



IMPROVING TEACHERS' SKILLS IN DESIGNING CO-CURRICULAR PROGRAM BASED ON HOLISTIC LEARNING THROUGH PARTICIPATORY-REFLECTIVE TRAINING IN BATAM

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Abstract

This study aims to analyze the management of teacher capacity-building in designing co-curricular programs to support holistic learning in Sei Beduk District, Batam City, Indonesia, conducted from September to October 2025. Co-curricular activities constitute an integral component of the Merdeka Curriculum; however, preliminary observations in elementary schools throughout Sei Beduk District revealed that the majority of teachers lack adequate understanding in designing structured co-curricular programs. This research employed a participatory, reflective, and collaborative training approach involving 49 phase A and phase C classroom teachers from 29 public and private elementary schools. The implementation method utilized the Participatory Learning and Action approach integrated with Lesson Study and Coaching and Mentoring, conducted through eight meetings encompassing workshops, technical assistance, implementation, monitoring, and evaluation. Results demonstrated a significant improvement in teacher competence, with the average pre-test score increasing from 58.78 to 90.61 on the post-test, representing an increase of 31.83 points. All participants successfully developed integrated co-curricular planning documents, and a teacher practitioner community was established. Thus, participatory-reflective training proved effective in enhancing teacher competence in designing co-curricular programs and can serve as a model for sustainable teacher professional development. Future studies should adopt longitudinal mixed-methods designs to examine the sustainability of teachers' skills in creating holistic cocurricular after participatory-reflective training. Comparative research across education levels and regions beyond Batam is needed to test model transferability. Further inquiry should assess the actual quality of cocurricular products using validated rubrics and explore moderating variables such as school culture, principal support, and teacher workload. Qualitative analysis of teachers' reflection depth could clarify how reflective practice transforms into design skills. Establishing teacher Communities of Practice is also recommended to sustain post-training impact and enable continuous peer feedback on cocurricular development.

Keywords: Co-curricular, holistic learning, Merdeka Curriculum, participatory training, teacher competence

INTRODUCTION

The Merdeka Curriculum positions co-curricular activities as an integral component for realizing holistic learning and achieving the Pancasila Student Profile. In contrast to extracurricular activities, co-curricular activities constitute mandatory integrated activities that serve as authentic vehicles for developing 21st-century competencies. UNESCO and OECD have recommended the integration of curricular, co-curricular, and extracurricular activities as global best practices in education. However, the implementation of co-curricular activities continues to face serious challenges regarding teacher readiness in designing activities aligned with the spirit of the Merdeka Curriculum. At the elementary

school level, Phase A and Phase C classroom teachers should ideally have sufficient competency to design co-curricular programs integrated with intracurricular learning and aligned with the Eight Dimensions of the Graduate Profile. Each educational unit is expected to form a Co-curricular Working Team to collaboratively develop program plans, encompassing needs analysis, objectives, activity formats, assessments, and reporting of learning outcomes.

At the elementary school level, phase A and phase C classroom teachers should ideally possess adequate competence in designing co-curricular programs that are integrated with intracurricular learning and refer to the Eight Dimensions of Graduate Profiles. Each educational unit is expected to form a Co-curricular Working Team to collaboratively develop program planning, encompassing needs analysis, objectives, activity formats, assessment, and learning outcome reporting. Preliminary observations conducted in 29 elementary schools throughout Sei Beduk District, Batam City, indicated that more than 70% of schools had not yet established effective Co-curricular Working Teams, and the majority of teachers had never participated in technical co-curricular training. Consequently, co-curricular activities had not been systematically integrated with intracurricular learning. This was reflected in the average teacher competence pre-test score of 58.78 on a 100-point scale, with a minimum score of 50 and a maximum score of 70.

