Lantanida Journal, Vol. 7 No. 1 (2019) 1-100

THE PROFILE OF INQUIRY MODEL ON STUDENT ACTIVITY AND LEARNING OUTCOMES ON COLLIGATIVE PROPERTIES

Said Ali Akbar
Department of Chemical Education, Serambi Mekkah University, Aceh, Indonesia
Email: said.aliakbar@serambimekkah.ac.id

ABSTRAK

Penelitian ini bertujuan untuk mengetahui profil aktivitas guru, aktivitas siswa, afektif siswa, psikomotor siswa, dan hasil belajar siswa. Metode penelitian ini menggunakan desain penelitian tindakan kelas dengan dua siklus. Setiap siklus terdiri dari tahap perencanaan, tindakan, observasi dan evaluasi, serta analisis dan refleksi. Pada aktivitas guru, perbedaan nilai terlihat pada kelas C dengan persentase 76,28% (sangat baik) di siklus pertama menjadi 92,55% (luar biasa) di siklus kedua. Peningkatan juga terjadi pada aspek afektif, kognitif, dan psikomotor siswa. Skor profil dari hasil belajar pada ketiga kelas mencapai skor ketuntasan pada siklus 2, meskipun pada siklus 1 kelas A telah mencapai ketuntasan dengan kelulusan mencapai 85,71%. Selanjutnya, model pembelajaran inkuiri terbimbing ini dapat meningkatkan afektif, kognitif, dan psikomotor siswa. Oleh sebab itu, hasil belajar siswa pada materi sifat koligatif larutan telah mencapai indikator keberhasilan.

Kata Kunci: Sifat Koligatif, Model Pembelajaran Inkuiri, Permasalahan Belajar, Aktivitas Siswa

INTRODUCTION

To understand chemistry well, the students must extend the knowledge on three levels of representation, namely the macroscopic, sub-microscopic, and symbolic level. Then, the student can link these levels of description. However, the results of the study indicated that chemistry was a subject which considered difficult for students, especially in understanding the submicroscopic and symbolic levels that cannot be experienced directly by students due to consists of abstract concepts (Akbar, 2016). This was what caused chemistry to be considered as a science that is not easily understood, so it tends to be memorised by students. Correspondingly, many students consider chemistry too abstract, too complicated and too mathematical and can only be followed by students who have cognitive abilities above average (Louga et al. 2013).

The results of the above research and other studies have been revealed facts that show students' difficulties in understanding chemistry. This difficulty was often unknown

by teacher due to the questions that given was not required complete understanding. Teachers often provided specific algorithms or formulas to solve problems. As a result, students were often "able" to solve chemical problems numerically, but that does not mean that they understand their chemical concepts. Besides, according to other studies that during examinations using multiple choice tests, students can answer correctly without knowing the reason why the answer is correct (Louga et al. 2013). Students also often use symbols without knowing the meaning of the logo. Then, students often use equations that are usually memorised by them and enter numbers to solve problems without using the basic concepts. Meanwhile, there are also conditions where students can solve new problems better if they first understand the basic concepts of chemistry (Wickware et al. 2017).

One of the concepts studied in chemistry is the colligative properties. There are still many students high school who experience misconceptions on the idea of colligative properties of the solution. Some mistakes found include students assuming that a solution with a higher density causes a high boiling point, that the presence of salt in solution can increase the boiling point because the salt prevents evaporation (Pinarbasi et al. 2009). It is also in line with the results of other studies which found that students considered the presence of salt would prevent evaporation and increase the boiling point of the solution. Other findings indicated that students believe the bond to salt to be strong enough and that a large amount of energy is needed to decide it so that the boiling point of the salt solution is higher than the boiling point of the water. The concept of the properties of colligative solutions is one of the concepts of chemistry which has many connections with other chemical concepts such as solubility and solubility and electrolyte and non-electrolyte solutions (Akbar, 2016). Before studying the colligative properties, you must know the concepts of various electrolyte and non-electrolyte solutions, which are related to the van't Hoff factor. Also, students must master in advance the types of concentration units which are the preconditions for the concept of the colligative properties of the solution (Akbar, 2016).

