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The Popularity of Critical Thinking Research in Indonesian Geography Educational Journals: Research Design to Data Analys

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Abstrac: Critical thinking abilities are one of the numerous objectives of 21st century education. This study employs content analysis of a number of papers published in Indonesian Geography Education publications between 2013 and March 2024, with the primary goal of improving critical thinking abilities. The study's findings demonstrate that the number of publications concentrating on critical thinking abilities has grown over the previous three years. The majority of these papers provide quantitative research in the form of a quasi-experiment. Furthermore, high school students and physical geography resources, such as hydrosphere dynamics and atmospheric dynamics, were the most targeted subjects and materials. The most often utilized equipment and procedures for data analysis were tests and percentages. In light of the study's findings, various recommendations for further research have been made, with critical thinking skills being the primary emphasis. A number of these concepts include extending the spectrum of research methodologies and choosing more appropriate data analysis procedures.

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INTRODUCTION

Nowadays, education is seen as critical for Creating a Competent Society in the 21st Century (Kivunja, 2014). According to Núñez (Núñez et al., 2022), students must not only memorize concepts (Lindsey et al., 2014), but also improve critical thinking and life skills. Collaboration with communicating skills is another ability that should be improved (Kivunja, 2014). Furthermore, science process abilities are seen as critical in today's scientific and technological period (Pathoni et al., 2020). Numerous patterns of thinking abilities, such as metacognitive (Uzer, 2020), creative (Arifin et al., 2021), and critical thinking skills (O'Reilly et al., 2022), are claimed to be the most important capital for graduates facing tough competition in the 21st century.

Critical thinking is frequently acknowledgement of one of the must-have talents for 21st century education (van Laar et al., 2020). Critical thinking, combined with creative, collaborative, and communicative thinking abilities that are strongly connected to the 4C, is an important component of practically all educational programs (Supena et al., 2021). In line with that, the ten important qualities encompass critical thinking skills have been formed into the Assessment and Teaching of 21st Century Skills or ACT21S (DiCerbo, 2014). Additionally, the LMTF incorporates thinking critically abilities as a sub-domain of the UNESCO-designed Global Framework of Learning Domains, a framework for 21st century skills (Zulkifli, 2019). In essence, the above occurs because of the positive characteristics that will be integrated with graduates who are equipped to think critically.

Despite the importance of critical thinking abilities, several research indicate that students' critical thinking skills in some nations are still underused. A study conducted by Zhou reported that it was found that inappropriate learning design made

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critical thinking lacking in China (Zhou, 2018). Students in Thailand (Monrat et al., 2022) and Malaysia (Puteh & Hamid, 2014) similarly shown poor critical thinking skills. Furthermore, comparable concerns were observed by other studies conducted in various locations of Indonesia, including Semarang (Jarwanto et al., 2022) and Bengkulu (Nainggolan et al., 2023). In certain nations, there is a lack of emphasis on developing critical thinking abilities could be attributed to the education system's implementation of designs and practices that prevent students from actively engaging in debates, discussions, and assessments of their own thought processes (Fang & Hang, 2017). Indeed, these activities are vital for developing critical thinking skills.

Educational development must assist the enhancement of students' critical thinking skills (Shaw, 2014). Recent research have emphasized the need of ongoing enhancement of the learning process's quality (Spencer-Rodgers & Cortijo-Ocaña, 2015). Conducted research to assess students' critical thinking abilities and identify ways to improve their empowerment throughout learning activities (Orhan & Çeviker Ay, 2023). The abundance of knowledge gleaned from such investigations is frequently utilized as the foundation for government policies and instructional programs developed by instructors and lecturers.

Numerous studies on critical thinking skills have been carried out in Indonesia, especially in relation to geography instruction. The distribution of pupils' critical thinking skills is the subject of some studies (As'ari et al., 2017), others look at the influence of certain instructional designs on students' critical thinking skills (Zin & Eng, 2014). Further research looks at the connection between different learning accomplishment metrics and thinking critically skills (Sari et al., 2021). Nonetheless, none of these investigations have sought to examine the material presented in all of the research.

