

Trends of Creative Thinking Skill Research in Chemistry Education Journal Across Indonesia

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ABSTRACT

This study focuses on analyzing how trend research about creative thinking ability in chemistry. This research contains an analysis study with the number of articles published in chemistry education with the research in Indonesia from 2018-2022. Studies are carried out on 23 journal articles including from 1 different journal with the scope in Indonesia search engine journal uses publish or perish with determined inclusive criteria. Publish or Perish is a software that retrieves and analyze academic citations and uses a variety data of sources. Step analysis started with reading the abstract and data reduction also data inference based on the research instrument used. Topic research involves publication number, types of research, chemistry material studied, research subject, and data analysis technique. The main research is quantitative research on hydrocarbon material with an analysis technique by using mean. Based on the result, some recommendations can be guidance for further study so that the research result is more useful and has an impact toward Indonesian life especially in teaching and learning terms.

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1. INTRODUCTION

The Industrial Revolution 4.0 has not yet achieved maximum results, yet nowadays, the world is facing changes towards the era of Society 5.0. Along with the era, life in the 21st century does not only talk about globalization but includes internationalization. The ease of information and communication technology sometimes has a negative effect on technology consumers. The widespread transmission of information that leads to hoaxes requires technology users in the era of globalization to improve their literacy ability (Xi & Jia, 2021). Individuals with a good understanding, creativity, high literacy, and the ability to find solutions can compete in the 21st-century era of life. The higher the level of one's knowledge, the lower the level of belief in fake news or circulating conspiracies. (Fitria & Tondok, 2022). So, to become an educated person in the 21st-century learning era, an individual is required to be able to filter information carefully and not to be easily influenced by hoax news.

The success of an individual in the 21st century can be viewed in how extend she or he can make knowledge as a means to improve self quality. Ability improvement can be started with basic empowered science knowledge (Rubini et al., 2019). The ability to recognize the science concept is not able to the students in the 21st century (Susetyarini & Fauzi, 2020). However, the skill required to think creatively must be honed. In order to help kids learn and grow, teachers need to push themselves to new limits in their own professional development (Dwi Wiwik Ernawati et al., 2019).

Creative thinking is the ability to build new ideas in solving problems related to knowledge. By having creative thinking ability, an individual will have self-confidence so that it is easier in gaining academic achievement (Vong & Kaewurai, 2017); (Dwi Wiwik Ernawati et al., 2019); (Apriwanda & Hanri, 2022). Students will find it easier to find the concept independently so the lesson student student-centred will easier to appear. (Perdana et al., 2019); (Chalkiadaki, 2018). Creative thinking ability must be implemented in the whole lesson topics involving mathematics, biology, physics and chemistry. (Hormadia & Putra, 2021); (Amida & Nurhamidah, 2021); (Mahmudah et al., 2021). Chemistry also has an important role in growing creative thinking ability. In line with this, an opinion proposed by (Wiyarsi et al., 2018) explained that chemistry lessons give the opportunity to present the presentation of chemistry. Apriwanda & Hanri (2022) add that chemistry presentations can help students in changing thinking forms and improve science comprehension. This case describes the importance of creative thinking in presenting chemistry lessons.

So far, this research relates to creative thinking ability becoming a research trend in chemistry subject. (Suryaningsih & Ainun, 2021); (Al-Idrus et al., 2021); (Heliawati & Permana, 2019); (Ginayah et al., 2018). The ability to find the way new thinking from calculating and solving also chemistry problems viewed by the researchers. Some instructional approach is tested to see the effect of creative thinking toward students' and the others subjects such as the implementation of the module that is able to facilitate creative thinking. The purpose of this research is to see how far the development of research on creative thinking is in Indonesia. Articles searches focused on articles that discussed creative thinking in chemistry learning. This analysis was carried out based on a number of publications, research subject, data analysis method and research instruments. The first step is to search for relevant articles presented in graphical form regarding the development of the research and described qualitatively. The usefulness of this research is that it can be information and reference for further research in taking the scopes research on creative thinking skills.

