OPEN ACCESS

Jurnal Riset Pendidikan MIPA, 6(2): 69-76, December 2022
ISSN 2549-0192 (e) | 2549-0184 (p)
https://new.jurnal.untad.ac.id/index.php/jrpm

Implementation of the Guided Inquiry Learning Model with High and Low Achievement Motivation on Student Learning Outcomes in Acid Base Material in Class X Department of Computer and Network Engineering (TKJ) in Vocational High Schools

Rini*, Mery Napitupulu & Tri Santoso
Pendidikan Sains Program Magister/Pascasarjana – Universitas Tadulako, Palu – Indonesia 94118
Email corresponding author: Rini_laporori@yahoo.com

Article History
Received 15 July 2022
Revised 21 August 2022
Accepted 28 September 2022

Keywords:
Guided inquiry Learning, achievement motivation, acid-base, student learning outcomes

Abstract

The aims of the study were to describe: 1. the application of the guided inquiry learning model, 2. student interaction in the guided inquiry learning model between high and low achievement motivation, 3. student responses to the application of the guided inquiry learning model, 4. improvement in student learning outcomes with achievement motivation high and low, and 5. student learning outcomes using guided inquiry learning models on acid-base material. The research method used is quasi-experimental. Data collection through learning achievement tests, achievement motivation questionnaires, and student responses as well as observation sheets. The results showed that: (1) the application of the guided inquiry learning model was well implemented, (2) there was student interaction in the guided inquiry learning model between high and low achievement motivation as indicated by the sig value (0.000) < α (0.05), (3) student responses were very high, both those with high and low achievement motivation, (4) there was an increase in the learning outcomes of students who had high and low achievement motivation, and (5) there were differences in learning outcomes before and after using the guided inquiry learning model. acid-base material.

doi: 10.22487/j25490192.2022.v6.i2.pp.69-76

Introduction

Chemistry is a collection of concepts, principles, laws, and theories formed through a systematic creative process through inquiry Gilbert et al. (2009) stated that chemistry developed through scientific investigation consists of 4 components: (1) the process, which is used for discover chemical knowledge; (2) products, in the form of specific facts, concepts (abstract and concrete), principles, laws, theories, and models; (3) the application (application) of knowledge in understanding and changing the world; and (4) the implications of understanding and change for individuals and society.

Maikristina et al. (2014) argued that the characteristics of abstract chemical concepts make chemistry difficult to study and require higher thinking skills to understand them. The purpose of learning chemistry is not only to provide opportunities for students to learn about facts and theories but also to develop scientific habits and attitudes to discover and renew their practice and reasoning skills in order to construct their knowledge and understanding.

Based on the reflection carried out by the researcher, there are several deficiencies in carrying out learning activities in class X TKJ SMKS PGRI Palu, namely methods and learning models that are not suitable, causing students to be passive, lack understanding of the material being taught and less motivating, ultimately impacting the achievement of results low learning.

Especially in chemistry subjects, many students do not know the material so an experiment or practicum is needed so that students better understand the material being taught. Researchers took acid and base materials because in vocational high schools, chemistry subjects were only in class X, and acid-base material supported the practicum because the tools and materials for practicum were very limited.

One of the efforts to improve student-centered learning and be able to generate curiosity from students is the guided inquiry learning model. According to Jack (2013), guided inquiry learning is very effective when used in chemistry learning to understand and apply concepts that are often considered difficult by students. Why did this happen? According to Santoso (2018), based on the theory of constructiveness, learning is an active process in which students build new ideas or concepts based on previous experiences and knowledge constructed through interactions with others in the form of guidance. Namely inquiry-based teaching emphasizes the concepts of cognitive learning and discovery and has the aim of developing more critical thinking. In other words, the teacher does not teach everything directly or explicitly. On the other hand, students are expected and

encouraged to find new knowledge and apply this knowledge in everyday life and in new cases.

Sunardi (2010) explains that inquiry is a student-centered learning strategy, which encourages students to investigate and determine information, where the learning activities carried out by students are the same as the procedures carried out by scientists in investigating problems and determining information. In this inquiry model learning students are mentally and physically involved to solve a problem given by the teacher. This is also in accordance with the results of research conducted by Viilagonzalo (2014) showing that the application of the guided inquiry model can increase the level of student work performance. Thus, students will have skills and attitudes like scientists in science, namely conscientious, diligent/tenacious, objective/honest, creative, and respect the opinions of others. The inquiry learning model emphasizes the process of searching and finding.