This project will conduct a content analysis of various scientific articles on geography education published in Indonesia between 2013 and March 2024 to get insight into the diversity of research addressing thinking critically abilities in Indonesia. This study attempts to address the following questions: (1) How popular is geography education research on thinking critically skills throughout time? (2) What are the different geography education research designs used in Indonesia to investigate thinking critically skills? (3) Which geographical themes are most frequently used to evaluate students' thinking critically skills? (4) What methods do researchers employ to improve students' thinking critically skills? (5) How do scholars assess thinking critically skills? (6) How do researchers examine data to assess critical thinking skills? (7) Can you provide an overview of the many studies that scholars have performed to investigate thinking critically skills?

This study differs from prior studies on thinking critically abilities in a number of ways. First, this analysis examines all publications published between 2013 and March 2024 that have been recognized by the Science and Technology Index (SINTA). Second, this study looked at a variety of papers with critical thinking abilities as the primary topic. Third, certain characteristics served as the foundation for content analysis.

METHOD

Data derived from the results of content analysis of geography education publications. Every article was extracted from publications of geography education that were registered with Science and Technology Index (SINTA) in March 2024. SINTA is a a framework for assessing the advancement of science and technology created by the Ministry of Education, Culture, Research and Technology of the Republic of Indonesia. The researchers discovered 13 geography education journals in the SINTA database after conducting a search by category. Furthermore, all studies that examined critical thinking skills were chosen from all of these journals. The papers evaluated in this study were published online before to March 2024. Of the hundreds

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of articles gathered, 30 focused on critical thinking. This research considered all of these papers.

This study employed a content analysis guideline tool that included the pertinent components listed in Table 1. The content analysis for this study focuses on seven primary elements. These factors include (1) annual publication count; (2) the type of study; (3) the research subject; (4) the geographic topic selected for research; (5) treatment; (6) data collecting tools; and (7) data analysis methodologies. Except for aspects (1), (4), and (5), The categories were not chosen at the outset because there was insufficient prior study to establish what should be included in them and because doing content analysis on several articles could result in categories that were too wide. Furthermore, the categories in aspects (2), (3), (6), and (7) were established prior to the collecting of data. The classifications are displayed in Table 2, which was developed from (Susetyarini and Fauzi 2020) and then changed to meet the demands of the researcher. Furthermore, aspect (2) is separated into Two smaller elements, which are (2a) general research kind and (2b) quantitative research model.

Table 1. Analysis of the Study's Content Using Aspects and Categories

No.	Aspects	Categories
1	Type of Research	1.A Research and Development (R&D) 1.B Class-action Research (CAR) 1.C Qualitative Research (QLR) 1.D Quantitative Research (QTR)
2	Types of Quantitative Research	2.A Observation Study (OS) 2.B Correlation Research (CR) 2.C Survey Research (SR) 2.D Design of Pre-Experiment (DPE) 2.E Design of True Experiment (DTE) 2.F Design of Quasi Experiment (DQE) 2.G Ex Post Facto Design (EPFD)
3	Research Subjects	3.A Junior High School Students (JHSS) 3.B High School Students (HSS) 3.C Undergraduate Students (US) 4.D Postgraduate Students (PGS) 5.F Teachers (TR) 6.G Lecturer (LR) 7.H Public/General (PG)
4	Data Collection Instruments	4.A Questionnaire Sheet (QS) 4.B Observation Sheet (OS) 4.C Test Sheet (TS) 4.D Interview Sheet (IS) 4.E Not Identified (NI)
5	Data Analysis Method	5.A Average 5.B Percentage 5.C N-Gain 5.D T-Test 5.E ANOVA 5.F ANCOVA 5.G Correlation 5.H Unidentified

RESULT and DISCUSSION

The number of papers published indicates how often research is undertaken during a certain time period. According to the trend in Figure 1, papers reviewing critical thinking abilities have been published since 2013. Until 2017, there was no discernible annual fluctuation in the quantity of publications. However, as seen in Figure 1, since 2021, the number of publications has grown more than prior years. The growing number of papers on critical thinking abilities implies a considerable increase in the number of scholars interested in studying high-level critical thinking skills.