Systematic training is needed with a participatory, reflective, and collaborative approach that integrates Participatory Learning and Action (PLA), the Lesson Study Approach, and Coaching and Mentoring. The combination of these three approaches allows teachers to gain theoretical knowledge while also experiencing the design process, collaborative reflection, and ongoing mentoring during school implementation. The low level of teacher competence is attributable to three primary factors: the lack of specific technical training on co-curricular activities, the unavailability of contextual practical guidelines that can serve as direct references, and limited mentoring from supervisors and Teacher Working Groups in fostering a collaborative culture of sharing best practices. Thus far, Teacher Working Group activities have predominantly focused on administrative aspects of intracurricular learning. Systematic training employing a participatory, reflective, and collaborative approach is necessary, integrating Participatory Learning and Action, the Lesson Study Approach, and Coaching and Mentoring. The combination of these three approaches enables teachers to acquire theoretical knowledge while directly experiencing the design process, engaging in collective reflection, and receiving ongoing mentoring during school implementation.

Previous research on the Merdeka Curriculum has predominantly highlighted teacher perceptions or challenges in project-based learning, yet has not specifically addressed the development of teacher competence in comprehensive co-curricular program planning. Studies on teacher training utilizing participatory approaches have also primarily focused on intracurricular aspects. Consequently, a research gap exists concerning co-curricular training models at the elementary school level. This study offers novelty through its specific focus on co-curricular program design, the integration of Participatory Learning and Action, Lesson Study, and Coaching and Mentoring approaches within a single sustainable training program, and its broad scope involving 49 teachers from 29 schools in Sei Beduk District. The research aims to: (1) describe the participatory-reflective-collaborative training process; (2) measure training effectiveness based on pre-test to post-test score improvement; and (3) analyze supporting and inhibiting factors in the implementation of the training model.

MATERIAL AND METHODS

This study employed a Research and Development approach adopting the ADDIE model, which comprises five systematic stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was selected due to its systematic and flexible characteristics in educational product development. The activities were conducted over one month, from September to

October 2025, in 29 public and private elementary schools throughout Sei Beduk District, Batam City. The research subjects comprised 49 classroom teachers representing phase A and phase C teachers from each school. The sampling technique employed purposive sampling with criteria including teacher activeness in the Teacher Working Group, a minimum of two years of teaching experience, and willingness to participate in the entire series of activities.

The Analysis stage aimed to identify teacher needs through in-depth interviews with supervisors and principals, as well as document analysis of existing co-curricular planning. Analysis results indicated that the majority of teachers lacked adequate understanding of co-curricular concepts and had never participated in similar training. The Design stage was conducted through Focus Group Discussions involving the Chairperson of the Principal Working Group, Chairperson of the Teacher Working Group, and teacher representatives to design the training structure and materials. The Development stage produced a co-curricular program development guide module, training materials in presentation and video formats, and pre-test and post-test instruments validated by educational management and learning experts. The Implementation stage was conducted through eight face-to-face meetings encompassing material presentation, focused discussions, case studies, design practice, peer review, and reflection.

During the first meeting, a pre-test was administered to measure participants' initial competence, followed by material on the meaning and importance of co-curricular activities and the co-curricular learning framework. The third and fourth meetings focused on independent and collaborative practice in developing co-curricular planning, implementation, and assessment, concluding with a post-test. The fifth through eighth meetings were utilized for monitoring the implementation of co-curricular programs in four randomly selected representative schools. During implementation, the Participatory Learning and Action approach, Lesson Study Approach, and Coaching and Mentoring were applied to ensure active engagement, inter-teacher collaboration, and sustainability of training outcomes. Data collection instruments included pre-test and post-test sheets to measure improvement in teacher competence in designing co-curricular programs, participant observation sheets to monitor activity implementation, open-ended questionnaires to gather participant feedback, and documentation of co-curricular planning outcomes. Pre-test and post-test instruments were developed based on a blueprint encompassing understanding of co-curricular concepts, integration with intracurricular learning, activity design, assessment, and reporting. Instrument validity was tested through expert validation, while reliability was tested using Cronbach's Alpha coefficient, which demonstrated values above the threshold of 0.70.

Data analysis was conducted quantitatively and qualitatively. Quantitative data from pre-test and post-test scores were analyzed descriptively by calculating means, maximum scores, minimum scores, and percentage improvement. Qualitative data from interviews, observations, Focus Group Discussions, and open-ended questionnaires were analyzed using the interactive model of Miles and Huberman, comprising data reduction, data display, and conclusion drawing. The trustworthiness of qualitative data was maintained through source and method triangulation. This study observed research ethics principles by obtaining official permission from the Education Office and the Principal Working Group management of Sei Beduk District. Informed consent was obtained from all participants after providing explanations regarding the objectives, procedures, and the right to withdraw. Anonymity and confidentiality of participant data were maintained by concealing identities in all research reporting.

