



TEACHERS' AND STUDENTS' PERCEPTIONS OF THE IMPLEMENTATION OF COLLABORATIVE-BASED WRITING LEARNING IN VOCATIONAL SCHOOLS (SMK)

Mariani; Fathiaty Murtadho Zuriyati

Universitas Negeri Jakarta

Email: mariani@mhs.unj.ac.id

ABSTRACT

This study aims to explore teachers' and students' perceptions of the implementation of collaborative writing learning in Vocational High Schools (SMK). Using a qualitative approach, this study involved three teachers and eight students from various departments at SMK Nurul Hikmah, Bogor Regency. Data were collected through in-depth interviews to obtain their views and experiences regarding the implementation of the collaborative writing learning model. The results showed that most students felt significant benefits from this collaborative learning model in improving their writing skills. Collaboration between students in groups allowed them to share ideas and provide constructive feedback, which enriched their writing. However, some students faced challenges in terms of group coordination and uneven distribution of tasks. From the teachers' perspective, there were positive views towards the implementation of this learning model. Teachers acknowledged that collaborative learning was able to improve students' writing skills and help them better understand scientific report texts. However, challenges faced by teachers included limited time to provide in-depth guidance and limited resources to support effective collaborative learning. This study contributes to the development of collaborative learning models in vocational education, particularly in improving students' scientific report writing skills. These findings are expected to serve as a reference in optimizing collaboration-based learning in vocational schools and provide insights for the development of education policies in Indonesia.

Keywords: Teacher Perception, Student Perception, Writing Learning, Collaborative Learning, Vocational High School.

INTRODUCTION

The ability to write scientific reports in Vocational High Schools (SMK) is a crucial competency that students must master, especially in the context of vocational education that focuses on practical skills. In the era of Industry 4.0, where knowledge-based skills and scientific literacy are highly sought after, scientific writing skills are not only useful in formal education but also highly valued in the industrial world. In many cases, vocational high school students are faced with the challenge of producing scientific texts that meet the academic standards expected by industry. Although many efforts have been made to develop these writing skills, the challenges faced by students remain significant. One of the main problems contributing to low writing skills in vocational high school students is a lack of interest and motivation to write (Nam Chi, Thi Thuy, & Nhan Ai, 2024), which in turn affects the quality of the resulting fieldwork practice (PKL) reports.

Many students feel less interested in writing scientific reports because they do not see their relevance to the real world and often feel they lack sufficient skills to write well (BBGP DIY, 2023). In addition, students often have difficulty understanding good text structure, which is an essential skill in writing systematic and well-organized reports (Hasibuan, Saputri, Hasibuan, Wilda Lestari, & Muhammad Anggie Januarsyah Daulay, 2025). This limited knowledge often makes their writing incoherent and lacks depth in analyzing their experiences in the world of work (Devitasari, Telaumbanua, & Sari, 2023). Not only cognitive and psychological factors, but neurological disorders such as dysgraphia also affect students' motor skills in writing, so they have difficulty expressing their ideas in writing (John & Renumol, 2018).

In addition to individual issues, environmental factors also contribute significantly to students' poor writing skills. Limited writing experience outside of school and a lack of direct involvement in the workplace make it difficult for many students to write reports that adequately describe the results of their internship experiences. This lack of practical experience creates a gap in writing learning, which should connect theory with practice in the field. Therefore, a more collaborative learning approach is needed, where students can receive more intensive guidance from teachers and companies. With a collaborative learning model, students can receive direct feedback that helps them understand how to write more effective reports that meet industry standards (Sophomore Talle Vacalares et al., 2023).

Collaborative Learning (CL) is a student-centered instructional approach that enhances understanding and learning outcomes by encouraging students to work together towards shared goals. Key features of this method include mutual support, active participation, and shared responsibility (Rodríguez-Vizzuett, Pérez-Medina, Muñoz-Arteaga, Guerrero-García, & Álvarez-Rodríguez, 2015) (Laal & Laal, 2012). Mutual support is demonstrated as students help each other, share knowledge, and provide feedback to improve their understanding and skills. Active participation requires learners to engage actively in discussions and share their perspectives during learning, enriching the learning experience. Additionally, CL emphasizes the collective responsibility of students in achieving learning objectives, fostering team spirit and a sense of collective ownership. Zheng et al. (2021) also highlight the significant role of technology in facilitating CL. Technologies such as online platforms, virtual reality, and augmented reality further enhance interaction and engagement in the learning process. One of the main problems is students' poor writing skills, which are often influenced by ineffective learning models, lack of student motivation, and their inability to write systematic and structured scientific texts (Andini & Fadly, 2024), (Widiastuti, Putrayasa, Pujawan, & Widian, 2024).

