Smart Data Analysis with SmartPLS: Training for Students at the University of West Sulawesi

Badirun Basir[1*], Abd. Latif Dollah[1]

[1] Management Study Program, University of West Sulawesi, Majene, Indonesia.

Abstract: Students' ability to perform quantitative data analysis, particularly using Partial Least Squares Structural Equation Modeling (PLS-SEM) based on SmartPLS 3.2.9, is still low and has an impact on the quality of student research. This community service activity aims to improve understanding of the basic concepts of PLS-SEM, train technical skills in operating SmartPLS 3.2.9, and strengthen students' abilities in processing and interpreting research data. The training lasted for two days, from September 13 to 14, 2025, and was attended by 79 students from the Management and Accounting Study Programs. The training method was participatory, involving material delivery, practical demonstrations, and case study-based exercises. The evaluation results showed a significant increase in participants' mastery, with the average pre-test score of 42% increasing to 86% on the post-test. This training proved effective in improving students' competence in research data analysis, while also strengthening the research culture at the University of West Sulawesi.

Keywords: SmartPLS, Quantitative Data Analysis, Students' Training, Structural Equation Modeling (SEM), Data Processing.

Introduction

Students' understanding of quantitative research data analysis based on Partial Least Square Structural Equation Modeling (PLS-SEM) is increasingly important in management, business, accounting, and other social science research. Among various approaches, PLS-SEM stands out because it is flexible for complex models, relatively small sample sizes, and data that does not have to be normally distributed, making it suitable for student research (Hair, Jr. et al., 2022). In addition, SmartPLS 3.2.9 software is widely used in various scientific studies due to its intuitive interface and ability to support advanced analysis, making it a relevant research tool (Basir et al., 2024).

Studies in the context of higher education show that PLS-SEM is increasingly popular for data analysis in management, business, accounting, and other social science research. For example, recent studies show an increase in the use of PLS-SEM, particularly in social science research (Magno et al., 2024). However, on the other hand, several practice reports reveal that students often find it difficult to translate statistical theory into

technical analysis steps, including the correct use of SmartPLS 3.2.9 (Edwar et al., 2024; Putu Gede Subhaktiyasa, 2024; Purwanto & Rusmining, 2024).
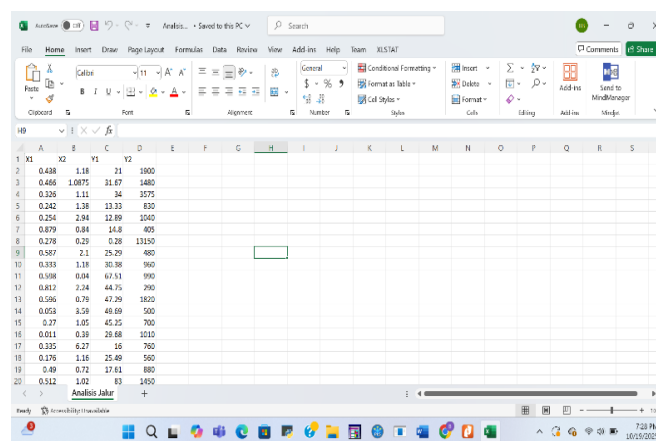

Figure 1. Data set (Data excel)

Similar conditions were found on the campus of the University of West Sulawesi, indicating that competency gaps still exist, with many students

experiencing difficulties in entering data, developing measurement and structural models, and interpreting output. This has the potential to reduce the quality of scientific work and slow down the completion of final projects.
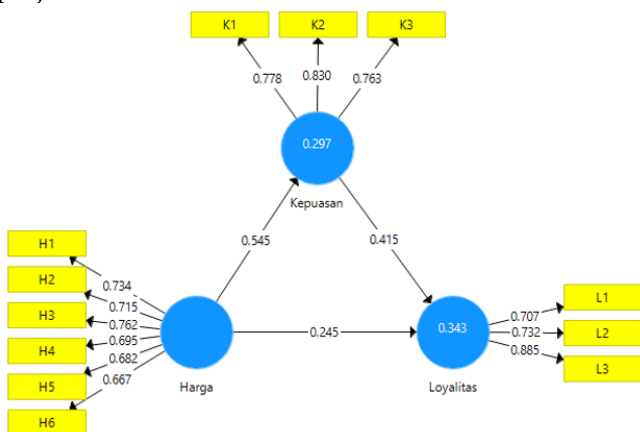