2. METHODS

This research focuses on content analysis regarding publication journals in the five last years in Indonesia type of this research is similar to what has been done by Susetyarini & Fauzi (2020). The data in this study are collected by using the Publish or Perish search engines by including detailed data based on the following inclusion criteria:

Table 1 Research article inclusion criteria:

No	Criteria	Scope
1	Publish year	Last 5 years (2018-2022)
2	Research subject	Teacher, university student and student
3	Article scope	SINTA and Scopus indexed articles that are open-access
4	Keyword	Creative thinking skill research, chemistry education

Publish or perish is a software that can help authors to find journal articles that match the desired criteria. The search results with publish or perish found 23 indexed journals that met the predetermined inclusion criteria. Overall the articles are published in 15 different journals with research scope in Indonesia.

This section will discuss the types of research, research subjects, and data analysis techniques. In presenting research, of course, it must be guided by a valid instrument. In this study, researchers use the same instrument as the research conducted by Susetyarini & Fauzi (2020) by adding some

modifications to suit the content that the researcher will analyze. The complete research instruments used are presented in Table 2.

Table 2 The Aspects and Categories used for Content Analysis in the Study

Aspects	Categories	
Types of Research (2a)	A.1-R and D	A.3-Qualitative Research
	A.2-CAR	A.4-Quantitative Research
Types of Quantitative Research (2b)	B.1-Observation Studies (OS)	B.5-True Experimental Designs (TED)
	B.2-Correlational Research (CR)	B.6-Quasi-Experimental Designs (QED)
	B.3-Survey Research (SR)	B.7-Ex Post Facto Designs (EPFD)
	B.4-Pre-experimental Designs (PED)	C.3-University Student
Research Subject	C.1-junior high school student	
	C.2-senior high school student	
Data Collection Instruments	D.1-questionnaire sheet	D.4-interview sheet
	D.2-observation sheet	D.5-unidentified
	D.3-test sheet	
Data Analysis Method	E.1-mean	E.6-ANCOVA
	E.2-percentage	E.7-Correlation
	E.3-N-gain	E.8-Unidentified
	E.4-t-test	E.9-Others
	E.5-ANOVA	

The researcher categorized the articles found according to the aspects listed in the research instrument. Conclusions presented as findings are in the form of data reduction results from abstracts, methods, and discussions from the journals discussed. To make it easier for readers to analyze the information, the data found is presented in the form of graphs and tables.

3. FINDINGS AND DISCUSSION

The results obtained from the research have to be supported by sufficient data. The research results and the discovery must be the answers, or the research hypothesis stated previously in the introduction part.

3.1. Number of Publications

Some findings of publications provide an overview of how many creative thinking research publications have been carried out by researchers in a given decade. Based on the results of an analysis of 24 journals in the last 5 years, the data can be presented in Figure 1.

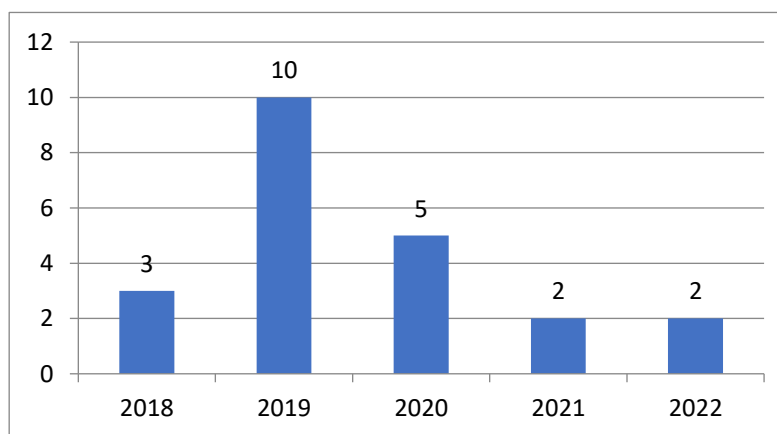


Figure 1 Distribution of the number of research publications in the last 5 years (2018-2022)

Based on the graphic analysis above, it can be concluded that research on creative thinking began in 2018. Research on creative thinking is mostly carried out in 2019. One of the hallmarks of research is to do what is hotly being discussed. One of the most topical issues in 2019 on creative thinking ability is demanded by students along with the times (Vong & Kaewurai, 2017); (Apriwanda & Hanri, 2022). From research in 2019, various learning models are found that can facilitate students' creative thinking abilities, such as the STEM approach (Suryaningsih & Ainun, 2021); (Wahyudi, 2020); (Liska Ariani, Sumardi, 2019); (Ramadhani & Suyanti, 2022), PBL (Naim et al., 2020); (Herdiawan et al., 2019), and project-based learning (Al-Idrus et al., 2021).