Several studies have also shown that implementing more interactive learning models, such as collaborative learning, can overcome these barriers and improve the quality of students' writing (Bhandari, 2022). Collaborative learning provides opportunities for students to share knowledge, experiences, and feedback, which helps them solve problems collectively and improve their writing skills in a more dynamic and constructive context. Collaborative learning also improves students' social skills, which are highly relevant in the industrial world that demands effective team collaboration.

Although several studies have examined the application of collaborative learning in vocational education contexts, most have focused on improving writing skills in general without delving into teacher and student perceptions. For example, a study in China showed that a combination of collaborative learning (CL) and task-based learning



teaching (TBLT) was effective in improving analytical reading and writing skills of vocational students, but did not address teacher and student perceptions of the model's implementation (Chen, Jantharajit, & Thongpanit, 2024).

Furthermore, research in Indonesia found that vocational high school students had positive perceptions of the implementation of collaborative learning in writing classes. However, the study only involved students from one school and did not compare teacher and student perceptions. Other research also showed that although there was an increase in writing motivation through CL techniques, there was no significant difference in writing skills between the experimental and control groups (Sever & Akyol, 2022).

Although collaborative writing learning has been proven effective in improving students' writing skills, especially in the context of vocational education, its implementation in Vocational High Schools (SMK) still faces various challenges. The main problem that this study aims to address is the lack of understanding of how teachers and students perceive the implementation of this learning model, and how challenges faced in practice affect the effectiveness of writing learning. The existing research gap shows that although vocational high school students show positive perceptions of the collaborative model, few have examined teachers' perceptions and compared them with students' experiences, which are key elements in understanding the barriers and opportunities in implementing collaborative learning in vocational high schools. Therefore, this study aims to explore and compare teachers' and students' perceptions of collaborative writing learning, as well as identify challenges faced in its implementation. The purpose of this study is to explore and analyze teacher and student perceptions of the implementation of collaborative writing learning in vocational high schools (SMK), as well as to identify challenges faced in implementing this learning model. This study aims to fill the existing literature gap, which is limited to studies that only examine student perceptions, by adding the perspective of teachers as educational practitioners. In addition, this study also aims to provide practical recommendations for the development of more effective learning models in the context of vocational education, particularly in vocational high schools, with a focus on improving the quality of student writing skills and understanding the dynamics of collaborative learning.

This study will answer several main questions as follows: 1) How do teachers perceive the implementation of collaborative writing learning in vocational schools, especially regarding its effectiveness in improving students' writing skills? 2) How do students perceive the implementation of collaborative writing learning in vocational schools? 3) What are the challenges faced by teachers and students in implementing collaborative writing learning in vocational schools, and how do these challenges affect the quality of learning?

This research makes an important contribution to the development of collaborative learning theory in the context of vocational education, particularly in vocational high schools. The results will enrich the literature on the effectiveness of collaborative learning in improving students' writing skills by adding a new perspective through a comparison of teacher and student perceptions. Furthermore, this study will provide a deeper understanding of the challenges faced by both parties in implementing this learning model, an area that has not been widely explored in previous research.

Practically, the research findings will provide recommendations for developing a more effective writing learning model that is relevant to the needs of vocational education in vocational high schools. By understanding the dynamics between teachers and students in collaborative learning, this research can provide useful insights for improving

curriculum policies and teaching strategies that are more responsive to challenges faced in the classroom. Consequently, this research has the potential to encourage improvements in the quality of vocational education, making it more prepared to meet the demands of the workplace.

METHOD

This research employed a qualitative approach with a case study design at SMKS Nurul Hikmah in Bogor Regency, which implements collaborative writing learning. This method was chosen to explore teachers' and students' perceptions regarding the application of collaborative learning models in improving writing skills. Data triangulation was used to ensure the validity of the findings, combining semi-structured interviews, observations, and document analysis. This technique, in accordance with Huber and Miles' theory, allows for a deeper understanding of the dynamics occurring in the field and ensures that the research results encompass multiple, complementary perspectives.