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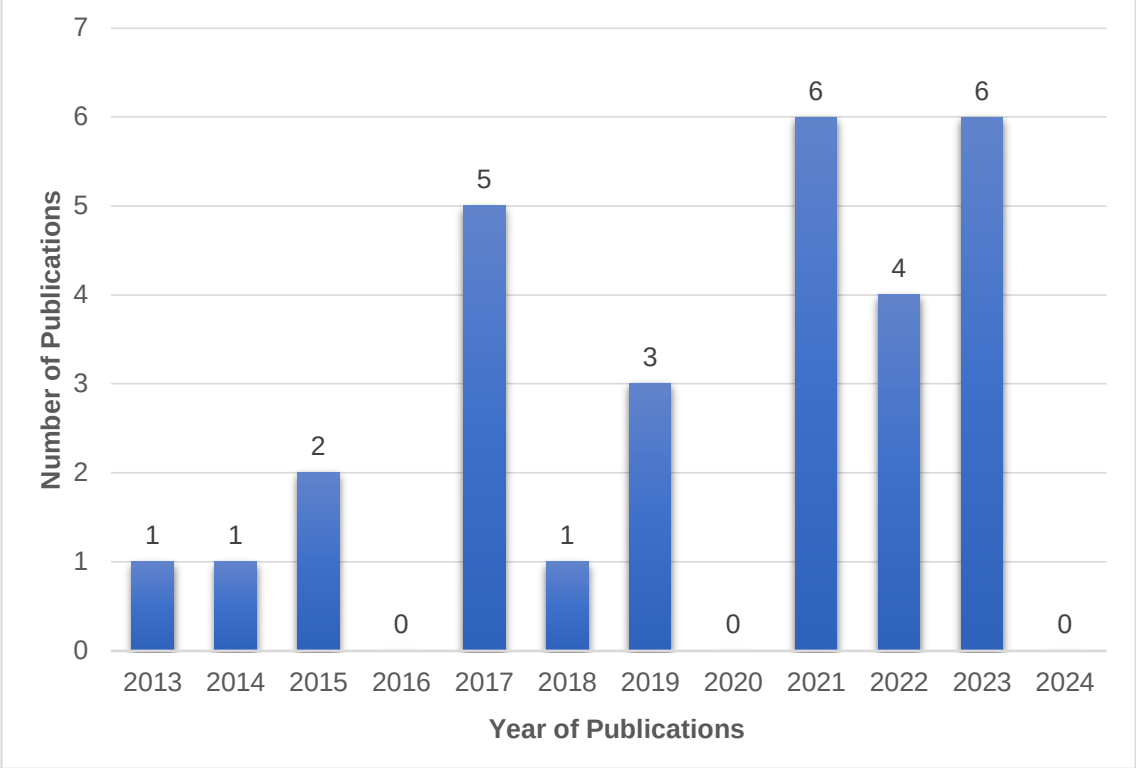

Figure 1. The prevalence of more education research in Indonesia during the past 11 years that focuses on critical thinking abilities

The majority of research is undertaken because researchers are sensitive to difficulties that frequently arise in their surroundings. One of the most typical difficulties is that Indonesian pupils have insufficient critical thinking abilities. As a result, doing study is thought to be The most efficient strategy to deal with the problem. Researchers are able to find the most effective learning design or learning material that can best suit students' critical thinking skills.

