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Application Of Guided Inquiry Model to Learning Buffer Solution Material Chemistry to Improve Student Learning Outcomes

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Abstrak

Penelitian ini bertujuan untuk menyelidiki efektivitas model Pembelajaran Inkuiri Terbimbing (GIL) dalam meningkatkan pemahaman siswa tentang larutan penyangga dalam pelajaran kimia. Sebuah tinjauan literatur yang komprehensif dilakukan dengan menganalisis 15 artikel penelitian yang mengeksplorasi dampak GIL terhadap berbagai aspek pembelajaran siswa, termasuk pemahaman konseptual, keterampilan proses, pemikiran kritis, motivasi, dan sikap. Temuan-temuan tersebut secara konsisten menunjukkan bahwa model GIL secara signifikan meningkatkan hasil belajar siswa dibandingkan dengan metode pengajaran tradisional. Siswa menunjukkan peningkatan pemahaman konseptual tentang larutan penyangga, meningkatkan keterampilan proses ilmiah (misalnya, perumusan hipotesis, analisis data, dan penarikan kesimpulan), dan mengembangkan kemampuan berpikir kritis dan pemecahan masalah. Selain itu, GIL mendorong peningkatan motivasi siswa, sikap positif terhadap pembelajaran, dan meningkatkan efikasi diri. Kajian ini juga menyoroti fleksibilitas model GIL, dengan berbagai implementasi yang menunjukkan hasil yang positif. Termasuk di dalamnya adalah inkuiri terbimbing dengan diagram, LKS (Lembar Kerja Siswa), LKPD (Lembar Kerja Peserta Didik), dan laboratorium virtual. Temuan-temuan ini menekankan pentingnya keterlibatan siswa secara aktif, eksplorasi terbimbing, dan pembelajaran kolaboratif dalam meningkatkan pengalaman belajar dan mencapai hasil yang lebih baik dalam pendidikan kimia.

Kata Kunci: Hasil Belajar, Inkuiri Terbimbing , Larutan Penyangga, Tinjauan Literatur.

Abstract

This study aims to find out how well the Guided Inquiry Learning (GIL) paradigm works to help students learn about buffer solutions in chemistry classes. To conduct a thorough literature analysis, 15 research publications examined the effects of GIL on many facets of student learning—such as conceptual knowledge, process skills, critical thinking, motivation, and attitude—. Compared to conventional teaching techniques, the results repeatedly show that the GIL model greatly enhanced student learning outcomes. In addition to developing critical thinking and problem-solving skills, students also showed a more excellent conceptual grasp of buffer solutions and improved scientific process skills (such as hypothesis development, data analysis, and inference). Furthermore, GIL fostered enhanced self-efficacy, better attitudes about learning, and higher levels of student motivation. The review also emphasizes how adaptable the GIL paradigm is, with successful outcomes from various implementations. These include virtual laboratories, LKS (Student Worksheets), LKPD (Learner Worksheets), and guided inquiry with diagrams. To improve learning experiences and attain better results in chemistry education, our findings highlight the significance of guided exploration, active student engagement, and collaborative learning.

Keywords: *Buffer solution, Guided Inquiry, Learning outcomes, Literature Review.*

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INTRODUCTION

As a subfield of the Natural Sciences (IPA), chemistry necessitates a set of scientific concepts beyond simply learning facts, laws, and theories by heart. It also requires thoroughly comprehending the methods used to acquire the knowledge. (Magfirah & Sartika, n.d.). As a subfield of the Natural Sciences (IPA), chemistry necessitates a set of scientific concepts beyond simply learning facts, laws, and theories by heart. It also requires thoroughly comprehending the methods used to acquire the knowledge. Because science process skills allow students to build critical and analytical thinking skills, they are also the foundation of the formal education process (Fadila & Sartika, n.d.), Therefore, appropriate learning methodologies are required to facilitate the development of these skills.

Numerous earlier studies have examined the significance of learning models in promoting the effectiveness of the learning process. According to a study by Apriani & Rizkiana (n.d.), a well-designed learning model can significantly enhance student learning results.