The research participants consisted of three teachers and eight students from three departments at SMKS Nurul Hikmah Bogor Regency: Accounting, Computer Engineering, and Office Administration. Participants were selected through purposive sampling based on their experiences in collaborative writing learning. Data were collected through face-to-face interviews, which were recorded and analyzed thematically. Data analysis used the Miles and Huberman approach, which involved iterative coding of information and identification of key themes to ensure interconnectedness, with data triangulation to strengthen the validity of the findings.

RESULTS AND DISCUSSION

This section presents the findings and discussion of data collected from semi-structured interviews with three Indonesian language teachers at Vocational High Schools (SMK) who are members of the Subject Teachers' Discussion Forum (MGMP) from SMK in Bogor Regency and students from three majors at SMKS Nurul Hikmah Bogor Regency in Accounting, Computer Engineering, and Office Administration. The analyzed data serve to describe teachers' and students' perceptions of collaborative writing learning.

After conducting research and analyzing the data obtained, the researcher discovered several facts that can be concluded as research findings. The results of transcribing and analyzing the data obtained revealed several teacher and student perceptions regarding collaborative writing learning. The results of transcribing and analyzing the data obtained revealed several teacher perceptions regarding collaborative writing learning. Furthermore, to clarify matters, the following are the results of the transcript analysis of the data obtained.

1. Teachers' Understanding of Collaborative-Based Writing Learning

The first teacher (with 10 years of experience teaching Indonesian) explained that the collaborative writing model is an effective approach in language learning (Mulyadi, Riyanto, & Kristanto, 2024). She has previously implemented this model in her classes, where students are asked to work together in groups to produce written texts, such as essays or articles, through discussion and mutual feedback. She believes this collaborative writing model is very suitable for use in writing materials. Through this collaboration, students can improve their writing skills, as well as their listening, speaking, and reading skills (Pratiwi, 2020). The strength of this model is that students



become more active and creative, and it builds self-confidence and a sense of responsibility for the tasks they work on together.

"So, this model encourages students to work together to complete writing assignments. They discuss ideas with each other, then combine their perspectives into a piece of writing."(GB1.PMK)

The second teacher (with 5 years of experience teaching Indonesian) explained that the collaborative writing learning model focuses on teamwork, where students are given the opportunity to share their ideas in groups, as well as helping them understand group dynamics and develop listening skills and a sense of responsibility when completing assignments. She has previously implemented this model in her class by asking students to write observational report texts, which are carried out through teamwork. This collaborative writing learning model is very appropriate for the Merdeka curriculum, where students must work together to complete writing assignments.

"So, this model encourages students to work together to complete writing assignments. They discuss ideas with each other, then combine their views into a piece of writing." (GB2.PMK)

The third teacher (with 3 years of experience teaching Indonesian) explained that the collaborative writing learning model is a model that uses teamwork in the teaching and learning process to obtain assessments of attitudes, knowledge, and skills. She has also implemented this model in her class, where she asked students to write procedural texts on how to make something (for example, food or drinks) through the Teaching Factory (TEFA) program that has been implemented at her school. The students then created a portfolio as a guide for the teacher when assessing. This collaborative writing learning model is suitable for Indonesian classes because it focuses on students with the teacher acting as a facilitator. This model is considered a better way to teach students according to the K-13 curriculum, although students still need more guidance from the teacher in some stages. According to her, this model is very suitable for implementation in Vocational High Schools as an alternative to develop students' writing skills.

"I think the collaborative writing learning model is excellent, especially because it emphasizes teamwork in the teaching and learning process. In this model, students work together to complete writing assignments, and they are assessed not only on their writing knowledge and skills, but also on their attitudes and responsibilities within the group." (GB3.PMK)

Based on interviews with the three teachers, they all stated that the collaborative writing learning model prioritizes cooperation between students. The first and second teachers explained that in this model, students are encouraged to work together in groups, discussing and sharing ideas to produce richer and more in-depth writing. They mentioned that this collaboration makes students more active in thinking and developing their ideas. Meanwhile, the third teacher added that in addition to improving writing skills, this model also teaches students about attitudes and responsibilities in working together. For example, the third teacher implemented this model by having students write procedural texts, such as how to make food or drinks, in the Teaching Factory (TEFA) program, where students work in groups and produce portfolios that are used as assessment materials. Overall, all three teachers believe that this model not only helps students improve their writing skills but also teaches the values of teamwork and responsibility that are very useful for their development.

