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Students collaboration and communication skills with problem-based learning model

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ARTICLE INFO	ABSTRAK
	Penelitian ini bertujuan untuk mengetahui tingkat keterampilan kolaborasi dan komunikasi peserta didik dengan model *Problem Based Learning* (PBL). Subjek penelitian ini adalah 77 peserta didik yang dipilih dengan teknik *purposive sampling*. Penelitian ini menggunakan jenis penelitian deskriptif kuantitatif. Pengukuran data menggunakan lembar observasi yang dianalisis dengan persentase. Berdasarkan hasil penelitian keterampilan kolaborasi dan komunikasi dengan model *Problem Based Learning* (PBL) menunjukkan bahwa secara keseluruhan peserta didik kelas XI IPS SMAN di Banyuwangi sudah mencerminkan keterampilan kolaborasi dan komunikasi. Persentase keterampilan kolaborasi peserta didik kelas XI IPS SMAN di Banyuwangi sebesar 60,5 persen yang termasuk dalam kategori "cukup". Selanjutnya persentase keterampilan komunikasi peserta didik kelas XI IPS SMAN di Banyuwangi sebesar 53,2 persen yang termasuk dalam kategori "cukup". Hasil dari keterampilan kolaborasi dan komunikasi peserta didik ini menyatakan bahwa setiap peserta didik telah menunjukkan sikap dari keterampilan-keterampilan tersebut.

ABSTRACT

This study aims to determine the level of collaboration and communication skills of students with problem-based learning models. The sample of this research was 77 students who were selected by purposive sampling technique. This research uses a type of quantitative descriptive research. Data from the observation sheets were analyzed by calculating the average value of the percentage. The results of a study on collaboration and communication skills with the Problem-Based Learning (PBL) learning model shows that overall, the students of class XI Social Sciences at Senior High School in Banyuwangi already reflect collaboration and communication skills. The percentage of collaboration skills of class XI Social students at Senior High School in Banyuwangi is 60.5 percent, which is in the "enough" category. Furthermore, the percentage of communication skills of class XI Social students at Senior High School in Banyuwangi is 53.2 percent, which is in the "enough" category. The results of these students' collaboration and communication skills state that each student has shown an attitude toward these skills.

INTRODUCTION

Learning with the 2013 curriculum has become a policy in the world of education which is expected to form a generation capable of advancing the nation. The progress of a nation will be hampered if the education is not of good quality. The quality of education is influenced by the learning process that occurs in schools (Nismawati et al., 2021). Therefore, to achieve quality education, learning activities must also be carried out properly and with quality. Learning activities that are relevant to current developments are 21st century learning. 21st century learning has 4 categories of skills that must be possessed by every student (Kids, 2019). 21st century skills have their respective roles in every learning process. In economics subjects, collaboration and communication skills are important for every student to have.

Collaboration skills are skills for working together and responsibility for existing tasks (Sufajar & Qosyim, 2022). It is important for every student to have collaboration skills in every learning process. If students do not have collaboration skills, it can hinder the problem-solving process. This is because during the discussion process there must be differences of opinion between students. So, if students have collaboration skills, this difference of opinion will not be a problem in the discussion because they already understand how to respect someone's opinion. Therefore, this effective collaboration skill can teach students how to generate ideas, respect others, build relationships, and work in groups with others to achieve common goals. Students can strengthen their collaboration skills through the experiences they get both inside and outside the classroom (Nopriska et al., 2021).

Communication skills are individual abilities in listening, speaking in public, writing, and conveying new thoughts, knowledge, and information both orally and in writing (Zubaidah, 2018). The lack of students' communication skills will have an impact on the quality of the students themselves because their ideas and thoughts will not be conveyed properly. Communication skills can be said to influence students' behavior and make it easier for them to understand what the teacher is trying to teach them (Wati et al., 2019), so it is important for students to improve their communication skills. Collaboration and communication skills as important aspects of life in the future, a person needs to communicate thoughts and teamwork in learning (Hayat et al., 2019), train social character (Amran et al., 2019) and prevent individualistic life.