The more study that is conducted on thinking critically abilities, the bigger the beneficial impact on the growth of education in Indonesia. This concept is predicated on the idea that improving educational practice is the main objective of research (Coburn & Penuel, 2016). Additionally, a study will have a range of effects on educational practice.: (1) its conclusions can be used as a basis for national, municipal, or institutional decision-making in education; (2) its conclusions can be regarded as reliable information that educators can use; and (3) its conclusions can have an impact on educators' perspectives.

The research type and design decide on the research's main topic. According to Figure 2, researchers most frequently employ quantitative research as their design. to investigate critical thinking skills. The higher percentage of quantitative research than other types of research is in line with past findings that researchers prefer quantitative research designs over qualitative ones when conducting studies on education. (Alsulami, 2023). Furthermore, qualitative methodologies are regarded relatively recent in educational research (Yli-Panula et al., 2020). However, qualitative designs are becoming increasingly popular (Shakouri, 2014) and have been used in social research, including certain educational difficulties (MOHAJAN, 2018). This state is closely associated with the benefits of using qualitative methodologies to characterize a phenomena in depth and thoroughly. As a result, the paucity of current qualitative research presents an excellent opportunity for future researchers to adopt qualitative design and concentrate their research on the capacity for critical thought.

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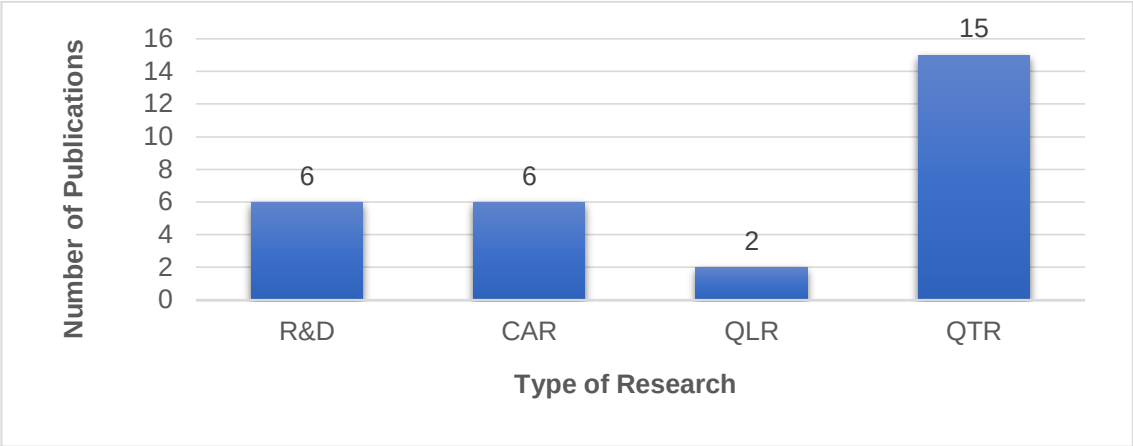

Figure 2. Distribution of Research with the Primary Focus on Critical Thinking Capabilities by Research Type

However, the findings that reveal the scarcity of qualitative research on critical thinking skills are refuted by Fauzidan Pradipta's research. According to Fauzi and Pradipta (2018), The most common type of research publication in 2017 was R&D research. R & D research is one of the most prominent types of educational research in Indonesia. In this type of study, researchers frequently generate instructional materials based on the outcomes and method of pure Geography research that they have done previously. The goods created can take the shape of pocket books (Baharsyah et al., 2020), modules (Pujiantiningtyas et al., 2022), or instructional media (Darung et al., 2020). According to these findings, critical thinking abilities are still lacking as a crucial foundation for producing research among Indonesian researchers.

