International Journal of Current Educational Research
Homepage: https://www.journal.iel-education.org/index.php/ijocer
Email: ijocer@iel-education.org
p-ISSN: 2961-8517; e-ISSN: 2961-8509

IJOCER, Vol. 4, No. 1 June 2025

Page 70-77

The Effectiveness of CFL Learning Model to Improve Junior High School Students' Problem-Solving Skills

Anis Zahrotin[1*], Wasis[1], Wahono Widodo[1], Hanandita Veda Saphira[2]
[1] State University of Surabaya, Surabaya, Indonesia
[2] University of Wollongong, Wollongong, Australia

DOI: https://doi.org/10.53621/ijocer.v4i1.535

Sections Info
Article history:
Submitted: May 20, 2025
Final Revised: June 18, 2025
Accepted: June 19, 2025
Published: June 30, 2025

Keywords:
CFL Model;
Learning Model;
Problem Solving Skills.

ABSTRACT

Objective: Problem-solving skills are essential for students because they help develop logical, critical, and systematic thinking necessary for addressing challenges in both academic and real-life situations. These abilities involve several cognitive processes, including identifying problems, analyzing situations, exploring possible solutions, making informed decisions, and evaluating outcomes. Enhancing these skills is essential to prepare students to face complex situations independently and confidently. This study aims to describe the effectiveness of the CFL (Collaborative Flipped Learning) learning model in improving students' problem-solving skills. **Method:** This research employed a quantitative experimental approach using a one-group pretest-posttest design. Students were assessed before and after the implementation of the CFL model to measure the improvement in their problem-solving skills. **Result**: The findings from the experiments indicated that the CFL learning model significantly enhanced students' problem-solving skills. The results show that students marked an improvement in recognizing and resolving problems more efficiently after participating in learning activities based on the CFL model. **Novelty:** The novelty of this research lies in the application of the CFL learning model specifically to the topic of temperature and heat at the junior high school level to enhance problem-solving skills. This focus has not been widely explored and offers new insights into effective science education strategies to enhance students' problem-solving skills.

INTRODUCTION

The standard learning paradigm is generally centered on competition to achieve high grades, leading educators often unconsciously to teach and train students to compete rather than to collaborate. A competitive mindset can only enhance students' cognitive abilities, which in turn may prevent them from engaging in collaboration. This contradicts the requirements of the 21st century, where people live in a tech-saturated environment with easy access to information and emerging methods of communication and collaboration. Therefore, to support success in the digital era, it is essential to develop a skill set based on digital-era competencies, including cooperation, communication, problem-solving, and critical thinking (Prahani et al., 2024; Saphira et al., 2022). The ability to solve problems is one of the most important learning objectives that must be highlighted.

Skills for the 21st century are crucial in education, enabling students to address future challenges through innovative thinking and idea generation from diverse sources, thereby staying current with technological advancements. Education 4.0 has emerged as a result of the Industrial Revolution 4.0, which has also heightened the demand for innovative teaching models and techniques that utilize information and communication

technology (Darmansyah, 2020). The advancement of increasingly intelligent information and communication technology is expected to enable more effective learning can occur anytime and anywhere, making it more convenient.

Based on the science-related 2018 Programme for International Student Assessment (PISA) survey, Indonesia scored 396, ranking 70th out of 78 countries, while the international average science score was 489 (OECD, 2019). This significant score gap indicates that Indonesian students' science proficiency is still relatively low. The questions tested in the PISA survey are Higher Order Thinking Skills (HOTs) standards, consisting of contextual problems from everyday life (Rosmalinda et al., 2021).

The findings of the Trends in International Mathematics and Science Study (TIMSS), which measures students' knowledge ranging from simple factual and conceptual understanding to solving complex problems requiring high-level reasoning, indicate that Indonesia scored 406 in 2011—ranking as the fifth lowest. In 2015, Indonesia scored 397, ranking as the fourth lowest out of 64 countries. These scores placed Indonesia in the Low Science Benchmark category. Based on Indonesia's rankings in TIMSS 2011 and 2015, Indonesian students possess only limited basic knowledge of biology, chemistry, physics, and general science. They are nevertheless unable to demonstrate or explain their understanding of physics, chemistry, biology, and other scientific subjects in various settings. Additionally, students struggle to describe and communicate biology, chemistry, physics, and science subjects in terms that are relevant to their daily lives in an abstract, practical, or experimental manner (Sumiantari et al., 2019).