Based on the results of observations made at Senior High School in Banyuwangi during the learning process, students in class XI Social showed discussion activities among group members and were able to write and present the results of the discussions in front of the class. But there are still some students who are reluctant to express their ideas or opinions in discussion activities and there are also students who do not want to accept the opinions conveyed by their friends. In addition, there are still students who are embarrassed to present the results of the discussion in front of the class. The results of this observation indicate that students in class XI Social do not have full collaboration and communication skills during the learning process.

One way to train and develop students' collaboration and communication skills is through the Problem Based Learning (PBL) model. According to some academics, the Problem Based Learning (PBL) learning approach presents actual and significant challenges so that students can conduct research and learn on their own or in groups. (Nasihah et al., 2019). Students are typically divided into groups to debate the problems the teacher presents during the learning process while adopting the Problem Based Learning (PBL) (Kilbane & Milman, 2014). The Problem Based Learning (PBL) model is based on the idea that learning involves more than just memorizing concepts or information but the process of interaction between individuals and their environment (Wati et al., 2019) and (Jalmo et al., 2019). This Problem Based Learning (PBL) model also allows the creation of multi-way communication, which can lead to efficient communication and enable optimal student activities during the learning process (Kurniawan, 2020). Fauzan (2017) has also explained that using the Problem Based Learning (PBL) model can develop students' communication, representation, and reasoning abilities during the learning process because students are required to solve problems.

Senior High School in Banyuwangi is one of the schools that have implemented the Problem Based Learning (PBL) model in economic learning activities. Economics subjects include subjects that have very complex material and have high relevance in everyday life (Hayati & Murdi, 2016).

Therefore, this economics subject has many daily problems and students need group cooperation in solving these problems and skills in writing and presenting the results of the discussion. International trade material is one of the suitable materials for the application of the Problem Based Learning (PBL) model because it has many problems that can be used as learning materials. The Problem Based Learning (PBL) model is preferred by Senior High School in Banyuwangi Class XI Social Sciences and Economics teachers because it is thought to help students understand the material being taught because it is related to real-world situations and the group learning process.

Based on the background of these problems, the researcher decided to examine the extent to which the level of collaboration and communication skills of students in class XI Social Senior High School in Banyuwangi with the Problem Based Learning (PBL) model in economics subjects on international trade material because previous research had not discussed skills collaboration and communication of students in the economic learning process. This study's contribution is to help people understand how vital teamwork and communication skills are to the success of the learning process and how they should be studied and used with all students. The study looked at four different ways to define collaboration abilities, including actively participating, taking responsibility, being adaptable in groups, and showing respect for others. The ability of students to ask questions, express results orally, and evaluate outcomes in writing were all considered to be three forms of communication abilities in this study. This study aims to clearly and comprehensively explain students' abilities to collaborate and communicate when learning activities are conducted utilizing the Problem Based Learning (PBL) model.

METHOD

The type of research used in this study is quantitative descriptive. Quantitative descriptive research to study, describe, and explain a subject as it is and to derive conclusions from observable occurrences (Listiani, 2017). Quantitative descriptive research is research that only describes the contents of a variable in research, not intended to test a particular hypothesis (Marlina, 2020). The subjects of this study were 77 students in class XI Social 3 and XI Social 4, consisting of 40 students XI Social 3 and 37 students XI Social 4 who were selected by purposive sampling technique. The location determination technique used is a purposive area technique where the location determination is done deliberately with certain considerations. Thus, the researchers determined the research location at Senior High School in Banyuwangi, precisely on Jl. K.H. Wahid Hasyim No. 20, Genteng, Banyuwangi, East Java.

The research started from March to April 2023. Research data was collected through observation and interviews. Data on collaboration and communication skills in this study were obtained from the results of observation sheets by directly observing students while carrying out learning activities. Student collaboration skill observation sheets consist of four indicators of ability, namely actively contributing in groups, being responsible for assigned tasks, flexibility in groups, and respecting others in the learning process.

