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Implementation of Problem Based Learning Approach Culturally Responsive Teaching to Enhance Engagement and Learning Outcomes in Algebraic Function Limit Material

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Abstract

This research aims to evaluate the engagement and learning outcomes of students through the Problem Based Learning model with a Culturally Responsive Teaching approach, particularly in the topic of algebraic function limit system. Based on observations and interviews conducted at Muhammadiyah Mlati High School, it was found that students in the eleventh grade of Social Sciences were less active in participating in mathematics classes, which are part of the mandatory curriculum based on the 2013 Curriculum. This study utilized the Classroom Action Research method conducted in three cycles. Each cycle included planning, implementation, observation, and reflection stages. The observation results indicated an increase in learning activity with a score of 56.25% in the first cycle, 72.13% in the second cycle, and 91.38% in the third cycle. This increase in learning activity correlates with the improvement in students' learning outcomes, where the N-gain value in the first cycle was 0.48 (medium category), 0.51 in the second cycle (medium category), and 0.56 in the third cycle (medium category), indicating that the success indicator (≥75.00) has been achieved. Thus, this research is considered successful and concluded at the end of the third cycle.

Keywords: PBL, CRT, Activeness, Learning results, Algebraic function limits

INTRODUCTION

A robust education system is pivotal for nurturing quality, open-minded, creative, and innovative young individuals adept at problem-solving and poised to confront future challenges [1]. However, realizing this lofty objective necessitates overcoming various hurdles and issues within the education landscape. Addressing educational challenges can be facilitated through a shared vision among stakeholders: students, teachers, school principals, parents, relevant institutions, and local governments [2][3][4]. Consequently, all stakeholders must diligently fulfill their roles. Teachers emerge as pivotal actors in national goal attainment [5]. They must hone their professional skills to adapt to evolving professional trends and requirements [6], particularly in teaching. Without the capacity to deliver effective teaching, teachers cannot exhibit innovation and creativity in executing their duties and responsibilities.

Teachers are inseparable from teaching activities while discharging their duties and responsibilities. Teaching unfolds as a process where students interact with teachers and learning resources in an educational setting [7], [8]. Within this interactive process, knowledge and values are transmitted from teachers to students and from the environment to students. Various strategies can be employed by teachers in this knowledge transfer process. The efficacy of learning strategies hinges on being informed by diagnostic test results for students [9]. Incorrect selection of teaching strategies can impact learning process outcomes [10][11].

The assessment of eleventh-grade Social Sciences students at Muhammadiyah Mlati High School shows that there are deficiencies in the students' initial knowledge. Surprisingly, less than 48% of students scored below Minimum Completeness in mathematics learning. This low basic knowledge has a negative impact on student learning outcomes. Prior knowledge serves as an important component for the success of the learning process. [12] emphasized that prior knowledge helps students perfect critical thinking skills and become independent learners. [13] also emphasized that student learning outcomes are shaped by previous knowledge.

Model selection stands out as one of the factors influencing mathematics learning outcomes. Problem-Based Learning (PBL) emerges as a learning model fostering active student participation in addressing real-world problems [14][15]. In the context of mathematics learning among eleventh-grade Social Sciences students at Muhammadiyah Mlati High School, the PBL model is anticipated to offer avenues for students to cultivate problem-solving skills, collaboration, and deeper conceptual understanding. Student engagement and cognitive autonomy are imperative for realizing learning objectives [16]. [17] and [18] highlighted in her study that the implementation of PBL models can bolster student learning outcomes. Moreover, the Culturally Responsive Teaching (CRT) approach ensures the presentation of learning materials while considering students' cultural backgrounds.

Culturally Responsive Teaching (CRT) serves as an instructional approach guaranteeing equitable education irrespective of students' cultural backgrounds [19]. The CRT approach aids students in better comprehending their cultural heritage. Infusing cultural values through the CRT approach involves integrating PBL during learning, which falls under the CRT approach's purview. [20] underscored that the CRT approach preserves cultural identity by embedding cultural values in learning. The integration of CRT with PBL serves as a benchmark for contextual learning approaches, fostering cultural characteristics, and instilling cultural values aligned with learning objectives.