The ability to solve issues when events are connected to problem-solving is one aspect of HOTs. Solving problems does not occur merely through memorization but requires connections and drawing conclusions from the issues presented (Saraswati & Agustika, 2020). HOTs refers to the processes of thinking, recalling, and processing that go beyond lower-order thinking skills while creating and evaluating fall under the HOTs category (Dewi et al., 2023; Muhayimana et al., 2022). Bloom's Taxonomy classifies knowledge, comprehension, and application under LOTs (lower-order thinking Skills), whereas analysis, synthesis, and evaluation are the other three stages and are regarded as HOTs (Ralmugiz, 2020). One of the factors contributing to students' low mathematical problem-solving ability is the inappropriate selection of learning strategies (Suwanto et al., 2019).

Flipped learning as a learning strategy supports student-centered and problem-based learning environments that improve students' critical thinking and learning autonomy (Aulianisyah et al., 2022; Sukri & Fatah, 2020; Zulaikah et al., 2022). The application of Flipped Learning can be an effective solution for learning without the need for face-to-face classroom activities (Ibrahim & Sukardjo, 2021). To support the implementation of learning methods, especially Flipped Learning, specific learning tools are needed. Learning tools are a collection of learning resources that enable teachers and students to engage in learning activities. Based on previous research, the learning tool commonly used to support Flipped Learning is video. Several benefits of using videos in both offline and online classrooms include: (1) videos are more easily accepted by learners and serve as ideal media for educators to introduce new knowledge; (2) they stimulate activity by providing stimulus in classroom learning; (3) videos convey more information; (4) videos engage learners; (5) videos integrate and bring the outside world into the classroom; (6) videos tell stories beyond words; (7) videos are flexible—they can be paused, rewound, and replayed; (8) videos enhance comprehension; and (9) videos create enjoyable learning experiences (Brown, 2021).

Flipped learning becomes more efficient when implemented collaboratively. This is supported by Birgili (2021), who stated that Flipped Learning helps students acquire collaboration skills. According to Widodo (2022), learning through a Flipped Classroom combined with inquiry-based collaborative learning can develop scientific investigation skills in students. Learning strategies are crucial for supporting effective teaching and learning processes. One such applicable strategy is Collaborative Learning (Shin et al., 2022). This aligns with the opinions of Zhao and Yu (2025), Saptaningrum and Suwono (2024), Chanthong and Singseewo (2024), and Isnaini and Rahardjo (2024), who all affirm the effectiveness of collaborative learning in enhancing problem-solving abilities. According to these perspectives, students' problem-solving skills can be improved through collaborative learning.

The novelty of this research lies in the application of the CFL learning model specifically to the topic of temperature and heat at the junior high school level to enhance problem-solving skills. This focus has not been widely explored and offers new insights into effective science education strategies to enhance students' problem-solving skills.

RESEARCH METHOD

This type of research uses a one-group pretest-posttest structure and is quantitative. The research took place at State Junior High School 2 Paron, involving a sample of 50 participants. This process comprises three stages: the preparation stage, the implementation stage, and the final research stage. The research flowchart is shown in Figure 1.

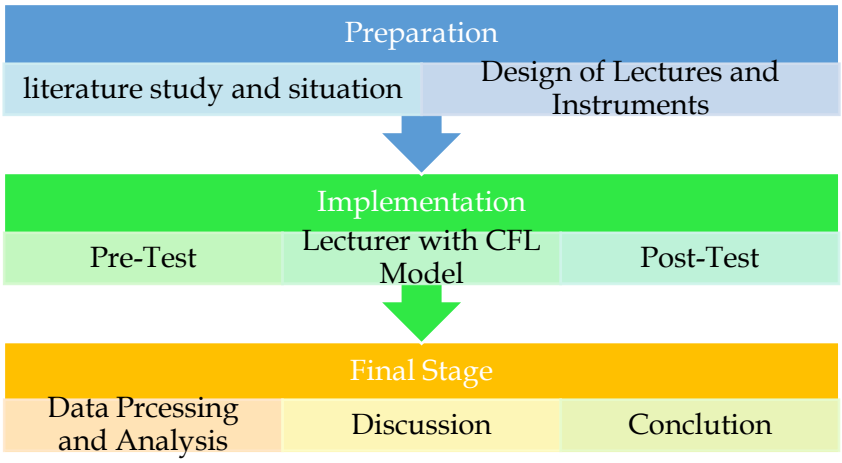

Figure 1. Research flowchart.

