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# Enhancing Teacher Competency in Interactive Video Development for Speech-Delayed Children through Guided Project-Based Learning Training

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**Abstract**
Speech delay affects 5-10% of preschool children, requiring specialized educational interventions. However, kindergarten teachers often lack competencies in creating appropriate interactive video media for these children. This study investigated the effectiveness of guided Project-Based Learning (PjBL) training in enhancing teacher capabilities for developing interactive video media specifically designed for speech-delayed children. An action research design using the Kemmis and McTaggart model was implemented over two cycles at AN-NUR Kindergarten, East Kalimantan. Ten kindergarten teachers participated in guided PjBL training focusing on interactive video creation using Canva application. Data collection employed pre-test/post-test assessments, structured observations, interviews, and product documentation. Cycle II incorporated expert collaboration and artificial intelligence features to enhance training effectiveness. Teacher competency showed substantial improvement from baseline scores of 46.5 to final scores of 83.5, representing a 79.6% overall increase. Cycle I achieved 32.3% improvement (46.5 to 61.5), while Cycle II demonstrated 35.7% enhancement (61.5 to 83.5). Design appropriateness improved by 183% and audio integration by 140% in Cycle II. Nine participants (90%) achieved competency thresholds by study completion, compared to 50% in Cycle I. Qualitative observations revealed enhanced confidence, collaboration, and creative expression among participants. Guided PjBL training effectively enhances teacher competencies for creating interactive video media for speech-delayed children. The structured, collaborative approach combining theoretical knowledge with hands-on practice proves superior to traditional training methods. The integration of expert collaboration and advanced technological features significantly accelerates competency development. These findings support the implementation of PjBL-based professional development programs for specialized educational populations.

## INTRODUCTION

Early childhood education represents a critical foundation for lifelong learning and development, with effective communication skills serving as cornerstone competencies that facilitate social interaction, academic achievement, and cognitive growth throughout the lifespan. Within established frameworks of communicative competence, speaking skills empower learners to interact effectively across diverse contexts, promoting fluency through spontaneous production, reinforcing lexical knowledge, and consolidating grammatical understanding (Wang et al., 2024). Students who demonstrate strong oral communication abilities are better positioned to engage meaningfully in classroom discussions, express complex concepts, and participate effectively in collaborative learning activities (Bambaeeroo & Shokrpour, 2017).

However, a significant proportion of children experience developmental challenges that impede their ability to communicate effectively. Speech delay represents a developmental condition where children fail to achieve age-appropriate language milestones, falling significantly behind their peers in communication abilities. Research indicates that language acquisition delays without identifiable underlying causes affect between 2.3% and 19% of preschool children aged 2-5 years (Nelson et al.,

2006). The American Speech-Language-Hearing Association reports that approximately 5-10% of preschool children experience speech delays, which can profoundly impact their language, cognitive, and social development (Macias & Twyman, 2011). Children experiencing speech delays demonstrate heightened vulnerability to psychological and behavioral adjustment difficulties during preschool years and beyond (Lu et al., 2020; Schoon et al., 2010). These language development challenges frequently correlate with attention deficits, learning difficulties, and long-term memory impairments (Shiani et al., 2025), while speaking difficulties can manifest as problems expressing thoughts through sound symbols, affecting children's ability to convey information effectively to listeners (Mumtaz, 2019).

Addressing the educational needs of speech-delayed children requires specialized pedagogical approaches and innovative instructional media. Interactive video technology has emerged as a particularly promising educational tool, offering enhanced engagement through audiovisual content that accommodates diverse learning preferences. Technology is becoming increasingly important in the educational environment (Aparicio et al., 2012), and videos present a clear example of modern educational tools preferred in educational environments due to their ease of use, accessibility, and cost-effectiveness (McCauley et al., 2003). Interactive videos are enhanced versions of videos that allow viewers to interact with the presented content, enabling learners to answer questions and navigate to different video segments according to their responses (Duffy, 2007; Öndin, 2008). In this context, interactive videos allow learners to change the playing speed, flow and direction, to optimize their interaction with the educational environment (Moreno & Mayer, 2007). Research suggests that interactive videos facilitate retention by improving interaction between working and long-term memory (Lohrmann, 2011), making them particularly suitable for supporting children with communication difficulties.