Eleventh-grade Social Sciences students receive algebraic function limits material as part of mandatory mathematics subjects. A lack of learning motivation impacts learning outcomes and engagement, evidenced by students' involvement in learning, participation in problem-solving, willingness to express opinions, offer suggestions, and respond to questions from teachers or peers. [21] and [22] delineated indicators of learning engagement, including active participation in learning tasks, involvement in problem-solving, seeking clarification from peers/teachers, gathering information for problem-solving, conducting group discussions, self-assessment, problem-solving practice, and applying acquired knowledge to complete tasks or problems.

[23] posited that learning entails organizing and structuring the learning environment to foster and stimulate learning. According to [24], learning encompasses teacher-student interaction and associated elements. Teachers wield a pivotal role in determining learning quality, with their planning, implementation, and evaluation skills significantly impacting its success. Hence, this research aims to enhance engagement and mathematics learning outcomes among eleventh-grade Social Sciences students at Muhammadiyah Mlati High School through the implementation of Problem-Based Learning (PBL) coupled with a Culturally Responsive Teaching (CRT) approach in the Algebraic Function Limits material.

MATERIALS AND METHODS

This research employed the Classroom Action Research method conducted in three cycles, with each cycle comprising planning, implementation, observation, and reflection activities. The study took place at Muhammadiyah Mlati High School during the second semester of the academic year 2023/2024, from February 10th to May 10th, 2024. The sample (subjects) used in this research consisted of eleventh-grade Social Sciences students at Muhammadiyah Mlati High School. The methods utilized in this research included observation, interviews with teachers or students to assess student engagement, as well as pre-tests and post-tests to determine learning outcomes, indicated by N-gain results and classical mastery. The outcomes of this research encompassed student engagement and learning outcomes.

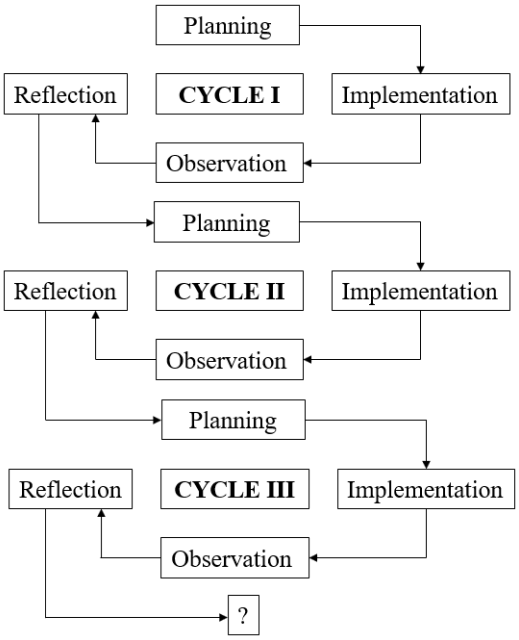

Figure 1: Research Flow

Student engagement can be assessed through eight indicators based on [25], where each indicator consists of three points. The data from the observation assessments regarding student engagement were then analyzed quantitatively by calculating the percentage of all aspects using the following formula [26].

$$\text{Percentage} = \frac{\text{Score obtained}}{\text{Maximum score}} \times 100\%$$

Analyzing student engagement data involves several steps. Firstly, observation data is collected based on the eight indicators of engagement. Secondly, scores are determined for each indicator based on observations. These scores are then summed up from all indicators. Subsequently, the maximum achievable score is calculated. Finally, the formula provided above is utilized to compute the percentage of student engagement. Additionally, student learning outcomes are derived from the improvement between pre-test and post-test scores, as well as the classical mastery of students. This improvement can be calculated using the N-gain formula.

$$\langle g \rangle = \frac{S_{post} - S_{pre}}{S_{m-ideal} - S_{pre}}$$

With the following criteria:

Table 1: Interpretation of ScoreiAverage N-gain

Value ⟨g⟩	Category
$\langle g \rangle \geq 0{,}7$	High
$0{,}3 \leq \langle g \rangle < 0{,}7$	Medium
$\langle g \rangle < 0{,}3$	Low

[27]

Learning implemented through the PBL model with a CRT approach is deemed successful if students' learning outcomes exhibit an increase in pre-test and post-test scores, based on the N-gain criteria reaching a minimum of 0.3, categorized as moderate. Classical mastery of students is calculated from the post-test scores achieving ≥75% of the total number of students obtaining the Minimum Criteria of 75. The classical mastery value can be analyzed using the formula according to [27] as follows:

$$\text{Classical Mastery} = \frac{\text{Number of students who pass}}{\text{Total number of students}} \times 100\%$$

RESULTS AND DISCUSSION

This Classroom Action Research involves four main activities: planning, implementation, observation, and reflection. In the lesson planning phase, instructional materials such as lesson plans, instructional media, learning resources, observation sheets, reflection sheets, and teaching strategies suitable for the characteristics and needs of the students are required. In cycles I and II, the Problem Based Learning (PBL) model with a Culturally Responsive Teaching (CRT) approach was utilized, with instructional media including videos and images, learning resources such as worksheets, and a quiz game (Quizziz) as cognitive assessment instruments. In cycle III, the PBL model with a CRT approach was employed, utilizing instructional media like videos, images, snakes and ladders, online monopoly, and student-produced posters, with learning resources in the form of worksheets.

During the implementation phase of the first cycle, eleventh-grade Social Sciences students engaged in discussions aided by Liveworksheet. They searched for information through the internet, YouTube, and books to assist in completing the worksheet, and group discussion outcomes were presented. In the second cycle, students participated in a tournament game/online snakes and ladders competition assisted by Quiz Whizzer, where they earned points by answering questions at each step, and the group with the highest points emerged as the winner. Activities like mini quizzes, snakes and ladders games, and monopoly in the second cycle were able to enhance student engagement, in line with [28] statement that combining Slide Share with quizzes can boost student activity during the learning process. In the third cycle, students made a product in the form of a poster using Canva about limits of algebraic functions. This is in line with [29] and [30] statement that learning with interesting media can help students understand the material better.

According to [31], [32] and [33], learning supported by Android-based media has several advantages. Firstly, this media can activate students to learn with high motivation due to their interest in using this technology. Secondly, Android-based media can facilitate understanding of learning material because of its interactive usage and support for various teaching methods. Lastly, this media also provides flexibility for students to access learning material anytime and anywhere, thereby enhancing accessibility and ease in the learning process.

The teaching approach in Cycles I, II, and III utilized CRT, integrating local culture through traditional games like snakes and ladders and crossword puzzles, which are included in PBL-based learning. These traditional games have cultural values passed down through generations (mutual cooperation, trust, honesty, sportsmanship) and are integrated with algebraic function limit material. Learning with the PBL model with a CRT approach provides a new experience for students, making them more active and motivated during the learning process. Students are free to create strategies, change seating positions during learning, and find it easier to understand the material presented. [34] stated that a learning environment that allows students to change seating positions, express themselves, and be creative can help with understanding the material.

The CRT approach is suitable for mathematics learning because it relates to culture, such as the use of traditional games to facilitate learning, introducing mathematical concepts from batik fabrics to using the local language to present learning discussion results. In this study, the material was delivered by adapting to the local culture, and students were free to use their local language, such as a student from Solo who occasionally used their local language when expressing opinions. Their peers responded openly and shared their respective cultures.