The improvement in the problem-solving abilities of the students can be determined by applying the equation:

$$NPM = \frac{number\ of\ scores\ obtained}{maximum\ number\ of\ scores}\ x\ 100$$

NKPM = Problem Solving Skills Value

The Problem-Solving Skills scores of the pretest and post-test results of students were analyzed using N-gain. N-gain shows an increase in students' collaborative problem-solving skills before and after treatment.

$$\langle g \rangle = \frac{Spost - Spre}{S\,\max - Spre}$$

Additionally, Table 1 shows the conversion performed on the n-gain calculation findings using the conditions.

Table 1 Normalized gain criteria (Hake, 1999).

N-Gain Score	Normalized Gain Criteria
0.70 < N-Gain	High
0.30 ≤ N-Gain ≤ 0.70	Medium
N-Gain < 0.30	Low

The analysis of the results from the development and trial of learning devices using the CFL learning model in this study involves a prerequisite test consisting of the Homogeneity Test and the Normality Test. Hypothesis testing uses a difference test. Testing students' problem-solving skills in class using the CFL model involves inferential statistics with a significance level of α = 0.050 (two-tailed).

RESULTS AND DISCUSSION

Results

To assess how well the CFL learning paradigm enhances students' problem-solving capacity, researchers compared average test scores from pretests and post-tests conducted in both limited and extensive trials. Tables 2 and 3 detail the outcomes of the preliminary statistical tests for normality and homogeneity applied to the entire class's pretest and post-test data on the problem-solving skills test.

Table 2. Findings from the normality test for the class's pretest and post-test data using the problem-solving skills test.

Trial	Class	Shapiro-Wilk Test			
		Statistic	df	Sig	Conclusion
Limited	State Junior High School 2 Paron A	0.924	25	0.650	Sig>0.050 (Normal)
	State Junior High School 2 Paron B	0.935	25	0.112	

Table 3. Results of the homogeneity test of pretest and post-test data for all classes based on the problem-solving skills test.

Trial	Class	Levene Test		
		Statistic	Sig	Conclusion
Limited	State Junior High School 2 Paron A	7.202	0.100	Sig>0.05 (Homogen)
	State Junior High School 2 Paron B	8.089	0.175	

The pretest and post-test problem-solving skill data from all trial classes were found to be normally distributed and homogeneous. To determine the difference between the scores, a parametric statistical test, the Paired Samples t-test was employed; the results are presented in Table 4.

Table 4. Paired samples t-test results pretest and post-test data for all classes based on problem-solving skill tests.

Trial	Class	t	df	Sig (2-tiled)	Conclusion
Limited	State Junior High School 2 Paron A	-24.252	48	0.000	Sig<0,05 (H_0rejected)
	State Junior High School Paron B	-24.252			

Based on the results of the difference test conducted, it is known that H0 is rejected for all trial classes. This indicates a significant difference between the pretest and post-test

scores of students' problem-solving skills across all trial classes of the CFL learning model. The average post-test score is higher than the pretest score. The overall data analysis reveals that, based on the results of the problem-solving skills test conducted after applying the CFL learning model, the model has proven effective in enhancing students' problem-solving skills.

Discussion

The reliability of the CFL learning model in enhancing students' problem-solving abilities is determined by the test outcomes that compare the N-gain values of the limited trial group and the broad trial group. Based on the N-gain value obtained, it is recommended to use the Independent Samples t-test (parametric) because the data have been declared normally distributed. The various tests conducted yielded a conclusion to reject the null hypothesis. This indicates that there is no significant distinction between the N-gain in the restricted trial and the broader trial (Sugiyono, 2017). The results of this data analysis indicate that, based on the problem-solving skills test, the application of the CFL learning model consistently improves students' problem-solving skills, even when implemented in different schools (Amanda, 2022; Akçayır & Akçayır, 2018).

