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Case Study of Collaboration Skills and Learning Outcomes of High School Students on Physics Learning in Global Warming Materials

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ABSTRACT

Purpose of the study: Describe the influence of collaboration skills on the learning outcomes of global warming concepts for students at Alumnika Sains High School Palembang.

Methodology: This type of research uses a qualitative descriptive method that aims to provide a description of collaboration skills and student learning outcomes in physics learning on global warming material. Data collection techniques in this research include direct observation, using research instruments in the form of rubric sheets and self-assessment collaborative research questionnaires.

Main Findings: The results show that if the significance value of the correlation test is 0.752, which is greater than the general significance threshold value which is set at 0.05, then the conclusion is that there is no significant relationship between collaboration skills and learning outcomes of students in the sample.

Novelty/Originality of this study: Adding a new perspective on how collaboration skills may not always be significantly correlated with learning outcomes on specific concepts such as global warming in Indonesian high school environments, provides an opportunity to explore other variables that may be more influential.

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1. INTRODUCTION

The younger generation will be able to make changes and face the challenges of the times as a result of learning that includes academic knowledge, social skills, and cooperation which are important components of education. In the context of modern education, collaborative skills are important because of the complexity of global problems that require cooperation and holistic thinking [1], [2]. This is the basis for the importance of 21st-century skills because it strengthens intellectual capital and social capital which refers to the skills of searching, reasoning, managing, presenting, and conveying information independently, critically, creatively, solutions, productively, collaboratively, and communicatively [3].

In the current era, collaboration skills play an important role in learning. As explained in the 2018 The Future of Global Higher Education seminar, the concept of 21st-century learning is known as the term 4C (Communication, Collaboration, Critical Thinking and Problem Solving, and Creativity and Innovation). This is because collaborative learning is a type of learning where students with various backgrounds and skills work together starting from small groups to achieve common goals [4]. Each student in each group will be responsible

for each other. In collaborative learning, students share roles, tasks, and responsibilities to achieve success. Collaborative learning is also a way to solve tasks or problems together quickly, better, and with less effort [5], [6].

Learning is a process that involves changing behavior through experience. Tasks that encourage habit formation provide direct knowledge to students. Learning is defined as a change in attitude or behavior caused by interaction with the environment [7]. Any psychological action that a person takes so that their behavior is different between before and after learning can also be included in the definition of learning. The acquisition of intelligence from activities after learning and engaging in activities, as well as changes in behavior or responses produced by new experiences [8], [9].

Learning carried out during the twenty-first century must be able to equip future generations of the Indonesian nation to embrace social progress in the field of information and communication technology (ICT). The learning that occurs during the twenty-first century is the result of how society changes over time. Society has developed from a prehistoric society to an agrarian society, then an industrial society, and finally an information society [10]. The 21st-century learning paradigm places great emphasis on students' ability to think critically, the ability to connect science with the real world, the ability to master information technology, and the ability to work together in teams. A person can obtain this ability by using appropriate learning methods for mastering material and skills. In the twenty-first century, four categories of skills can be found throughout the world: (a) Ways of thinking: innovation and creativity, critical thinking, problem-solving, decision-making, and learning to learn; (b) How to work: communicate and collaborate; (c) Job tools: general knowledge and skills of communication and information technology; and (d) Way of life: career, social and personal responsibility, including awareness of competence and culture (Binkley This definition of modern skills relates to many scientific disciplines and aspects of human life. Modern-age abilities do not have a special place in the curriculum. Skills and understanding are not the only elements emphasized in this century's education; it also emphasizes creativity, cooperation, and speaking skills. Some also involve technology, behavior, and moral values, while also emphasizing more critical thinking and communication skills providing challenges in the process [3], [10].

The term "collaboration" has been used as a synonym for "cooperation" since the 1980s. As an academic phrase that reflects students' abilities and learning outcomes from cooperative processes, collaboration is the word of choice. At the same time, team building is referred to as collaboration by many senior educators from other countries. Today's technology makes communication and collaboration easier when using digital learning tools. E-tools that enhance digital connections between two or more individuals, such as email, blogs, and wikis, are examples of capabilities. Meanwhile, according to the big dictionary, the word collaboration, which signifies cooperation, is the root of the Indonesian word work together. Working together requires collaboration. Collaboration requires teamwork with other members of the organization. Students' capacity to collaborate is referred to as : 1) The ability to do work well and respect each other or other teams; 2) Flexible practices and a willingness to help each other in reaching the agreements necessary to achieve common goals; 3) Collaborate to produce valuable contributions from each team member. The following is Table 1. Indicators of aspects of collaboration skills according to Greenstein [11] are as follows,