Therefore, it can be concluded that teachers generally share a common understanding of the collaborative writing learning model, namely as an approach that involves students working together to produce writing and providing feedback to each other. Although there are differences in how they express it, all three agree that collaboration between students is a key element that distinguishes this model from traditional writing learning models that focus more on individual work.

2. Students' Understanding of Collaborative Writing Learning

The following are findings from students from three departments, accounting, network engineering, and office engineering, regarding the collaborative writing learning model. The findings are as follows:

So, in my opinion, the collaborative writing model involves working on writing assignments together with friends. So, we don't just write individually, but we discuss things first, come up with ideas together, and then help each other put the writing together. That's great because we can give each other feedback, which helps improve our writing. Besides writing, we also learn to collaborate with our friends, which improves communication. (SIMPLB, PMKS)

"The essence of collaborative writing is that we work on writing assignments together with our group mates. This way, we can exchange ideas and help each other write. I think this can be applied in the Computer and Network Engineering (TKJ) department as well, for example, to create documentation or technical reports. The teamwork is really felt, so writing doesn't feel confusing, because there's someone helping." (S2TKJ.PMKS)

"As far as I understand, collaborative writing is about writing together with friends, not just by ourselves. So, we can discuss with friends, help each other to make better reports or assignments. For example, when we're making a financial report, we write it in sections, then we combine them into one. So, besides learning to write, we also learn to collaborate and ensure our reports are correct." (S3AK.PMKS)

The responses from the three students indicated a good understanding of the benefits of a collaborative writing learning model. This model not only helps them improve their writing skills but also develops teamwork, communication, and collective problem-solving skills. They view collaboration as a fun and productive way to complete assignments, enabling them to achieve better results and prepare themselves for the challenges of the workplace.

On the other hand, while students found this model beneficial, they also acknowledged that each group faced challenges in terms of task allocation and communication. However, they realized that with good cooperation, these tasks could be completed more effectively.

3. Implementation of Collaboration-Based Writing Learning Model

Teachers carry out lesson planning to ensure systematic learning and achieve learning objectives. The various writing lesson planning activities teachers undertake are no different from those carried out in other subjects. Teacher 1 explained:



"Before starting, I always outline clear steps to ensure all students understand their roles in the group. I divide students into small groups and then assign them a writing assignment related to the topic being studied." (BG1.IMK)

The learning planning carried out by teachers is to create learning tools in the form of teaching modules. who adopted from Ministry of Education and Culture signed by the principal. Teacher 2 conveyed other plans, namely:

"When planning writing lessons, especially with a collaborative model, I usually create teaching modules tailored to the learning outcomes and characteristics of vocational high school students. I develop these modules by referring to teaching materials from the Ministry of Education and Culture, but I further adjust them so that the context is more relevant to classroom practice. I also insert collaborative activities such as group discussions, joint assignments, and peer-reviews between students. Once completed, I submit the modules for the principal's signature as a form of legality and administrative compliance. My goal in designing this way is so that scientific writing activities are not just burdensome individual tasks, but can become a more active and enjoyable learning experience through collaboration between students." (GB2.IMK)

Teachers plan by preparing the material to be delivered. They can explore material beyond textbooks. Teacher 3 also shared other planning ideas:

"In lesson planning, I prepare the material to be delivered by combining materials from various sources, not just textbooks. This aims to ensure the material provided is more varied and relevant to students' needs." (GB3.IMK)

Based on the interview results above, it was found that teachers can carry out various learning plans in implementing learning, including: make device teaching modules, preparing materials, studying learning outcomes, and determining the materials needed to conduct student assessments at the start of learning.

Therefore, it can be concluded that various learning plans in the implementation of the collaborative writing learning model were carried out by each teacher according to the context and subjects they taught. The first teacher designed the plan by emphasizing a clear division of tasks among group members, as well as facilitating brainstorming sessions to ensure effective discussion of ideas before starting to write. The second teacher planned writing assignments by compiling teaching modules tailored to the learning outcomes and characteristics of vocational high school students and inserting collaborative activities such as group discussions, joint assignments, and peer-review between students with the aim of making scientific writing activities not only a burdensome individual task, but can become a more active and enjoyable learning experience through collaboration between students. The third teacher carried out planning in the form of preparing material to be delivered by exploring material not only from books with the aim of making the teaching material provided more varied and relevant to students' needs.