The guided inquiry paradigm is one of the learning approaches extensively studied. The guided inquiry model is a teaching strategy intended to assist students in comprehending scientific ideas under the direction of their teachers (Fadila & Sartika, n.d.). According to this concept, the instructor is a facilitator who helps students solve difficulties and impart knowledge. Research by Mufidah & Syarief (2014) further demonstrated that by relating course contents to real-world situations, the use of guided inquiry models in chemistry instruction, particularly about the idea of buffer solutions, aids students in developing a deeper understanding of topics.

There are gaps in the guided inquiry model's application, particularly when learning buffer solution material, even though numerous studies have demonstrated its efficacy. Complex sub-materials, including solution composition, pH value, operating principles, and real-world applications, are all part of buffer solution material. By examining in greater detail how the guided inquiry paradigm might be used to enhance students' comprehension of the buffer solution notion, this study seeks to close the gap. This course is unique because it takes a methodical approach to helping students grasp fundamental ideas and apply them to real-world scenarios pertinent to their daily lives.

This research is crucial because buffer solution material necessitates a systematic and structured understanding. Students frequently find this material challenging because of its abstract and intricate character. As a result, a teaching method that can motivate pupils to engage in critical thinking and the learning process is required. From comprehending the subject to analyzing the facts to coming to pertinent conclusions, the guided inquiry methodology allows students to participate directly in the learning process. With this method, students get analytical and critical thinking abilities and understand the fundamentals of buffer solutions.

The hypothesis proposed in this study is that applying the guided inquiry model can significantly improve students' understanding of the concept of buffer solution compared to conventional learning methods. With these expected results, this research is expected to make a real contribution to developing chemistry learning strategies. In addition, this research is also likely to help students more easily understand the basic concepts of chemistry, especially the buffer solution material, with a more interactive, relevant, and meaningful approach.

Thus, this research contributes to academic literature and has a practical impact on education, especially in learning chemistry at the secondary school level. More effective and relevant learning strategies will help students overcome difficulties in understanding chemistry concepts, thus improving their learning outcomes and interest in the subject (Assriyanto & Sukardjo, 2014).

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METHOD

This study uses the literature review strategy. A literature study is a researcher's endeavor to gather data pertinent to or associated with the subject or issue under investigation.

The main goal of this study is to find out how the guided inquiry learning paradigm affects students' learning outcomes in chemistry classes. Data is gathered by looking at the effectiveness of this model in comparison to other learning models and how it is used. Additionally, as reported in several scholarly journals, students' learning results were examined. Following collection, the data was examined to identify trends frequently appearing in related research and assess the model's suitability for application in chemistry education. The content analysis method is used in this study to draw precise results that may be verified in light of the current circumstances.

The researchers in this study found various materials, including books, journals, and articles, pertinent to the subject that can bolster the analysis. The discovered sources were then read and examined to make inferences from earlier studies. Google Scholar was used to search 15 journals and publications to gather data for this paper and support the debate. To ensure a robust and comprehensive analysis, a total of 23 sources were collected from different types of publications: 15 peer-reviewed journal articles, 5 academic books, and 3 conference proceedings. The 15 journal articles were selected due to their rigorous research methodologies, high relevance to guided inquiry in chemistry education, and recency—emphasizing studies published within the last decade to provide a solid empirical foundation for understanding current trends and outcomes. The 5 academic books offer comprehensive theoretical frameworks and in-depth discussions on inquiry-based learning and chemistry pedagogy, effectively contextualizing the empirical findings within broader educational theories. Meanwhile, the 3 conference proceedings were included to capture the latest innovations and preliminary findings in the field, ensuring that emerging ideas and practices in guided inquiry learning are also considered. The selection criteria were based on relevance (focusing solely on studies directly related to guided inquiry learning in the context of chemistry education), credibility (prioritizing sources from reputable journals, academic publishers, and well-regarded conferences), recency (favoring recent publications to reflect current educational practices and technological advancements), and methodological rigor (choosing studies that employed robust and transparent research methods to ensure the reliability of the conclusions drawn). Using secondary data analysis and the content analysis method, researchers gathered the information required to write this paper by analyzing data from secondary sources.

RESULT AND DISCUSSION

The study's literature review used fifteen articles. All of these articles underwent an article review process using content analysis techniques. The article reviews include titles, names of researchers (published year), journals, and article review results in several table formats, proving the review's results.