Table 1. Observation guidelines regarding collaboration skills

No	Aspects	Indicator
1	Actively contributing in groups	a) Express ideas, suggestions, or solutions for solving problems in the discussion process
		b) Help each other when group members have difficulty completing tasks
2	Being responsible for assigned tasks	a) Complete their respective tasks in accordance with the division of tasks
		b) Don't depend on others to complete the task
3	Flexibility in groups	a) Accept a joint decision
		b) Accept criticism and suggestions
		c) Negotiate differences of opinion to reach a solution to the problem
4	Respecting others in the learning process	a) Respond to other people's differences of opinion with an open mind
		b) Show courtesy and respect

Table 2. Observation guidelines regarding communication skills

No	Aspects	Indicator	
1	Interpret results in writing	a)	Able to write down the results of problem solving in good language
		b)	Able to use the correct sentence structure so that the result is clear
2	Communicate results orally	a)	Able to present the results of problem solving in a loud and clear voice
		b)	Able to present the results of solving problems in language that is easy to understand
3	The ability to ask questions between groups that are presenting	a)	Pay attention and listen to other groups while making presentations
		b)	Able to ask questions to the group doing the presentation

Table 3. Collaboration and communication skills level criteria adopted from Arikunto (2019)

Percentage of score obtained	Category
81% - 100%	Very high
61% - 80%	High
41% - 60%	Enough
21% - 40%	Low
0% - 20%	Very low

While the observation sheet of students' communication skills consists of three indicators, namely the ability of students to interpret results in writing, communicate results orally, and the ability to ask questions between groups that are presenting. For more details, see Table 1 and Table 2.

The interview method was also used to collect additional data. Interviews were conducted with five informants consisting of students in class XI Social 3 and XI Social 4 who had the highest and lowest scores of collaboration and communication skills, two students respectively, and one teacher of economics class XI Social. Interviews were conducted to dig deeper into the factors behind the students' high collaboration and communication skills. In order to provide the findings of the observation scores in percentage form, the observation scores are averaged, summed, and presented. Conclusions are reached based on the specified category classifications after getting the percentage results, as indicated in Table 3.

RESULT

Results of observations conducted during one meeting in each class were used to compile information on the collaboration and communication abilities of the students using the Problem Based Learning (PBL) model in this study. Three observers were used by the researcher to view one class, with each observer seeing two different groups to achieve great objectivity and accuracy, this is done. Therefore, four observations were made over the course of one week in two distinct classes. The Problem Based Learning (PBL) syntax and the elements on the predefined observation sheet are both taken into account when adapting the observation process. Indicators of teamwork and communication abilities are used to sort and integrate the results of observational data. This grouping's outcomes are intended to produce the final score needed for analysis. Data from observations of collaboration skills from the two classes are presented in Table 4.

Based on the results of the collaboration skill percentage table above, it can be concluded that the indicator with the highest percentage is in the aspect of respecting others, while the lowest percentage is in the aspect of actively contributing. In accordance with the results of an interview with one of the students regarding what actions the student will take if another group member has an opinion that is different from their own during a group discussion, namely accepting differences of opinion in the discussion and later will be discussed again in order to get the best answer. Overall, students in class XI Social Senior High School in Banyuwangi have a level of

collaboration skills with a percentage of 60.5%, which is in the "enough" category. Furthermore, data from the observation of communication skills from the two classes are presented in Table 5.