Table 1. Collaboration Skills Indicators

Aspect	Indicator
Contribute actively	Express ideas, suggestions and solutions in discussions
Work productively	• Collect assignments on time • Produce products that meet standards
Manage practical work well	• Manage projects well • Doing project
Demonstrate an attitude of responsibility	Attend meetings on time
Shows flexibility and compromise	• Willing to accept a Joint Decision • Flexibility in Collaboration • Accept criticism and suggestions
Show mutual respect	• Be polite and kind when carrying out practicum with other people • Listen and respect other people's opinions in the practicum process • Appreciate the contribution or work of others in the practicum process

Collaborative learning is defined as a series of actions carried out by teachers to help students interact with each other to achieve certain goals. Teachers provide opportunities for students to work together and place the teacher as a leader and supervise learning [12]. Collaborative learning can build positive attitudes in students, such as teaching them to appreciate diversity and understand individual differences. In collaborative learning, students will also learn and work to be able to review different perspectives and have the opportunity to express their ideas in small groups. The ability to communicate well with others can be improved through collaborative learning. This kind of ability is very important for students in social situations anywhere [9]. In the current education curriculum, the Merdeka Curriculum has been introduced as an effort to give schools more freedom in determining learning approaches that suit student characteristics and needs [13]–[15] Alumnika Palembang Science High School which is located at Jalan Perindustrian II, Kebun Bunga Village, Sukarami District, Palembang with the Establishment Decree Kpts-087/YPLBBA.007/2018 and has a vision of having a superior reputation in the fields of science and technology through achieving achievements at the national and international levels. In the 2024/2025 learning year, there will be three study groups consisting of 20 tenth-grade students, 17 eleventh-grade students, and 26 twelfth-grade students implementing the Independent Curriculum, namely independent sharing. Independent sharing in educational units is a system of using the Merdeka curriculum structure in developing and implementing the principles of the Merdeka Curriculum including assessment, with a commitment to share good practices with other educational institutions. At the tenth (phase e) and eleventh (phase f) grade levels, this school implements the independent curriculum, while the 2013 Curriculum is implemented for the twelfth-grade level.

The results of interviews with teacher colleagues show that students show interest in discussing global warming material so global warming learning outcomes are also good. Apart from that, the researcher is also a teacher at the school so he can interact directly with students and other school staff. The implementation of the Merdeka Curriculum and the 2013 Curriculum in schools contain differences such as learning outcomes (KURMER) which are arranged per phase with groups increasing knowledge, attitudes, and skills in achieving, strengthening, and improving competence; core competencies and basic competencies (2013 curriculum) which are arranged per week are grouped for formation of spiritual attitudes, social attitudes, knowledge and skills [16]. Learning that cannot be separated from educational activities is not only a personal process, but also a social process that relates to one another so that it can build mutual understanding and insight [17].

Physics as an important subject for understanding global problems, especially when talking about Global Warming requires an understanding of scientific concepts and the ability to work together to find the best solutions. Previous research conducted by Rahmawati et al., [18], the results showed that from cycle I to cycle IV, students' ability to work together in basic physical learning increased. The research conducted by Nurhayati et al., [19] showed that the collaborative skills of high school students in project learning as a whole were categorized as very good. Next, research from Pratiwi et al., [20] shows that students responded positively to the assessment of collaboration skills. Therefore, based on several studies that have been carried out, this research will be entitled "Preliminary Study of Collaboration Skills and Learning Outcomes of High School Students in Physics Learning on Global Warming Materials".

2. RESEARCH METHOD

This research was carried out at Alumnika Sains High School Palembang for the 2023/2024 academic year. This type of research uses a qualitative descriptive method that aims to provide a description of collaboration skills and student learning outcomes in physics learning on global warming material. Data collection techniques in this research include direct observation, using research instruments in the form of rubric sheets and self-assessment collaborative research questionnaires which will be given to students to assess collaboration skills, and also tests for understanding global warming material.

3. RESULTS AND DISCUSSION

This research was carried out by collecting information through direct observation, collecting data using research instruments in the form of rubric sheets and self-assessment collaborative research questionnaires which will be given to students to assess collaboration skills, as well as tests for understanding global warming material. Based on the data obtained. To investigate the relationship between collaboration skills and learning outcomes of high school students in the context of physics learning on global warming. Data was collected through direct observation, rubrics for collaborative skills assessment, self-assessment questionnaires, and a test to evaluate students' understanding of global warming. The analysis included correlation and regression tests, as well as descriptive statistical evaluations of the data distribution.