RESULT AND DISCUSSION

This study aimed to measure the impact of training on improving teacher competence in designing co-curricular programs and co-curricular planning to support holistic learning. In this regard, teacher competence in preparing instructional administration from a total of 58 participants

with 49 attendees is illustrated in Table 1, which presents the initial overview of teacher ability in developing co-curricular programs and co-curricular planning through assessment scores. Table 2 illustrates the profile of teacher ability in developing co-curricular programs and co-curricular planning after participating in the training. Table 3 presents the initial and final ability scores as well as the average participant ability after participating in the training.

Table 1. Teacher Assessment Results Before and After Participating in Training

| No | Name | School | Pretest | Postets | Average |
|----|-----------------------------|----------------------------|---------|---------|---------|
| 1 | Buana Army | SD Apolos | 60 | 90 | 75 |
| 2 | Destiani br Ginting | SD Apolos | 50 | 100 | 75 |
| 3 | Makmur | SD Charitas | 50 | 80 | 65 |
| 4 | Tria Ayu Latifah | SD Juara Batam | 60 | 90 | 75 |
| 5 | Hariyanti Ratuloly | SD Juara Batam | 60 | 90 | 75 |
| 6 | Henni Wulansih | SDN 006 Sei Beduk | 70 | 90 | 80 |
| 7 | Ismail | SDN 002 SEI BEDUK | 70 | 80 | 75 |
| 8 | Noflisa Yaka | SDN 007 SEI BEDUK | 50 | 80 | 65 |
| 9 | Febby Arisandy | SDIT Al Amin Salim Mattar | 50 | 100 | 75 |
| 10 | Fadli Vitriadi | SDIT Al-Amin Salim Mattar | 60 | 100 | 80 |
| 11 | Hati Nurhayati | SDIT AL-Mujahidin | 60 | 80 | 70 |
| 12 | Yanyan | SDIT Al-Mujahidin | 50 | 80 | 65 |
| 13 | Idiawati | SDIT Alpancory | 50 | 100 | 75 |
| 14 | Denik Patminarsih | SDIT Fajar Ilahi 3 | 60 | 100 | 80 |
| 15 | Galih Prasetyo, M.Pd., Gr. | SDIT Fajar Ilahi 3 | 60 | 100 | 80 |
| 16 | Tiur Nauli Octavia | SDIT Jet Tempur | 60 | 90 | 75 |
| 17 | Suwarti Ningsih | SDIT Jet Tempur | 60 | 80 | 70 |
| 18 | Dyah Ayu Setyorini, S. Pd | SDIT Tahfidz Nurul Islam | 70 | 100 | 85 |
| 19 | Finawati | SDIT Tahfidz Nurul Islam | 70 | 100 | 85 |
| 20 | Erniasih Saputri, S.Pd | SDIT Ummul Qurro | 60 | 90 | 75 |
| 21 | Norlaili farichah | SDIT Ummul Qurro | 60 | 90 | 75 |
| 22 | Hurry Pebrianie | SDN 001 Sei Beduk | 70 | 100 | 85 |
| 23 | Muji Lestari | SDN 001 Sei Beduk | 70 | 100 | 85 |
| 24 | Dian Anggraini, S.Pd.SD | SDN 003 Sei Beduk | 60 | 100 | 80 |
| 25 | Sarifah, S.Pd. | SDN 003 Sei Beduk | 60 | 100 | 80 |
| 26 | Desmiyetty | SDN 004 Sei Beduk | 70 | 90 | 80 |
| 27 | Anniy Mufiqah | SDN 004 Sei Beduk | 70 | 90 | 80 |
| 28 | Lusiana Ferawati S,S.Pd | SDN 005 Sei Beduk | 50 | 100 | 75 |
| 29 | Nuri Melati | SDN 005 Sei Beduk | 50 | 100 | 75 |
| 30 | Bangunna Naibaho, S.Pd | SDN 006 Sei Beduk | 60 | 100 | 80 |
| 31 | Ratna Dewi | SDN 007 Sei Beduk | 50 | 80 | 65 |
| 32 | Darna | SDN 008 Sei Beduk | 70 | 80 | 75 |
| 33 | Erniati | SDN 008 Sei Beduk | 70 | 90 | 80 |
| 34 | Ponco Wahyu Ningrum | SDN 009 Sei Beduk | 60 | 80 | 70 |
| 35 | Eka Suprianti | SDN 009 Sei Beduk | 60 | 80 | 70 |
| 36 | Desri Christina N. | SDS Cerdas Ceria | 50 | 80 | 65 |
| 37 | Rut Asriani | SDS Cerdas Ceria | 60 | 80 | 70 |
| 38 | Irnawati Br Tamba | SDS Cerdas Ceria | 60 | 80 | 70 |
| 39 | Trisia Enjelina S, S.Pd.,Gr | SDS Charitas Bida Ayu | 50 | 90 | 70 |
| 40 | Lestari | SDS Cyanita Playing Centre | 60 | 80 | 70 |
| 41 | Romian Asararita Pasaribu | SDS Eben Haezer Family | 60 | 100 | 80 |
| 42 | Henny Mariance Siagian, | SDS Hidup Baru 2 | 50 | 80 | 65 |
| 43 | Megawati Pasaribu | SDS Hidup Baru 2 | 40 | 70 | 55 |
| 44 | Eli Febriyanti | SDS Islam Nur Hidayah | 60 | 100 | 80 |
| 45 | Putri Yuliza | SDS Islam Nur Hidayah | 60 | 100 | 80 |
| 46 | Julianti Pakpahan | SDS Permata Kasih | 60 | 90 | 75 |