Table 4. Overall results percentage of collaboration skills

Aspects	Indicators	Average number per indicator	Category
Contribute actively	a) Express ideas, solutions to problem solving	56.2%	Enough
	b) Mutual help fellow group members		
Responsible	a) Complete tasks according to the division	57.5%	Enough
	b) Do not depend on others		
Flexibility in groups	a) Receiving a joint decision	63.4%	High
	b) Accept criticism and suggestions		
	c) Negotiate differences of opinion		
Respect for others	a) Respond to other people's differences of opinion with an open mind	64.7%	High
	b) Show politeness and respect		
	Overall average sum	60.5%	Enough

Table 5. Overall results percentage of communication skills

Aspects	Indicators	Average number per indicator	Category
Interpret the results in writing	a) Write down the results of problem solving in good language	52.5%	Enough
	b) Using the right sentence structure so that the result is clear		
Communicate results orally	a) Presenting the results of problem solving in a loud and clear voice	68.9%	High
	b) Presenting the results of problem solving in language that is easy to understand		
Question and answer	a) Pay attention, listen to other groups when making presentations	38.2%	Low
	b) Asking questions to the group making the presentation		
	Overall average sum	53.2%	Enough

Based on the research results from the Table 5, it can be concluded that the indicator with the highest percentage is in the aspect of the ability to communicate results orally, while the lowest percentage is the aspect of question-and-answer ability. In accordance with the results of interviews with one of the students regarding whether the students participated actively and experienced difficulties in presenting the results of problem solving, namely students actively participated in presenting the results and students had no difficulty presenting the results in front of the class. Overall, students in class XI SOCIAL Senior High School in Banyuwangi have a level of communication skills with a percentage of 53.2%, which is in the "enough" category.

DISCUSSION

The Problem Based Learning (PBL) model gives students the chance to discuss a problem in groups and present their individual creative solutions to problems, as well as to communicate the results of the discussion with presentations in front of the class, it encourages students to work collaboratively and communicate effectively while learning. In line with research conducted by Purwati & Darussyamsu (2021) explained that the Problem Based Learning (PBL) model affects students' communication skills because the learning environment becomes more active as the learning process progresses and discussion activities in groups are able to answer the challenges presented and exchange of ideas occurs. well. In a study by Wynn et al., (2014) outlined how the problem-based learning environment Learning that is Problem-based Learning and demands

students to participate actively in both thinking and communicating the consequences of their thinking will be more engaging and foster student involvement and collaboration. Student collaboration skills will make tough students, and positive interdependence (Scager et al., 2016) and students will be more confident in expressing their ideas when learning is requires students to work together, so that higher self-confidence will improve communication skills student (Kovalyova et al., 2016).

The indicator in collaboration skills that has the highest percentage is the aspect of respecting others with a percentage of 64.7%, which is in the high category. The high aspect of respecting other people has an impact on the sustainability of discussion activities, where discussion activities will run smoothly because each student respects the opinions of fellow group members so when there are differences of opinion it will not be a serious problem because these differences can be discussed with an open mind. This is in accordance with the results of direct observation during the discussion process, students respect each other when there are differences of opinion in discussion activities. Each group member receives all the different opinions from other group members. They make this difference of opinion as new knowledge to complete the task given so that they are able to respond to this difference of opinion with an open mind without anyone blaming or cornering each other for having different opinions. In line with the results of research conducted by Junita, et al. (2021) which states that an indicator of collaboration skills, namely respect for each member of the group, can be shown by the attitude of each student who is able to be polite and kind with fellow group members, always listen and respect different opinions from other group members.

Furthermore, the aspect of the shooting skill indicator that has the lowest proportion is the aspect of actively contributing with a proportion of 56.2%, which is in the sufficient category. During the discussion process, group discussions could run well and be active, but there were still some students who did not contribute to the discussion. This is in line with the results of research conducted by Susetyarini et al., (2022) that in discussion activities there are generally only 3 students who are very active, express ideas to each other, and work together to solve the problems given. Students who do not participate actively in discussion activities because they are unable to understand the problem and how to solve it so they just stay silent waiting for other group members to answer it. This is in accordance with the results of an interview with one of the students that he rarely looked for answers to these problems because he did not understand the problems given.