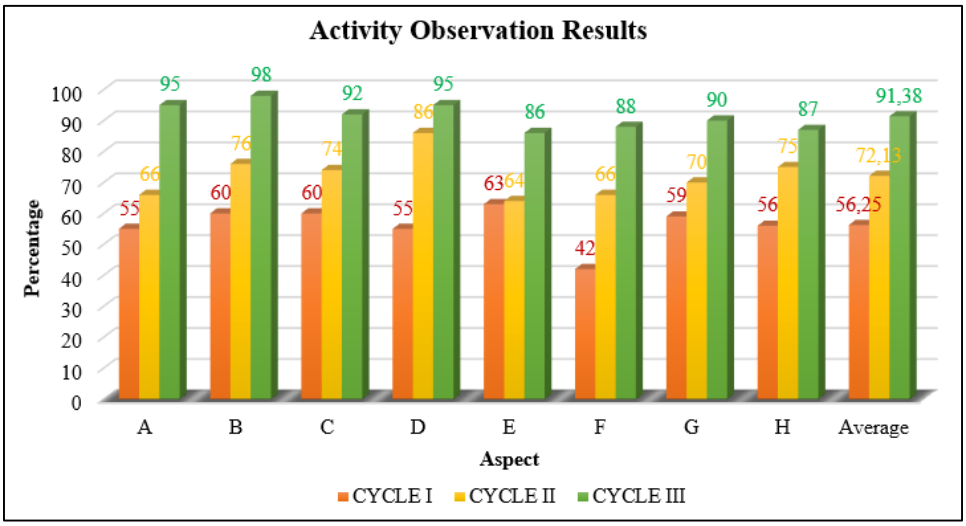

Figure 2: Results of Observation Activities

In the third activity of this research, there are two main activities: observation of students' learning engagement (covering affective and psychomotor domains) and evaluation of learning outcomes through worksheets, tournament games, and quizzes (as cognitive domains). The observation results indicate that the learning engagement of eleventh grade Social Sciences students increased from cycle I to cycle III. In cycle I, using the Problem-Based Learning (PBL) method, the engagement reached 56.25%. Cycle II showed an increase of 15.88% to 72.13% because the learning method was enriched with additional games/tournaments that catered to various learning styles of the students. In cycle III, the engagement increased by 19.25% to 91.38%, consistent with [35] statement that increased engagement can be achieved through social interaction accommodating various learning styles.

This improvement occurred because the learning model used PBL, which encourages students to analyze complex problems, identify potential solutions, and apply learned knowledge to produce innovative and effective products. Additionally, PBL contextualizes learning, allowing students to see the practical applications of the theories learned and how this knowledge is used to solve real-world problems. They also verbally express opinions related to phenomena in their environment, in line with [36] statement that the CRT approach helps students understand concepts by finding real-life examples around them.

Learning engagement refers to the active involvement of students in the learning process. This can be seen through various signs, such as participation in class discussions, problem-solving abilities, interaction in question-and-answer sessions, and more. According to [37] and [38], learning engagement not only includes physical aspects but also mental and emotional aspects. Active learners are physically engaged, such as participating in class activities, but also mentally and emotionally engaged by contributing to problem-solving and expressing their opinions. Thus, learning engagement reflects the holistic involvement of students in the learning process, both physically and mentally.

The observation results of student engagement are measured based on eight indicators from [39], which include various achievement aspects: (A) using Canva to create posters, operating liveworksheet worksheets, and observing and listening to presentations and explanations from teachers or peers; (B) involvement in problem-solving, where students actively participate in discussions or tournament games; (C) asking other students or teachers for clarification when they do not understand the problem; (D) making efforts to gather various information, with students using books or internet media for problem-solving; (E) group discussion implementation, which includes discussion and collaboration in all group activities; (F) self-assessment of abilities and results obtained, where students express opinions and demonstrate confidence in learning; (G) practicing problem-solving, with students working on problems or issues using worksheets; (H) opportunities to apply what is learned, where students use acquired knowledge to complete tasks or face challenges.