Overall, the three teachers demonstrated that thorough planning and clear assignments are crucial for implementing collaborative writing instruction. Each teacher also ensured that group discussions and feedback were integrated into the learning process, ensuring optimal achievement of learning objectives. Systematic lesson planning tailored to the subject matter context is key to the successful implementation of this model.

4. Challenges and Obstacles in Implementing Collaborative-Based Writing Learning Models

Obstacles encountered by researchers based on interviews and internal field observations that cause students' difficulties in improving their ability to write scientific reports include low interest and motivation, limited cognitive and writing skills, and limited time. Many students lack an understanding of the importance of writing skills and perceive the task of writing scientific reports as a burden, so without strong motivation, they tend not to put in maximum effort. In addition, limitations in cognitive abilities such as difficulty organizing ideas and connecting arguments logically also hinder their ability to write coherent and structured texts. External factors that cause students' difficulties in improving their ability to write scientific reports include a lack of practical experience and understanding of the world of work, a lack of guidance and resources from teachers, and ineffective learning models. Vocational high school students often have difficulty writing internship reports due to a lack of experience in documenting their work experience, as well as a lack of guidance from the company and relevant data. Furthermore, limited time and resources available to teachers make it difficult for them to provide adequate attention to each student. A lack of constructive feedback also hinders the development of students' writing skills. On the other hand, learning models that are not based on a collaborative approach or direct practice hinder the mastery of writing skills, so that students do not get adequate experience to write scientific reports that are relevant to the industrial world.

Furthermore, limited facilities and infrastructure in many vocational schools are also external factors that hinder students' writing skills. Not all students have adequate access to technology or facilities that can support their writing process, such as computers or word processing software. This limits their efficiency in composing well-structured scientific reports. These limitations also contribute to students' difficulties in completing report writing assignments that require technical skills and deeper understanding.

CONCLUSION

This study demonstrates that collaborative-based writing instruction has a positive impact on improving students' writing skills. Both teachers and students acknowledge that this approach enhances student engagement in the writing process, enriches the learning experience, and strengthens their understanding of writing structure and effective techniques. Collaboration among students allows them to share ideas and provide constructive feedback, helping them overcome difficulties in composing scientific reports. This illustrates that collaborative learning creates a dynamic learning environment, where students are more actively involved and gain a deeper understanding of the material being studied.

However, there are several challenges in implementing this collaborative-based learning, particularly related to time and resource constraints that can hinder its effectiveness. The limited time available for intensive collaboration and the lack of supporting facilities for collaborative learning are significant obstacles. Nevertheless, both teachers and students agree that collaborative-based learning offers greater opportunities for students to improve their writing skills. This is highly relevant to the needs of the industry, which demands effective written communication and collaborative skills.



ACKNOWLEDGMENT

The author would like to express his sincere gratitude to the lecturers and academic advisors in the Graduate Program of Applied Linguistics, Jakarta State University, for their guidance, constructive input, and ongoing support throughout the completion of this study. Special thanks are also extended to colleagues and peers who provided insightful discussions and suggestions that enriched the quality of this literature review.

Finally, the authors would like to thank the authors of the various national and international studies reviewed in this paper, whose scientific works have provided valuable references and conceptual foundations for this study.