According to Sukma et al. (2016) stated that guided inquiry is a learning model that can improve student learning outcomes by designing and finding their own concepts that will make the material longer stored in students' memories. In guided inquiry, the role of students is more dominant and active, while the teacher directs and guides students in the right direction.

In addition to using a learning model that supports educators, they must provide motivation in learning, namely achievement motivation so that it can further improve student achievement and are enthusiastic in improving learning outcomes. Achievement motivation is a motive that encourages humans to do good for others in achieving their goals. Achievement motivation is said to be the overall driving force within students that creates enthusiasm for learning activities and ensures the continuity of these learning activities. So that the desired goal by the subject can be achieved with the best possible results. According to Wahida et al. (2016) achievement motivation is a process or factor that encourages to act and do something in a certain way to achieve the highest glorious achievement, with motivation, students will be eager to implement and participate in classroom learning.

In the learning process. Achievement motivation is also one of the factors that is thought to have a large influence on student learning outcomes. The importance of achievement motivation is formed so that learning changes for the better. Sahidin & Jamil (2013). The difference in learning outcomes in this study is caused by students who have high achievement motivation always desire to complete something to achieve a standard of success. Students who have high achievement motivation will have a strong desire to achieve learning outcomes until they achieve the desired success. Achievement motivation can encourage. Besides that, according to Handaka et al. (2018), the difference in achievement motivation greatly affects the value of knowledge, attitudes, and skills.

Based on these problems, the researchers conducted research on the effect of guided inquiry learning models on student achievement motivation and on student learning outcomes in acid-base material.

Materials and Method

The research design used was a quasi-experiment or quasi-experiment using one group pre-test and post-test design. This research was conducted at SMKS PGRI Palu in class X TKJ for students who are active and registered in the odd semester of the 2019/2020 school year. The sampling method was purposive sampling, namely the sampling technique based on certain considerations, the reason for selecting the sample was that in class X the computer and network engineering department (TKJ) consisted of 1 class which would be used as the experimental class. The population in this study were all students of class X majoring in computer and network engineering (TKJ), totaling 32 students.

The type of data in this study consisted of qualitative and quantitative data. Quantitative data were obtained from the results of learning outcomes tests and qualitative data were obtained from the results of students' motivation questionnaires and observations of student activities in the implementation of learning. Drawing conclusions based on the method of descriptive analysis, hypothesis t-test, and n-gain test.

The analysis technique used in this study consists of 3 techniques, namely:

1. Analysis of research instruments, namely (1) analysis of validity by experts (test of learning outcomes, on questionnaire sheets, lesson plans, and student worksheets). Achievement motivation consists of 15 statements and a student response questionnaire consisting of 20 questions about the learning used, RPP, and LKPD about the style and movement of the material.
2. Analysis of the validity of learning outcome test items with the acceptance criteria for each item is fulfilling if $0.21 \leq rpbi \leq 1.00$, (2) analysis of the distinguishing power of the test items with the criteria for distinguishing power of the test items used $0.21 \leq d \leq 1.00$. (3) Analysis of the difficulty level of the test item with the test item difficulty index criteria used was $0.31 \leq P \leq 0.70$, and (4) analysis of the reliability of the test with the test criteria if rl l> 0.70 can be concluded that the test is reliable.
3. Research data analysis. This analysis uses quantitative descriptive analysis techniques with statistical tests to see normality, homogeneity of variance, achievement motivation, student responses, and student learning outcomes.

Results and Discussion

A. Instrument test results

In this descriptive data, the results of research data will be presented which include learning activities by looking at the influence of the guided inquiry learning model during acid and alkaline chemistry lesson activities. The research data obtained in this study were in the form of learning outcomes and high and low achievement motivation questionnaires as well as student responses to guided inquiry learning models, comparison of the mean pretest and posttest scores to see the average increase tested with n-gain, and as well as see the feasibility of learning.

1. Average score of learning outcomes test based on high and low achievement motivation and n-gain

The pre-test and the final test were conducted in the experimental class which consisted of 32 students. The values given have a range of 0-100. The results of pre-test and final test data processing for the class, obtained data on the Gain value, the average value, and the criteria for each gain value as shown in Table 1.