It can be seen as a trend that in 2019, researchers are trying to combine several learning models with creative thinking ability so that in 2022, researchers are focusing more on qualitative research and developing variables that are measured in models that have been tried out. Nurmilawati et al. (2021) conducted a content analysis related to the delivery of material that should be presented in the PBL model to improve creative thinking skills. This can be a reference for researchers to conduct a content analysis on some of the teaching content that has been tried in the past 4 years to find a meeting point for content that should be presented in facilitating creative thinking ability.

3.2 Type of Research

This discussion focuses on the types of research that are mostly conducted by researchers in the context of creative thinking skills. Based on Figure 2, it can be seen that experimental research is a study that is often carried out. This is in line with the opinion proposed by Boeren (2018) that the majority of educational journals that have been published in journals use quantitative analysis. This is because quantitative data has more powerful statistical analysis.

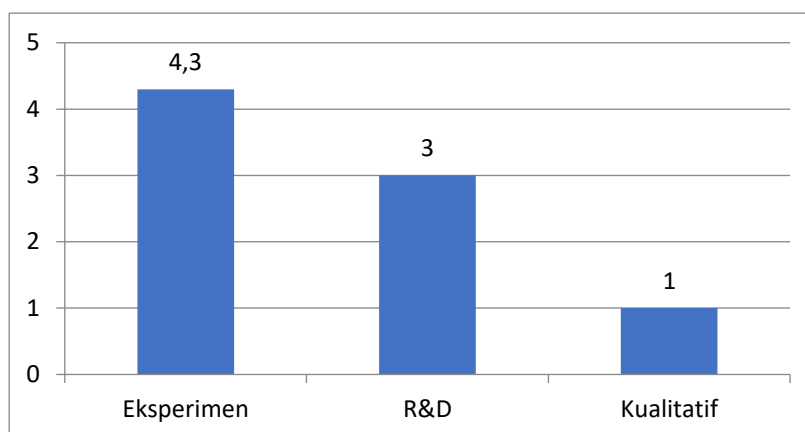


Figure 2 Distribution of types of research conducted by researchers in the last 5 years (2018-2022)

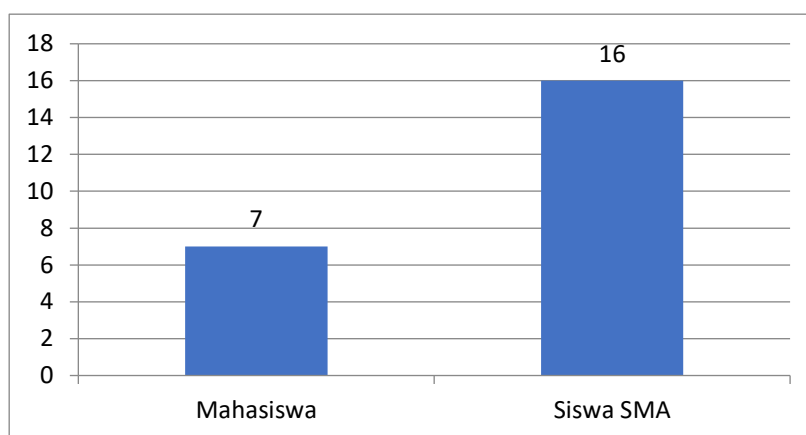
In quantitative research, researchers combine one of the models that can facilitate students' creative thinking ability. In general, researchers use a quasi-experimental design by using a control class and an experimental class in implementing the effectiveness of a model or approach. However, one of the weaknesses of this research is when an educational institution has grouped its students into excellent classes and regular classes so that researchers cannot get maximum results from this research.

However, according to an examination of recent qualitative research, it is evident that the investigation into creative thinking ability has only achieved prominence during the past five years. Consequently, the author predicts that qualitative study pertaining to creative thinking capacity will not commence until the year 2022. The ability for researchers to engage in similar studies is advantageous due to the current scarcity of research in this particular area. The fundamental distinction between quantitative and qualitative research is in their respective approaches to data analysis. Quantitative research primarily centres around the utilisation of statistical methods to analyse data, whereas qualitative research encompasses a broader range of data collection methods, including observation, interviews, and questionnaires. (Boeren, 2018) (Boeren, 2018). Furthermore, according to

LaDonna et al (2018), the integration of qualitative and quantitative research methodologies is posited to yield a more robust and comprehensive investigation. The exclusive reliance on qualitative research presents several limitations, including the utilisation of open-ended statements that may elicit diverse interpretations. To date, research on creative thinking talents has not included a combination of study types or mixed methods. This source can serve as a valuable reference for future scholarly investigations.