Tabel 2. Results of Corelation Analysis

		Keterampilan Kolaborasi	Hasil Belajar
Collaboration skills	Pearson Correlation	1	.042
	Sig. (2-tailed)		.752
	N	60	60
Learning Outcomes	Pearson Correlation	.042	1
	Sig. (2-tailed)	.752	
	N	60	60

Table 2, shows a significance value (2-tailed) of 0.752 > 0.05, so there is no relationship between collaboration skills and student learning outcomes. Where if the significance value of the correlation test is 0.752, which is greater than the general significance threshold value which is set at 0.05, then the conclusion is that there is no significant relationship between collaboration skills and the learning outcomes of students in the sample. This means that in the context of the data analyzed, there is insufficient evidence to support the existence of a significant relationship between collaboration skills and student learning outcomes. While collaboration is a key 21st-century skill, its effects may be indirect or contingent on other mediating factors such as instructional methods or task complexity [21].

Table 3. Results of Linear Regression Analysis

Y = 69.226 + 0.236X

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	69.226	15.044		4.602	.000
	Collaboration skills	.236	.746	.042	.317	.752

Regression analysis Table 3 further explored this relationship by modeling the influence of Collaboration skills on learning outcomes. The regression equation derived, Y = 69.226 + 0.236X, indicates that collaboration skills have a positive, albeit very weak, influence on learning outcomes. The unstandardized coefficient for collaboration skills (B = 0.236) suggests that for every unit increase in collaboration skills, the learning outcomes are predicted to increase by 0.236 units. However, the significance value (0.752) demonstrates that this influence is not statistically meaningful. These findings align with prior research suggesting that collaboration may enhance learning outcomes only when explicitly aligned with pedagogical strategies [22], [23].

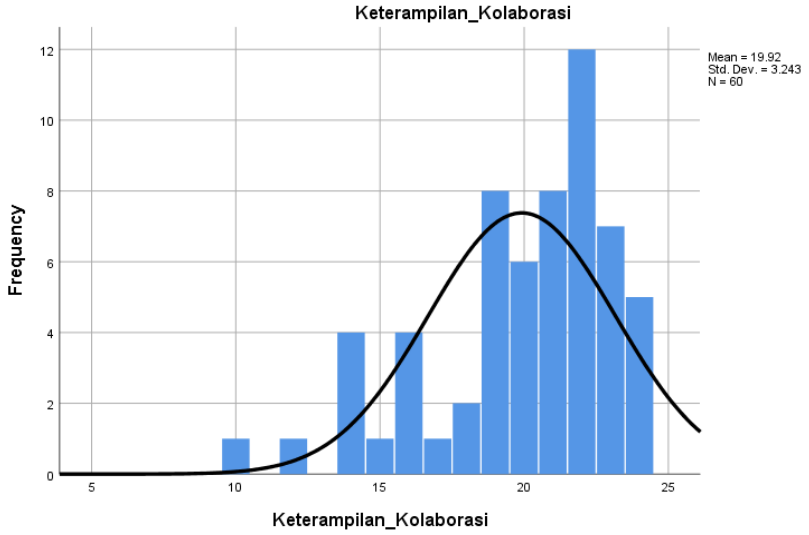

Figure 1. Collaboration Skill Level Histogram

Figure 1. Shows a graph that has a mean of 19.92, indicating that the average value or center of the data distribution is around that number. Meanwhile, the standard deviation shown is 3.2, it can be concluded that the data has a relatively low variation from the average value. This means that most of the data values tend to be within a relatively close distance from the mean.

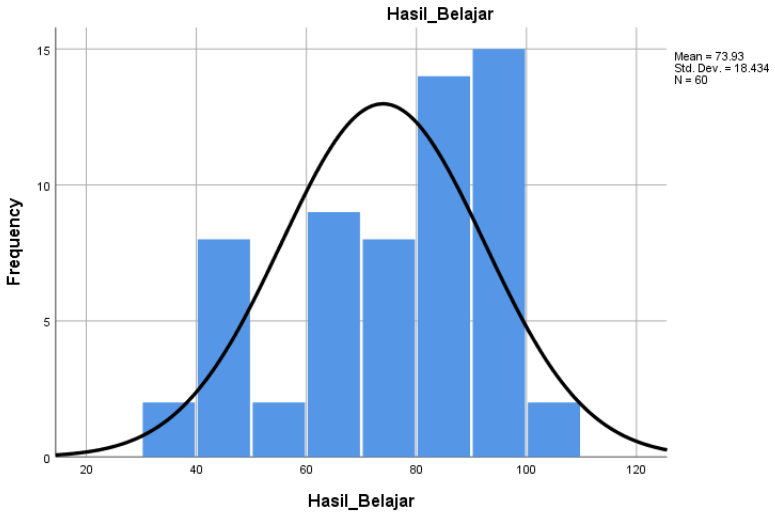

Figure 2. Histogram of Learning Results

A graph that has a mean of 73.93 shows that the average value or center of the data distribution on collaboration skills and learning outcomes is around that number. Apart from that, with a standard deviation of 18.4, it can be concluded that the data has quite large variations from the average value. This means that there is significant variation in participants' collaboration skills and learning outcomes [24].