| | | | | | |
|-----------------------|--------------------|----------------|--------------|--------------|--------------|
| 47 | Tcr. Rimbun | SDS Visi Kudus | 60 | 90 | 75 |
| 48 | Lena murni Damanik | SDTK Sahabat | 60 | 100 | 80 |
| 49 | Ropina Silaban | SDTK Sahabat | 60 | 100 | 80 |
| Average | | | 60,20 | 90,61 | 75,41 |
| Highest Scores | | | 70 | 100 | 85 |
| Lowest Scores | | | 50 | 70 | 65 |

The following diagram presents the percentage of teacher ability in developing co-curricular planning before and after participating in the training:

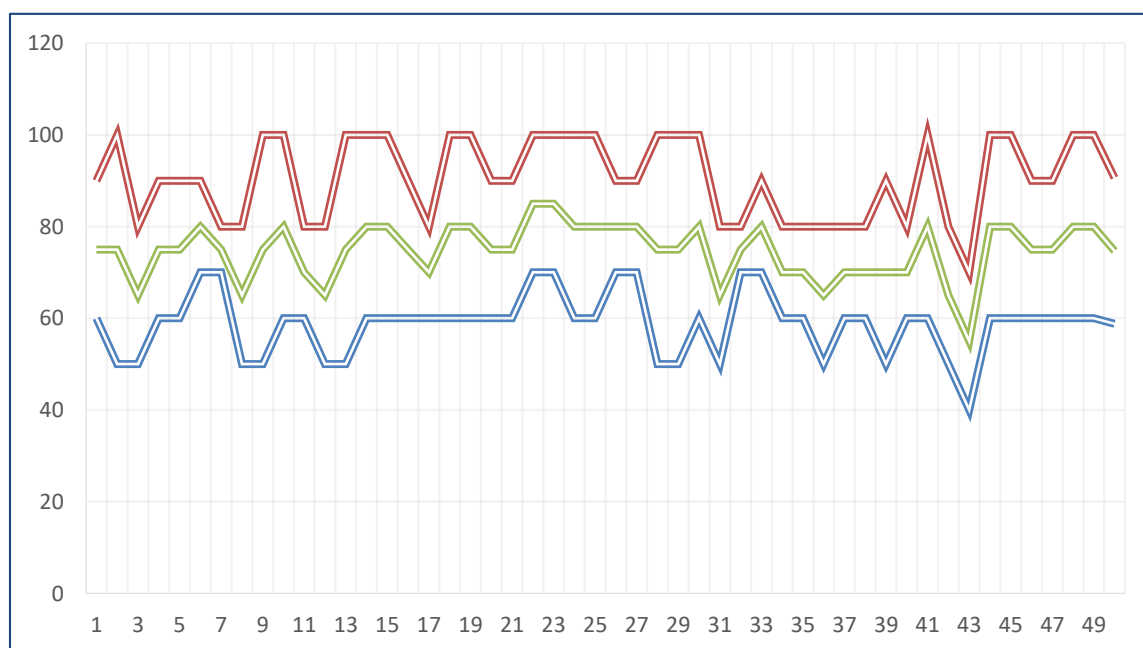


Figure 1. Percentage of Teacher Scores Before and After Participating in Training

The research results indicate that training employing a participatory, reflective, and collaborative approach significantly improved teacher competence in designing co-curricular programs, as evidenced by the increase in the average score from 58.78 on the pre-test to 90.61 on the post-test, representing an increase of 31.83 points. All participants (100%) successfully developed co-curricular planning documents integrated with intracurricular learning and aligned with the Eight Dimensions of Graduate Profiles, and a practitioner community was established as a forum for sharing best practices among elementary school teachers throughout Sei Beduk District.

The significant improvement can be attributed to the integration of three complementary approaches. The Participatory Learning and Action approach positions teachers as active subjects in program design practice according to their respective school contexts. The Lesson Study Approach encourages cross-school collaboration through peer review and collective reflection that enriches teachers' professional insights. Meanwhile, Coaching and Mentoring provides ongoing support during the implementation stage, enabling teachers to address technical challenges in the field. The combination of these three mechanisms creates a holistic learning ecosystem that simultaneously enhances theoretical knowledge, practical skills, and teacher self-confidence.

These findings align with the research of Tria Marvida and colleagues (2025), which demonstrated the effectiveness of participatory approaches in developing culture-based teaching modules, as well as the research of Idhi Agung Mulyawan and colleagues (2025), which confirmed the effectiveness of the 4D development model in developing student worksheets. Although both studies focused on the intracurricular domain, the principle of active teacher engagement in the