Table 1. Average test of student learning outcomes, high and low achievement motivation, and n-gain

No	Category Achievement Motivation	The mean score of the test		ΔN	G	Nonima
		Early	End			
1	High	46.12	78.82	32.71	0.61	S
2	Low	28.00	61.07	33.07	0.46	S

In Table 1, it is found that the learning outcomes of students who have high and low categories have an increase in the initial and final tests and have different N-gain values but are still in the same category, namely the medium category.

2. High and low-motivated student interaction data

The following is the calculation of the percentage differs based on the type of motivation in the student achievement motivation questionnaire from high and low-motivated students, it can be seen in Table 2.

Table 2. Data on student achievement motivation tests of normality

No	Types of Student Motivation	SMBT(%) From 17 Student	SMBR(%) From 15 Student
1	Active learning	88.24	56.67
2	Choose learning over play	77.94	50.00
3	To the library to read books and do assignments	70.59	51.67
4	When having difficulty doing assignments, you will ask questions and discuss with friends	89.71	61.67
5	Believe in one's ability to achieve success	91.18	51.67
6	Disappointed if test scores decrease	94.12	53.33
7	Confident when competing with others	80.88	56.67
8	Confidence in one's ability to do assignments	86.76	53.33
9	Choosing to do nothing to avoid failure	79.41	55.00
10	Feel successful when reaching the target	86.76	55.00
11	Feel successful if your test scores are high	89.71	55.00
12	Strive to be the best	86.76	55.00
13	If you experience failure, try again to achieve success	89.71	53.33
14	Do better when you're worried about failing	85.29	53.33
15	The greater the chance of failure, the stronger the determination to achieve success	92.65	53.33
	Avarage	85.88	54.38
	Overall Motivation Mean Score (high and low)	71.09	

Note: SMBT = High achievement motivation student, SMBR = Low achievement motivation student

3. Student response data in learning

The following is the calculation of the percentage differences in the types of student responses to the learning model Guided inquiry based on questionnaire responses from high and low-motivated students can be seen in Table 3.

Table 3. High and low motivated student response data

No	Type of Student Response	SMBT (%) From 17 Student	SMBR (%) From 15 Student
1	Happy to take part in learning chemistry on acids and bases	94.12	85.00
2	It is easier to understand the material using a guided inquiry model	91.18	86.00
3	Guided inquiry models make questions more active	82.35	80.00
4	It is easier to remember acidic and alkaline materials using the guided inquiry model	91.18	85.00
5	It is easier to solve problems on acid and base materials using the guided inquiry model	85.29	80.00
6	Focus on the subject matter using the guided inquiry model	88.24	81.67
7	Guided inquiry model motivates task completion	91.18	78.33
8	Have a high willingness to take chemistry lessons Acid and base materials use a guided inquiry model	82.35	81.67
9	It is desirable to issue opinions on acidic and alkaline materials using the guided inquiry model	73.53	83.33
10	Guided inquiry models make learning with friends better	91.18	88.33
11	Using a guided inquiry model can build better relationships between friends	89.71	81.67
12	Guided inquiry models can foster a relationship of mutual respect for the opinions of others	89.71	81.67
13	More courageous in expressing opinions in chemistry subject using guided inquiry models	83.82	76.67
14	Guided inquiry models can increase cooperation between friends	85.29	83.33
15	It's easier to apply in everyday life about acid-base solutions using a guided inquiry model	80.88	68.33
16	It is easier to distinguish between acid-base solutions using a guided inquiry model	88.24	80.00
17	It is easier to explain about acid-base solutions using a guided inquiry model	88.24	83.33
18	It is easier to provide examples of acid-base solutions using the guided inquiry model	83.82	81.67
19	Guided inquiry models can make finding new ideas on the material being discussed	77.94	80.00
20	Guided inquiry model makes it motivated to increase achievement of the material discussed	89.71	78.33
	Avarage	86.40	81.25
	Overall Response Score (high and low Motivated)	83.98	

Note: SMBT = high achievement motivation student, SMBR = Low achievement motivation student

4. Learning implementation data (RPP)

Learning implementation is obtained based on the observation sheet of the implementation of the learning implementation plan (RPP) using a guided learning model in which there are several aspects observed consisting of preliminary, core, and closing activities. All activities contained in the Learning Implementation Plan (RPP) were carried out well, this can be seen from the results of the observations presented in Table 4.