While this study finds no direct relationship between collaboration skills and learning outcomes, it highlights the complexity of fostering both competencies in educational settings. Collaborative activities may contribute to broader skills such as critical thinking and problem-solving, which indirectly enhance learning outcomes [25]. However, the development of effective collaboration requires structured tasks, clear goals, and teacher facilitation to maximize its impact on learning [26]. Future research could explore the interaction between collaboration and other variables, such as teacher support or task design, to better understand how these skills translate into academic achievement.

4. CONCLUSION

Research on the influence of collaboration skills on learning outcomes makes important contributions to our understanding of the factors that influence student academic achievement and helps promote more effective educational practices. Figure 1. The Histogram of Collaboration Skill Levels shows that the data distribution tends to be symmetrical with most values gathered around the mean, while a small number of values are spread around the ends of the distribution. However, for further information about data distribution, such as the shape of the distribution and the possibility of outliers, it is necessary to carry out further analysis, such as histogram visualization or more in-depth statistical testing. Meanwhile, Figure 2. Histogram of Learning Results shows that participants have varied collaboration skills and learning outcomes, with some participants having higher skills and learning outcomes than others. Further analysis, such as histogram visualization or statistical analysis, may be required to further understand patterns or trends in the data. If the research does not find a significant relationship between collaboration skills and learning outcomes, this means that in the context of the research, collaboration skills do not have a significant influence on learning outcomes. This can be caused by various factors, such as research design, sample size, or other unmeasured variables.

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REFERENCES

[1] H. Irawan, “Membangun Generasi Berkualitas Melalui Pendidikan Kesadaran Dan Kepatuhan Hukum,” vol. 02, no. 01, pp. 27–36, 2023.