Despite the recognized potential of interactive video technology, significant gaps persist in teacher preparation and competency development for creating such specialized educational media. Traditional teacher training programs often lack adequate focus on technology integration, particularly for addressing the needs of children with developmental delays. Darwanis et al. (2024) demonstrated that guided training programs significantly influence teacher interest and competency in utilizing integrated instructional media. Similarly, Herniyastuti et al. (2025) found that optimized independent guided training effectively enhanced teacher capabilities in literacy assessment. These studies underscore the importance of structured professional development approaches that combine theoretical foundations with practical application.

The challenge of developing teacher competencies in interactive media creation becomes more complex when addressing specific populations such as speech-delayed children. Mulyanah and Andriani (2021) highlighted the effectiveness of guidance and training strategies for teachers in implementing technology-based learning applications during pandemic conditions, demonstrating improved learning effectiveness. Furthermore, Sujuti (2022) emphasized the role of guided training through workshop methodologies in enhancing professional competencies among educational practitioners. These findings suggest that well-structured training programs incorporating hands-on experience and sustained guidance can effectively develop teacher capabilities in specialized areas.

Project-based learning (PjBL) has emerged as a particularly effective pedagogical approach for professional development, emphasizing inquiry-based instructional methods that engage learners in knowledge construction through meaningful project completion (Brundiers & Wiek, 2013; Krajcik & Shin, 2023). PjBL is characterized by six essential hallmarks: driving questions, focus on learning goals, participation in educational activities, collaboration among students, use of scaffolding technologies, and creation of tangible artifacts (Krajcik & Shin, 2023). The creation of artifacts that solve authentic problems distinguishes PjBL from other student-centered pedagogies, requiring learners to work collaboratively in finding solutions to authentic problems through knowledge integration, application, and construction (Blumenfeld et al., 1991; Helle et al., 2006).

Research demonstrates that PjBL induces quality improvements in teaching and learning, cognitive development, innovative problem solving, planning, communication, authentic research, and

self-directed learning (Yang & Cheng, 2010; Dehdashti et al., 2013). Students engaged in PjBL reveal higher intrinsic motivation, significantly enhanced critical thinking skills, and greater appreciation for peer learning (Holmes & Hwang, 2016). Additional benefits include enhanced engagement that stimulates curiosity and discovery, followed by increased motivation (Chu et al., 2012), and advancement in perceptions of skills, utility value of participation, and career aspirations (Beier et al., 2019).

The integration of PjBL principles in teacher professional development programs offers substantial potential for addressing the competency gap in interactive media creation. Project-based learning promotes cooperation between participants while facilitators act as guides during the project implementation (Greenier, 2020), making it an efficient method for developing twenty-first century skills including critical thinking, problem solving, interpersonal communication, information and media literacy, cooperation, and leadership (Chu et al., 2017). The approach enables participants to learn through searching solutions, asking questions, debating ideas, designing plans, and communicating with others (Choi et al., 2019), characteristics that align well with the complex demands of creating specialized educational media.

This research addresses the critical need for enhancing kindergarten teacher competencies in developing interactive video media specifically designed for speech-delayed children through guided training based on project-based learning principles. The study aims to investigate how structured professional development incorporating PjBL methodology can improve teacher capabilities in both the technical aspects of interactive video creation and the pedagogical understanding necessary for addressing speech delay characteristics. By examining the implementation of guided training programs that combine theoretical knowledge with practical application, this research contributes to understanding effective approaches for developing specialized teacher competencies.

The significance of this research extends beyond immediate professional development outcomes to encompass broader implications for inclusive education practices and support for children with developmental delays. Enhancing teacher capabilities in creating targeted educational media represents a crucial step toward developing more responsive and effective educational environments for all learners, particularly those requiring specialized intervention approaches. The findings of this study may inform policy development, curriculum design, and professional development frameworks aimed at improving educational outcomes for vulnerable student populations while advancing teacher professional competencies in technology-enhanced instruction.

## METHODS

This study employed an action research design combining qualitative and quantitative approaches (mixed methods) based on the Kemmis and McTaggart model. The action research methodology was selected to address practical problems faced by kindergarten teachers while actively involving them in the learning process. The research followed four cyclical stages: planning, action, observation, and reflection, implemented to develop teacher competencies in creating interactive video media through guided training using Project-Based Learning (PjBL) approaches.

