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FOSTERING CRITICAL THINKING IN BIVARIATE DATA ANALYSIS INSTRUCTION FOR SENIOR HIGH SCHOOL TEACHERS IN NGANJUK REGENCY

Rabiatul Adawiyah[*], **Gangga Anuraga, Arief Triatmaja Permana Sadewa**

Statistika, Fakultas Sains dan Teknologi, Universitas PGRI Adi Buana Surabaya, Surabaya, Indonesia
Correspondence: rabiatuladawiyah@unipasby.ac.id

ABSTRACT

Statistics education is a vital component of the learning process, particularly in fostering logical, analytical, and quantitative thinking skills. Within this context, critical thinking plays a crucial role. Critical thinking is defined as the ability to objectively analyze information, evaluate arguments, identify assumptions, and draw logical conclusions. The development of critical thinking skills in statistics education aligns closely with the demands of the 21st century. This seminar aims to positively impact educators and students, specifically high school teachers in Nganjuk Regency, through the subtopic "Critical Thinking in Bivariate Data Analysis Learning." This theme was selected due to its high relevance to contemporary needs and its potential to provide extensive insights for teachers regarding the importance of critical thinking in statistics education, especially bivariate data analysis. The seminar's objectives extend beyond providing technical knowledge, aiming also to cultivate a critical mindset among teachers. The seminar activities include preparatory stages, theoretical and practical approaches, case studies, and interactive sessions such as question-and-answer and feedback discussions designed to achieve the seminar's primary goals. Throughout these phases, the seminar enhances teachers' understanding of the importance of raising awareness and developing students' critical thinking skills in statistics education. Consequently, teachers can more effectively foster students' critical thinking abilities through statistics learning.

Keywords: Critical Thinking; Bivariate; Learning; Community Service; High School

A. BACKGROUND

Statistics education is a crucial component of the educational system, especially in fostering logical, analytical, and quantitative thinking skills (Susilawati et al., n.d.). Statistics not only involves the collection, presentation, and analysis of data but also requires students to interpret data and make decisions based on the information obtained (Prasetyo et al., 2025). In this context, critical thinking skills become highly important (Rantau et al., 2025). Critical thinking is defined as the ability to objectively analyze information, evaluate arguments, identify assumptions, and draw logical conclusions (Iftirosy et al., n.d.). Within statistics, students often face complex data, various types of numerical and visual representations, and problems that require evidence-based solutions. Without critical thinking skills, students tend merely to memorize formulas and procedures without understanding their meaning and relevance in real life (Rianti, 2018).

The importance of developing critical thinking skills in statistics education also aligns with the demands of the 21st century (Mongkau et al., 2024). According to these literatures, higher-order thinking skills are essential to confront increasingly complex information alongside technological advancements. Therefore, statistics learning strategies must be designed to encourage students to develop their critical thinking abilities, whether through contextual problem solving, group discussions, or interpreting real-world data (Mareti et al., 2021).

Teachers who engage in critical thinking can deepen their understanding of concepts and convey them more clearly and meaningfully to students (Kusuma et al., 2024). Hence, this seminar aims to make a tangible contribution to high school teachers in Nganjuk Regency. It is intended not only to deliver technical knowledge but also to instill a critical mindset among teachers.

Understanding critical thinking in statistics learning assists teachers in various ways. First, it facilitates a comprehensive understanding of concepts (Faizah et al., 2024), considering that statistics is not just about calculating numbers but about understanding data, interpreting results, and drawing logical conclusions (Wahab, 2022). Secondly, it helps avoid reasoning errors, as statistics is prone to data misinterpretation, such as overgeneralization or misleading graphical use (Putri 2023). Through critical thinking, teachers can be more cautious in analyzing data and instruct students to do the same (Niami, 2022). Finally, it supports decision-making, where many decisions within statistics learning—such as selecting

appropriate analyses or assessing data validity—must be made. Critical-thinking teachers can make more rational and targeted decisions (Shamboul, 2022).

B. METHOD

Recruitment of seminar participants to support community service activities conducted by the lecturers of the Statistics Study Program, Faculty of Science and Technology, at Universitas PGRI Adi Buana, was facilitated with the assistance of MGMP (Subject Teacher Deliberation Group) of Nganjuk Regency. The target participants for this community service training program are high school teachers in the Nganjuk Regency area.

