

JEJE in improving elementary students' speaking skills, what learning models and strategies are suitable?

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KEYWORDS

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ABSTRACT The ability of students that must be owned and developed is how students can express ideas, ideas, and other thinking abilities, namely by being able to convey them to others. This can be done when students have skills in speaking. JEJE is used as a solution by combining the jigsaw cooperative learning model with the strategy used in objects around us to improve students' speaking skills. This study aims (1) to determine teacher activity in learning Indonesian through the application of the Cooperative jigsaw learning model in grade V SD. 2) to find out students' activities in learning Indonesian, and (3) to find out the increase in students' learning abilities, speaking skills. This type of research is Classroom Action Research which is carried out in two cycles of action. The subjects of this study were teachers and all 17 fifth-grade students at SD Qiswa An-Nafi. The procedures in this study were (1) planning, (2) implementation, (3) observation and evaluation, and (4) reflection. The type of research data is qualitative data from observation sheets and quantitative data from student learning outcomes. The results show that the average value of students in the first cycle is 63.64. In cycle II, the percentage of completeness increased, with the average score of students in process II being 80.82. So it can be concluded that JEJE has proven to be effective in improving elementary students' speaking skills.

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1. INTRODUCTION

The ability of students that must be owned and developed is how students can express ideas [Ahmed et al \(2021\)](#), ideas [Anggraini et al \(2022\)](#); [Darmayanti et al \(2023\)](#), and other thinking abilities [Cahyadi et al \(2023\)](#); [Cholily \(2023\)](#) namely by being able to convey them to others. This can be done when students have skills in speaking. JEJE is used as a solution by combining the jigsaw cooperative learning model with the strategy used in objects around us to improve students' speaking skills. According to [Rahman et al \(2022\)](#); [Usmiyatun \(2022\)](#) stated that education is also the most significant pillar in the development mission of every school in a country and everything that is always related to all aspects that exist in humans [Doherty et al \(2021\)](#); [O'Reilly \(2022\)](#) starting from the physical [Fridaram et al \(2021\)](#), mental [Fridaram et al \(2021\)](#) and morals [Jeong \(2021\)](#). Therefore, to develop the potential within, namely with quality education or education that can produce students who excel in their respective fields in facing global challenges and increasingly fierce free competition by learning a good and correct language [Rahman et al \(2022\)](#); [Usmiyatun \(2022\)](#); [Yaguchi \(2021\)](#).

According to (the Ministry of National Education, 2016), language learning is learning to communicate. There-

fore, learning Indonesian aims to improve students' ability to communicate using Indonesian [Beveridge et al \(2021\)](#); [Nava&Park \(2021\)](#); [Rosenkoetter et al \(2015\)](#), both orally [Pariyar \(2020\)](#); ? and in writing. The Indonesian language subject at Madrasah Ibtidaiyyah includes various components, including language and literary skills, which involve four critical aspects: listening, speaking, reading, and writing. Among these four aspects, speaking plays a very significant role in the use of language [Depdiknas \(2016\)](#).

Speaking is expressing thoughts, ideas, and feelings to others by pronouncing articulation sounds or words using spoken language. When speaking skills are low, students will have difficulty conveying their views, ideas, and opinions. They will face challenges in communicating, asking questions, explaining, telling, and understanding the meaning of speech [Fauziah \(2016\)](#); [Marto \(2019\)](#). Even so, it is essential to remember that learning to speak is one of the main aspects of the listening process. In this case, listening activities play a role of 42%, followed by speaking at 32%, reading at 15%, and writing at 11%. According to Bruner, learning to speak involves understanding the concepts and structures in the material being studied and efforts to find relationships between these concepts and designs [Nugraha \(2018\)](#).

Darsono defines learning according to the flow of psychology, namely 1) psychology of power, learning is power and effort in training the human soul to function more; 2) cognitive psychology, learning is an effort to help students or students in achieving learning needs both cognitively through understanding and 3) humanistic psychology is learning based on the teacher's efforts to create a more enjoyable learning atmosphere and in this learning students are more motivated in learning. Concerning this question [Nurudin \(2020\)](#); [Sukma et al \(2021\)](#). These learning outcomes are indicators of changes that will occur to individuals after experiencing learning activities, where to convey usually use an assessment tool made by the teacher, for example, an evaluation test. This is what is meant in understanding and understanding the lessons given.

