal education has been shown to not only strengthen cognitive aspects but also foster important soft skills such as responsibility, teamwork, and problem-solving. These findings enrich the literature on competency-based education by providing empirical evidence that integration across educational pathways can create more transformative learning experiences.

From a policy perspective, the results of this study emphasise the importance of the National Qualifications Frameworks (NQF), as explained by Allais (2022), which serve to ensure the link between formal and non-formal learning outcomes. Through the NQF, learning outcomes from both streams can be recognised equally and measurably, thereby expanding access to competency recognition. However, the results also indicate that policies related to the recognition of non-formal learning outcomes are still partial and not fully implemented in Indonesia. This situation is similar to the findings of Duvekot et al. (2022), who highlighted that Recognition of Prior Learning (RPL) often remains merely a symbolic policy without systemic follow-up. Therefore, successful curriculum synchronisation requires not only institutional commitment but also strong regulatory support for the effective implementation of recognition across educational streams. In this context, this study makes a practical contribution by offering an

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implementation model that educational institutions can adapt to integrate formal and non-formal learning operationally.

Beyond the policy aspect, this study also highlights the importance of agency and collaboration in the curriculum-making process. Priestley & Biesta (2023) emphasised that the curriculum is not merely an administrative document but a social process involving interactions between teachers, students, and the community. Field findings indicate that intensive collaboration between secondary school teachers and instructors from non-formal institutions is a key factor in the successful implementation of synchronisation. Regular communication and joint planning enable alignment between learning materials and students' competency needs. This also reinforces McGrath & Powell's (2023) view that equitable education requires multi-stakeholder participation, particularly in linking education policies to community needs. Therefore, the results of this study indicate that the curriculum synchronisation model can serve as a collaborative platform for building an inclusive and socially just education ecosystem.

From an international perspective, this study reinforces the recommendations of UNESCO (2012) and the OECD, which emphasise the importance of integrating educational pathways to support lifelong learning. UNESCO's recognition, validation, and accreditation (RVA) principle has proven relevant to the Indonesian context, where many students acquire skills through non-formal pathways that are not yet integrated into the formal system. The curriculum synchronisation developed in this study can serve as a local mechanism for translating RVA principles into national education policies and practices. Thus, this research has not only national implications but also global relevance in efforts to realise inclusive and sustainable education.

The finding of significant improvements in students' psychomotor dimensions strengthens the argument that practice-based learning experiences are more effective in developing applied competencies than traditional, purely theory-oriented learning. This aligns with the findings of Widiaty et al. (2023), who asserted that learning that connects theory with field practice can bridge the gap between education and industry. Thus, the primary contribution of this research is to empirically demonstrate how formal and non-formal education can work synergistically to develop the multidimensional competencies of secondary school students. This model also reaffirms the relevance of the student-centred learning approach in the Indonesian educational context, as emphasised by the Ministry of Education, Culture, Research, and Technology (2022) through the implementation of the Independent Curriculum.

Supporting and Hindering Factors in Secondary Curriculum Synchronisation

From a practical perspective, this research has significant significance for the development of national education policy. *First*, the results provide empirical evidence that curriculum synchronisation can increase the effectiveness of competency-based learning at the secondary school level. *Second*, this research offers an implementation framework that educational institutions and local governments can use to develop cross-sector learning integration programs. *Third*, this research opens up opportunities for closer collaboration between schools, training institutions, businesses, and local communities, thereby creating an educational ecosystem that is more adaptive to change. This aligns with the view of McGrath et al. (2020) that vocational and secondary education must transform to respond to the dynamic world of work. *Fourth*, the results of this research can form the basis for developing a national policy for recognising non-formal learning outcomes, as advocated by Werquin (2020), thus providing broader

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opportunities for students to receive recognition for their competencies, regardless of their educational pathway.

Theoretically, this research makes an important contribution to strengthening the conceptual framework for curriculum integration across educational pathways. The developed synchronisation model combines situated learning theory (Lave & Wenger, 1991), the concept of communities of practice (Wenger-Trayner & Wenger-Trayner, 2020), and the principles of competency-based education (Mulder, 2019) into a single holistic framework. Through this approach, formal education no longer exists as a closed, standards-oriented entity but rather as part of a broader and more dynamic social learning network. Thus, this research enriches the literature on integrative curriculum design and broadens understanding of how various educational pathways can be harmonised to achieve national and global learning goals.

Although the research results demonstrate the effectiveness of the curriculum synchronisation model, several limitations are noteworthy. *First*, the model's implementation is still limited to a limited number of schools and non-formal institutions willing to collaborate intensively. This may affect the generalizability of the findings to other contexts with different social and institutional characteristics. *Second*, the relatively short duration of the study (one academic year) may not be sufficient to capture the long-term impact of curriculum integration on student competency development. *Third*, limited local policy support and differing perceptions between formal and non-formal stakeholders are external factors that influence the model's implementation effectiveness. However, these limitations actually open up opportunities for further research to test the sustainability of the synchronisation model in a broader context, both temporally and geographically.

Overall, this research has high academic and practical significance. Academically, it expands scientific understanding of how formal and non-formal education can be integrated to support competency-based learning. Practically, this research makes a significant contribution to the development of education policy in Indonesia, particularly in the context of the implementation of the Independent Curriculum (Kurikulum Merdeka), which emphasises autonomy, differentiation, and cross-sector collaboration. The results of this research are also relevant internationally, particularly for developing countries striving to build inclusive and sustainable education systems, as advocated by UNESCO (2012). Thus, the curriculum synchronisation model developed in this research not only strengthens Indonesia's position in facing the challenges of the Industrial Revolution 4.0 and Society 5.0, but also makes a significant contribution to the global discourse on competency-based education and lifelong learning.

IV. CONCLUSION

This study concludes that synchronising formal and non-formal education curricula at the secondary school level has proven effective in improving students' competencies holistically, encompassing cognitive, affective, and psychomotor aspects. Empirical results indicate a significant increase in students' ability to apply theoretical knowledge to practical contexts, particularly through project-based learning activities and collaboration with non-formal institutions. The synchronisation model developed in this study bridges the gap between academically oriented formal education and contextually oriented non-formal education, resulting in a learning system more relevant to 21st-

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century needs. Recommendations for further research include expanding the scope of the study to different geographic contexts and educational levels to test the consistency of the synchronisation model on a national scale. Further research is also needed to explore the long-term impact of curriculum synchronisation on students' work readiness and social participation. Furthermore, a more in-depth exploration of collaborative strategies among stakeholders to support the sustainability of the synchronisation program, particularly between the government, educational institutions, industry, and local communities, is needed. With this research direction, it is hoped that the concept of curriculum synchronisation can continue to be developed as a strategic innovation in responding to the challenges of educational transformation in the era of the Industrial Revolution 4.0 and Society 5.0, as well as strengthening the contribution of Indonesian education to the global discourse on competency-based learning and sustainable human development.

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