Table 4. Results of the learning implementation observation sheet

Activities	Observed aspects	Implementation
Introduction	Orientation - Appreciation	Aye
	Motivation - Referral	Aye
Core	Formulate problems	Aye
	Formulating Hypotheses	Aye
	Conducting Experiments	Aye
	Evaluating Hypotheses	Aye
	Making Conclusions	Aye
Closing	Reflection	Aye

5. Normality test

The normality test is carried out to determine whether the population is normally distributed or not. This normality test was carried out by using the chi-square test with a significance level of $\alpha = 0.05$. After processing the data, the results of the normality test get the arithmetic value $\chi^2\ count > \chi^2 table$ in the initial test table and the $\chi^2\ count < \chi^2\ table$ value in the final test for the experimental class. Based on the decision-making criteria, the initial test H_0 is rejected and the final test H_0 is accepted. This shows that the sample of the experimental class comes from a normally distributed population.

6. Homogeneity test

The next step to see whether the data comes from the same variance or not is to test the homogeneity using the F statistical test with a significance level of $\alpha = 0.05$. After processing the data, produces F*count* in the initial test of 1.07 and in the final test of 0.88 while F*table* has a value of 2.15. Based on these results, it can be seen that

F*count* < F*table* at the final test, so it can be concluded that the experimental class in the pre-test and in the final test comes from the same variance (homogeneous).

This hypothesis testing is useful for seeing the average difference between the pretest and posttest scores by using the guided inquiry learning model in class X TKJ SMKS PGRI Palu. The requirement for conducting this test is that the data must be normally distributed and homogeneous. Testing this hypothesis using t-test statistics (two-sample test is related). Statistical test data are presented in Table 7.

Table 7. Hypothesis test results

Class	Mean pretest difference dan posttest (M_d)	t_{count}	t_{tabel} (α = 0,05)	Decision
Experiment	7.97	15.62	1.69	H_1 be accepted

Based on Table 7 or 15.62> 1.69. This means the value is outside the area of acceptance (Arikunto, 2006), thus rejected and accepted. There is an average difference between the posttest score and the pretest score in class X TKJ SMKS PGRI Palu, so it can be concluded that students with high achievement motivation get better learning outcomes than students with low achievement motivation.

The results of the analysis obtained the gain value shows that the average increase in student learning outcomes of acid-base material in the experimental class is in the medium criteria with an average N-gain value for the experimental class of 0.54.

At the beginning of the experimental class research was given a pretest and achievement motivation questionnaire. The initial test (pretest) was used to determine the extent of the ability of students' initial knowledge of acid-base material. At the end of the study, students were given a posttest, where the data information obtained from this posttest was used to analyze whether there was an increase in student learning outcomes on acid-base material. In addition, students are also given a questionnaire to find out how many students respond to learning using a guided inquiry learning model.

1. Implementation of guided inquiry learning

Model Application Overall the learning process is in accordance with the stages in the guided inquiry learning model, this can be seen in the results of the study in Table 4. This is in accordance with the opinion of Sanjaya (2008) which explains that the guided inquiry learning model in its implementation the teacher provides instructions, guides, directing, and formulating problems so that students are not let go of doing an activity so students who think slowly or have low intelligence are still able to participate in activities, not only students who have high intelligence.

The results of this study indicate that there is an influence of the interaction between guided inquiry learning models and high and low student achievement motivation. This is because most of the good students who have high achievement motivation and low achievement motivation at the beginning of learning really like learning using the guided inquiry learning model because in its application students are more daring to express their opinions through the discussion process, making conclusions and make it easier for students to understand the material that can be applied in everyday life. According to the opinion, Silfi & Umatin (2019) that using the guided learning model can spur students to always ask questions and discuss which allows students to practice communicating with others so as to improve their social skills. And the use of guided inquiry learning models contributes to creating active, creative, and effective learning so that students' motivation and learning hassles increase.

Through the guided inquiry learning model students are more active in asking questions, more focused on the material, have a high willingness to take part in lessons, are easier to find new ideas, guide students to learn better together, increase cooperation between fellow students, thus making students motivated to improve achievement of the material discussed or to be studied. This is in accordance with the research conducted by Wahida, et al. (2016), the guided learning model and achievement motivation also have an effect on improving student learning outcomes. With meaningful learning and having fun eating student learning outcomes can develop well.