The indicator in communication skills that has the highest percentage is the aspect of the ability to communicate results orally with a percentage of 68.9%, which is in the high category. Based on the results of direct observation during the presentation activities, the high aspect of the ability to communicate results verbally proves that students have the confidence to appear in front of the class, each student is able to present results in a loud and clear voice, and is able to present results in plain language. easily understood by the audience. In accordance with the opinion of Sugito (2017) claimed that discussion-based learning is more successful for enhancing oral communication skills in order to help students use effective vocabulary, construct understandable sentences, and use the appropriate voice and intonation when speaking and listening. The oral communication abilities of pupils are influenced by the learning model utilized during the learning process (Sari et al., 2019). The ability to understand the material is also influenced by the ability to communicate results orally because with students able to present results well, then they must have understood what they presented. In line with the results of research conducted by Wati, et al. (2019) which states that if student communication during the learning process is good, the success of students in understanding the lesson will also be good.

The aspect of the communication skills indicator that has the lowest percentage is the question-and-answer aspect with a percentage of 38.2%, which is in the low category. When the learning process took place, it was shown that most of the students had low question and answer skills. This is evidenced by the lack of interest of students to pay attention to other groups during presentations, as well as the confidence to ask questions to the group presenting. According to the results of research conducted by Wati, et al. (2019) low question-and-answer ability is caused by

some students who are still embarrassed to give responses and ask questions when they find answers that are different from the results of discussions with other groups.

Based on the results of interviews with subject teachers, low interest and desire in knowing new things about students during the learning process also affects the ability to ask questions. This is in accordance with the results of research conducted by Ramadina & Rosdiana (2021) which states that the ability to ask questions is influenced by students' lack of self-confidence or doubt when expressing opinions because students are used to not asking questions so there is no interest or motivation. Kamaruzzaman (2016) added that an inability to speak, difficulty starting conversations with others, lack of listening skills, lack of interest in what their friends are doing, and lack of empathy for others can all be causes of students' lack of oral communication skills.

Based on the explanation above, collaboration and communication skills with the Problem Based Learning (PBL) learning model of class XI SOCIAL students at Senior High School in Banyuwangi show that they reflect 4 aspects of collaboration skill indicators and 3 ability indicators of communication skills although there are still indicators that are less than optimal such as actively contributing and asking questions. Therefore, the subject teacher must have various ways to improve the ability to actively contribute students in each discussion process. As said by Awang & Daud, (2015) that in Problem Based Learning (PBL) learning it trains interactions between students and with educators in finding solutions to problems. The researcher hopes that this research can be a reference for further research. Researchers need to convey suggestions to teachers, as it is known that students do not contribute actively in group discussions because students do not understand the material and problems provided by the teacher. Therefore, the teacher must be able to attract the attention of students by inviting students to interact during the explanation of the material and the explanation of the problems to be solved in group discussions. Furthermore, to improve students' question and answer skills, it is expected that teachers can provide rewards in the form of additional value for students who dare to ask questions or answer questions.

CONCLUSION

Based on the results and discussion of the research, it can be concluded that in class XI Social students learning economics on international trade material with the Problem-Based Learning (PBL) model at Senior High School in Banyuwangi have demonstrated collaboration skills in four aspects, namely contributing actively, being responsible, flexibility in groups, and respecting others. Furthermore, in communication skills students have demonstrated communication skills in three aspects, namely the ability to write results in writing, the ability to communicate results orally, and question and answer. However, the question-and-answer ability is the lowest. This study still has limitations in the lack of discussion about the low ability of students' questions and answers. So, it is suggested that future researchers continue research that focuses on exploring the factors that cause students' low question-and-answer skills in learning activities on broader subjects and grade levels.

Author contributions

The authors made significant contributions to the study's conception and design. The authors was in charge of data analysis, interpretation, and discussion of results. The final manuscript was read and approved by the authors.

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Conflict of interest

The authors declare that there is no potential conflict of interest.

Data availability statement

All data are available from the authors.

REFERENCES

Amran, A., Perkasa, M., Satriawan, M., Jasin, I., & Irwansyah, M. (2019). *Assessing students 21st century attitude and environmental awareness: promoting education for sustainable development through science education. Journal of Physics: Conference Series*, 1157(2). https://doi.org/10.1088/1742-6596/1157/2/022025

Arikunto, S. (2019). *Prosedur penelitian: suatu pendekatan praktik*. Jakarta: Rineka Cipta.