In school education, learning outcomes are the acquisition value of students, which will then be referred to as learning achievement. According to [Partono et al \(2021\)](#) says that learning outcomes are a level of success that will be achieved at the end of the teaching and learning activities that have been carried out. Furthermore, [Rudianto et al \(2022\)](#) provide an understanding of the meaning of learning outcomes as a result that describes the level of student mastery of the material that has been implemented [Wartini \(2018\)](#); [Kamaruddin \(2021\)](#).

Speaking is the ability to pronounce articulate sounds or words to express them, express thoughts, ideas, and feelings to others using spoken or written language. Low speaking skills make it difficult for students to convey views, ideas, and opinions. Learners will find it challenging to communicate, ask, explain, tell stories, and interpret meaning in conversation. Learning to speak is the primary thing after the listening process, namely 42% listening activity, 22% speaking, 15% reading, and 11% writing. The Jigsaw Type Cooperative learning model aims to present an alternative approach to lectures and reading, focusing on exploring positive dependencies in communication and information exchange between group members. The main objective is to stimulate the development of mature thinking and provide opportunities for students to practice speaking and listening skills and improve cognition in conveying information [Darmayanti et al \(2023\)](#); [Usmiyatun et al \(2021\)](#).

Based on the background of the problem above, the researcher offers a solution by conducting a study entitled "Improving Speaking Skills Through the Jigsaw Type Cooperative Learning Model on the theme 9 Objects Around Me Class V SD Qiswa An-Nafi".

2. METHODS

The research methodology used is Classroom Action Research (CAR). According to [Arikunto et al \(2021\)](#), Classroom Action Research is a research approach that investigates the cause-and-effect relationships of interventions, as well as documenting the events that occurred during the implementation of the intervention and the entire process from the initiation of the intervention to its impact. The research implementation design consisted of four stages: (1) action planning, (2) action implementation, (3) observation and evaluation, and (4) reflection. Classroom Action Research (CAR) is a translation of "classroom action research" from Indonesian, which deals with action research conducted by teachers in their classrooms through self-reflection [Wardhani et al \(2020\)](#).

This research will be carried out in Class V of SD Qiswa An-Nafi in the even semester of the 2022/2023 academic year and will be carried out in several cycles. Meanwhile, the subjects of this study were teachers and fifth-grade students at SD Qiswa An-Nafi, totaling 17 students consisting of 8 male students and nine female students. The data in this study are qualitative data and quantitative data. The data sources in this study were registered and active students in the even semester of the 2022/2023 school year and teachers of class V at SD Qiswa An-Nafi. 2 data analyses will be used in this study, namely qualitative data analysis and quantitative data analysis. This qualitative data will be analyzed in a qualitative descriptive manner which originates from the results of observations made.

According to [Amirono&Daryanto \(2016\)](#), in calculating classical mastery, multiply the number of students who have successfully achieved learning mastery by 100%, then divide it by the total number of students in the class. Meanwhile, to calculate the average student score, the step is to add all student scores and divide it by the number of students in the class [Amirono&Daryanto \(2016\)](#); [Wirahmad&Arifin \(2020\)](#).

3. RESULT & DISCUSSION

3.1 Teacher Activity

The results of observations on the researcher's teaching activities as a teacher at meeting one cycle I showed that there were still weaknesses or aspects that had not been carried out by the teacher, such as: a) the teacher did not make suitable arrangements when forming new groups (expert groups), b) the teacher did not explain the things that students do when the discussion group has been formed, c) the teacher does not give directions that are easy for students to understand when the discussion with the expert group has finished.

The results of observing the teaching activities of researchers as teachers at meeting one cycle II show that there have been many developments made by researchers as teachers in the learning process, but student activity still needs to be improved. Even so, there has been an improvement in the learning process compared to before because more students actively argue in discussions than students who are silent during meetings [Desi \(2022\)](#); [Theresia \(2022\)](#).

3.2 Student Learning Activities

Based on the observations in the first cycle of the first meeting, it was shown that there were still students playing around during learning activities, disturbing their friends. I should have paid more attention when the teacher explained the lesson material. At the second meeting, students were getting used to the learning process that was applied, even though in the learning process, there were still students who needed help understanding needed help understanding the steps of the cooperative learning model. Jigsaw type and needed to be more confident in group presentations. In the learning process of the second meeting, the teacher began to see students who were active in the discussion and dared to ask questions when something was not understood [Rudianto et al \(2022\)](#); [Rahmansyah&Prilicia \(2018\)](#).