The development of thinking critically skills is encouraged for students. According to the details given on the type of study, the researchers made the most use of the quasi-experimental design. This implies that the study's overall goal is to compare some of the best teaching practices for developing students' critical thinking abilities. In order to test their hypothesis, researchers need study participants. Students in high school are the most common study subjects., followed by college students and junior high school students, as seen in Figure 4. Researchers have not discovered any content assessing the quantity of studies in geography education, but this conclusion is in line with a study conducted, who evaluated the content of all biology education studies published in Indonesia in 2017 (Fauzi & Pradipta, 2018).

Research also demonstrates high school students' supremacy. (Mardiah et al., 2023). In the past 15 years, research has frequently focused on three themes, according to their findings: students' conceptual understanding and the learning process. This conclusion is consistent with previous study (Lin et al., 2019), which revealed that "students" is the third most used term for educational research (Yildiz et al., 2020). According to Yilzid et al., the most common research samples in education papers in Turkey were higher education students and teachers.

Figure 3 shows that a class is less likely to be chosen as a research topic the higher it is in a particular educational level. Seventh pupils in junior high were also regularly chosen, whereas ninth graders were rarely considered. Tenth pupils in senior high school were the most likely to participate in the research, while twelfth graders were the least likely. Due to the strict summative schedule, most schools have a propensity to be selective when granting permission for researchers to do study in junior high or senior high school grades nine or twelve.

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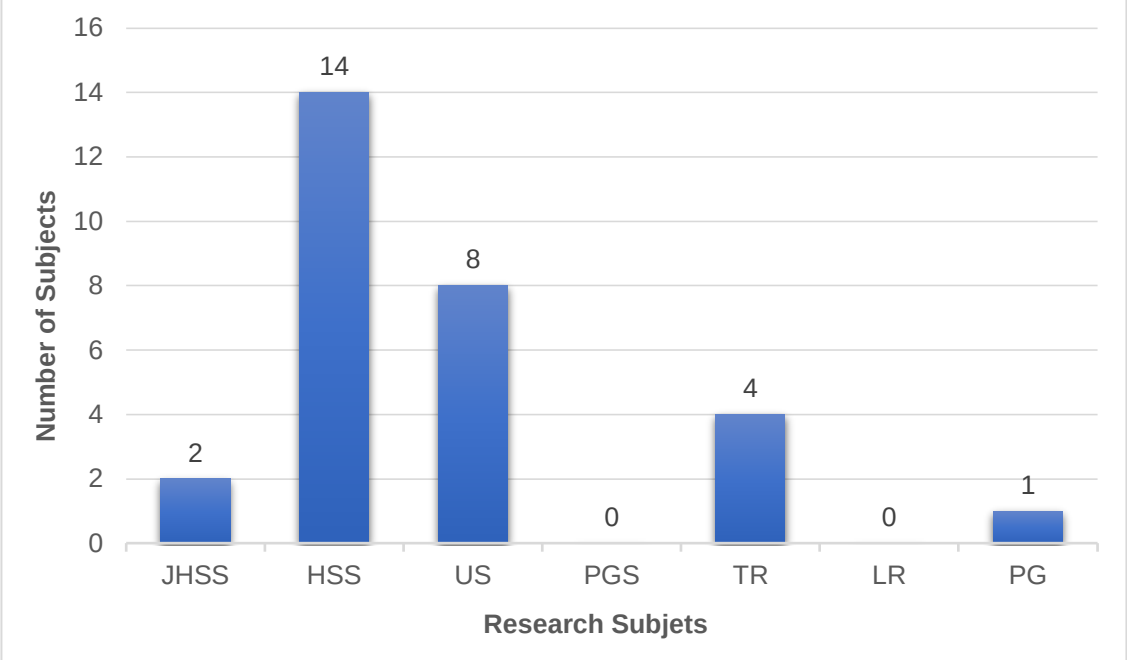

Figure 3. The allocation of research topics in certain education studies where critical thinking abilities are the primary focus in Indonesia

Geography is one of the subjects that has many topics (Aksa, 2019). Students rate certain topics as simple, while others as tough. Aside from this study, some publications just tackle one specific issue, whilst others emphasize others. According to Table 2, the researchers picked several themes to test their study throughout junior high, high school, and college. The most popular themes for study included basic geography, atmospheric dynamics, maps and GIS, disaster, and integrated social studies (SMP). Each of these subjects has two publications assessing the degree of critical thinking abilities of students, Nevertheless, none of them provide context for the study related to the actual situation between these problems and the students' critical thinking abilities.