The findings from the conducted research indicate that all aspects of problem-solving abilities have improved during the application of the CFL learning model, both in online and in-person formats. This demonstrates the efficiency of the CFL learning model in enhancing problem-solving abilities; these results are supported by previous research, namely learning using the Flipped Learning method, which is carried out with a Collaborative approach to improve problem-solving skills (Rohmatulloh & Nindiasari, 2022; Saraswati, 2019; Wahyuni & Saraswati, 2021; Rifandi et al., 2022; Pratiwi, 2021). The application of Flipped Learning, combined with Case-based Learning, significantly improves problem-solving skills compared to conventional learning (Diningrat et al., 2024) and fosters a long-term beneficial effect on problem-solving abilities (Yu et al., 2023). From the discussion above, it can be concluded that the CFL learning model effectively enhances problem-solving abilities. This study focuses on developing the CFL learning model to enhance problem-solving abilities.

CONCLUSION

Fundamental Finding: This research investigates how the CFL significantly enhances students' problem-solving abilities, as demonstrated by the increase in pretest and post-test scores and N-gain values across all trial classes. The findings from the inferential statistical test indicated a notable difference between the pretest and post-test scores, with a steady rise observed in every class. The implementation of the CFL learning model received a favorable reaction for enhancing students' problem-solving abilities. **Implication:** The findings of this research indicate that the CFL model is effective in enhancing students' problem-solving abilities, as evidenced by a rise in pretest and post-test scores, significant N-gain values, and consistent results across trial classes. These findings have several important implications in the educational context. First, from a pedagogical perspective, the application of the CFL model provides an alternative approach to learning that is more active and student-centered. Second, institutionally, schools and educational institutions are expected to support the implementation of CFL-based learning by providing adequate technological infrastructure, teacher training in managing online learning, and developing a learning culture that is adaptive to changes in conventional learning models toward more modern and collaborative ones.

Limitation: This study has several limitations that must be considered when interpreting the results and applying them in a broader context. This study was conducted on a limited scope, specifically in a select number of classes within specific educational units. The duration of the application of the CFL model in this study was still relatively short. The observed increase in students' problem-solving skills is likely the result of short-term intervention. **Future Research**: To strengthen the findings and enhance the external validity of this learning model, further studies with broader coverage, employing mixed methods, and longer intervention durations are needed.

ACKNOWLEDGEMENTS

The author would like to thank all observers and respondents who participated in the research for their invaluable contributions and insights. Thanks are also extended to the teachers and all parties who have assisted in this research.

REFERENCES

Akçayır, G., & Akçayır, M. (2018). The flipped classroom: A review of its advantages and challenges. *Computers & Education, 126*, 334–345. https://doi.org/10.1016/j.compedu.2018.07.021

Amanda, F. F., Sumitro, S. B., Lestari, S. R., & Ibrohim, I. (2022). The correlation of critical thinking and concept mastery to problem-solving skills: The role of complexity science-problem based learning model. *Pedagogika / Pedagogy, 146*(2), 80–94. https://doi.org/10.15823/p.2022.146.4

Aulianisyah, R., Budiharti, R., & Fauzi, A. (2022). Penerapan strategi pembelajaran flipped classroom untuk meningkatkan kemampuan berpikir kritis siswa kelas XI. *Jurnal Sains Edukatika Indonesia (JSEI), 4*(2), 123–135.

Birgili, B., Seggie, F. N., & Oguz, E. (2021). The trends and outcomes of flipped learning research between 2012 and 2018: A descriptive content analysis. *Journal of Computers in Education, 8,* 1-32. https://doi.org/10.1007/s40692-020-00169-2

Brown, L. (2021). *Benefits for teachers using video in the classroom*. Wondershare Filmora.

Chanthong, K., & Singseewo, A. (2024). The effectiveness of gamified cooperative learning in enhancing creative problem-solving skills of high school students. *Thinking Skills and Creativity, 53*, 1-12. https://doi.org/10.1016/j.tsc.2024.101320

Darmansyah, D. (2020). Inovasi dan peran teknologi pendidikan di era revolusi industri 4.0. *Webinar Nasional Jurusan Kurikulum dan Teknologi Pendidikan Padang,* 1-7.