Awang, H., & Daud, Z. (2015). *Improving a communication skill through the learning approach towards the environment of engineering classroom. Procedia - Social and Behavioral Sciences*, 195, 480–486. https://doi.org/10.1016/j.sbspro.2015.06.241

Fauzan, M., Gani, A., & Syukri, M. (2017). Penerapan model problem based learning pada pembelajaran materi sistem tata surya untuk meningkatkan hasil belajar siswa. *Jurnal Pendidikan Sains Indonesia*, 5(1), 27-35. https://jurnal.usk.ac.id/JPSI/article/view/8404

Hayat, M. S., Rustaman, N. Y., Rahmat, A., & Redjeki, S. (2019). Perkembangan keterampilan komunikasi dan kolaborasi mahasiswa dalam perkuliahan keanekaragaman tumbuhan melalui inkuiri berorientasi enterpreneurship. *Jurnal Mangifera Edu*, 4(1), 21. https://doi.org/10.31943/mangiferaedu.v4i1.41

Hayati, A. F., Murdy, K. (2016). Pengaruh metode pembelajaran berbasis masalah (*problem based learning*) terhadap peningkatan kemampuan berpikir kreatif siswa pada mata pelajaran ekonomi. *Oikos : Jurnal Kajian Pendidikan Ekonomi dan Ilmu Ekonomi*, 1(1), 61-71. https://doi.org/10.23969/oikos.v1i1.235

Jalmo, T., D. Fitriyani, & B. Yolida. (2019). Penggunaan *problem based learning* untuk meningkatkan keterampilan kolaborasi dan berpikir tingkat tinggi. *Jurnal Bioterdidik*, 7(3), 77-87. http://jurnal.fkip.unila.ac.id/index.php/JBT/article/view/17480

Junita, A., B. Suprianto, & W. (2021). Purwianingsih. Profil keterampilan kolaborasi siswa sma pada praktikum maya sistem ekskresi. *Assimilation: Indonesian Journal of Biology Education,* 4(2), 50-57. https://doi.org/10.17509/aijbe.v4i2.41480

Kamaruzzaman. (2016). Analisis keterampilan komunikasi interpersonal siswa*. Jurnal Konseling*. 2(2), 202-210. https://doi.org/10.24176/jkg.v2i2.744

Kilbane, C. R dan Milman, N. B. (2014). *Teaching model, designing instruction for 21st century learners*. New York: Pearson.

Kids, B. for. (2019). *Framework for 21st century learning definitions*. Partnership for 21st Century Learning.

Kurniawan, H. (2020). *Pembelajaran era 4.0; integritas penguatan pendidikan karakter, keterampilan abad 21, hots, dan literasi dalam perspektif merdeka belajar*. Yogyakarta: Media Akademi.

Kovalyova, Y. Y., Soboleva, A. V., & Kerimkulov, A. (2016). Project based learning in teaching communication skills in english as a foreign language to engineering students. *International Journal of Emerging Technologies in Learning (iJET),* 11(04), 153–156. https://doi.org/10.3991/ijet.v11i04.5416

Listiani, N. M. (2017). Pengaruh kreativitas dan motivasi terhadap hasil belajar mata pelajaran produktif pemasaran pada siswa kelas xi smk negeri 2 tuban. *Jurnal Ekonomi Pendidikan Dan Kewirausahaan*, 2(2), 263. https://doi.org/10.26740/jepk.v2n2.p263-275

Marlina, E. (2020). Pengembangan model pembelajaran *blended learning* berbantuan aplikasi sevima edlink. *Jurnal Padegogik*, 3(2), 104–110. https://doi.org/10.35974/jpd.v3i2.2339

Nasihah, E. D., Supeno, S., & Lesmono, A. D. (2019). Model *problem based learning* (pbl) disertai tutor sebaya untuk meningkatkan keterampilan berpikir kritis siswa sma. *FKIP E-Proceeding*, 3(2), 178–183. https://jurnal.unej.ac.id/index.php/fkip-epro/article/view/9419