The study was conducted at AN-NUR Kindergarten in East Kutai Regency, East Kalimantan Province, during May 2025 over a four-week period aligned with the academic calendar. The research site was selected based on several criteria: limited teacher capabilities in creating interactive video media, specific needs for interactive media for speech-delayed children, willingness to implement Project-Based Learning approaches, institutional support for teacher competency development, and teacher readiness to engage in project-based learning methodologies.

Ten kindergarten teachers from AN-NUR Kindergarten participated as research subjects during the 2024/2025 academic year. Subject selection was based on material prerequisites and independent variable requirements. Material prerequisites included basic understanding of speech delay development and comprehension of speech delay learning principles. Independent variable

prerequisites encompassed limited experience in creating interactive video media, direct involvement in project-based training activities, and willingness to participate in all training and evaluation stages.

Data collection employed multiple instruments designed to capture comprehensive information about teacher competency development. Observation instruments consisted of structured observation sheets with 15 items using a 5-point rating scale, focusing on teacher engagement during training, conceptual understanding of speech delay characteristics, application proficiency with Canva software, storyboard development skills, group collaboration effectiveness, creativity in product development, and consistency in attendance and task completion. Interview instruments utilized in-depth interview guidelines exploring teacher experiences, perceptions, challenges, and reflections regarding training and interactive video creation processes. The interview protocol addressed three main aspects: understanding of interactive media, responses to PjBL training methods, and challenges in video production processes.

Competency testing instruments measured teacher knowledge and skill improvements through both cognitive and practical assessments. Cognitive tests evaluated theoretical knowledge about speech delay characteristics, interactive video media concepts, Project-Based Learning understanding, and digital media creation procedures. Practical tests assessed storyboard design capabilities, Canva application utilization, interactive video creation aligned with speech delay needs, and integration of artificial intelligence features, animations, and interactive elements. Documentation techniques captured interactive video products created by teachers, serving as evidence of competency development and quality assessment materials.

Data analysis employed descriptive quantitative and qualitative approaches. Quantitative analysis utilized comparative descriptive analysis, comparing pre-training and post-training results through pretest and posttest comparisons. Mean calculations determined average scores for both assessment periods, followed by percentage improvement calculations using the formula: (Posttest Score - Pretest Score) / Pretest Score × 100%. Qualitative analysis followed the Miles and Huberman model through three stages: data reduction involving filtering relevant interview excerpts and summarizing field notes, data presentation through tables and graphs, and conclusion drawing based on comprehensive findings.

Success criteria were established based on established action research principles, requiring measurable improvements in learning processes and outcomes. Success indicators included 75% achievement across all observed aspects, teacher competency improvement categorized as "good" level, and minimum performance test scores reaching 80 points. The cyclical nature of action research allowed for continuous refinement of training approaches based on reflection and evaluation results, ensuring optimal teacher competency development in creating interactive video media specifically designed for speech-delayed children.

## RESULTS AND DISCUSSION

### Results

The action research was conducted over two cycles at AN-NUR Kindergarten in East Kutai Regency, involving ten kindergarten teachers as participants. Each cycle consisted of two meetings with a duration of 4 x 30 minutes per session. The research followed the Kemmis and McTaggart model, encompassing four stages: planning, action, observation, and reflection.

#### *Initial Conditions and Baseline Assessment*

Prior to the intervention, interviews with participating teachers revealed significant challenges in creating interactive video media for speech-delayed children. Initial supervision by the school principal indicated that teacher competency in interactive video media creation was critically low at only 20%. Teachers demonstrated insufficient understanding of appropriate interactive video media characteristics suitable for speech-delayed children's learning principles, limited familiarity with video creation applications such as Canva, and inadequate knowledge of available features and their implementation.

### *Cycle I Implementation and Outcomes*

The first cycle was conducted on May 7 and 15, 2025, focusing on foundational concepts and basic application skills. Table 1 presents the comparative analysis of pre-test and post-test results for Cycle I competency assessment.