2. Student response with high and low achievement motivation against the application of guided inquiry learning model

The learning process uses the guided inquiry learning model, students become more aware of the material that has been given because, in the experimental process or the experimental phase, students tend to be more enthusiastic because they do or will know new things, besides that students are also given the freedom to make their discoveries. This increases student response during the learning process until the end of learning. It is also supported by the student response questionnaire statements given at the end of the lesson, where if seen in Table 3 the percentage value of each type of student response is very good, namely the response of high and low achievement motivation students and the average value of both also has a not too far difference, namely High achieving motivation students have average scores (86.40) and low (81.25), based on the results of these students' calculations, students respond well to guided inquiry learning models. This is in accordance with the research conducted by Ika et al. (2017). Students gave a positive response to the application of the guided inquiry learning model on chemistry, namely colloid material by showing interest and good responses and being interested in taking an active role in learning activities.

3. Increased learning outcomes of students who have high achievement motivation and low achievement motivation

Based on the division of students into achievement motivation, namely high achievement motivation, and low achievement motivation, those who have high achievement motivation are more increased, this is based on the percentage value of each type of motivation contained in the student motivation questionnaire and can be seen in the results of the study in Table 2 and the value The average high and low motivation in Table 5 is that students who have high achievement motivation get higher scores than those with low achievement motivation.

The difference in motivation between high and low achievement motivated students was significantly different based on the mean. This achievement motivation questionnaire is given at the beginning of learning, this is because the initial motivation of students in learning has not been well developed, of the many types of motivation in the questionnaire, low achievement motivation students have a very low percentage value.

For example, in the type of motivation that requires students to have confidence, the ability to do their own assignments, and a strong determination in achieving success in doing something, students who have low achievement motivation are not motivated to achieve success, due to lack of active learning, lack of achievement. References in doing assignments and if there is a failure do not try to get back to it, thus causing a greater chance of failure.

However, in contrast to students with high achievement motivation, all types of motivation contained in the questionnaire, students feel the same way in these students, in the sense that students are excited when they have to study, and do assignments, because these students have strong enthusiasm and determination when doing something has a failure, in other words, students who are highly motivated for achievement have all the means to try again when they fail to learn and as much as possible to avoid failure, by studying actively, and having lots of references in doing assignments, because they often do assignments in the library and read a lot of books to avoid mistakes in doing assignments.

The explanation in the previous paragraph is supported by the statements contained in the student achievement motivation questionnaire, namely increasing the enthusiasm of students before learning begins. Most of the students strongly agreed with the statement and other statements contained in the questionnaire. This difference in achievement motivation also affects the final learning outcome, namely students who have high achievement motivation get a higher average learning outcome (78.88) and low achievement motivation score (61.07). These results are consistent with research from Sukarman et al. (2014). Saying that there are differences in learning outcomes in the cognitive domain of students with high achievement motivation and low achievement motivation, using a free and guided learning model. This is also in accordance with research conducted by Herlina et al. (2016). Saying that students who have high achievement motivation have better learning outcomes than students who have low achievement motivation.

This is because students who have high achievement motivation from the beginning of the teaching and learning process are optimistic and enthusiastic about participating in learning to gain better knowledge and grades. This statement is in accordance with the research of Rianti et al. (2017) which shows that the average science learning outcome increases, so it can be said that there is a significant influence on the guided inquiry learning

model on science learning outcomes. In addition, controlling student achievement motivation and using guided inquiry learning models shows significant differences in student learning outcomes. Also, in accordance with research conducted by Wahida et al. (2016) states that student achievement motivation makes a significant contribution to the achievement of student learning outcomes. The higher the motivation that students have, the higher the learning outcomes that students get. Vice versa, the lower the student's achievement motivation in learning, the lower the learning outcomes obtained. In addition, according to Rumithi et al. (2017) differences in the learning achievement of students who have high and low achievement motivation are influenced by the interaction between guided learning models and increased achievement motivation.