The implementation has been running as expected in the second stage of learning implementation. This can be

seen from the active involvement of students in the learning process, the ability of students to discuss with classmates, and the increase in students' self-confidence in appearing in front of the class. Student behavior was significantly increased in observing the learning process, especially in the activeness aspect. Students are active in the learning process, enthusiastic about receiving subject matter and involved in asking and answering. This excellent student activity is one of the supporting factors for the success of their learning. In addition, there was a good increase in students' self-confidence. This can be seen when students do group presentations. They no longer hesitate to raise their hands or compete in appearing in front of the class. Cooperation between students is also excellent, where they begin to share and help each other with student responsibility, which also shows positive developments. Students diligently study the subject matter to communicate information well with classmates. As a result, the student achievement level has reached a success indicator of 80%, indicating a significant improvement in their learning outcomes. Students diligently study the subject matter to share information well with classmates. As a result, the student achievement level has reached a success indicator of 80%, indicating a significant improvement in their learning outcomes. Students diligently study the subject matter to share information well with classmates. As a result, the student achievement level has reached a success indicator of 80%, indicating a significant improvement in their learning outcomes.

3.3 Learning Outcomes of Students' Speaking Skills

The learning outcomes of students' speaking skills in cycle I, which were incomplete, were 45.86 out of the 76 indicators observed; 45 were obtained with a percentage of 41.1%. Then, out of the 76 observed indicators, 63.64 were completed, with a rate of 70.58%. Furthermore, in cycle II, 63.64 of the 76 observation indicators were incomplete, with a percentage of 70.58%, and those that were completed 76 hands of observation were obtained at 80.82 with a rate of 94.11%.

3.4 Discussion

According to the Ministry of National Education in Trianto, a class is said to have completed its learning (classical completeness) if $\geq 85\%$ of students have completed their studies. With the percentage of completeness in cycle II as many as 16 people or 94.11%, there was an increase in the entire learning outcomes that had reached an indicator of success in this study, namely 80%. This increase indicates that there has been a massive change in terms of cognition, namely seen from the increased student learning outcomes (Aminah (2017); Higaki (2016); Tabrizi (2017)). In addition, this type of jigsaw cooperative learning model has developed student intimacy through group cooperation in sharing information, and even students are very enthusiastic in the discussion. This can be seen when the activity took place. Students were very active in studying the subject matter provided, and no one lacked confidence because all students were ready in the sense that they understood and mastered the material being taught.

Based on the results of research conducted after applying the cooperative learning model, the jigsaw type, there was an increase in student learning outcomes from cycle I

to cycle II because the learning atmosphere was compelling and fun for students, even though there were obstacles at the first meeting in the distribution of subject matter there were still some students still telling stories with his friends and not paying attention to the teacher. However, at the next meeting, this can be overcome. Students began to be orderly and very excited about learning.

The results of the study concluded that the application of the cooperative learning model jigsaw type is effective in increasing active participation of students, collaboration between students, and learning outcomes of students' speaking skills, on theme nine objects around us in class V SD Qiswa An-Nafi in sub-themes 1 & 2 learning 1 and 2, because after 51 actions the data is obtained. Learning outcomes data show an increase in each action cycle according to the steps of the jigsaw cooperative learning model. Winschel (2015); Yaguchi (2021) revealed that the Jigsaw learning model is an exciting strategy if the material to be studied can be divided into several parts and does not require a sequence in delivering the material.

4. CONCLUSION

Improving teacher teaching activities, based on the observation sheet, the teacher can master the class well; the teacher must condition the course well so that during the learning process, students do not disturb their friends or do not play much when the teacher is still explaining. The teacher can motivate students to be actively involved when the learning process is ongoing, and the teacher must provide more guidance to students in the discussion process so that the discussion can run smoothly.

Increasing student learning activities in the learning process observed is student behavior in terms of activeness experiencing a significant increase and has reached an excellent level. This can be seen during the learning process, where students are active in participating, enthusiastic in receiving subject matter and involved in asking and answering. This excellent student activity is an essential factor that contributes to the success of student learning in theme 9 Things around us in class V SD Qiswa An-Nafi, which has also experienced an increase.