Inquiry learning models have a positive impact on teaching and learning activities, which can increase student activity during learning, improve the achievement of learning outcomes, and can increase student interest in following the learning (Byrne et al. 2018; Sriarunrasmee e al. 2015; Lange, 2018). Besides, inquiry learning was a learning environment for research exercises "Inquiry training" starts from the belief that child development was independent, according to a model that can provide convenience for

learners to engage in scientific research (Cho et al. 2017; Deluca et al. 2017). Based on Permendikbud Number 65 at 2013 concerning Process Standards, the preferred learning model in the implementation of the 2013 Curriculum was Inquiry-Based Learning, Discovery Learning, Project Based Learning, and Problem Based Learning.

Because of the material properties of the colligative solution has particular characteristics and abstract concepts require symbolic memorisation, applied and events that often occur in everyday life. This conceptual material was suitable when taught with a learning model that involves students actively in finding concepts. Based on the above description, researchers are interested in researching by applying guided inquiry learning models in the material of colligative properties to students of class XII IPA SMA Negeri 10 Fajar Harapan Banda Aceh. This study aims to look at the profile of improving learning outcomes in various classroom-level conditions.

METHOD

This study has four stages of activities namely planning, implementing, observing, and reflecting in two cycles. This research was carried out at SMA Negeri 10 Fajar Harapan Banda Aceh Academic Year 2017/2018. The research subjects were students of class XII IPA which was divided into three classes, with the number of students in each class was ± 30 students (Table 1). The class classification was based on a psychological test that has been prepared by the team.

Research data in the form of teacher activities, student activities, affective and psychomotor students, were obtained through observation techniques at each learning meeting. Cognitive learning outcomes of students were obtained through test techniques at the end of each learning cycle. The success of students in understanding the material was shown by the students who answer correctly to each item tested.

Table 1. Student Participants

Treatment	N	Grade	Age
The student with high skills (A)	28	12	16 - 17
The student with moderate skills (B)	32	12	16 - 17
The student with low skills (C)	30	12	16 - 17

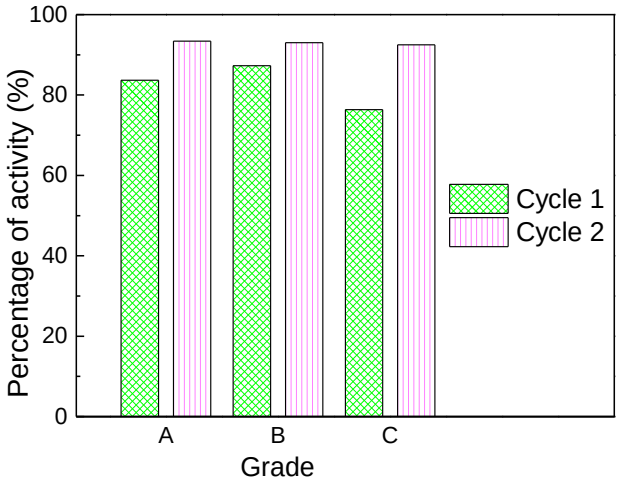
Furthermore, the success of student learning was classified based on the Minimum Completeness Criteria (KKM) that has been determined by the school. The students are said to achieve completeness if they get a score = 75 and classically 75% or more of the

total students have completed individual integrity. The indicators of success in this study are as follows:

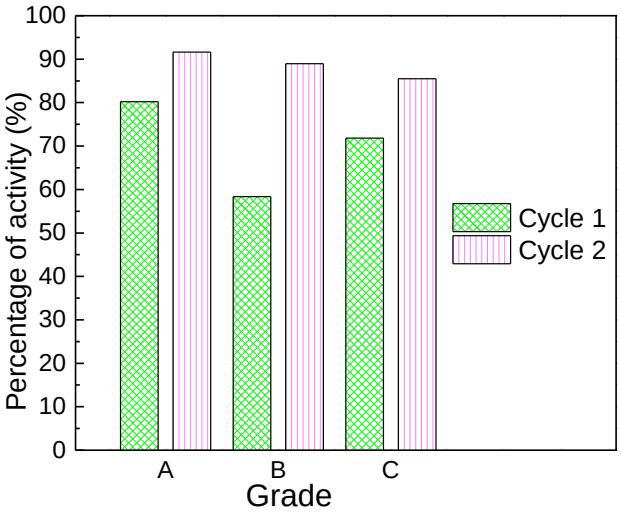
1. Minimum teacher activity in right category by reducing teacher dominance in learning.
2. The minimum student activity in the active category.
3. Affective students on the behaviour of character and action of social skills are in the proper category.
4. Psychomotor students are minimal in the skilled predicate.
5. The students achieved completeness when they get grades = 75 and classically achieve integrity of learning outcomes if 75% or more students get a score = 75. Cognitive learning outcomes of students are having an increase when the average learning outcomes are in the right predicate.

RESULT AND DISCUSSION

The results of classroom action research on the material of colligative properties of the solution using guided inquiry learning models have been carried out in two cycles repeatedly. This research looks more at student profiles in improving learning as well as a comparison in each class. The expected outcome of this study was not only on improving learning outcomes, but readers will find a real comparison because it is also applied to various grade levels. SMA Fajar Harapan 10 is one of the leading schools in the city of Banda Aceh, but in this case, not all classes show learning outcomes that pass ≥ 75% of the KKM. The results obtained in the form of teacher activities, student activities, affective and psychomotor attitudes of students assessed by observers at each meeting in each cycle, and student learning outcomes obtained by the test at the end of each cycle. The comparison of teacher activity scores in cycle 1 and cycle 2 for each class can be seen in Figure 1a. Noticed an increase in teacher activity in the learning process in cycle 1 to cycle 2.



(a)



(b)

Figure 1. Percentage activity of (a) teacher and (b) student

The increasing score of student activity in cycle 2 compared to cycle 1, can be seen in Figure 1b — seen an increase in student activity in the learning process in cycle 1 to cycle 2. Class B, shows learning activities at 58.53% which is lower than class C, whereas class C is a class with an average ability below class B. In this case interest in learning class C is higher compared to class B even though class C absorption is lower than class B (Tabel 2).

Affective improvement scores of students in cycle 2, when compared to cycle 1, can be seen in Table 3. Visible emotional improvement of students in the learning process in cycle 1 to cycle 2. In cycle one, the affective value for the second C class is higher than in class B, namely by the average percentage of 62.29%. Furthermore, in the second cycle, the affective values of the three classes tended to rise with the portion of class A higher at

87.13% indicating a better character in learning. This treatment makes the increase in student affective influences student learning outcomes. The average cognitive percentage of ± 57% in cycle one was classified as good enough for class A and B, but the excellent value in class C was 77.41% in the first cycle. Therefore, in cycle one alone, class C has shown good social skills (Mardhiah & Akbar, 2018; Nallen et al. 2018).

Comparison of students psychomotor observations in cycle 1 and cycle two can be seen in Table 2. Observers observations and teacher ratings with students psychovmotor observation sheets increased from Cycle 1 to Cycle 2. Student psychomotor C increased from the percentage of 65.24% with fewer categories on cycle one becomes 79.81% in the right class in cycle 2. This is following the work of students on the Student Worksheet (LKS) where psychomotor skills of students experience an increase in each meeting; this happens because students get action from the teacher through the learning model guided inquiry that has been running effectively. In the cycle, one practicum activities are the first practicum activities ever carried out by students so that psychomotor students are still deficient. In cycle two students have received action by the teacher so that psychomotor skills increase (Stenbom, 2018).

Table 2. Category of teacher and student activity assessment in cycle I and cycle II

Teacher	Cycle		Student	Cycle	
Activity	1	2	Activity	1	2
A	Very Good	Very Good	A	Active	Very Active
B	Very Good	Very Good	B	Quite Active	Very Active
C	Good	Very Good	C	Active	Very Active

Student learning outcomes on the colligative properties seen from the value of the KKM of SMA 10 Fajar Harapan Banda Aceh in the academic year of 2017/2018 that is equal to 75. Then, the completeness of student learning outcomes on colligative properties in cycle one can be seen in Figure 2 It can be seen in cycle one that only class A has reached the standard of learning success with the per cent graduation above the KKM reaching 85.71%. In principle, when the learning process has reached the learning level, PTK does not need to continue the next cycle, but in this research, the team wants to see the real profile of the study. Good results for class C with a graduation increase of 30% in cycle 2.