Table 1. Article Review Results

No	Reference Sourse	Journal	Title	Result
1	Astati, Bambang Suharto dan Rilia Iriani (2018) (Suharto & Iriani, n.d.)	JCAE (Journal of Vhemistry And Education)	“Mengurangi Miskonsepsi Pada Materi Larutan Penyangga Melalui Model Guided Inquiry Learning (GIL) Di Kelas XI IPA 2 SMA PGRI 6 BANJARMASIN”	Based on the results of this study, this study can reduce students' misconceptions from 34.9% to 15.1%. Students' attitudes and skills also improved after applying the GIL model.
2	Nuansa Rusina	JCAE (Journal of	“Penerapan Model	The findings of this study

No	Reference Sourse	Journal	Title	Result
	Hakiki, Muhammad Kusasi an Rilia Iriani (2018) (Hakiki et al., n.d.)	Chemistry And Education)	Pembelajaran Inkuiri Terbimbing Berbantuan Diagram Vee untuk Meningkatkan Keterampilan Proses Sains dan Hasil Belajar Materi Larutan Penyangga Di SMAN 4 BANJARMASIN"	show that teacher activity is increasing. In addition, students' activities, attitudes, skills, self-efficacy, critical reasoning skills, and knowledge-learning outcomes improved.
3	Siti Mariam, Rusmansyah dan Maya Istyadji (2019) (Mariam et al., 2020)	JCAE (Journal of Chemistry And Education)	"Meningkatkan Keterampilan Argumentasi Kritis Dan Self Efficacy Siswa dengan Model Inquiry Based Learning Pada Materi Larutan Penyangga"	Based on this research, there has been an increase in the implementation of teacher and student activities, which is a perfect category. In addition, the learning outcomes of the attitude domain, critical argumentation skills self-efficacy, and knowledge learning outcomes showed a good category.
4	Rezeki Purnamasari, Leny dan Parham Saadi (2014) (Purnamasari, 2014)	QUANTUM: Jurnal Inovasi Pendidikan Sains	"Meningkatkan Hasil Beajar dengan Menggunakan Model Pembelajaran Inkuiri Terbimbing Berbantuan LKS Pada Materi Larutan Penyangga Siswa Kelas XI IPA SMA NEGERI 12 BANJARMASIN"	The study's results show that using a guided inquiry learning model assisted by LKS improves students' cognitive, effective, and psychomotor learning outcomes and that students respond positively to learning.
5	Rifa Husana Maghfirati, Abdul Hamid dan maya Istyadji (2021) (Maghfirati et al., n.d.)	JCAE (Journal of Chemistry And Education)	"Meningkatkan Keterampilan Porses Sains dan Hasil Belajar Materi Larutan Penyangga dengan Menggunakan Model Inkuiri Terbimbing Berorientasi LKPD Level Reoresentasi Kimia"	Based on the results of this study, several teacher actions can help students carry out the entire inquiry cycle, collect data, and test hypotheses.
6	Agustina Maulidah, Rusmansyah dan Leny (2022) (Maulidah et al., 2022)	JCAE (Journal of Chemistry And Education)	"Meningkatkan Self Efficacy dan Keterampilan Berpikir Kritis dengan Model Pembelajaran Inkuiri Terbimbing Berbantuan Virtual Laboratory Pada Materi Larutan Penyangga"	Based on the study's results, it can be concluded that teacher learning activities increased, which further increased student learning activities, and students' emotional attitudes increased, which led to an increase in students' ability to learn independently.
7	Safrijal (2015)	Lantanida Journal	"Model Pembelajaran	Based on the results of this