Improving results in this study, there was an increase in students' speaking skills from cycle I to cycle II. Out of 17 students, 12 completed the task with a percentage of 70.58%, while five did not, with a rate of 29.41%. However, in cycle II, there was an increase. Out of 17 students, 16 completed the task, with a percentage of 94.11%, while only one failed to complete the job, with a rate of 5.88%. Thus, in cycle II, a success indicator of 80% of all students was achieved, so student learning outcomes in this study increased. In addition, observation in learning activities was also successfully carried out by the steps of the jigsaw cooperative learning model.

References

- Ahmed, M., Usmiyatun, Nurhidayah, & Darmayanti, R. (2021). PDKT: Introducing Numbers 1-10 for Kindergarten A Students Using Card Media, Does It Improve? *AMCA Journal of Education and Behavioral Change*, 1(2).
- Aminah, S. (2017). Penggunaan Model Active Learning Tipe Role Reversal Question pada Siswa SD Negeri 007 Sungai Kubu Rokan Hilir. *Jurnal Serambi PTK*, 4(2), 20-28.

- Amirono, & Daryanto. (2016). *Evaluasi dan Penilaian Pembelajaran Kurikulum 2013*.
- Anggraini, N. A., Ningsih, E. F., Choirudin, C., & Darmayanti, R. (2022). Application of the AIR Learning Model Using Song Media to Improve Students' Mathematical Representational Ability. *AMCA Journal of Science and Technology*, 2(1), 28–33.
- Arikunto, S., Supardi, & Suhardjono. (2021). *Penelitian Tindakan Kelas: Edisi Revisi*. Bumi Aksara.
- Beveridge, R., Moody, M. F., Pauly, B., Murray, G., & Darimont, C. T. (2021). Applying community-based and Indigenous research methodologies: lessons learned from the Nuxalk Sputc Project. *Ecology and Society*, 26(4). <https://doi.org/10.5751/es-12702-260421>
- Cahyadi, M. R., Maryanto, B. P. A., Syaifuddin, M., & Darmayanti, R. (2023). Development of Essay Test Assessment Rubric for Polya Theory-Based Mathematical Problem-Solving. *JNPM (Jurnal Nasional Pendidikan Matematika)*, 7(1).
- Cholily, Y. M., Darmayanti, R., Lovat, T., Choirudin, C., Usmiyatun, U., & ... (2023). Si-GEMAS: Serious game mathematical crossword puzzle learning media for students' critical thinking ability. *Al-Jabar: Jurnal Pendidikan Matematika*, 14(1).
- Darmayanti, R., Sugianto, R., Baiduri, B., Choirudin, C., & Wawan, W. (2022). Digital comic learning media based on character values on students' critical thinking in solving mathematical problems in terms of learning styles. *Al-Jabar: Jurnal Pendidikan Matematika*, 13(1), 49–66.
- Darmayanti, R., Utomo, D. P., Choirudin, C., Usmiyatun, U., & Nguyen, P. T. (2023). Bruner's theory on the development of e-book traditional snacks ethnomathematics for mathematical understanding ability. *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, 5(1), 21–39. <https://doi.org/10.35316/alifmatika.2023.v5i1.21-39>
- Depdiknas. (2016). *Peraturan Menteri Pendidikan Dan Kebudayaan Nomor 22 Tahun 2016 Tentang Standar Proses Pendidikan Dasar Dan Menengah*.
- Desi, S. (2022). Meningkatkan Kemampuan Kognitif pada Kegiatan Bermain Mengelompokkan Benda Melalui Media Losse Part Saat di Rumah Saja. *AUDIENSI: Jurnal Pendidikan Dan Perkembangan Anak*, 1(1), 50–62.
- Doherty, M. J., Wimmer, M. C., Gollek, C., Stone, C., & Robinson, E. J. (2021). Piecing Together the Puzzle of Pictorial Representation: How Jigsaw Puzzles Index Metacognitive Development. *Child Development*, 92(1). <https://doi.org/10.1111/cdev.13391>