Table 2: Research Results

Indicator	CYCLE I	CYCLE II	CYCLE III
Pretest	42,50	65,20	91,71
Posttest	69,91	82,92	96,33
N-Gain	0,48	0,51	0,56
Classical Completeness	20%	55%	100%

Based on the above, the learning outcomes of eleventh grade Social Sciences students experienced improvement in each cycle, as evidenced by the increase in pretest and posttest scores. In cycle I, the classical mastery percentage of eleventh grade Social Sciences students was 20%, with an N-Gain value of 0.48 categorized as moderate. In cycle II, there was an increase in the classical mastery percentage by 35% from 20% to 55%, and an increase in the N-Gain value by 0.03 from 0.48 to 0.51, still categorized as moderate. In cycle III, the classical mastery percentage increased by 45% from 55% to 100%, and the N-Gain value increased by 0.05 from 0.51 to 0.56, remaining in the moderate category. This is in line with the statements by [40] and [41], which state that learning outcomes are the achievements attained by students during the learning process, such as changes in mindset or perspective, grades, attitudes, behavior changes, appreciation, and skills.

In the fourth activity of this research, which is conducting reflection at the end of the learning process, this reflection activity is done together with students and mentoring teachers or colleagues. In cycle I, students were given the opportunity to express their opinions about the learning process. For example, if students felt bored and faced difficulties during the discussion in the first meeting, then in the second meeting of cycle I, a quiz or mini-game from Quizziz was given. However, when the mini-quiz was conducted, it took more time than expected, cutting into the presentation time, so the mentoring teacher and colleagues suggested paying attention to the time management.

Due to the issues encountered in cycle I, improvements were made in the implementation of the learning process. In cycle II, the learning process focused more on the affective and psychomotor aspects of students through activities like online snake ladder tournaments and offline monopoly games. The snake ladder game was innovated by adding questions at each step of the game and a timer was provided to ensure the tournament ran smoothly and on time. However, in this cycle, there was a weakness, namely students were not active in expressing opinions and lacked confidence in answering questions in the snake ladder game, so improvements were made in the learning process in cycle III.

Improvements in the learning process in cycle III included creating a final product in the form of a poster summarizing algebraic function limits and presenting the results. All students were given the opportunity to ask questions, express opinions, and there was a visible increase in confidence among the students. Cycle III showed an increase in engagement and learning outcomes among eleventh grade of Social Sciences students, thus this action research stopped at cycle III.

CONCLUSION

This study concludes that the PBL model with a CRT approach on the topic of algebraic function limits is able to enhance the engagement and learning outcomes of eleventh grade Social Sciences students at Muhammadiyah Mlati High School. This model is effective in improving student engagement and learning outcomes, as evidenced by the research analysis and implementation experience. The increase in learning activity is parallel to the improvement in student learning outcomes, where the N-gain values in cycle I were 0.48 (medium category), in cycle II were 0.51 (medium category), and in cycle III were 0.56 (medium category), indicating that the success indicator (≥75.00) has been achieved.

REFERENCES

[1] T. W. Njonge, "Situating critical thinking and creativity as enablers of value-based education among secondary school students in Kenya," *J. Educ. Learn.*, vol. 1, no. 1, pp. 1–12, 2022, doi: 10.51317/jel.v4i1.44.

[2] M. Mincu, "Why is school leadership key to transforming education? Structural and cultural assumptions for quality education in diverse contexts," *Prospects*, vol. 52, no. 3–4, pp. 231–242, 2022, doi: 10.1007/s11125-022-09625-6.

[3] J. Alinsunurin, "School learning climate in the lens of parental involvement and school leadership: lessons for inclusiveness among public schools," *Smart Learn. Environ.*, vol. 7, no. 25, pp. 1–23, 2020, doi: 10.1186/s40561-020-00139-2.

[4] Juharyanto, S. Sultoni, I. Arifin, I. Bafadal, A. Nurabadi, and H. Hardika, "'Gethok Tular' as the Leadership Strategy of School Principals to Strengthen Multi-Stakeholder Forum Role in Improving the Quality of One-Roof Schools in Remote Areas in Indonesia," *SAGE Open*, vol. 10, no. 2, pp. 1–12, 2020, doi: 10.1177/2158244020924374.

[5] S. M. Bonner, K. Diehl, and R. Trachtman, "Teacher belief and agency development in bringing change to scale," *J. Educ. Chang.*, vol. 21, no. 2, pp. 363–384, 2020, doi: 10.1007/s10833-019-09360-4.