Table 2. The Top Five Geographic Research Topics in Indonesia with Critical Thinking Capabilities as a Primary Concern

Topics	Number of Publications
Introduction of Geography	2
Atmospheric Dynamics	2
Maps and GIS	2
Disaster	2
Integrated Social Studies (Junior High Scool)	2

In addition to the above topics, there are several topics identified in publications in geography education journals including geography curriculum analysis, population, rural and urban interactions, natural resources, hydrosphere dynamics, tourism geography, biogeography, geomorphology, biology, and economics. Researchers argue that these most widely used topics contain complex material and theories, requiring deeper analysis to master the material. This shows that Indonesian researchers have considerable potential to create answers to help children develop their critical thinking skills and problem-solving abilities for the challenges they encounter.

The objective behind treatment is to test the researcher's hypothesis or to determine the importance of specific variables on the parameters being studied. Inquiry/discovery-based learning (IBL), problem-based learning (PBL), and case-based learning (CBL) are the three most commonly employed approaches in critical thinking

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research, according to Table 3. Six publications are listed that use PBL, three publications that use IBL, and two publications that use CBL. After these three methods, there are many treatments used by researchers in geography research including, Treffiger, Interactive Blended Problem-Based Learning (IBPBL), Contextual Collaborative Learning (CCL), WS-2M (Word Search and Mind mapping), Self-Organized Learning Environment, Two Stay Two Stray (TSTS), Partial Least Square - Structural Equation Model (PLS-SEM), EXO OLO TASK Learning Model. All of the above learning models are included in 21st century thinking skills where students are required to think critically and deeply in problem solving. Meanwhile, development models that appear in publications include the Peck & Hannafin model, the Plomp model, and the ADDIE model. Students' critical thinking abilities may be adequately empowered by learning activities that direct them to scientific activity.

Table 3. The primary concern in geography research is critical thinking skills, and three types of treatments or independent variables are frequently chosen in Indonesia

Treatment/Independent Variable	Number of Publications
Problem Based Learning (PBL)	6
Inquiry/ Discovery Based Learning	3
Case Based Learning (CBL)	2

The results of the study also show that most researchers prefer to use a certain instructional design as the independent variable or treatment in their own research. However, despite the fact that demographics influences student learning achievement, there is still a dearth of study on the impact of demographic variables in Indonesian studies. Several research have yielded differing conclusions about the impact of demographic characteristics on pupils' critical thinking skills. According to certain research, demographic factors have little influence on pupils' thinking critically skills (Saroiroh, 2022). Additionally, Rodzalan et al. (2020) found that demographics had a considerable impact on pupils' critical thinking skills (Rodzalan et al., 2020).

When performing research, researchers require equipment to aid in data collection. Previous scholars produced a variety of measures to assess students' thinking critically skills. Tests are the most common tool used to gather information about critical thinking abilities, according to the graph in Figure 5. Critical thinking capacity is essentially a mode of thought that may be evaluated or accessible through pupils' responses to challenging questions. Furthermore, tests are thought to be a more objective method of gathering data than surveys, interviews, or observations.