BIBLIOGRAPHY

- Andini, & Fadly, A. (2024). Meningkatkan Keterampilan Menulis pada Pembelajaran Bahasa Indonesia Kelas VIII.2 SMP Muhammadiyah 22 Pamulang melalui Pendekatan Pembelajaran Berbasis Proyek. *Seminar Nasional Dan Publikasi Ilmiah 2024 FIP UMJ*, 1835–1844.
- Bhandari, B. L. (2022). Effectiveness of Collaborative Learning for Improving Learners' Writing Proficiency in English Classrooms. *Tribhuvan University Journal*, 36(01), 199–210. <https://doi.org/10.3126/tuj.v36i01.43624>
- Chen, X., Jantharajit, N., & Thongpanit, P. (2024). Enhancing Analytical Reading and Writing Skills in Vocational Education: The Role of Collaborative and Task-Based Learning. *Journal of Education and Learning*, 14(2), 150. <https://doi.org/10.5539/jel.v14n2p150>
- Devitasari, L., Telaumbanua, S., & Sari, S. (2023). Kesulitan Siswa SMA Dalam Menyusun Artikel Ilmiah. *Jurnal Educatio*, 9(4), 2140–2148. <https://doi.org/10.31949/educatio.v9i4.5946>
- Hasibuan, S. F., Saputri, D., Hasibuan, L. A., Wilda Lestari, & Muhammad Anggie Januarsyah Daulay. (2025). Analisis Kesulitan Siswa dalam Menulis Teks Laporan Pendidikan Bahasa Indonesia : Studi Deskriptif. *Jurnal Pendidikan Tambusai*, 9(1), 9160–9165.
- John, S., & Renumol, V. G. (2018). Impact of fine motor skill development app on handwriting performance in children with dysgraphia: A pilot study. *ACM International Conference Proceeding Series*, 11–16. <https://doi.org/10.1145/3284497.3284502>
- Laal, M., & Laal, M. (2012). Collaborative learning: What is it? *Procedia - Social and Behavioral Sciences*, 31(2011), 491–495. <https://doi.org/10.1016/j.sbspro.2011.12.092>
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. sage.
- Mulyadi, E., Riyanto, Y., & Kristanto, A. (2024). The Influence Of Collaborative Blended Learning Through Written Small Group Discussion Model On High School Students' English Writing Skills. *The Influence Of Collaborative Blended Learning Through Written Small Group Discussion Model On High School Students' English Writing Skills*, 30(5), 5895–5904. <https://doi.org/10.53555/kuey.v30i5.3051>
- Nam Chi, N. T., Thi Thuy, T., & Nhan Ai, N. (2024). Exploring Factors Influencing Students' Challenges in Academic Writing: A Qualitative Analysis Based on Student Perspectives. *International Journal of Advanced Multidisciplinary*

- Research and Studies*, 4(3), 32–37.
<https://doi.org/10.62225/2583049x.2024.4.3.2737>
- Panitz, T. (1996). A Definition of Collaborative vs Cooperative Learning. *Deliberations*, London Metropolitan University, UK. Retrieved Nov. 5, 2011, from http://www.londonmet.ac.uk/deliberations/collaborative_learning/panitz-paper.cfm
- Pratiwi, V. U. (2020). Improving students' writing skills through collaborative learning: A case study of senior high school veteran 1 of sukoharjo. *Theory and Practice in Language Studies*, 10(5), 527–535. <https://doi.org/10.17507/tpls.1005.06>
- Rodríguez-Vizzuett, L., Pérez-Medina, J. L., Muñoz-Arteaga, J., Guerrero-García, J., & Álvarez-Rodríguez, F. J. (2015). Towards the definition of a framework for the management of interactive collaborative learning applications for preschoolers. *ACM International Conference Proceeding Series*, 07-09-September-2015, 2–9. <https://doi.org/10.1145/2829875.2829878>
- Sever, E., & Akyol, H. (2022). The Impact of Collaborative Learning Techniques on Written Expression, Self-Regulation and Writing Motivation*. *International Electronic Journal of Elementary Education*, 14(5), 587–603. <https://doi.org/10.26822/iejee.2022.265>
- Sophomore Talle Vacalares, Elmar Clarin, Reyniel Lapid, Michael Malaki, Vensar Plaza, & Madjid Barcena. (2023). Factors affecting the writing skills of the education students: A descriptive study. *World Journal of Advanced Research and Reviews*, 18(2), 1192–1201. <https://doi.org/10.30574/wjarr.2023.18.2.0931>
- Widiastuti, N. P. K., Putrayasa, I. B., Pujawan, I. G. N., & Widiana, I. W. (2024). Linguistic Intelligence: Improving Writing Ability through Mind Mapping of Project Based Learning. *International Journal of Language Education*, 8(3), 472–486. <https://doi.org/10.26858/ijole.v8i3.66491>
- Zheng, Z., Ren, W., Cao, X., Wang, T., & Jia, X. (2021). Ultra-high-definition image hdr reconstruction via collaborative bilateral learning (pp. 4449–4458). *Proceedings of the IEEE/CVF international conference on computer vision*. <https://doi.org/10.1109/ICCV48922.2021.00441>