4. **Student learning outcomes using guided inquiry learning model**

Based on the test results, it is known that student learning outcomes using the guided inquiry learning model have increased (0.54%), this is because there are differences in learning outcomes before and after the learning process, besides that, it is supported by the superiority of the guided inquiry learning model including almost all students are active in the learning process so that the teacher only acts as a facilitator, namely by formulating problems and organizing students to research, then the teacher motivates students to be involved in problem-solving activities, in this case, the teacher invites students to first formulate a hypothesis of the problem. The teacher also encourages students to get the right information through experiments and seeking explanations, helps develop, analyze, evaluate hypotheses, and make conclusions based on experimental results related to the material being taught. Erlina et al. (2016) show that the application of the guided inquiry model is effective in increasing student learning activities and student learning outcomes to be very good, through the guided inquiry learning model the teacher can provide reinforcement in the form of self-confidence in presenting the results of the student's research.

The guided inquiry learning model makes it easier for students to remember and know the concepts of abstract chemical material, especially acid-base material. Through acid-base experiments using the PH indicator on several types of materials tested for acid and base levels, students can understand more about the ingredients in everyday life, through taste and color students also understand acidic pH levels below 7, neutral 7, and above the number 7 is alkaline. In addition, students better understand the material being taught and develop thinking skills and train students to investigate important contextual problems to become independent individuals.

This statement is also supported by Maikristina et al. (2014) saying that the guided inquiry learning model has a significant effect on science learning outcomes when compared to other learning models because the guided inquiry learning model of the teacher not simply let students do activities, the teacher is in charge of providing direction and guidance. Other supporting research, namely from Vlassi & Karaliota (2013) who conducted research in Greek middle schools, states that the use of guided inquiry learning models is more effective when compared to conventional models. And Dewi et al (2013) stated that the significant differences in learning outcomes and scientific attitudes prove that using guided inquiry learning models is better than conventional learning models.

The advantage of this learning model is student activity. Through this learning model students are guided and involved to actively think, be creative, find directly the understanding or concept they want to know, and can find out various abstract concepts through experimental methods or simple practicum. In addition to these advantages, there are also disadvantages of this guided inquiry learning model, namely that it takes a long time to complete activities or problems related to the material being taught, besides that the teacher is required to have good skills in managing the class.

The advantage of this learning model is student activity. Through this learning model students are guided and involved to actively think, be creative, find directly the understanding or concept they want to know, and can find out various abstract concepts through experimental methods or simple practicum and through acid and alkaline material practicum students know acidic materials and bases found in everyday life so that students are active and enthusiastic because they have new knowledge that is easily applied in their daily environment. In addition to these advantages, there are also disadvantages of this guided inquiry learning model, namely that it takes a long time to complete activities or problems related to the material being taught, besides that the teacher is required to have good skills in managing the class.

From the results of this study, it was found that student learning outcomes using guided inquiry learning models greatly influenced student learning outcomes. This is known based on the value of increased learning outcomes as well as supporting statements contained in the student achievement motivation questionnaire and student responses so as to increase students' confidence in following the learning process and students know better what materials in their daily life are acidic and alkaline.

Conclusions

The application of the guided inquiry learning model has been carried out well. There is an interaction between the guided inquiry learning model and high and low student achievement motivation which is indicated by the sig (0.000) <α (0.05), the student response is very high both with

high achievement motivation and low, there is an increase in learning outcomes in high and low achievement motivation students and There are differences in learning outcomes before and after using guided inquiry learning models on acids and bases.

Acknowledgments

Thank you profusely from the authors to all those who helped in the process of research and writing articles.

References

Arikunto, S. (1999). *Dasar-dasar evaluasi pendidikan*. Jakarta: Bumi Literasi.

Dewi, N. L., Dantes, N., & Sadia, I. W., (2013). Pengaruh model pembelajaran inkuiri terbimbing terhadap sikap ilmiah dan hasil belajar IPA. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha, Jurusan Pendidikan Dasar, 3*(1), 1-10.

Erlina., Rede, A., & Saehana, S. (2016). Penerapan model pembelajaran inkuiri terbimbing untuk meningkatkan aktivitas dan hasil belajar IPA siswa kelas V SD Inpres 2 kayumalue ngapa. *Mitra Sains E-Journal, 4*(1), 1-7.

Gilbert, J. K., De jong, O., Justi, R., Treagust, D. F., & Van driel, J. H. (2009). *Chemical education: towards research-based practice*. New York: Kluwer Academic Publishers.