The seminar, entitled "Critical Thinking in Statistics Learning", includes a sub-topic focus on "Critical Thinking in Bivariate Data Analysis Learning". This theme was selected due to its high relevance to contemporary needs and its potential to provide extensive insights to teachers about the importance of critical thinking in statistics education. The training activities include preparation stages, theoretical and practical approaches, case studies, as well as question-and-answer and feedback sessions, which are expected to achieve the seminar's primary objectives. The materials were delivered by three speakers including Gangga Anuraga, S.Si., M.Si., Ph.D., Rabiatul Adawiyah. S.Kom., M.Tr.Kom., and Arief Triatmaja Perrnana Sadewa, S.Kom., M.Kom. The activity was carried out at SMAN 2 Nganjuk, East Java.

C. RESULTS AND DISCUSSION

At the beginning and end of the event, our team of lecturers did not conduct evaluations in the form of pre-tests or post-tests; instead, evaluation was performed through observations and interviews. Based on our observations throughout the series of completed activities, especially in collaboration with the Chair of the MGMP of Nganjuk Regency, it can be concluded that this seminar is the first of its kind organized by the MGMP team, inviting lecturers to share experiences and knowledge directly with teachers who actively teach students. Conversely, teachers also shared their experiences with the students. Based on these interactions, teachers expressed difficulty in presenting material, particularly material related to calculations, in a way that makes it easier for students to grasp, understand, and absorb the content being explained.

Therefore, this seminar provides new insights for lecturers to impart the knowledge they have gained. The Chair of the MGMP expressed great gratitude for the successful implementation of this seminar, which is expected to have a positive impact in the future, especially for MGMP throughout Nganjuk Regency. Since this is the first such activity, it is hoped that similar events will be held again.

This community service activity (PPM) was conducted by the Statistics Study Program team of the Faculty of Science and Technology at Universitas PGRI Adi Buana Surabaya, attended by high school teachers around the area of SMAN 2 Nganjuk. The PPM was conducted face-to-face in the meeting room of SMAN 2 Nganjuk.

The event opened with the MC, followed by the singing of the Indonesian National Anthem (Indonesia Raya) and Hymne Guru. The event continued with speeches from the Head of MGMP of Nganjuk Regency and the Chair of the Statistics Study Program at Universitas PGRI Adi Buana, represented by the Vice Dean, Mrs. Artanti Indrasetianingsih, S.Si., M.Si.

In the speech from the Chair of MGMP of Nganjuk Regency, the enthusiasm of schools and teachers toward the seminar organized by the Statistics Study Program of UNIPA Surabaya was conveyed, along with hopes that the seminar's outcomes would enhance participants' knowledge and skills in critical thinking. The speech from the Chair of the Statistics Study Program UNIPA Surabaya, represented by Artanti Indrasetianingsih, S.Si., M.Si., provided a general overview of the Statistics Study Program, explained the purpose of the seminar, outlined the topics to be presented, and described the benefits participants could gain from attending.

Figure 1. Speech by the Chair of MGMP Nganjuk

During the training session of the community service activity organized by the Statistics Study Program of UNIPA Surabaya, the material was presented by Mr. Gangga Anuraga, S.Si., M.Si., Ph.D., titled "Critical Thinking in Bivariate Data Analysis Learning." This material aims to provide participants with an understanding of bivariate data analysis, which seeks to comprehend the relationship between two variables. In statistics education, critical thinking is essential so that students do not merely calculate statistical values but are also capable of accurately interpreting the results. Critical thinking helps in identifying the types of relationships between variables, avoiding misinterpretations such as conflating correlation with causation, and drawing conclusions based on statistical evidence.

Figure 2. Material Delivery

The presented material emphasized that critical thinking in bivariate data analysis teaches students not only to compute statistics but also to understand their deeper meaning. With this approach, students become better prepared to avoid errors in interpreting relationships between variables, validate analysis results by considering other factors, and effectively use data in decision making. Through appropriate practice, students can develop critical thinking skills that will aid them in better understanding a data-driven world.

Question and Answer Session by Participants At the end of the material presentation delivered by the speaker, participants were given the opportunity to ask questions related to the material presented. Questions from participants were answered directly by the speaker. The enthusiastic participation in questions

indicated that the participants were highly interested in the material concerning critical thinking patterns delivered by the speaker.