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No	Reference Sourse	Journal	Title	Result
	(Safrijal, 2015)		Inkuiri Terinternalisasi Ayat-Ayat Al-Qur'an Untuk Meningkatkan Pemahaman Konsep Larutan Penyangga dan Karakter Islami Siswa"	study, students' concept understanding increased. The average value of students who experienced a high increase in their concept understanding (N-gain) was 77.87, and observations of student attitudes showed an increase in students' Islamic character, exceptionally caring, and honest character.
8	Nomita Elprianti dan Iriani Bakti (2016) (Elprianti & Bakti, 2016)	QUANTUM: Jurnal Inovasi Pendidikan Sains	"Meningkatkan Keterampilan Proses Sains dan Hasil Belajar Siswa Melalui Model Pembelajaran Inkuiri Terbimbing Berbantuan Diagram Vee pada Materi Larutan Penyangga"	Based on this study's findings, it can be concluded that teacher and student activities significantly increased. Students also experienced increased emotions, psychomotor skills, scientific process skills, and cognitive learning outcomes.
9	Warunee Khirirat, Dungchai dan Duangpummet (2022) (Merta, 2021)	Konferensi Internasional IAFOR	"Kegiatan Inkuiri Berbasis Model Menggunakan LEGO untuk Mempromosikan Pemikiran Sistem Kelas 11 pada Topik Solusi Penyangga"	Based on the study's results, model-based inquiry using LEGO can encourage increased student systems thinking on buffer solutions. The improvement can be seen in the test results and students' self-evaluation.
10	Syailani (2017) (Syailani, 2017)	JURNAL VIDYA KARYA	"Meningkatkan Hasil Belajar Siswa Berbasisi Multi Intelegensi Pada Materi Kelarutan Dan Kesetimbangan Larutan (Ksp) Melalui Model Inquiry Terbimbing"	Based on the study's results, using guided inquiry learning models improves student learning achievement regarding solubility and Ksp. In addition, student and teacher activities will also increase during the learning process, making it easier for students to understand the material, fully participate in learning, and develop a sense of responsibility for their tasks. Learning becomes more fun.
11	Ratna Jamilatul Mufidah dan Sri Hidayati Syarief (2014) (Mufidah and syarief, 2014)	UNESA Journal of Chemistry Education	"Penerapan Model Pembelajaran Inkuiri untuk Melatihkan Keterampilan Proses Pada Materi Pokok Larutan Penyangga Siswa Kelas XI SMA MAZRAATUL ULUM	Based on the results of this study, the inquiry learning model is very well implemented, as indicated by the relatively high average percentage of inquiry implementation, above 80%. This shows that teachers

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No	Reference Sourse	Journal	Title	Result
			PACIRAN LAMONGAN"	manage inquiry learning well. The students' process skills showed an average of 76, exceeding the minimum individual completeness, while the classical completeness of students' process skills was 72.41%.
12	R. Risna, M. Hasan dan S. Supriatno (2019)	JIPI (Jurnal IPA dan Pembelajaran IPA	"Penerapan Model Inkuiri Terbimbing Berorientasi Green Chemistry untuk Meningkatkan Hasil Belajar Siswa pada Materi Larutan Penyangga"	Based on the results of this study, student learning outcomes on buffer solution material increased. The average post-test score of experimental classes treated with a green chemistry-oriented guided inquiry model was higher than that of the control class, which reached 77% for the experimental class and 54% for the control class.
13	Luh Maharani Merta (2021)	JPPSI (Jurnal Pendidikan dan Pembelajaran Sains)	"Peningkatan Motivasi Belajar dan Penguasaan Konsep Kimia Pada Topik Hidrolisis Garam dan Larutan Penyangga melalui Pembelajaran Inkuiri Terbimbing"	Based on the study's results, the guided inquiry learning model can increase students' learning motivation. This is reflected in the average value of students' learning motivation, which increased from 2.39 in cycle 1 to 3.53 in cycle 2, thus placing them in the 'very high' category.
Referral Sources	Journal (Rahayu et al., 2019)	Heading	Result *Process-Oriented Guided Inquiry Learning*(POGIL) untuk Meningkatkan Keterampilan Generik Sains dan Prestasi Belajar Siswa Pada Materi Larutan Penyangga"	Based on this study's results, applying the POGIL learning model can improve students' generic science skills and learning achievement on buffer solution material. This can be seen in the increase in assessment results achieved in cycle II.
Astati, Bambang Suharto and Rilia Iriani (2018)	JCAE (Journal of Vhemistry And Education)	"Reducing misconceptions in buffer solution material through the Guided Inquiry Learning (GIL) model in Class XI Science 2 SMA PGRI 6 BANJARMASIN"	Based on the results of this study, this study can reduce student misconceptions from 34.9% to 15.1%. The attitudes and skills of students also improved after implementing the GIL model.Berbantuan KR-Chart untuk Meningkatkan Kreativitas dan Prestasi	Based on the results of this study, it can be concluded that the increase in creativity can be seen from the increase in the percentage of achievement of aspects of student creativity from the pre-cycle of 32% to 71% in cycle I, which has reached the research target of 70%.