Dewi, L., Susilana, R., Setiawan, B., Alias, N., & Zulnaidi, H. (2023). A proposed Problem-Centered Thinking Skill (PCTS) model at secondary schools in Indonesia and Malaysia. *International Journal of Instruction, 16*(3), 615–638.

Diningrat, S. W. M., Kristanto, A., Pradana, H. D., & Kholidya, C. F. (2024). Enhancing students' problem solving through a flipped case-based learning. *Educational Technology Journal, 4*(1), 6-14.

Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *American Journal of Physics, 66*(1), 64–74. https://doi.org/10.1119/1.18809

Ibrahim, N., & Sukardjo, M. (2021). How flipped classroom helps the learning in the times of COVID-19 era? *JTP Jurnal Teknologi Pendidikan, 22*(3), 151–158. https://doi.org/10.21009/jtp.v22i3.17555

Isnaini, N. A., & Rahardjo, S. B. (2024). Penerapan model pembelajaran STEM berbasis kolaboratif untuk meningkatkan kemampuan pemecahan masalah. *Jurnal Pendidikan*

Matematika, 12(1), 23–31.

Muhayimana, T., Kwizera, L., & Nyirahabimana, M. R. (2022). Using Bloom's taxonomy to evaluate the cognitive levels of primary leaving English exam questions in Rwandan schools. *Curriculum Perspectives, 42*(1), 51–63. https://doi.org/10.1007/s41297-021-00156-2

OECD. (2019). *PISA 2018 science framework*. OECD Publishing.

Prahani, B. K., Saphira, H. V., Jatmiko, B., Suryanti, S., & Amelia, T. (2024). The impact of emerging technology in physics over the past three decades. *Journal of Turkish Science Education, 21*(1), 134-152. https://doi.org/10.36681/tused.2024.008

Pratiwi, K. A. M. (2021). Pengaruh model pembelajaran berbasis masalah terhadap hasil belajar dan sikap ilmiah siswa. *Jurnal Pendidikan dan Pengajaran, 54*(2), 234–242. https://doi.org/10.30596/bibliocouns.v1i2.2077

Ralmugiz, U. (2020). Kemampuan siswa SMP Kota Kupang dalam menyelesaikan masalah HOTS matematika. *Gammath: Jurnal Pendidikan Matematika, 5*(1), 38–43. https://doi.org/10.32528/gammath.v5i1.3200

Rifandi, R., Saputra, N. A., & Ananda, A. (2022). Flipped classroom berbasis project-based learning dalam meningkatkan kemampuan pemecahan masalah siswa. *Jurnal Pendidikan Matematika, 9*(1), 1–10.

Rohmatulloh, M., & Nindiasari, H. (2022). Penerapan model pembelajaran kolaboratif dalam lingkungan digital untuk meningkatkan keterampilan abad 21. *Jurnal Teknologi Pendidikan, 24*(1), 45–53.

Rosmalinda, N., Syahbana, A., & Nopriyanti, T. D. (2021). Analisis kemampuan berpikir kritis siswa SMP dalam menyelesaikan soal-soal tipe PISA. *Transformasi: Jurnal Pendidikan Matematika dan Matematika, 5*(1), 483–496. https://doi.org/10.36526/tr.v5i1.1185

Saphira, H. V., Rizki, I. A., Alfarizy, Y., Saputri, A. D., Ramadani, R., & Suprapto, N. (2022). Profile of students' critical thinking skills in physics learning: A preliminary study of games application integrated augmented reality. *Journal of Physics: Conference Series, 2377*, 1-8. https://doi.org/10.1088/1742-6596/2377/1/012088

Saptaningrum, N. D., & Suwono, H. (2024). Collaborative mind mapping based on problem-based learning: Improving students' collaboration skills in biology. *Atlantis Highlights in Social Sciences, Education and Humanities, 9*, 342–348. https://doi.org/10.2991/978-2-38476-128-5_36

Saraswati, C. P. D. (2019). Pengembangan model pembelajaran berbasis kolaboratif untuk meningkatkan kemampuan berpikir kritis siswa. *Jurnal Ilmu Pendidikan, 18*(2), 89–97.