The next activity after the speaker finished delivering the material and answering questions during the Q&A session was the presentation of souvenirs to participants who actively participated by asking questions during the session. The Community Service activity was concluded with a prayer led by a representative teacher from SMAN 2 Nganjuk, followed by a group photo session. The group photo was taken by the Lecturer Team of the Statistics Study Program at UNIPA Surabaya together with the seminar participants.

D. CONCLUSION AND SUGGESTION

Throughout all stages that have been carried out, the lecturer team and the school authorities have conducted the necessary coordination in the community service activities. This training successfully enhanced the awareness and skills of the participants regarding the importance of Critical Thinking in Statistics Education. It underscores the significant role of teachers in developing students' critical thinking abilities through statistics learning. Critical thinking not only aids students in deeply understanding concepts but also trains them to analyze data, evaluate information, and make decisions based on evidence (Dwipayana & Astawan, 2024). In the context of statistics, critical thinking is highly relevant, as students are confronted with data and interpretations that demand precision and strong conceptual understanding.

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REFERENCES

Dwipayana, I. K. A., & Astawan, I. N. (2024). Potensi penerapan pendekatan linguistik kritis dalam pembelajaran analisis teks pada Kurikulum Merdeka Belajar jenjang pendidikan SMA/SMK. Pedalitra: Prosiding Pedagogi, Linguistik, dan Sastra, 4(1).

Faizah, H., & Kamal, R. (2024). Belajar dan Pembelajaran. Jurnal Basicedu, 8(1), 466–476. https://doi.org/10.31004/basicedu.v8i1.6735

Iftirosy, V. A., Ningsih, R., & Sancaya, S. A. (2025). Pentingnya berpikir kritis dalam pengambilan keputusan pada siswa SMA. Prosiding Konseling Kearifan Nusantara (KKN), 4, 381–387. https://doi.org/10.29407/ag5hvg81

Kusuma, E, S, J., Handayani, A. & Rakhmawati, D. (2024). Pentingnya Pengembangan Kemampuan Berpikir Kritis pada Siswa Sekolah Dasar: Sebuah Tinjauan Literatur. Jurnal Wawasan Pendidikan, 4(2), 369-379.

Mareti, J. W., Herlina, A., & Hadiyanti, D. (2021). Model Problem Based Learning Untuk Meningkatkan Kemampuan Berpikir Kritis dan Hasil Belajar IPA Siswa. *Jurnal Elementaria Edukasia*, *4*(1), 31–41. doi: 10.31949/jee.v6i1

Mongkau, J. G., Daniel, R., & Pangkey, H. (2024). Kurikulum Merdeka: Memperkuat Keterampilan Abad 21 untuk Generasi Emas. *Journal on Education*, *06*(04), 22018–22030.

Niami, D. (2022). Upaya guru PPKn meningkatkan kemampuan berpikir kritis siswa. Seminar Nasional Ke-Indonesiaan. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 379–386

Prasetyo, R., Muksar, M., & Rufiana, I. S. (2025). Analisis Muatan Literasi Statistik Pada Buku Teks Matematika Di Platform Merdeka Mengajar Jenjang Sekolah Dasar. *Briliant: Jurnal Riset Dan Konseptual*, *10*(1), 99–106. doi: 10.28926/briliant.v10i1.1857

Putri, M. (2023, August 31). Menghindari kesalahan umum penggunaan statistik. LinkedIn. https://www.linkedin.com/pulse/menghindari-kesalahan-umum-penggunaan-statistik-melanie-putri/

Shamboul, H. A. E. (2022). The Importance of Critical Thinking on Teaching Learning Process. *Open Journal of Social Sciences*, *10*(01), 29–35. doi: 10.4236/jss.2022.101003

Susilowati, W. (2021). *Berpikir statistis, penalaran, literasi dan self-efficacy mahasiswa melalui pendekatan brainbased learning dengan strategi metakognitif*. UIN Sunan Gunung Djati Bandung. https://digilib.uinsgd.ac.id/id/eprint/46636

Wahab, A., Junaedi, & Anwar, M. (Ed.). (2022). *Pengantar statistik: Teori dan soal penyelesaian praktis dalam ilmu pendidikan dan sains* (Edisi pertama). Makassar: Mitra Ilmu.

Zulfah, Z., & Rianti, W. (2018). Kemampuan Representasi Matematis Peserta Didik Bangkinang dalam Menyelesaikan Soal PISA 2015. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *2*(2), 118-127. https://doi.org/10.31004/cendekia.v2i2.56