**Table 1.** Cycle I Pre-test and Post-test Competency Assessment Results

| Assessment Component | Pre-test Mean | Post-test Mean | Improvement |
|---|---|---|---|
| PjBL Concept Understanding | 2.5 | 5.0 | 100% |
| Technical Skills (Canva) | 2.5 | 4.5 | 80% |
| Design Appropriateness | 2.5 | 3.0 | 20% |
| Audio Integration | 1.5 | 2.5 | 67% |
| Overall Project Quality | 25.5 | 30.5 | 20% |
| Total Mean Score | 46.5 | 61.5 | 32.3% |

The results shown in Table 1 indicate that while participants demonstrated notable improvement in understanding PjBL concepts and basic technical skills, significant gaps remained in design appropriateness and audio integration capabilities. The overall mean score increased from 46.5 to 61.5, representing a 32.3% improvement, though this remained below the target threshold of 75%. Based on the Cycle I outcomes, five participants (50%) achieved the minimum competency threshold. However, the overall performance remained categorized as "adequate" rather than the desired "good" or "excellent" levels. Observational data revealed several persistent challenges: participants arriving late and disrupting concentration, limited confidence in developing creative ideas during video creation, and insufficient innovation in media design resulting in suboptimal responses when implemented with speech-delayed children.

### *Cycle II Implementation and Enhanced Outcomes*

Recognizing the limitations identified in Cycle I reflection, Cycle II was implemented on May 21 and 29, 2025, with enhanced instructional strategies. A subject matter expert specializing in interactive video media creation was introduced as a collaborating instructor. The enhanced training incorporated artificial intelligence features within the Canva application to improve media sophistication and effectiveness.

Table 2 demonstrates the substantial improvements achieved through the enhanced Cycle II intervention.

**Table 2.** Cycle II Pre-test and Post-test Competency Assessment Results

| Assessment Component | Pre-test Mean | Post-test Mean | Improvement |
|---|---|---|---|
| PjBL Concept Understanding | 5.0 | 5.0 | 0% |
| Technical Skills (Canva) | 4.5 | 5.0 | 11% |
| Design Appropriateness | 3.0 | 8.5 | 183% |
| Audio Integration | 2.5 | 6.0 | 140% |
| Overall Project Quality | 30.5 | 44.0 | 44% |
| Total Mean Score | 61.5 | 83.5 | 35.7% |

The data presented in Table 2 reveals remarkable improvements across all competency dimensions. Most notably, design appropriateness showed a 183% improvement, while audio integration capabilities increased by 140%. The overall mean score advanced from 61.5 to 83.5, representing a 35.7% improvement and achieving the "very good" performance category.

### *Qualitative Observations and Behavioral Changes*

Field notes documented significant behavioral and attitudinal changes throughout the intervention. Cycle I observations revealed hesitancy in creative expression and limited technical confidence. However, Cycle II observations showed increased participant engagement, enhanced collaborative behavior, and greater willingness to experiment with advanced features. Participants

demonstrated improved problem-solving capabilities when encountering technical challenges and showed increased confidence in presenting their creative work.

Interview data further supported these observations, with participants expressing enhanced understanding of speech-delayed children's learning needs and increased confidence in technology integration. Representative participant feedback included statements about improved pedagogical understanding and enhanced technical self-efficacy.

**Discussion**

This research demonstrates the substantial effectiveness of guided Project-Based Learning approaches in enhancing teacher competencies for creating interactive video media designed for speech-delayed children. The 79.6% overall improvement from baseline measurements provides empirical support for Maros et al. (2023) conceptualization of project-based learning as a highly effective alternative to traditional teacher-led education methods. The structured implementation of PjBL's six essential phases—driving questions, project planning, scheduling, progress monitoring, outcome assessment, and experience evaluation—proved instrumental in achieving competency development objectives, aligning with Krajcik and Shin's (2023) identification of these elements as fundamental PjBL hallmarks.

The collaborative nature of project planning between instructors and participants fostered ownership and engagement, which corresponds to Chen and Yong's (2019) findings that project-based learning has medium to large positive effects on academic achievement compared to traditional education. The current study extends these findings to adult learning contexts, demonstrating that teachers working collaboratively to solve authentic problems—specifically creating interactive media for speech-delayed children—acquire knowledge and skills through the same inquiry-based processes identified by Choi et al. (2019), where learners engage through searching solutions, asking questions, debating ideas, and designing plans.