3.3 Research Subjects

The majority of research on creative thinking ability is aimed at high school students. As we know research that is often carried out is quantitative research by using certain models to see the achievement of students' creative thinking ability. Based on picture 3 it can be seen that the research subjects that are often measured are high school students with various materials presented. This is in line with the bibliometric study conducted by Marmoah et al. (2022) that research that has often been carried out over the last 3 years involves students as research subjects. This is evident from the search results for keywords high school(secondary school) students who have the most searches on Google Scholar.



Explanation: mahasiswa=university student, siswa SMA=secondary student

Figure 3 Distribution of research subjects conducted by researchers in the last 5 years (2018-2022)

Besides that, the data analysis found that the level class researched is XI grade of secondary students on the acid-base topic (Suryaningsih & Ainun, 2021); (Apriani, 2019); (Cintia et al., 2018); (Rahmawati et al., 2019); (Hidayat et al., 2018). This research is caused by one of the high school materials that have a little scope but the in-depth discussion is Acid-Base. Based on research conducted by (Hidayat et al., 2018) teachers get difficulties in varying acid-base questions for students, therefore, most acid-base questions only measure superficial achievement even though this material is broadly related to human life. The results of the analysis of chemical topic data can be seen in Table 3.

Table 3 Chemistry Topics chosen by researchers in the last 5 years (2018-2022)

Chemistry topics	Number of Articles
Acid	5
Hydrocarbon	4
Electrolytes and Non-electrolytes	1
Inorganic chemistry	1
Organic Chemistry	1
Colloids	1
Chemical Equilibrium	1
Solubility and Solubility Product	1
Chemical environment	4
Biochemistry	1

3.4 Data Analysis Technique

The accuracy of the data analysis will give high confidence and validity to the research results. Based on Figure 4 it is known that the data analysis that is often carried out is the mean analysis or average comparison. Of course, this analysis is still low to be used as a reference. Using the various types of analysis, only 1 study used the Manova test. These results explain that researchers more often use the mean test in displaying data between the two groups that have been tested.

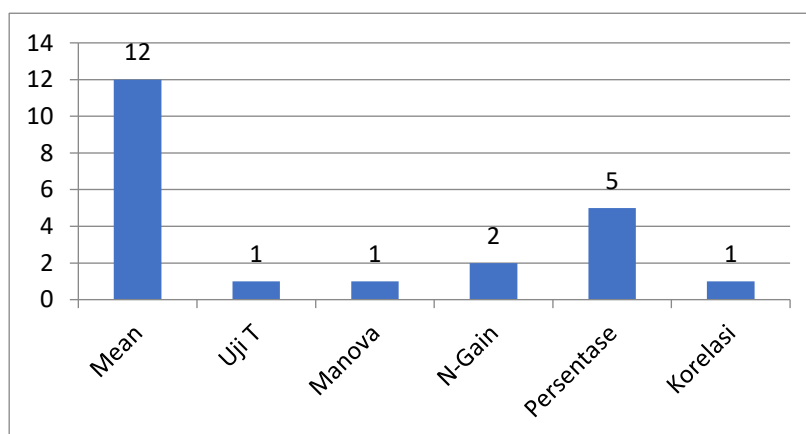


Figure 4. Data Analysis Technique

Explantion: rata-rata=mean, uji-t=T test, manova=maniva, N-Gain, persentase=percentage, korelasi=correlation. Based on the suggestion and some previous studies covarian analysis is recommended analysis (Susetyarini & Fauzi, 2020).

4. CONCLUSION

This study focuses on analyzing creative thinking ability published in Indonesia Journal with duration last 5 years (2018-2022) that has been reviewed. Study trend gives a description that the often study is quantitative research for secondary students on acid-base material by using average comparative analysis. Bsed on the finding, it was found that some recommendations for further research to enrich the knowledge and useful result. First, the type of research suggested is qualitative research and mixed methods to analyze creative thinking ability. Second, studies for higher students are still minimal to be conducted so that research subjects can be replaced in order to occur the variation for result education impact. Until the end, the given recommendation must be appropriate to the hypothesis and research design needed by the researcher.

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