[6] F. A. Ajay and C. A. Udeh, "Review of Workforce Upskilling Initiatives for Emerging Technologies in It," *Int. J. Manag. Entrep. Res.*, vol. 6, no. 4, pp. 1119–1137, 2024, doi: 10.51594/ijmer.v6i4.1003.

[7] M. Pischetola, "Teaching Novice Teachers to Enhance Learning in the Hybrid University," *Postdigital Sci. Educ.*, vol. 4, no. 1, pp. 70–92, 2022, doi: 10.1007/s42438-021-00257-1.

[8] H. A. Putri and D. H. Siswanto, "Teaching at The Right Level (TaRL) as an Implementation of New Education Concepts in the Insights of Ki Hajar Dewantara," *Indones. J. Educ. Sci. Technol.*, vol. 3, no. 2, pp. 89–100, 2024.

[9] M. Okkinga, R. van Steensel, A. J. S. van Gelderen, E. van Schooten, P. J. C. Sleegers, and L. R. Arends, "Effectiveness of Reading-Strategy Interventions in Whole Classrooms: a Meta-Analysis," *Educ. Psychol. Rev.*, vol. 30, no. 4, pp. 1215–1239, 2018, doi: 10.1007/s10648-018-9445-7.

[10] N. Sghir, A. Adadi, and M. Lahmer, *Recent advances in Predictive Learning Analytics: A decade systematic review (2012–2022)*, vol. 28, no. 7. Springer US, 2023. doi: 10.1007/s10639-022-11536-0.

[11] J. DeJaeghere, B. H. Duong, and V. Dao, "Quality of teaching and learning: the role of metacognitive teaching strategies in higher-performing classrooms in Vietnam," *Educ. Res. Policy Pract.*, vol. 22, no. 2, pp. 239–258, 2023, doi: 10.1007/s10671-023-09330-x.

[12] G. Reynders, J. Lantz, S. M. Ruder, C. L. Stanford, and R. S. Cole, "Rubrics to assess critical thinking and information processing in undergraduate STEM courses," *Int. J. STEM Educ.*, vol. 7, no. 9, pp. 1–15, 2020, doi: 10.1186/s40594-020-00208-5.

[13] S. Urmetzer, J. Lask, R. Vargas-Carpintero, and A. Pyka, "Learning to change: Transformative knowledge for building a sustainable bioeconomy," *Ecol. Econ.*, vol. 167, no. February 2019, p. 106435, 2020, doi: 10.1016/j.ecolecon.2019.106435.

[14] S. T. Patnawar, "A Comprehensive Review on PBL and Digital PBL in Engineering Education - Status, Challenges and Future Prospects," *J. Eng. Educ. Transform.*, vol. 37, no. 2, pp. 142–157, 2023, doi: 10.16920/jeet/2023/v37i2/23157.

[15] E. S. Groenewald, O. K. T. Kilag, R. P. Unabia, M. V. Manubag, M. B. Zamora, and D. F. Repuela, "The Dynamics of Problem-Based Learning : A Study on its Impact on Social Science Learning Outcomes and Student Interest," *Int. Multi-disciplinary J. Educ.*, vol. 1, no. 6, pp. 303–313, 2023, [Online]. Available: https://multijournals.org/index.php/excellencia-imje/article/view/184%0Ahttps://multijournals.org/index.php/excellencia-imje/article/download/184/193

[16] A. Raes, P. Vanneste, M. Pieters, I. Windey, W. Van Den Noortgate, and F. Depaepe, "Learning and instruction in the hybrid virtual classroom: An investigation of students' engagement and the effect of quizzes," *Comput. Educ.*, vol. 143, no. April 2019, p. 103682, 2020, doi: 10.1016/j.compedu.2019.103682.