The dramatic improvements observed in design appropriateness (183% increase) and audio integration (140% increase) in Cycle II demonstrate how expert collaboration can accelerate competency development. This finding supports Greenier's (2020) assertion that project-based learning promotes cooperation between participants while facilitators act as guides during project implementation. The introduction of artificial intelligence features through Canva application in Cycle II proved particularly beneficial, enabling participants to create more sophisticated and appropriate media for speech-delayed children. This technological enhancement aligns with contemporary understanding that technology is becoming increasingly important in educational environments (Aparicio et al., 2012), with interactive videos representing modern educational tools preferred for their ease of use, accessibility, and cost-effectiveness (McCauley et al., 2003).

The research outcomes reveal significant progress in developing teachers' understanding of speech delay characteristics and appropriate instructional media design. The improvement in creating media aligned with speech-delayed children's learning principles reflects enhanced pedagogical content knowledge specific to this population. This finding supports the theoretical foundation that interactive videos facilitate retention by improving interaction between working and long-term memory (Lohrmann, 2011), making them particularly suitable for supporting children with communication difficulties as originally proposed in the study's conceptual framework.

The interactive video media created by participants showed progressive sophistication from Cycle I to Cycle II, incorporating elements specifically beneficial for speech delay intervention: clear visual cues, appropriate pacing, repetitive elements for reinforcement, and engaging audio-visual integration. These design improvements demonstrate how interactive videos allow learners to optimize their interaction with educational environments by changing playing speed, flow, and direction (Moreno & Mayer, 2007), particularly crucial for children with developmental delays who require individualized pacing and multimodal support.

The development of twenty-first century skills among participating teachers represents another significant outcome of this research. Participants demonstrated enhanced critical thinking and problem-solving abilities, interpersonal communication skills, and cooperative leadership capabilities throughout the training process. These improvements align with Chu et al.'s (2017) identification of project-based learning as an efficient method for developing such competencies. Additionally, the enhanced engagement that stimulated curiosity and discovery, followed by increased motivation, corresponds to findings by Chu et al. (2012) regarding PjBL's motivational benefits.

The two-cycle implementation revealed the importance of iterative refinement in professional development programming, supporting the inquiry-based learning approach inherent in PjBL methodology. Cycle I served as a foundational building phase where participants developed basic competencies, while Cycle II enabled consolidation and advancement through expert collaboration. This progressive structure demonstrates how students must plan their tasks and assess completeness, as noted by Robertson (2011), making them more responsible for all aspects of their learning tasks (Klopfenstein, 2003). The iterative approach allowed teachers to deepen and expand knowledge while integrating it into a comprehensive system of understanding (Maros et al., 2023), particularly regarding the intersection of technology skills and special needs pedagogy.

The collaborative approach incorporating subject matter experts in Cycle II proved particularly effective, suggesting that professional development programs benefit from multiple expertise sources. This finding demonstrates how project-based learning enables participants to work independently and creatively, plan and complete their work, take responsibility for outcomes, and overcome obstacles while working with information and expressing themselves correctly (Turek, 2008). The teachers learned to present their own work, cooperate effectively, communicate clearly, and evaluate both their work and that of others—competencies essential for creating quality educational media for specialized populations.

The research contributes empirical evidence supporting Tsybulsky and Muchnik-Rozanov's (2019) assertion that students work to solve and evaluate problems while presenting results to audiences, thereby acquiring knowledge and skills needed for professional practice. The participating teachers demonstrated autonomy, cooperation, communication, and reflection in real-life practices (Kokotsaki et al., 2016), specifically within the context of creating educational interventions for vulnerable student populations.

However, this study's limitations warrant careful consideration. The research involved only ten participants at a single institution over a four-week period, which may limit broader applicability across diverse educational contexts. Additionally, the study did not assess long-term retention of competencies or actual implementation effectiveness in classroom settings with speech-delayed children. Bertucci et al.'s (2010) recommendation that groups of two are suitable for students with no teamwork experience suggests that future implementations might benefit from varied group configurations based on participants' collaborative experience levels.