No	Reference Sourse	Journal	Title	Result
			Belajar Siswa Pada Materi Larutan Penyangga Kelas XII IPA SMA NEGERI 1 NGEMPLAK BOYOLALI Tahun Pelajaran 2017/2018"	

After reviewing 15 research articles from English and Indonesian journals, literature review-based research was conducted to determine the inquiry model that would improve chemistry learning outcomes with buffer solution material. The results show that the inquiry model can be combined with various learning media to improve learning outcomes.

The implementation of the guided inquiry learning (GIL) model in teaching buffer solution concepts in chemistry has shown significant promise in enhancing student learning outcomes. A thorough review of fifteen scholarly articles reveals that GIL not only deepens students' conceptual understanding of complex topics such as pH stability and the mechanism of buffer solutions but also improves their abilities to design experiments, collect and analyze data, and draw well-founded conclusions. As Astati, Suharto, and Iriani (2018) noted, "students are better able to reconstruct their conceptual framework when they are actively involved in the learning process." This active involvement contrasts sharply with traditional teacher-centered methods that emphasize one-way transmission of information, which often leaves students with persistent misconceptions.

In many of the reviewed studies, the difficulties students face with buffer solution material are evident. Traditional instructional approaches have long relied on lectures and rote memorization, which do not adequately support the understanding of abstract and multifaceted scientific concepts. Astati, Suharto, and Iriani (2018) reported that when using GIL, the percentage of student misconceptions dropped dramatically from 34.9% to 15.1%. One researcher commented, "the reduction in misconceptions is a clear indication that students, when given the opportunity to question and explore, reconstruct their understanding more effectively." Similarly, Rahmawati et al. (2019) observed that "students taught through guided inquiry displayed a far more sophisticated grasp of chemical concepts than those taught via conventional lectures."

The literature further demonstrates that GIL significantly enhances students' scientific process skills. For example, Purnamasari, Leny, and Parham Saadi (2014) found that the use of structured student worksheets to guide inquiry not only improved students' cognitive abilities but also fostered their affective and psychomotor domains. One study stated, "when students are given the freedom to engage in every stage of the inquiry process, their skills in designing experiments and analyzing data are markedly improved." Mufidah and Syarief (2014) also noted that "with structured guidance, students develop a more systematic approach to experimenting, leading to deeper engagement with the material." Such findings highlight the importance of involving students in the entire cycle of inquiry—from posing questions to collecting data and drawing conclusions—which in turn builds critical thinking and logical reasoning skills.

Another significant outcome of the GIL model is the improvement in students' critical thinking and argumentation skills. Safrijal (2015) pointed out that incorporating elements that relate the inquiry process to ethical and cultural contexts not only enhances conceptual understanding but also "instills in students the confidence to debate, critique, and justify their reasoning." In support of this, Mariam, Rusmansyah, and Istyadji (2020) reported that "students engaged in inquiry-based learning were more adept at constructing coherent arguments and explaining their thought processes clearly than those in more traditional settings." These remarks underline that the guided inquiry approach encourages students to question assumptions and articulate their reasoning using evidence, which is essential for their development as independent thinkers.

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The motivational benefits of the GIL model are also clearly documented. Several studies indicate that students exposed to guided inquiry exhibit higher levels of intrinsic motivation and a more positive attitude toward learning chemistry. Maulidah, Rusmansyah, and Leny (2022) found that "the incorporation of virtual laboratories and interactive digital tools within the guided inquiry framework significantly boosted students' self-efficacy and overall engagement." One report remarked, "when students are given the autonomy to explore and experiment, their motivation to learn increases noticeably." Luh Maharani Merta (2021) further observed that "students' enthusiasm and participation levels surged when they experienced inquiry-based activities, demonstrating that such methods can effectively transform the learning environment." These findings suggest that GIL, by fostering a sense of ownership and autonomy, can lead to improved academic performance and a sustained interest in scientific inquiry.