Handaka, A., Sukarmin., & Sunarno, W. (2018). Pembelajaran fisika melalui konstruktivisme menggunakan metode inkuiri terbimbing dan inkuiri bebas modifikasi ditinjau dari motivasi berprestasi dan sikap ilmiah. *Jurnal Pendidikan Sains, 7*(2), 190-198.

Herlina, Kasim, A., & Mamu, H. D. (2016). Pengaruh model problem based learning dan motivasi berprestasi terhadap hasil belajar siswa pada mata pelajaran biologi kelas XI IPA MAN 2 MODEL Palu. *Jurnal Sains dan Teknologi Tadulako, 5*(1), 11-18.

Ika, J., Sumarti, S. S., & Widodo, A. T. (2017) Penerapan model pembelajaran inkuri terbimbing terhadap self efficacy dan hasil belajar kimia pada materi koloid. *Jurnal Pendidikan Sains Inovatif, 6*(1), 49-58.

Jack, G. (2013). Concept mapping and guided inquiry as effective techniques for teaching difficult concepts in chemistry: Effect on students' academic achievement. *Journal of Education and Practice, 4*(5), 9-15.

Maikristina, N., Dasna, I. W., & Sulistina, O. (2014). *Pengaruh penggunaan model pembelajaran inkuiri terbimbing terhadap hasil belajar dan keterampilan proses IPA siswa kelas XI IPA SMAN 3 Malang Pada materi hidrolisis garam*. Malang: Universitas Negeri Malang.

Rianti, K. J., Margunayasa, I. G., & Parmiti, P. D. (2017). Pengaruh model pembelajaran inkuiri terbimbing dan motivasi berprestasi terhadap hasil belajar IPA kelas V SD. *E-journal Pgsd Universitas Pendidikan Ganesha, 5*(2), 1-10.

Rumithi, N. M., Santyasa, I. W., & Warpala, I. W. S., (2017). Pengaruh model pembelajaran inkuiri terbimbing dan motivasi berprestasi pada pembelajaran biologi di kelas X SMA Negeri Rendang. *Jurnal Teknologi Pembelajaran, 7*(2), 47-54.

Sahidin, L. & Jamil, D. (2013). Pengaruh motivasi berprestasi dan persepsi siswa tentang cara guru mengajar terhadap hasil belajar matematika. *Jurnal Pendidikan Matematika, 4*(2), 212-213.

Sanjaya, W. (2008). *Proses pendidikan berorientasi strategi pembelajaran standar*. Jakarta: Kencana Predana Media.

Santoso, T., Yuanita, L., & Erman, E. (2018). The role of students' critical questions in developing students' critical thinking skills. *Journal of Physics*, Ser, 953 012042, 1-6.

Silfi, R. K., & Umatin, C. (2019). Pengaruh model pembelajaran inkuiri terbimbing terhadap motivasi dan hasil belajar siswa. *Jurnal Pendidikan Ilmu Sosial, 5*(2), 29-36.

Sukarman., Sunaryo., & Siahaan, B. Z. (2014). Pengaruh Model Pembelajaran Inkuiri dan Motivasi Berprestasi terhadap Hasil Belajar Fisika di SMA Negeri 94 Jakarta. *Prosiding seminar fisika nasional (e-journal), 3*, 151-155.

Sukma., Komariyah, l. & Syam, M. (2016). Pengaruh model pembelajaran inkuiri terbimbing dan motivasi terhadap hasil belajar fisika siswa. *Jurnal Saintifika, 18*(1), 59-63.

Sunardi, S. S. (2010). Multimedia pembelajaran tatasurya dengan pendekatan inkuiri untuk siswa kelas X SMK. *Jurnal Teknologi Informasi, 6*(1), 37-42.

Viilagonzalo, E. C. (2014). *Process orientex quided inquiry learning: an effective approach in enhancing student 'academic performance. Presented at the dlsu research congress 2014.* Philippines: De La Salle University, Manila.

Vlassi, M. & Karaliota, A. (2012). The comparison between quided inquiry and tradional teaching method. a case study for the teaching of the structure of matter to 8th grade greek students. *Academia Journal, 93*(2013), 494-497.

Wahida, M., Margunayasa, I.G., & Kusmariyatni, N. (2016). Pengaruh model pembelajaran inkuri terbimbing dan motivasi berprestasi terhadap hasil belajar IPA siswa. *E-journal PGSD Universitas Pendidikan Ganesha, 4*(1), 1-11.