[2] N. Nur, S. Rohmah, S. Narimo, and C. Widyasari, "Strategi Penguatan Profil Pelajar Pancasila Dimensi Berkebhinekaan Global Di Sekolah Dasar," vol. 6, no. 3, pp. 1254–1269, 2023, doi: 10.31949/jee.v6i3.6124.
[3] R. Dwi Prayogi and R. Estetika, "Kecakapan Abad 21: Kompetensi Digital Pendidik Masa Depan," *J. Manaj. Pendidik.*, vol. 14, no. 2, pp. 144–151, 2019, doi: 10.15330/jpnu.5.1.40-46.
[4] Y. A. Respati, "Collaborative Learning Dalam Upaya Peningkatan Keaktifan," *J. Efisiensi - Kaji. Ilmu Adm.*, vol. XV, no. 2, pp. 15–23, 2018.
[5] S. Shirinnoush, N. B. Kejani, and ..., "A Case Study of Iranian Physics Education Students' Understanding of the Nature of Science," *... Learn. \& Mem.*, vol. 3, no. 12, pp. 51–60, 2021, doi: 10.22034/iepa.2021.271923.1250.
[6] Tim GTK DIKDAS, *Modul Belajar Mandiri Calon Guru Pegawai Pemerintah dengan Perjanjian Kerja (PPPK)*. Jakarta: Kementerian Pendidikan dan Kebudayaan, 2020.
[7] A. Budiningsih, *Belajar dan Pembelajaran*. Jakarta: Rineka Cipta, 2005.
[8] A. Djamaluddin and Wardana, *Belajar Dan Pembelajaran*. 2019.
[9] A. Haqqi, "Collaborative Learning: Model Pembelajaran Dalam Upaya Meningkatkan Literasi Informasi Mahasiswa Jurusan Ilmu Perpustakaan dan Informasi Melalui Belajar secara Kolaboratif," *Baitul al Ulum J. Ilmu Perpust. dan Inf.*, vol. 1, pp. 1–22, 2017.
[10] E. Syahputra, "Pembelajaran Abad 21 dan Penerapannya," *Prosiding Seminar Nasional SINASTEKMAPAN*, vol. I, no. 11. pp. 1276–1283, 2018. http://portaluniversitasquality.ac.id:590/sinastekmapan/index.php/sinastekmapan/article/view/219
[11] L. M. Greenstein, *Assessing 21st Century Skills: A Guide to Evaluating Mastery and Authentic Learning.* SAGE Publication, 2012. https://uk.sagepub.com/en-gb/eur/book/assessing-21st-century-skills#preview
[12] A. A. Gokhale, "Collaborative Learning Enhances Critical Thinking." Journal of Technology Education, 1995.
[13] N. F. Alias and R. A. Razak, "Malaysian Journal of Learning," *Malaysian J. Learn. Instr.*, vol. 20, no. 2, pp. 267–294, 2023.
[14] R. F. G. Mapile and M. R. C. Lapinid, "Online Collaborative Learning: Applicability in Comparison with Individual Learning and Face-to-face Collaborative Learning," *Math. Teaching-Research J.*, vol. 15, no. 2, pp. 21–44, 2023.
[15] R. S. Nadira, Zulyusri, Helendra, and Y. Atifah, "Analisis Kebutuhan LKPD Berbasis STEM (Science, Technology, Engineering, And Mathematics) pada Materi Sistem Pencernaan Kelas XI SMA," *J. Teach. Educ.*, vol. 4, no. 2, pp. 324–333, 2022.
[16] Kemendikbudristek, *Peraturan Menteri Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia Nomor 7 Tahun 2022 Tentang Standar Isi Pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, dan Jenjang Pendidikan Menengah*, (2022).
[17] Supriandi, "Pengembangan Keterampilan Kritis dan Kreatif melalui Pendidikan Berbasis Masalah: Pendekatan Praktis di Kelas (Studi Pada Salah Satu Sekolah Dasar di Sukabumi)," *J. Pendidik. West Sci.*, vol. 1, no. 05, pp. 271–282, 2023, doi: 10.58812/jpdws.v1i5.380.
[18] A. Rahmawati, N. Fadiawati, and C. Diawati, "Analisis keterampilan berkolaborasi siswa SMA pada pembelajaran berbasis Proyek daur ulang minyak jelantah," *J. Pendidik. dan Pembelajaran Kim.*, vol. 8, no. 2, pp. 1–15, 2019, https://jurnal.fkip.unila.ac.id/
[19] A. D. Nurhayati, L. P. Ayuningtyas, and Hikmah Yuliasari, "Peningkatan Collaboration Skills Dalam Kegiatan Praktikum Fisika Dasar Mahasiswa Program Studi Teknologi Pangan Unu Purwokerto," *EduMatSains J. Pendidikan, Mat. dan Sains*, vol. 5, no. 2, pp. 211–224, 2021, doi: 10.33541/edumatsains.v5i2.2237.
[20] H. R. Pratiwi, A. Juhanda, and S. Setiono, "Analysis Of Student Collaboration Skills Through Peer Assessment Of The Respiratory System Concept," *J. Biol. Educ.*, vol. 3, no. 2, p. 110, 2020, doi: 10.21043/jobe.v3i2.7898.
[21] D. W. Johnson, R. T. Johnson, and K. A. Smith, "Cooperative Learning: Improving University Instruction by Basing Practice on Validated Theory," *J. Excell. Coll. Teach.*, vol. 25, pp. 85–118, 2014, http://www.ncbi.nlm.nih.gov/pubmed/10180297
[22] R. Slavin, *Cooperative Learning: Teori, Riset Dan Praktik(Success For All! Cara Efektif Dan Menyenangkan Pacu Prestasi Seluruh Peserta Didik)*. Nusa Media, 2005. doi: https://onesearch.id/Record/IOS3239.slims-74385.
[23] B. Sintia Devi, B. Subali, and S. Artikel, "2021) Unnes Physics Education Journal Terakreditasi SINTA 3 Jurusan Fisika, Fakultas Matematika dan Ilmu Pengetahuan Alam," *Upej*, vol. 10, no. 2, p. 50229, 2021, http://journal.unnes.ac.id/sju/index.php/upej
[24] A. A.CHAEDAR and SENNY, *Pokoknya Menulis: Cara Baru Menulis dengan Metode Kolaborasi*. Bandung kiblat buku utama, 2005. http://kin.perpusnas.go.id/DisplayData.aspx?pId=39178&pRegionCode=TELUNI&pClientId=116

[25] J. Roschelle and S. Teasley, "The Construction of Shared Knowledge in Collabortive Problem Solving," *Comput. Support. Collab. Learn.*, no. January 1995, 1995, doi: 10.1007/978-3-642-85098-1.
[26] R. M. Gillies, "Cooperative learning: Review of research and practice," *Aust. J. Teach. Educ.*, vol. 41, no. 3, pp. 39–54, 2016, doi: 10.14221/ajte.2016v41n3.3.