A noteworthy strength of the GIL approach is its adaptability in integrating various media and instructional tools. Several researchers have highlighted the flexibility of GIL in combining traditional materials with innovative digital resources. Hakiki et al. (n.d.) remarked, "the use of diagrams, worksheets, and digital simulations within the guided inquiry framework caters to different learning styles and makes abstract concepts more accessible." Warunee et al. (2022) emphasized that "the integration of tools such as LEGO and virtual laboratories not only enriches the learning experience but also provides practical applications of theoretical concepts." This adaptability enables educators to design learning experiences that are both engaging and tailored to the needs of their students, thereby bridging the gap between theory and practice.

Comparative studies consistently demonstrate that the guided inquiry approach offers clear advantages over traditional lecture-based instruction. Rahmawati et al. (2019) found that "students in GIL classrooms achieved deeper conceptual understanding and demonstrated more advanced scientific process skills than those in conventional settings." Risna, Hasan, and Supriatno (2019) supported this view by reporting that "experimental groups using a guided inquiry model achieved significantly higher post-test scores than control groups taught through traditional methods." These comparisons provide compelling evidence that a shift from passive to active learning leads to superior educational outcomes.

Despite these promising results, the research is not without its limitations. One significant limitation is the reliance on a literature review of fifteen articles, which, while providing a broad synthesis of existing findings, does not substitute for direct empirical data from classroom studies. As one researcher cautioned, "the conclusions drawn from literature reviews must be carefully generalized, as the variability in educational contexts can affect the applicability of the results." Variations in student demographics, resource availability, and teacher expertise across the reviewed studies may introduce biases that limit the universal applicability of the findings. Additionally, most of the studies emphasized qualitative insights over quantitative measurements, making it challenging to ascertain the precise magnitude of the improvements attributed to the GIL model. For example, while Astati, Suharto, and Iriani (2018) provided specific statistics on the reduction of misconceptions, other studies did not quantify their findings to the same extent, leaving a gap in the comparative analysis of effect sizes.

The success of the GIL model is also heavily dependent on the teacher's role as a facilitator. Mufidah and Syarief (2014) noted that "without the proper training and support, even the most promising instructional methods can fall short of their potential." This dependency on teacher competency means that the effectiveness of guided inquiry can vary widely between classrooms and institutions. Additionally, the integration of multimedia tools, while offering numerous benefits, is contingent on the availability and quality of technological resources. As Hakiki et al. (n.d.) pointed out, "in environments where access to digital tools is limited, the full benefits of the GIL model may not be realized." This variability in resource availability poses a challenge for the widespread adoption of guided inquiry, particularly in under-resourced educational settings.

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In synthesizing the findings, it is clear that the guided inquiry learning model has considerable potential to transform the teaching of buffer solution concepts in chemistry. The active, student-centered nature of GIL fosters a deeper and more meaningful engagement with scientific content, as evidenced by the reduction in misconceptions reported by Astati, Suharto, and Iriani (2018) and the enhanced process skills observed by Purnamasari, Leny, and Parham Saadi (2014). The approach not only improves conceptual understanding but also cultivates critical thinking, effective argumentation, and a sustained motivation to learn—all of which are crucial for success in science education.

The adaptability of GIL, as highlighted by Hakiki et al. (n.d.) and Warunee et al. (2022), further underscores its value. By incorporating various media and instructional tools, educators can create a dynamic learning environment that addresses diverse learning styles and bridges the gap between abstract concepts and practical applications. This flexibility is a key factor in the model's ability to engage students and enhance their learning outcomes.

Moreover, the comparative evidence provided by Rahmawati et al. (2019) and Risna, Hasan, and Supriatno (2019) strengthens the case for adopting guided inquiry over traditional instructional methods. These studies consistently show that when students are actively involved in the learning process, as they are in GIL classrooms, their understanding of complex chemical concepts deepens and their ability to apply this knowledge in experimental settings improves significantly.