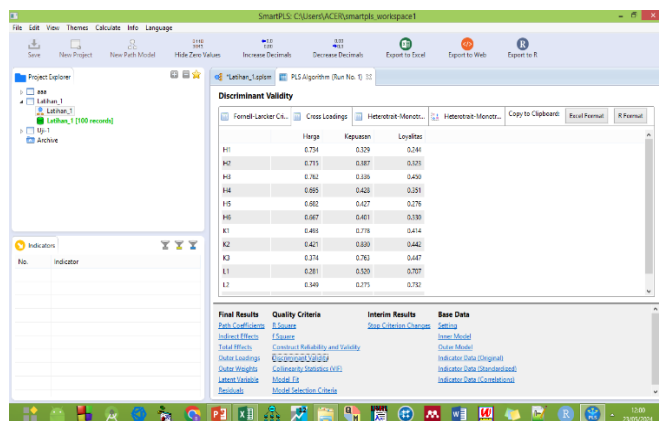**Figure 2.** Model Intervening with SmartPLS

Figure 3. SmartPLS Bootstraping Menu

Final projects are delayed due to the declining quality of scientific work when students lack methodological skills and writing abilities, when data processing training support is inadequate, or when access to sources and references is limited (Escalona & Eslit, 2025; Karunaratne et al., 2019; A Matin & A W Khan, 2017). Empirical literature identifies technical and process components that directly reduce manuscript quality. Students often experience difficulties in research design, data analysis, and interpretation of results, which reduces the quality of the methodology and discussion of the manuscript (Bai, 2025).

The discussion of scientific manuscripts in this community service activity is designed as practical training based on case studies to meet the need for students to master the methods and software that are urgently needed in management, business, and other social science research. This is in line with the latest literature recommendations that emphasize the importance of "hands-on training" using the PLS-SEM application (Hair et al., 2014; Sarstedt et al., 2023).

Method

The community service activities were carried out intensively over two days, from September 13 to 14, 2025, at the Faculty of Economics, University of West Sulawesi. The activities were designed with a participatory approach to ensure that participants not only understood the basic concepts of Partial Least Square Structural Equation Modeling (PLS-SEM), but were also able to apply them directly in scientific research. According to Hair, Jr. et al., (2022), a practice-based learning approach is the most effective strategy for improving the competence of PLS-SEM users, especially for beginners who still need a gradual understanding of reliability, validity, and model structure. Therefore, the initial session of the activity focused on delivering the basic theory of SEM and PLS-SEM based on the SmartPLS 3.2.9 application, including measurement principles and structural models.

In the next stage, the training was directed at technical demonstrations of the use of SmartPLS 3.2.9 software. The presenters demonstrated data processing steps, such as dataset input, measurement model construction, outer model evaluation, and inner model analysis. This demonstrative approach is in line with the latest recommendations (Sarstedt et al., 2023), which emphasize that PLS-SEM learning must be supplemented with software demonstrations to minimize procedural errors commonly encountered by students. Furthermore, participants were given the opportunity to practice independently through case studies, which have been proven to improve technical understanding retention (Agustina & Sugiarti, 2024).

The final stage of the activity includes evaluation through pre-tests and post-tests to measure improvements in mastery of data processing training material, as well as follow-up assistance through the "SmartPLS West Sulawesi University" community. This sustainable mentoring model follows the best practices of modern statistical training, which, according to (Magno et al., 2024), can strengthen the sustainability of students' competencies in PLS-SEM-based data analysis. Both online and offline communities allow participants to receive technical support after training, including data analysis consultations, common errors in SmartPLS 3.2.9, and interpretation of research outputs. Thus, this training method is not only effective in the short term but also supports the sustainable development of student capacity.