design and reflection process demonstrates similar mechanisms. This study extends previous findings by demonstrating that similar approaches are also effective in enhancing teacher competence in the co-curricular domain, which has received less attention in the literature on teacher professional development.

Theoretically, these findings support Knowles' andragogy theory, which emphasizes that adults learn most effectively through active engagement and relevance to real-world experience, and reinforce the Lesson Study framework as a community-based professional development model. Practically, this training model can serve as a reference for Teacher Working Groups, Principal Working Groups, and Education Offices in designing effective teacher development programs to support the implementation of the Merdeka Curriculum.

The novelty of this study lies in its specific focus on the co-curricular domain, the integration of three approaches within a single sustainable training program, and its broad scope involving 49 teachers from 29 public and private schools. However, this study has limitations regarding its restricted geographical scope, limited sample size, and short-term impact measurement. Further research is recommended to replicate this model in broader regions, employ longitudinal designs to measure long-term impact, and examine indirect effects on student learning outcomes.

CONCLUSION

Based on the research results, it can be concluded that training employing a participatory, reflective, and collaborative approach integrating Participatory Learning and Action, the Lesson Study Approach, and Coaching and Mentoring has proven effective in enhancing teacher competence in designing co-curricular programs, as evidenced by the significant increase in the average score from 58.78 to 90.61, representing an increase of 31.83 points. All participants successfully developed integrated co-curricular planning documents, and a practitioner community was established as a forum for sharing best practices. These findings support andragogy theory and reinforce Lesson Study as a model for teacher professional development, while providing practical implications for teachers, Teacher Working Groups, Principal Working Groups, and Education Offices in supporting the implementation of the Merdeka Curriculum. Despite limitations regarding geographical scope and sample size, this study recommends replication of the model in broader regions, utilization of longitudinal designs, and examination of impact on student learning outcomes for further development.