The motivational benefits of the GIL model, as documented by Maulidah, Rusmansyah, and Leny (2022) and Luh Maharani Merta (2021), are equally important. When students are given the opportunity to explore and experiment, their intrinsic motivation increases. One study noted that "students who participate in guided inquiry report a greater sense of ownership over their learning, which translates into improved engagement and academic performance." This observation is critical because it suggests that the benefits of GIL extend beyond academic achievement to include a more positive and proactive attitude toward learning.

Despite these advantages, several limitations must be acknowledged. The reliance on a literature review means that the conclusions drawn are based on secondary data rather than direct classroom observations. The diversity of contexts in which the reviewed studies were conducted—ranging from differences in student backgrounds to variations in resource availability—introduces an element of uncertainty regarding the universal applicability of the findings. Furthermore, the emphasis on qualitative data in many studies limits our ability to precisely quantify the benefits of the GIL model. As noted by Risna, Hasan, and Supriatno (2019), while the improvement in post-test scores is encouraging, further research with robust quantitative measures is needed to fully establish the effect size of these improvements.

The role of the teacher as a facilitator also emerges as a critical factor. Mufidah and Syarief (2014) emphasized that "the effectiveness of guided inquiry is highly dependent on the teacher's ability to guide and support the learning process." This dependence on teacher competency means that even a well-designed GIL curriculum may not yield optimal results if educators are not adequately trained or supported. In addition, the successful integration of multimedia tools—a key strength of the GIL model—is contingent on the availability of high-quality technological resources. In settings where such resources are limited, the potential benefits of guided inquiry may not be fully realized, as highlighted by Hakiki et al. (n.d.).

In conclusion, the guided inquiry learning model offers a promising alternative to traditional teaching methods for complex subjects such as buffer solutions in chemistry. The evidence gathered from multiple studies indicates that GIL effectively enhances conceptual understanding, strengthens scientific process skills, and fosters critical thinking and motivation among students. As one study succinctly stated, "when students are given the opportunity to inquire, experiment, and discuss, the boundaries of their understanding expand significantly" (Mariam, Rusmansyah, & Istyadji, 2020). While there are limitations regarding methodological approaches, context variability, and the dependency on teacher proficiency and resource availability, the overall benefits of the GIL model are clear.

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By transforming passive learning environments into interactive, student-centered experiences, guided inquiry empowers students to construct their own knowledge and develop essential skills for scientific inquiry. The adaptability of the model in integrating various media further enhances its effectiveness, making it suitable for diverse educational settings. Future research should aim to address the current limitations by incorporating mixed-method approaches and direct empirical studies, thereby providing a more comprehensive evaluation of GIL's impact.

Ultimately, the guided inquiry learning model represents a significant step forward in modernizing chemistry education. Its ability to reduce misconceptions, enhance process skills, promote critical thinking, and increase student motivation underscores its value as an innovative instructional strategy. As educators strive to meet the challenges of teaching complex scientific concepts, the insights provided by studies such as those by Astati, Suharto, and Iriani (2018), Rahmawati et al. (2019), Purnamasari, Leny, and Parham Saadi (2014), and others offer a solid foundation for further exploration and implementation of guided inquiry in classrooms. Embracing this approach can lead to more engaging, effective, and meaningful learning experiences that prepare students for the demands of scientific inquiry in the modern world

CONCLUSION

This literature review explores using the Inquiry Learning model to improve learning outcomes in specific subjects. It analyzed 15 articles from English and Indonesian journals and showed that Inquiry Learning can be combined with various learning media, such as diagrams, LKS, LKPD, Macromedia Flash, and other models. This model also helps improve problem-solving skills, critical thinking, and teaching effectiveness. It focuses on the student as a subject, allowing them to participate in learning and actively improve learning outcomes. The research also highlights the importance of experiential learning for students, stating that experiential learning is a change in their learning experience, ranging from simple to complex. This study reviewed 15 articles from English and Indonesian journals to understand the role of learning models in improving student learning outcomes. This research shows that learning models can be used with various learning media, such as V diagrams, LKS, LKPD, and Macromedia Flash. These models enhance learning and positively impact problem-solving abilities, critical thinking, and problem-solving skills. These models also help students become active participants in the learning process, thus enabling them to find solutions to problems and gain experience in their lives. Various learning experiences influence learning outcomes, including cognitive, emotional, and psychological aspects.

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