- Fauziah, S. (2016). Berbicara Sebagai Suatu Keterampilan Berbahasa. *Jurnal Penelitian Pendidikan Guru Sekolah Dasar*, 6(August), 128.
- Fridaram, O., Istharini, E., Cicilia, P. G. C., Nuryani, A., & Wibowo, D. H. (2021). Meningkatkan Konsentrasi Belajar Peserta Didik dengan Bimbingan Klasikal Metode Cooperative Learning Tipe Jigsaw. *Magistrorum et Scholarium: Jurnal Pengabdian Masyarakat*, 1(2). <https://doi.org/10.24246/jms.v1i22020p161-170>
- Garcia, M. B. (2021). Cooperative learning in computer programming: A quasi-experimental evaluation of Jigsaw teaching strategy with novice programmers. *Education and Information Technologies*, 26(4). <https://doi.org/10.1007/s10639-021-10502-6>
- Higaki, T. (2016). A Theoretical Model of Jigsaw-Puzzle Pattern Formation by Plant Leaf Epidermal Cells. *PLoS Computational Biology*, 12(4). <https://doi.org/10.1371/journal.pcbi.1004833>
- Jeong, H. (2021). Effects of jigsaw strategy into flipped learning on efl pre-serviced kindergarten teachers' english attitude and motivation with online-based classroom. *International Journal of Information and Education Technology*, 11(11). <https://doi.org/10.18178/ijiet.2021.11.11.1558>
- Kamaruddin, H. (2021). Upaya Meningkatkan Kompetensi Guru SMK Negeri 4 Gowa dalam Melaksanakan Proses Pembelajaran di Kelas Melalui Program Supervisi. *Jurnal Paedagogy*.
- Marto, H. (2019). Kesulitan Guru Sekolah Dasar dalam Menulis Karya Ilmiah sebagai Pengembangan Kompetensi Profesional di Kabupaten Tolitoli. *Bomba: Jurnal Pembangunan Daerah*.
- Nava, I., & Park, J. (2021). Pre-service stem teachers and their enactment of community-stem-project based learning (C-stem-pbl). *Journal of Higher Education Theory and Practice*, 21(9). <https://doi.org/10.33423/jhe.tp.v21i9.4602>
- Nugraha, V., Permana, I., & Permana, A. (2018). Pembelajaran Menulis Resensi Novel Pertemuan Dua Hati Dan Laskar Pelangi Menggunakan Teknik Comparing. *P2M STKIP Siliwangi*, 5(2), 55. <https://doi.org/10.22460/p2m.v5i2p55-61.966>
- Nurudin, N. (2020). Pengaruh persepsi kompetensi guru dan persepsi komunikasi interpersonal guru terhadap prestasi belajar. *Prosiding Seminar Nasional Magister Psikologi*.
- O'Reilly, A., O'Brien, G., Moore, J., Duffy, J., Longmore, P., Cullinan, S., & McGrory, S. (2022). Evolution of Jigsaw - a National Youth Mental Health Service. *Early Intervention in Psychiatry*, 16(5). <https://doi.org/10.1111/eip.13218>
- Pariyar, M. (2020). Caste, military, migration: Nepali Gurkha communities in Britain. *Ethnicities*, 20(3). <https://doi.org/10.1177/1468796819890138>
- Partono, P., Wardhani, H. N., Setyowati, N. I., Tsalitsa, A., & Putri, S. N. (2021). Strategi Meningkatkan Kompetensi 4C (Critical Thinking, Creativity, Communication, & Collaborative). *Jurnal Penelitian Ilmu Pendidikan*, 14(1), 41–52. <https://doi.org/10.21831/jpipfip.v14i1.35810>
- Rahman, A., Munandar, S. A., Fitriani, A., Karlina, Y., & Yumriani. (2022). Pengertian Pendidikan, Ilmu Pendidikan dan Unsur-Unsur Pendidikan. *Al Urwatul Wutsqa: Kajian Pendidikan Islam*, 2(1), 1–8.
- Rahmansyah, H., & Pricilia, G. M. (2018). Upaya meningkatkan kemampuan berbicara Bahasa Inggris siswa kelas V SDN 106830 Beringin melalui story