Result and Discussion

The implementation of smart research data analysis training using SmartPLS 3.2.9 was attended by 79 students from the University of West Sulawesi's Management and Accounting Study Programs, with a high level of participation during the two-day event. All sessions, ranging from theoretical introductions and software demonstrations to case study-based independent exercises, proceeded according to plan. Documentation results showed active participant involvement in the data analysis process, reflecting the effectiveness of the practical learning approach. This type of training model is considered important, as recent research shows that experiential learning improves students' retention of statistical knowledge and data processing skills (Agustina & Sugiarti, 2024). This is particularly relevant in the context of quantitative learning, which requires the integration of concepts and practice.

In addition, the training modules and independent practice sessions helped participants understand the steps involved in analysis, from creating measurement models to interpreting the results of outer models and inner models. These results are also supported by (Magno et al., 2024), who state that the success of statistical training is greatly influenced by the clarity of the learning structure and the quality of the demonstrative material.

The outputs of the activity showed excellent results, including the development of training modules, the formation of the "SmartPLS 3.2.9 University of West Sulawesi" consultation community, and the completion of the training impact evaluation. Constraints that arose during the training, such as difficulties in installing the software, variations in participants' statistical abilities, and time constraints for advanced material, were successfully overcome through the provision of portable software and intensive assistance from the implementation team.

Figure 4. First day of data processing training.

The learning evaluation results show a significant improvement in student competence. The average pre-test score of 42% increased to 86% on the post-test, as shown in Figure 1, indicating that participants were able to understand the PLS-SEM analysis process more comprehensively after the training. This improvement is in line with the findings (Hair, Jr. et al., 2022) which confirm that hands-on and case study-based PLS-SEM learning is the most effective method for both beginners and intermediate users.
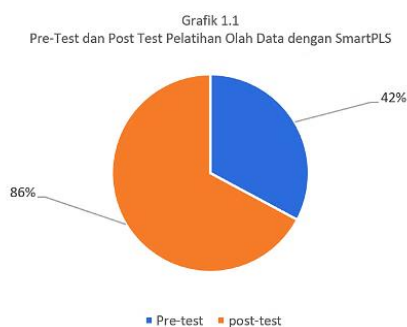

Figure 6. Second Day of Data Processing Training

Ongoing mentoring through the community has proven to be important, as recent literature indicates that sustained support after training is a key factor in maintaining students' data analysis skills (Aslam et al., 2025). Overall, this activity has had a tangible impact on improving students' data processing capabilities and has the potential to strengthen the research culture in higher education.

Conclusion

Smart data processing training using SmartPLS 3.2.9 software successfully improved students' competence in understanding and applying PLS-SEM-based quantitative data analysis, as indicated by the improvement in pre-test to post-test scores, which reflects the effectiveness of the practice-based learning approach. These results are in line with the findings (Hair, Jr. et al., 2022), which confirm that hands-on training is the most effective strategy for novice users to comprehensively understand measurement and structural models. Additionally, the establishment of the "SmartPLS University of West Sulawesi" learning community provides ongoing support for students, in

Figure 5. Pre-Test and Post-Test Data Processing Results with SmartPLS.

line with the recommendations of (Monceaux, 2015) which emphasize the importance of post-training support in maintaining analytical skill retention. The impact of this activity is also reflected in the strengthening of the students' research culture and the improvement of their readiness in compiling data-based scientific papers. In the future, training development can aim at advanced material such as multi-group analysis and predictive modeling, as suggested in a recent study that highlights the need to improve quantitative analysis literacy in higher education (Nova Yanti Maleha, Mustikawati, 2025).

References

A Matin, M., & A W Khan, M. (2017). Common Problems Faced by Postgraduate Students During their Thesis Work in Bangladesh. *Bangladesh Journal of Medical Education*, 8(1), 22–27.