[17] I. D. A. Ningrum, A. Swastika, and A. N. Cahyo, "The Effect of the PBL Model on Learning Outcomes Viewed from Mathematical Communication Ability of Students," *J. Medives J. Math. Educ. IKIP Veteran Semarang*, vol. 8, no. 1, pp. 30–39, 2024, doi: 10.31331/medivesveteran.v8i1.2722.

[18] A. N. Irka, "The Effect of Problem Based Learning Model on Mathematics Learning Outcomes of Class VIII Students at SMP Negeri 10 Bengkulu City," *Indones. J. Pedagog. Teach. Educ.*, vol. 2, no. 1, pp. 1–6, 2024, doi: 10.58723/ijopate.v2i1.127.

[19] E. Sukmanasa, L. Novita, E. Suhardi, A. Maesya, Awiria, and F. 'Ala, "Students' Motivation through Problem-based Learning with a Culturally Responsive Teaching (CRT) Approach in Mathematics Lessons," *Pedago. J. Ilm. Pendidik.*, vol. 8, no. 1, pp. 90–97, 2024, doi: 10.55215/pedagonal.v8i1.9573.

[20] Z. Berlian and M. Huda, "Reflecting Culturally Responsive and Communicative Teaching (CRCT) through Partnership Commitment," *Educ. Sci.*, vol. 12, no. 5, 2022, doi: 10.3390/educsci12050295.

[21] I. K. Manik, "Penerapan Model Pembelajaran Problem Solving Sebagai Upaya Meningkatkan Prestasi Belajar Matematika," *J. Educ. Action Res.*, vol. 4, no. 2, pp. 153–163, 2020, doi: 10.23887/jear.v4i2.24805.

[22] D. M. Litynski *et al.*, "Classifying learning skills for educational enrichment," *Researchgate.Net*, vol. 10, no. June, 2019, [Online]. Available: https://www.researchgate.net/profile/David-Leasure/publication/334112742_Classifying_Learning_Skills_for_Educational_Enrichment/links/639f29ca40358f78ebfd99b2/Classifying-Learning-Skills-for-Educational-Enrichment.pdf?_sg%5B0%5D=started_experiment_milesto

[23] J. Borup, C. R. Graham, R. E. West, L. Archambault, and K. J. Spring, "Academic Communities of Engagement: an expansive lens for examining support structures in blended and online learning," *Educ. Technol. Res. Dev.*, vol. 68, no. 2, pp. 807–832, 2020, doi: 10.1007/s11423-020-09744-x.

[24] D. H. Siswanto, E. K. Alghiffari, N. I. Pujiastuti, C. Author, and D. Hadi, "Implementation of the CTL Model as a Strategy to Increase Interest in Learning Mathematics," *Indones. J. Educ. Sci. Technol.*, vol. 3, no. 2, pp. 61–74, 2024.

[25] N. Sudjana, *Penilaian Hasil Proses Belajar Mengajar*. Bandung: Rosdikarya, 2016.

[26] A. Fatmawati, "Pengembangan Perangkat Pembelajaran Konsep Pencemaran Lingkungan Menggunakan Model Pembelajaran Berdasarkan Masalah untuk SMA Kelas X," *EduSains*, vol. 4, no. 2, pp. 94–103, 2016.

[27] R. R. Hake, "Analyzing Change/Gain Scores," *Dept. Physics, Indiana Univ.*, vol. 16, no. 7, pp. 1073–80, 1999, [Online]. Available: http://www.wcer.wisc.edu/nise/CL1/resource/R2.htm

[28] R. M. Indrawati, "Peningkatan Aktivitas dan Hasil Belajar Materi Peristiwa Sekitar Proklamasi melalui Bermain Peran," *J. Elem. Educ.*, vol. 2, no. 1, pp. 15–22, 2013.

[29] S. E. Pranoto, "Penggunaan Game Based Learning Quizizz untuk Meningkatkan Keaktifan Belajar Siswa pada Mata Pelajaran Sosiologi Materi Globalisasi Kelas XII IPS SMA Darul Hikmah Kutoarjo," *Habitus J. Pendidikan, Sosiologi, Antropol.*, vol. 4, no. 1, p. 25, 2020, doi: 10.20961/habitus.v4i1.45758.