The findings support the fundamental premise that students should not learn abstract definitions but rather engage in solving complex projects (Čapek, 2019), extending this principle to adult professional development contexts. The transition from traditional training methods to project-based learning involved a fundamental shift from instructor-focused to participant-focused approaches (Maros et al., 2023), significantly changing the classroom experience for both trainers and teachers while altering how participants responded to the general learning process (Choi et al., 2019).

Future research should investigate longitudinal impacts of such training programs, examine implementation across diverse institutional contexts with varying group sizes as suggested by Chen and Yong (2019), and assess the actual effectiveness of teacher-created media in improving speech-delayed children's learning outcomes. Additionally, comparative studies exploring different professional development methodologies would strengthen understanding of optimal approaches for specialized teacher competency development, particularly in integrating advanced technologies with special needs pedagogy.

## CONCLUSION

This action research successfully demonstrated the effectiveness of guided Project-Based Learning training in enhancing kindergarten teachers' competencies for creating interactive video media specifically designed for speech-delayed children. The intervention achieved a remarkable 79.6% improvement in overall teacher competency, with post-intervention scores reaching 83.5 from an initial baseline of 46.5. The two-cycle implementation revealed that structured PjBL approaches, particularly when enhanced with expert collaboration and advanced technological features, significantly improve both technical skills and pedagogical understanding of specialized populations' learning needs.

The research contributes to the educational field by providing empirical evidence for PjBL effectiveness in professional development contexts, specifically addressing the intersection of special needs education, technology integration, and teacher competency development. The study extends existing literature by demonstrating how collaborative expert involvement can accelerate competency acquisition and by establishing a replicable model for training teachers to create specialized educational media. Furthermore, the research addresses a critical gap in professional development approaches for supporting children with developmental delays through technology-enhanced instruction.

The practical implications suggest that educational institutions should adopt structured, iterative professional development programs incorporating hands-on project creation, expert collaboration, and technology integration when preparing teachers for specialized populations. The findings indicate that traditional training approaches may be insufficient for complex competency development, requiring instead immersive, project-based methodologies that combine theoretical understanding with practical application.

However, several limitations constrain the generalizability of findings. The study involved only ten participants at a single institution over a four-week period, limiting broader applicability. Additionally, the research did not assess long-term retention or actual implementation effectiveness in classroom settings with speech-delayed children.

Future research should investigate longitudinal impacts of such training programs, examine implementation across diverse institutional contexts, and assess the actual effectiveness of teacher-created media in improving speech-delayed children's learning outcomes. Additionally, comparative studies exploring different professional development methodologies would strengthen understanding of optimal approaches for specialized teacher competency development.

## REFERENCES

Aparicio, F., De Buenaga, M., Rubio, M., & Hernando, A. (2012). An intelligent information access system assisting a case based learning methodology evaluated in higher education with medical students. *Computers & Education*, *58*(4), 1282-1295. https://doi.org/10.1016/j.compedu.2011.12.021

Bambaeeroo, F., & Shokrpour, N. (2017). The impact of the teachers' non-verbal communication on success in teaching. *Journal of advances in medical education & professionalism*, *5*(2), 51. https://pmc.ncbi.nlm.nih.gov/articles/PMC5346168/

Beier, M. E., Kim, M. H., Saterbak, A., Leautaud, V., Bishnoi, S., & Gilberto, J. M. (2019). The effect of authentic project-based learning on attitudes and career aspirations in STEM. *Journal of Research in Science Teaching*, *56*(1), 3-23. https://doi.org/10.1002/tea.21465

Bertucci, A., Conte, S., Johnson, D., & Johnson, R. (2010). The impact of size of cooperative group on achievement, social support, and self-esteem. *The Journal of General Psychology*, 137(3), 256–272. https://doi.org/10.1080/00221309.2010. 484448

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational psychologist*, *26*(3-4), 369-398. https://doi.org/10.1207/s15326985ep2603&4_8

Brundiers, K., & Wiek, A. (2013). Do we teach what we preach? An international comparison of problem-and project-based learning courses in sustainability. *Sustainability*, *5*(4), 1725-1746. https://doi.org/10.3390/su5041725

Čapek, R. (2019). *Moderní didaktika – lexicon výukových a hodnoticích metod*. Grada Publishing, a.s. ISBN 978-80-247- 3450-7.