- telling. *Journal Education and Development*, 6(2), 114–117.
- Rosenkoetter, M. M., McDonough, J., McCall, A., Smith, D., & Looney, S. (2015). A flex-model for long-term assessment of community-residing older adults following disasters. *Journal of Emergency Management*, 13(5). <https://doi.org/10.5055/jem.2015.0251>
- Rudianto, R., Diani, R., Subandi, S., & Widiawati, N. (2022). Development of assessment instruments 4C skills (critical thinking, collaboration, communication, and creativity) on parabolic motion materials. *Journal of Advanced Sciences and Mathematics Education*, 2(2), 65–79. <https://doi.org/10.58524/jasme.v2i2.115>
- Sugianto, R., Darmayanti, R., & Muhammad, I. (2023). Teacher Competence in The Preparation of Test and Non-Test Instruments. *Journal of Teaching and Learning Mathematics*, 1(1), 25–32.
- Sukma, B. P., Puspitasari, D. A., Amalia, C., & Okitasari. (2021). *Demi Bahasa Bermanfaat Dan Bermartabat: Per-cikan Pemikiran Strategi Kebahasaan Dalam Dinamika Bahasa, Pendidikan, Dan Kebudayaan Era Kiwari*.
- Tabrizi, N. (2017). Fostering an entrepreneurial mindset in “Digital systems” class through a jigsaw-puzzle model. *Proceedings - Frontiers in Education Conference, FIE*, 1–8. <https://doi.org/10.1109/FIE.2017.8190661>
- Theresia, M., & Rati, S. (2022). Upaya Meningkatkan Hasil Belajar Siswa Melalui Model Example Non Exampel Pada Subtema Keindahan Alam Negeriku Bagi Siswa Kelas IV SD Negeri 164 Pasar Maga. *JIPDAS*, 2(1).
- Usmiyatun. (2022). Use The Problem Based Learning Model And Probing Prompting In First Middle School To Improve Critical Thinking Ability And Student Motivation. *Universitas Muhammadiyah Malang*.
- Usmiyatun, Sah, R. A., & Darmayanti, R. (2021). Design Development of Audiovisual Teaching Materials for Canva Application-based Reading Skills in Early Childhood. *Jurnal Caksana: Pendidikan Anak Usia Dini*, 4(1), 1–12.
- Villegas, D. A., & Marin, A. M. (2022). Bilingual brand communities? Strategies for targeting Hispanics on social media. *Journal of Product and Brand Management*, 31(4). <https://doi.org/10.1108/JPBM-10-2019-2625>
- Wardhani, R. A. novi, & Wijaya, S. A. (2020). Pengaruh Kompetensi Terhadap Pengembangan Karir Dan Kinerja Guru Ekonomi SMA Negeri di Kota Jember. *Jurnal Pendidikan Ekonomi Undiksa*, 12(1). <https://doi.org/10.23887/jjpe.v12i1.24797>
- Wartini, W. (2018). Upaya peningkatan kompetensi guru dalam melaksanakan proses belajar mengajar melalui supervisi akademik di SDN 011 Bukit Raya Singingi Hilir. *Jurnal Pajar (Pendidikan dan Pengajaran)*, 2(6). <http://dx.doi.org/10.33578/pjr.v2i6.6546>
- Windiaati, E., Poerwanti, I. S. J., & Yulianti. (2016). Peningkatan Keterampilan Menulis Karangan Narasi Melalui Metode Picture and Picture. *Didaktika Dwija Indria*, 4(10), 1–5.
- Winschel, G. A. (2015). Using Jigsaw-Style Spectroscopy Problem-Solving to Elucidate Molecular Structure through Online Cooperative Learning. *Journal of Chemical Education*, 92(7), 1188–1193. <https://doi.org/10.1021/acs.jchemed.5b00114>
- Wirahmad, I. I., & Arifin, Z. (2020). Implementasi, Implementasi Model Pembelajaran ATI (aptitude treatment interaction) Untuk Meningkatkan Hasil Belajar dan Aktivitas Belajar Siswa Materi Geometri Ruang Kelas XII.IPA.1 SMA Negeri 4 Kota Bima Tahun Pelajaran 2019/2020. *Pedagogos (Jurnal Pendidikan)*, 2(1), 46–56. <https://doi.org/10.33627/gg.v2i1.308>
- Yaguchi, A., Oshikawa, M., Watanabe, G., Hiramatsu, H., Uchida, N., Hara, C., Kaneko, N., Sawamoto, K., Muraoka, T., & Ajioka, I. (2021). Efficient protein incorporation and release by a jigsaw-shaped self-assembling peptide hydrogel for injured brain regeneration. *Nature Communications*, 12(1). <https://doi.org/10.1038/s41467-021-26896-3>