[30] I. Widiasanti, N. A. Ramadhan, M. Alfarizi, A. N. Fairus, A. W. Oktafiani, and D. Thahur, "Utilization of Multimedia Facilities and Internet Media as Effective Learning Tools," *J. Penelit. Pendidik. IPA*, vol. 9, no. 6, pp. 148–153, 2023, doi: 10.29303/jppipa.v9i6.3805.

[31] P. Aditya and C. Hiltrimartin, "Development of Problem-Solving-Based Digital Learning Media for Flat-Sided 3D Geometry in Junior High School," *JTAM (Jurnal Teor. dan Apl. Mat.*, vol. 8, no. 1, pp. 58–71, 2024, doi: 10.31764/jtam.v8i1.17018.

[32] Y. N. Deda, H. Disnawati, O. Daniel, and R. Ekawati, "Development of Android-Based Learning Media for High School Students in Indonesia: A Systematic Review of Literature," *J. Iqra' Kaji. Ilmu Pendidik.*, vol. 8, no. 1, pp. 402–417, 2023.

[33] P. D. Iswara, J. Julia, T. Supriyadi, and Enjang Yusuf Ali, "Developing Android-Based Learning Media to Enhance Early Reading Competence of Elementary School Students," *Pegem J. Educ. Instr.*, vol. 13, no. 4, pp. 43–55, 2023, doi: 10.47750/pegegog.13.04.06.

[34] H. Romadiah, P. Dayurni, and L. E. W. Fajari, "Meta-Analysis Study: The Effect of Android-Based Learning Media on Student Learning Outcomes," *Int. J. Asian Educ.*, vol. 3, no. 4, pp. 253–263, 2022, doi: 10.46966/ijae.v3i4.300.

[35] H. Reinius, T. Korhonen, and K. Hakkarainen, "The design of learning spaces matters: perceived impact of the deskless school on learning and teaching," *Learn. Environ. Res.*, vol. 24, no. 3, pp. 339–354, 2021, doi: 10.1007/s10984-020-09345-8.

[36] A. D. M. Putra, E. El Faisal, and D. Dahlia, "Meningkatkan Keterlibatan Peserta Didik SMA Negeri 6 Palembang pada Pembelajaran PPKn melalui Strategi Pembelajaran Berdiferensiasi dalam Pendekatan Pembelajaran SCL," *Innov. J. Soc. Sci. Res.*, vol. 4, no. 2, pp. 8270–8282, 2024.

[37] A. Hernandez and K. Burrows, "Implementing Culturally Relevant Teaching in the Classroom," *Open J. Leadersh.*, vol. 10, no. 4, pp. 338–363, 2021, doi: 10.4236/ojl.2021.104020.

[38] A. N. Gunasekara, K. Turner, C. Y. Fung, and C. Stough, "Impact of lecturers' emotional intelligence on students' learning and engagement in remote learning spaces: A cross-cultural study," *Australas. J. Educ. Technol.*, vol. 38, no. 4, pp. 112–126, 2022, doi: 10.14742/ajet.7848.

[39] E. Acosta-Gonzaga and E. F. Ruiz-Ledesma, "Students' Emotions and Engagement in the Emerging Hybrid Learning Environment during the COVID-19 Pandemic," *Sustain.*, vol. 14, no. 16, pp. 1–14, 2022, doi: 10.3390/su141610236.

[40] R. Janudom, "Instilling Growth Mindset to Promote Students' English Learning Behaviors and Oral Communication Learning Achievement," *Pasaa*, vol. 67, no. December, pp. 1–32, 2023.

[41] Y. Jiang, H. Liu, Y. Yao, Q. Li, and Y. Li, "The Positive Effects of Growth Mindset on Students' Intention toward Self-Regulated Learning during the COVID-19 Pandemic: A PLS-SEM Approach," *Sustain.*, vol. 15, no. 3, 2023, doi: 10.3390/su15032180.