Chen, C. H., & Yong, Y. C. (2019). Revisiting the effects of project-based learning on students' academic achievement: A meta-analysis investigating moderators. *Educational Research Review*, 26, 71–81. https://doi.org/10.1016/j.edurev. 2018.11.001

Choi, J., Lee, J. H., & Kim, B. (2019). How does learner-centered education affect teacher self-efficacy? The case of projectbased learning in korea. *Teaching and Teacher Education*, 85, 45–57. https://doi.org/10.1016/j.tate.2019.05.005

Chu, R. H., Minasian, R. A., & Yi, X. (2012). Inspiring student learning in ICT communications electronics through a new integrated project-based learning approach. *International Journal of Electrical Engineering Education*, *49*(2), 127-135. https://doi.org/10.7227/IJEEE.49.2.3

Chu, S. K. W., Zhang, Y., Chen, K., Chan, C. K., Lee, C. W. Y., Zou, E., & Lau, W. (2017). The effectiveness of wikis for project-based learning in different disciplines in higher education. *The internet and higher education*, *33*, 49-60. https://doi.org/10.1016/j.iheduc.2017.01.005

Darwanis, D., Daulay, M. I., & Ediputra, K. (2024). Pengaruh Pelatihan Terbimbing Terhadap Minat Dan Kemampuan Guru Dalam Penggunaan Media Kumpulan Instrument Terpadu Ipa Di Sd Negeri 12 Topang. *Jurnal Intelek Dan Cendikiawan Nusantara*, *1*(5), 7559-7566. https://jicnusantara.com/index.php/jicn/article/view/1303

Dehdashti, A., Mehralizadeh, S., & Kashani, M. M. (2013). Incorporation of Project-based Learning into an Occupational Health Course. *Journal of occupational health*, *55*(3), 125-131. https://doi.org/10.1539/joh.12-0162-OA

Duffy, P. (2012). Engaging the YouTube Google-eyed generation: Strategies for using Web 2.0 in teaching and learning. *Leading Issues in e-Learning Research. Academic Publishing International Limited. United Kingdom*, 47-70.

Greenier, V. T. (2020) The 10Cs of project-based learning tesol curriculum. *Innovation in Language Learning and Teaching*, 14(1), 27–36. https://doi.org/10.1080/17501229.2018.1473405

Helle, L., Tynjälä, P., & Olkinuora, E. (2006). Project-based learning in post-secondary education–theory, practice and rubber sling shots. *Higher education*, *51*(2), 287-314. https://doi.org/10.1007/s10734-004-6386-5

Herniyastuti, H., Yusdarwati, A., & Kadir, A. (2025). Optimalisasi Pelatihan Mandiri Terbimbing untuk Meningkatkan Penilaian Awal Literasi Membaca Guru Kelas di SDN 276 Latappere. *DEIKTIS: Jurnal Pendidikan Bahasa dan Sastra*, *5*(1), 1-6. https://doi.org/10.53769/deiktis.v5i1.1280

Holmes, V. L., & Hwang, Y. (2016). Exploring the effects of project-based learning in secondary mathematics education. *The Journal of Educational Research*, *109*(5), 449-463. https://doi.org/10.1080/00220671.2014.979911

Klopfenstein, B. J. (2003). *Empowering learners: Strategies for fostering self-directed learning and implications for online learning* [Master's thesis]. University of Alberta.

Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. *Improving Schools*, 19 (3). https://doi.org/10.1177/1365480216659733

Krajcik, J., & Shin, N. (2023). Student conceptions, conceptual change, and learning progressions. In *Handbook of research on science education* (pp. 121-157). Routledge.

https://www.taylorfrancis.com/chapters/edit/10.4324/9780367855758-7/student-conceptions-conceptual-change-learning-progressions-joseph-krajcik-namsoo-shin

Lohrmann, D. K. (2011). Thinking of a change: Health education for the 2020 generation. *American Journal of Health Education*, 42(5), 258–269. http://dx.doi.org/10.1080/19325037.2011.10599196

Lu, H. H., Tsao, F. M., & Tsai, J. D. (2020). Behavioral problems of Mandarin-speaking late-talking toddlers and preschool aged children: A prospective case–control study in Taiwan. *Medicine*, *99*(48), e23341. https://doi.org/10.1097/MD.0000000000023341