Nismawati., C. Nugroho., S. Selfiardy. (2021). *Teacher strategies based local wisdom in building character effort of high school students in tomohon. ICHELSS: International Conference on Humanities, Education, Law, and Social Sciences*, 1(1), 559-563. https://journal.unj.ac.id/unj/index.php/hispisi/article/view/22218

Nopriska, N. I., A. S. Putri., T. R. Calista., & R. Hikmawan. (2021). Apakah model pembelajaran problem-based learning efektif diterapkan pada pendidikan kejuruan abad 21?. *Jurnal INTEGRATED (Information Technology and Vocational Education)*, 3(1), 23-31. https://ejournal.upi.edu/index.php/integrated/article/view/32735

Purwati, S., & Darussyamsu, R. (2021). Model pembelajaran *problem based learning* untuk meningkatkan kemampuan komunikasi. *Prosiding Seminar Nasional Biologi*, 1(1), 917-922. https://doi.org/10.24036/prosemnasbio/vol1/115

Ramadina, A., & L. Rosdiana. (2021). Keterampilan komunikasi siswa setelah diterapkan strategi active knowledge sharing ketika pembelajaran daring. *PENSA E-JURNAL : PENDIDIKAN SAINS*, 248-251. https://ejournal.unesa.ac.id/index.php/pensa/article/view/38273

Sari, N.H., Sesunan, F., & Nyeneng, I.D.P. (2019). Pengaruh model pembelajaran *think pair share* terhadap hasil belajar fisika siswa ditinjau dari keterampilan berkomunikasi. *Jurnal Pendidikan Fisika Universitas Muhammadiyah Metro*, VII(1), 68-80. http://dx.doi.org/10.24127/jpf.v7i1.1396

Scager, K., Boonstra, J., Peeters, T., Vulperhorst, J., & Wiegant, F. (2016). Collaborative learning in higher education: evoking positive interdependence. *CBE Life Sciences Education, 15*(4), 1–9. https://doi.org/10.1187/cbe.16-07-0219

Sufajar, D., & A. Qosyim. (2022). Analisis keterampilan kolaborasi siswa smp pada pembelajaran ipa di masa pandemi covid-19. *Pensa E-Jurnal : Pendidikan Sains*, 10(2), 254-259. https://ejournal.unesa.ac.id/index.php/pensa/article/view/45054

Sugito, S., Susilowati, S. M. E., Hartono, H., & Supartono, S. (2017). Enhancing students' communication skills through problem posing and presentation. *International Journal of Evaluation and Research in Education*, 6(1): 17-22. http://doi.org/10.11591/ijere.v6i1.6342

Susetyarini, E., E. Nurohman., & H. Husamah. (2022). Analysis of students collaborative, communication, critical thinking, and creative abilities thought problem based learning. *Jurnal Penelitian dan Pengkajian Ilmu Pendidikan: e-saintika*, 6(1), 33-42. https://doi.org/10.36312/esaintika.v6i1.584

Wati, M. Y., I. A. Maulidia., Irnawati, & Supeno. (2019). Keterampilan komunikasi siswa kelas vii smpn 2 jember dalam pembelajaran ipa dengan model *problem based learning* pada materi kalor dan perubahannya. *Jurnal Pembelajaran Fisika*, 8(4), 275 – 280. https://jurnal.unej.ac.id/index.php/JPF/article/view/15237

Wynn, C., Mosholder, R., & Larsen, C. (2014). Measuring the effects of problem-based learning on the development of postformal thinking skills and engagement of first-year learning community students. *Learning Communities Research and Practice*, *2*(2), 4. http://washingtoncenter.evergreen.edu/lcrpjournal/vol2/iss2/4

Zubaidah, S. (2019). Keterampilan abad ke-21: bagaimana membelajarkan dan mengasesnya. *Seminar Nasional*, 1-25.