Saraswati, P. M. S., & Agustika, G. N. S. (2020). Kemampuan berpikir tingkat tinggi dalam menyelesaikan soal HOTS mata pelajaran matematika. *Jurnal Ilmiah Sekolah Dasar, 4*(2), 257–269. https://doi.org/10.23887/jisd.v4i2.25336

Shin, S., So, H. J., Xiong, Y., & Kim, H. (2022). Parental involvement in digital home-based learning during COVID-19: An exploratory study with Korean parents. *Computers & Education, 179*, 1-11. https://doi.org/10.1016/j.compedu.2022.104407

Sugiyono, S. (2017). *Metode penelitian pendidikan: Pendekatan kuantitatif, kualitatif, dan R&D*. Alfabeta.

Sukri, H., & Fatah, D. A. (2020). Rancang bangun model pembelajaran flipped classroom sebagai solusi peningkatan daya belajar mandiri mahasiswa. *Jurnal Ilmiah Edutic: Pendidikan dan Informatika, 7*(2), 101–110. https://doi.org/10.21107/edutic.v6i2.6171

Sumiantari, N. L., Nyoman, S., & Selamet, K. (2019). Pengaruh model problem based learning terhadap kemampuan pemecahan masalah IPA siswa kelas VIII SMP. *JPPSI: Jurnal Pendidikan dan Pembelajaran Sains Indonesia, 2*(1), 1-9. https://doi.org/10.23887/jppsi.v2i1.17219

Suwanto, S., Aisyah, N., & Santoso, B. (2019). Strategi siswa dalam menyelesaikan soal pemecahan masalah matematika SMA Negeri 1 Indralaya. *Cakrawala, 19*(1), 139–148. https://doi.org/10.31294/jc.v19i1

Wahyuni, S., & Saraswati, C. P. D. (2021). Implementasi blended learning dengan pendekatan kolaboratif untuk meningkatkan keterampilan pemecahan masalah siswa. *Jurnal Pendidikan Inovatif, 11*(1), 12–20.

Widodo, W. (2022). Online flipped classroom: Developing postgraduate science education students' critical thinking skills. *Journal of Science Learning, 5*(3), 469–477. https://doi.org/10.17509/jsl.v5i3.43107

Yu, L., Li, Y., Lan, Y., & Zheng, H. (2023). Impacts of the flipped classroom on student performance and problem solving skills in secondary school chemistry courses. *Chemistry Education Research and Practice, 24*(3), 1025–1034. https://doi.org/10.1039/D2RP00339B

Zhao, Y., & Yu, H. (2025). The effects of the group cognitive graph approach on collaborative problem-solving performance and knowledge building. *International Journal of Educational Technology in Higher Education, 22*(1), 9-16. https://doi.org/10.1186/s41239-025-00520-6

Zulaikah, Z., Nurwahidin, M., & Yulianti, D. (2022). Strategi pembelajaran flipped classroom untuk meningkatkan keterampilan civic disposition siswa. *Jurnal Teknologi Pendidikan: Jurnal Penelitian dan Pengembangan Pembelajaran, 6*(1), 45–58. https://doi.org/10.33394/jtp.v8i2.6444

*__Anis Zahrotin, M.Pd. (Corresponding Author)__
Faculty of Mathematics and Sciences,
Surabaya State University,
Jl. Ketintang Sel. No.Kel, Ketintang, Kec. Gayungan, Surabaya, Jawa Timur 60231
Email: anis1906@mhs.unesa.ac.id

Prof. Dr. Wasis, M.Si.
Faculty of Mathematics and Sciences,
Surabaya State University,
Jl. Ketintang Sel. No.Kel, Ketintang, Kec. Gayungan, Surabaya, Jawa Timur 60231
Email: wasis@unesa.ac.id

Prof. Dr. Wahono Widodo, M.Si.
Faculty of Mathematics and Sciences,
Surabaya State University,
Jl. Ketintang Sel. No.Kel, Ketintang, Kec. Gayungan, Surabaya, Jawa Timur 60231
Email: wahonowidodo@unesa.ac.id

Hanandita Veda Saphira
Faculty of Arts, Social Sciences and Humanities
Univesity of Wollongong,
Northfields Ave, Wollongong, 2500, New South Wales, Australia
Email: hanandita.saphira346@uowmail.edu.au