There are several assessments that may be applied to evaluate students' thinking critically skills. In many Indonesian publications, the most commonly found assessments are the modified results of the Illinois Critical Thinking Essay Test developed by Finken and Ennis (1993) and writings created by Zubaidah, Corebima, and Mistianah (2015) that evaluate critical thinking abilities (Zubaidah, S., Corebima, A.D. & Mistianah, 2015). However, several studies did not disclose the tools used to gather data on critical thinking abilities in their articles. Researchers that employed tests as the primary strategy of data collection did not mention if the instruments used had been evaluated for validity and reliability. It is critical to assess the validity and reliability of instruments before using them for data collection (Bajpai & Bajpai, 2014). Stated otherwise, data about reliability and validity is seen as crucial to convince the target audience.

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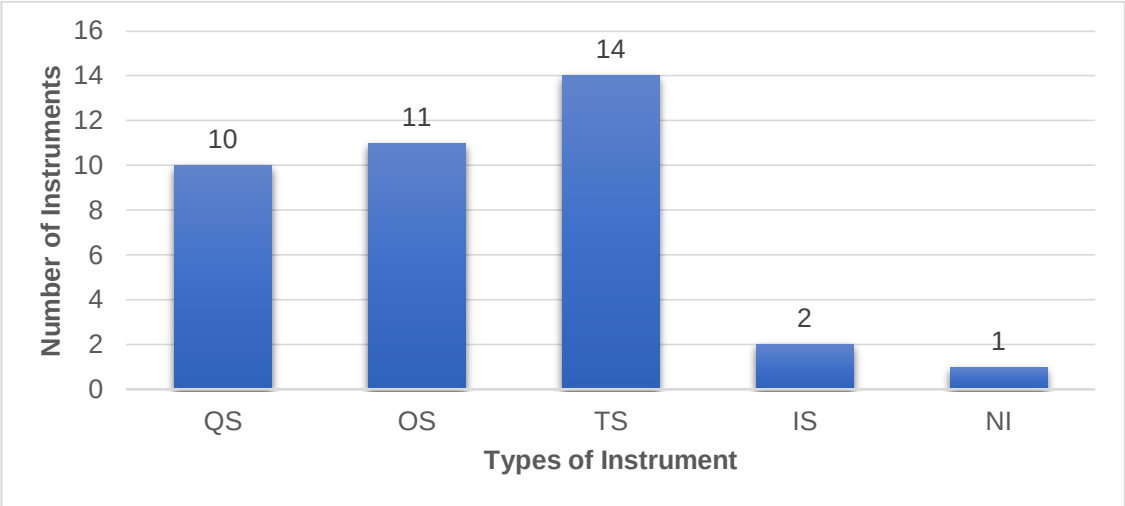

Figure 4. The selection of instruments for data collection in some education research projects in Indonesia that prioritize critical thinking abilities

Analytical methods utilized is determined by the researcher's choice of study type. This is because the precision with which procedures are selected for data analysis establishes a study's level of validity. The graph in figure 5 illustrates that just one study employed Ancova as the data analysis method out of fifteen that employed a quasi-experimental design (figure 3). Furthermore, figure 5 reveals that the percentage data analysis approach, followed by the T-test, is the most popular data analysis method among researchers. This conclusion explains why researchers frequently use percentages and T-tests to summarize the study's results in general. The researchers demonstrated two basic trends when utilizing percentages and T-tests for hypothesis testing. The researchers initially just collected post-test data from each class and assessed it using the t-test. Second, the researchers compared the data from the pre-test and post-test for both sets before determining the N-Gain. After that, the N-Gain of the two classes was compared using the t-test. There were other data analysis techniques that were not documented in the research. This propensity reduces the research's validity. The study's findings (Fauzi & Pradipta, 2018) support the erroneous usage of data analysis tools.