Macias, M. M., & Twyman, K. A. (2011). Speech and language development and disorders. *Developmental and Behavioral Pediatrics*, 201-220. https://doi.org/10.1542/9781581105506-ch11

Maros, M., Korenkova, M., Fila, M., Levicky, M., & Schoberova, M. (2023). Project-based learning and its effectiveness: evidence from Slovakia. *Interactive Learning Environments*, *31*(7), 4147-4155. https://doi.org/10.1080/10494820.2021.1954036

McCauley, J., Jenckes, M. W., & McNutt, L. A. (2003). ASSERT: the effectiveness of a continuing medical education video on knowledge and attitudes about interpersonal violence. *Academic medicine*, *78*(5), 518-524. https://journals.lww.com/academicmedicine/abstract/2003/05000/assert__the_effectiveness_of_a_continuing_medical.17.aspx

Moreno, R., & Mayer, R. (2007). Interactive multimodal learning environments: Special issue on interactive learning environments: Contemporary issues and trends. *Educational psychology review*, *19*(3), 309-326. https://doi.org/10.1007/s10648-007-9047-2

Mulyanah, N., & Andriani, A. (2021). Strategi Bimbingan dan Pelatihan Guru Dalam Pembelajaran Menggunakan Aplikasi Google Pada Pembelajaran Daring Untuk Meningkatkan Efektifitas Belajar Siswa Dimasa Pandemi Covid-19. *Jurnal Riset Pendidikan Dasar (JRPD)*, *2*(1), 67. https://doi.org/10.30595/jrpd.v2i1.9229

Mumtaz, F. (2019). *Bahasa Indonesia Untuk Perguruan Tinggi Terampil Berbahasa, Menulis, Dan Berbicara Di Depan Umum*. PT. Pustaka Baru.

Nelson, H. D., Nygren, P., Walker, M., & Panoscha, R. (2006). Screening for speech and language delay in preschool children: systematic evidence review for the US Preventive Services Task Force. *Pediatrics*, *117*(2), e298-e319. https://doi.org/10.1542/peds.2005-1467

Öndin, Z. (2008). *İnteraktif Videonun Egitimde Kullanılmasını Saglayan Bir DVD Uygulaması*. Yayımlanmış Yükseklisans Tezi. İstanbul: Yıldız Teknik Üniversitesi Sosyal Bilimler Enstitüsü.

Robertson, J. (2011). The educational affordances of blogs for self-directed learning. *Computers & Education*, 57(2), 1628– 1644. https://doi.org/10.1016/j.compedu.2011.03.003

Shiani, A., Mansouri, B., Kiani, A., Massahi, T., Khalid Omer, A., Sharafi, K., & Tavakol, K. (2025). Effect of exposure to toxic compounds on developmental language disorder (DLD)-a narrative review. *Iranian Journal of Toxicology*, *19*(1), 37-44. http://dx.doi.org/10.32592/IJT.19.1.37

Sujuti, S. R. (2022). Meningkatkan kompetensi profesional guru bk dalam menyusun program melalui bimbingan dan pelatihan dengan metode workshop di mgbk. *MANAJERIAL: Jurnal Inovasi Manajemen dan Supervisi Pendidikan*, *2*(2), 213-221. https://doi.org/10.51878/manajerial.v2i2.1300

Tsybulsky, D., & Muchnik-Rozanov, Y. (2019). The development of student-teachers' professional identity while teamteaching science classes using a project-based learning approach: A multi-level analysis. *Teaching and Teacher Education*, 79, 48–59. https://doi.org/10.1016/j.tate.2018.12.006

Turek, I. (2008). *Didaktika*. Iura Edition, ISBN 978-80-8078-198-9.

Wang, R., Do Dange, M., & Izadpanah, S. (2024). The effect of animated movies on speaking skills among motivated English foreign language learners: Elementary level. *European Journal of Education*, *59*(3), e12665. https://doi.org/10.1111/ejed.12665

Yang, H. L., & Cheng, H. H. (2010). Creativity of student information system projects: From the perspective of network embeddedness. *Computers & Education*, *54*(1), 209-221. https://doi.org/10.1016/j.compedu.2009.08.004