Agustina, P. A., & Sugiarti, H. (2024). Structural Equation Modeling for the Influence of Effectiveness, Lifestyle, and Income Level on the Use of E-Wallet Services by Urban Workers'. *Jurnal Ilmiah Sains*, 24(April), 70–79. https://doi.org/10.35799/jis.v24i1.54458

Aslam, S., Bin, S. Y., & Zhao, C. Z. (2025). *Impact of Student-Centered Teaching Approaches on Physical Skill Development in Non-Athlete University Students at Henan Province Universities*. 1–32.

Bai, Q. (2025). Management and Quality Assurance of Undergraduate Theses in Private Universities: Strategies and Implications. *Asia Pacific Economic and Management Review*, 1(2), 1–9. https://doi.org/10.62177/apemr.v1i2.267

Basir, B., Fahrudin, A., Ladjin, N., Hendratri, B. G., & Data, A. (2024). *Pelatihan Penggunaan Aplikasi Smart PLS dalam Menganalisis Data Penelitian bagi Dosen di Perguruan Tinggi*. 5(5), 9125–9130.

Edwar, R. C., Landjang, X. I. S., Mangopo, Y. R., & Damanik, L. G. S. (2024). Peningkatan Kompetensi Penelitian Kuantitatif Mahasiswa Manajemen melalui Pelatihan Partial Least Squares (PLS) dalam Penyusunan Skripsi. *Kawanad : Jurnal Pengabdian Kepada Masyarakat*, 3(2), 119–126. https://doi.org/10.56347/kjpkm.v3i2.218

Escalona, S. L., & Eslit, E. R. (2025). *From Struggle to Success: Exploring Effective Interventions for Undergraduate Thesis Writing*. 0–14.

https://doi.org/10.20944/preprints202506.0404.v1

Hair, Jr., J. F., M. Hult, G. T., M. Ringle, C., Sarstedt, & Marko. (2022). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) [3 ed]. In *Sage Publishing* (Vol. 3, Issue 1).

Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review*, 26(2), 106–121. https://doi.org/10.1108/EBR-10-2013-0128

Karunaratne, T., Hansson, H., & Aghaee, N. (2019). The effect of multiple change processes on quality and completion rate of theses: a longitudinal study. *Assessment in Education: Principles, Policy and Practice*, 26(2), 184–201. https://doi.org/10.1080/0969594X.2017.1303442

Magno, F., Cassia, F., & Ringle, C. M. (2024). A brief review of partial least squares structural equation modeling (PLS-SEM) use in quality management studies. *TQM Journal*, 36(5), 1242–1251. https://doi.org/10.1108/TQM-06-2022-0197

Monceaux, A. (2015). Structured Mentorship : Guiding Students through the Academic Writing and Research Processes. *Malaysian Journal of ELT Research*, 11(1), 1–16.

Nova Yanti Maleha, Mustikawati, M. N. A. T. (2025). *Optimalisasi Penelitian Mahasiswa Tugas Akhir Melalui Pelatihan Analisis Data Berbasis SmartPLS Optimizing Undergraduate Thesis Research through SmartPLS- Based Data Analysis Training metode statistik dasar seperti regresi linier sederhana atau uji t , me*. 10(2), 346–355.

Purwanto, A., & Rusmining. (2024). Pls-Sem Analysis of Social Environment'S Impact on Mathematics Digital Literacy. *Barekeng*, 18(3), 1527–1538. https://doi.org/10.30598/barekengvol18iss3pp1527-1538

Putu Gede Subhaktiyasa. (2024). PLS-SEM for Multivariate Analysis: A Practical Guide to Educational Research using SmartPLS. *EduLine: Journal of Education and Learning Innovation*, 4(3), 353–365.

https://doi.org/10.35877/454ri.eduline2861

Sarstedt, M., Hair, J. F., & Ringle, C. M. (2023). "PLS-SEM: indeed a silver bullet"–retrospective observations and recent advances. *Journal of Marketing Theory and Practice*, 31(3), 261–275. https://doi.org/10.1080/10696679.2022.2056488