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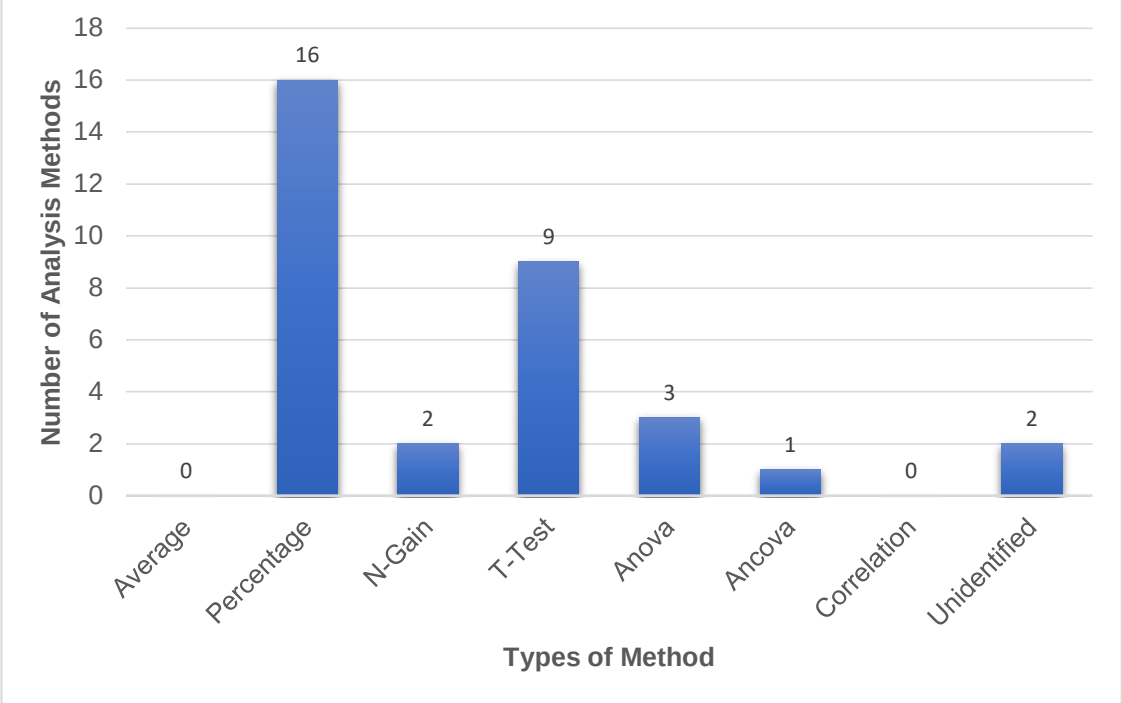

Figure 5. Data Analysis Method Selection Distribution in Certain Education Research in Indonesia with a Primary Focus on Critical Thinking Capabilities

Ancova is strongly advised, especially when researchers want to use a quasi-experimental design where they are unable to select study participants one at a time.. In this type of condition, Ancova gives researchers the ability to control outside factors that could change the relationship between the independent and dependent variables. Additionally, based on the study participants' characteristics as shown in the pre-test data, Ancova can identify differences between groups in terms of the corrected mean (Warmenhoven et al., 2019). Finally, it is advised to use Ancova for quasi-experimental research incorporating information from both pre- and post-tests.

CONCLUSIONS

Articles showcasing critical thinking skills that appeared in Indonesian geography education periodicals from 2013 to March 2024 were examined in this study. There has been an increase in the quantity of publications that concentrate on thinking critically skills within the past three years. The majority of the hundreds of papers include quantitative research using a quasi-experimental methodology. Furthermore, high school students were the majority of research subjects, with physical geography materials such as hydrosphere dynamics and atmospheric dynamics being the most popular themes. The most popular methods for collecting and analyzing data were percentages and sequential examinations, whereas the most popular therapy was problem based learning (PBL). The results of this study have led to a number of suggestions for additional research. First, more qualitative studies on the growth of critical thinking skills must be carried out. Second, research and development focused at generating instructional goods should focus on improving students' critical thinking abilities, which are currently low. Third, researchers should provide detailed information regarding their study equipment, as well as their validity and reliability. Finally, it is advised that researchers use the most relevant test for the hypothesis and study design while performing research.

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