Future research should replicate this training model in wider geographical areas to test its generalizability across diverse educational contexts. Longitudinal studies are recommended to measure the long-term impact of the training on teacher performance and the sustainability of co-curricular program implementation in schools. Additionally, subsequent studies should examine the indirect effects of improved teacher competence in co-curricular program design on student learning outcomes and the achievement of the Pancasila Student Profile. The development of digital-based co-curricular planning tools and online mentoring platforms may also be explored to enhance the efficiency and reach of similar training programs. Barriers encountered during implementation, including time constraints due to teachers' primary responsibilities and variations in school infrastructure, should be carefully considered in the design of future training initiatives.

ACKNOWLEDGMENT

The authors would like to express their gratitude to the Education Office of Batam City, the Principal Working Group of Sei Beduk District, and the Teacher Working Group of Sei Beduk District for their support and facilitation of this research activity. Appreciation is also extended to all

participating teachers from the 29 elementary schools in Sei Beduk District for their active engagement and commitment throughout the training program.

REFERENCES

- Androsova, N., Tsukanova, N., Demchenko, Y., Prybora, T., & Tkachenko, O. (2023). Formation of professional competence of future primary school teachers against the background of large-scale military aggression (a response to the challenges of the times). *Journal of Curriculum and Teaching*, 12(2), 11--18. <https://doi.org/10.5430/jct.v12n3p11>
- Asiyah, S., Wiyono, B. B., Hidayah, N., & Supriyanto, A. (2021). The effect of professional development, innovative work and work commitment on quality of teacher learning in elementary schools of Indonesia. *Eurasian Journal of Educational Research*, 2021(95), 227--246. <https://doi.org/10.14689/EJER.2021.95.13>
- Branch, R. M. (2009). *Instructional design: The ADDIE approach*. Springer. <https://doi.org/10.1007/978-0-387-09506-6>
- Bufasi, E., Cakane, I., Dudareva, I., & Namsone, D. (2024). Professional development for primary school teachers intended to promote students' spatial ability. *International Journal of Engineering Pedagogy*, 14(2), 130--144. <https://doi.org/10.3991/ijep.v14i2.43673>
- Chaipidech, P., Srisawasdi, N., Kajornmanee, T., & Chaipah, K. (2022). A personalized learning system-supported professional training model for teachers' TPACK development. *Computers and Education: Artificial Intelligence*, 3, Article 100064. <https://doi.org/10.1016/j.caeai.2022.100064>
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage Publications.
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute. <https://doi.org/10.54300/122.311>
- Elmira, U. (2021). Formation of information and professional competence of primary school teachers with online education. *World Journal on Educational Technology: Current Issues*, 13(4), 838--850. <https://doi.org/10.18844/wjet.v13i4.6269>
- Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). Sage Publications..
- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2019). *How to design and evaluate research in education* (10th ed.). McGraw-Hill Education..
- Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching: Theory and Practice*, 8(3), 381--391. <https://doi.org/10.1080/135406002100000512>
- Hake, R. R. (1999). *Analyzing change/gain scores*. Indiana University. <http://www.physics.indiana.edu/~sdi/AnalyzingChange-Gain.pdf>
- Hept, B., Henschel, S., Hardy, I., Hettmannsperger-Lippolt, R., Gabler, K., Sontag, C., Mannel, S., & Stanat, P. (2022). Professional development for language support in science classrooms: Evaluating effects for elementary school teachers. *Teaching and Teacher Education*, 109, Article 103518. <https://doi.org/10.1016/j.tate.2021.103518>
- Howell, E., Perez, S., & Abraham, W. T. (2021). Toward a professional development model for writing as a digital, participatory process. *Reading Research Quarterly*, 56(1), 95--117. <https://doi.org/10.1002/rrq.294>
- Kemendikbudristek. (2022). *Panduan pengembangan kokurikuler untuk mendukung implementasi Kurikulum Merdeka*. Badan Standar, Kurikulum, dan Asesmen Pendidikan, Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia. Kemendikbudristek. (2022). *Kurikulum Merdeka: Kerangka dasar dan struktur kurikulum*. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi

- Republik Indonesia.
Kemendikbudristek. (2022). Kurikulum Merdeka: Kerangka dasar dan struktur kurikulum. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia.
- Knowles, M. S., Holton III, E. F., & Swanson, R. A. (2020). *The adult learner: The definitive classic in adult education and human resource development* (9th ed.). Routledge
- Kravik, R., Berg, T. K., & Siddiq, F. (2022). Teachers' understanding of programming and computational thinking in primary education: A critical need for professional development. *Acta Didactica Norden*, 16(4), Article 9. <https://doi.org/10.5617/adno.9194>
- Lewis, C., Perry, R., & Murata, A. (2006). How should research contribute to instructional improvement? The case of lesson study. *Educational Researcher*, 35(3), 3--14. <https://doi.org/10.3102/0013189X035003003>
- Mayer, R. E. (2024). The past, present, and future of the cognitive theory of multimedia learning. *Educational Psychology Review*, 36(1), Article 8. <https://doi.org/10.1007/s10648-023-09842-1>
- Marvida, T., Siregar, S., & Helminsyah. (2025). Development of an Acehese culture-based teaching module to enhance elementary students' understanding of mathematical concepts in Aceh Besar. *PIONIR: Jurnal Pendidikan*, 14(3), 1--20..
- Mayer, R. E. (2024). The past, present, and future of the cognitive theory of multimedia learning. *Educational Psychology Review*, 36(1), Article 8. <https://doi.org/10.1007/s10648-023-09842-1>.
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Sage Publications.
- Mulyawan, I. A., Suriswo, & Nurgraha, R. A. (2025). Development of 4D model-based student worksheets to improve learning independence in grade V elementary school. *PIONIR: Jurnal Pendidikan*, 14(3), 1--12.
- Ngafifurrohman, N., Sembiring, M. G., & Alimuddin, J. (2025). Pengaruh literasi digital, literasi informasi, dan literasi media pada guru sekolah dasar terhadap keberhasilan penerapan Kurikulum Merdeka. *Syntax Literate: Jurnal Ilmiah Indonesia*, 10(2), 145--162.
- OECD. (2021). **21st-century readers: Developing literacy skills in a digital world**. OECD Publishing. <https://doi.org/10.1787/a83d84cb-en>
- Pratiwi, I., & Firmansyah, A. (2023). Persepsi guru sekolah dasar terhadap implementasi Kurikulum Merdeka di Kota Semarang. *Jurnal Ilmiah Pendidikan Dasar*, 8(1), 45--58. <https://doi.org/10.26877/jipd.v8i1.14256>
- Setiawan, B., Rachmawati, Y., & Purnomo, A. (2024). Tantangan implementasi pembelajaran berbasis proyek dalam kegiatan kokurikuler di sekolah dasar. *Jurnal Inovasi Pendidikan Dasar*, 9(2), 112--125. <https://doi.org/10.21009/jipd.v9i2.38765>
- Shvardak, M., Ostrovska, M., Bryzhak, N., Predyk, A., & Moskovchuk, L. (2024). The use of digital technologies in professional training of primary school teachers. *International Electronic Journal of Elementary Education*, 16(3), 363--376. <https://doi.org/10.26822/iejee.2024.337>
- Sugiyono. (2019). *Metode penelitian pendidikan: Pendekatan kuantitatif, kualitatif, dan R&D* (3rd ed.). Alfabeta.
- UNESCO. (2018). *Global framework of reference on digital literacy skills for indicator 4.4.2*. UNESCO Institute for Statistics.
- UNESCO. (2021). *Reimagining our futures together: A new social contract for education*. UNESCO Publishing. <https://doi.org/10.54675/ASRB4722>
- Widodo, W., Gustari, I., & Chandrawaty, C. (2022). Adversity quotient promotes teachers' professional competence more strongly than emotional intelligence: Evidence from Indonesia. *Journal of Intelligence*, 10(3), Article 44. <https://doi.org/10.3390/jintelligence10030044>

Zhakiyanova, Z., Zhaitapova, A., Orakova, A., Baizhekina, S., Shnaider, V., & Nametkulova, F. (2023). Investigation of primary school teachers' professional competencies and technological pedagogical content knowledge (TPACK) competencies. *International Journal of Education in Mathematics, Science and Technology*, 11(5), 1154--1172. <https://doi.org/10.46328/ijemst.3604>