Table 3. Completeness of student learning outcomes

Cycle	Affective (%)			Cognitive (%)			Psychomotor (%)		
	A	B	C	A	B	C	A	B	C
1	68,92	56,34	62,29	58,33	56,82	77,41	67,84	72,35	65,24
2	87,13	81,73	75,78	82,62	74,28	91,58	85,59	82,85	79,81

In the learning process cycle, one as a whole has been going well. This can be seen from the results of observations. In learning in cycle one there is a deficiency in class C, the teacher has not been able to guide students to analyse the problems contained in worksheets that are distributed to each in each group and students still do not understand what is meant by the stages of formulating hypotheses. This happens because teachers and students are still in a state of self-adjustment, there is a learning atmosphere that is different from what is commonly used by chemistry teachers (Wickware et al. 2017). The deficiencies found in cycle one will be considered and improved in the implementation of the learning process in cycle 2.s

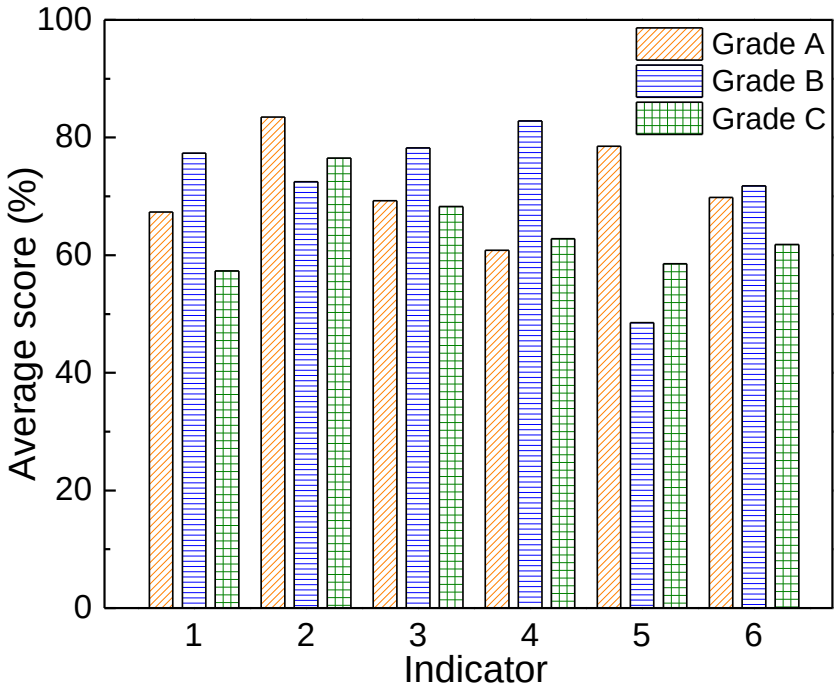
The implementation of learning in cycle 2, time management is more effective than in cycle one where the teacher has carried out several stages of learning activities following the Learning Process Plan (RPP) according to the time provided. Teachers often ask and give attention evenly, so that students who look passive in learning cycle 1 look more active in participating in learning activities. With many questions, students are actively involved in the learning process. The teacher can guide students at the stage of collecting data and analysing data so that students do not feel confused in carrying out learning activities (Wickware et al. 2017). Compared to the learning atmosphere in cycle 1, the implementation of the teacher's teaching process in cycle 2 was more controlled when. The improvement from good categories in cycle 1 becomes excellent in cycle 2.

If reviewed by learning indicators, it is found that the average learning outcomes obtained in the first cycle are only class B which shows the best results (Figure 2). This indicates that five indicators passed the KKM just in the first cycle. But in the next cycle, all three classes have shown results that are following the KKM as a whole.

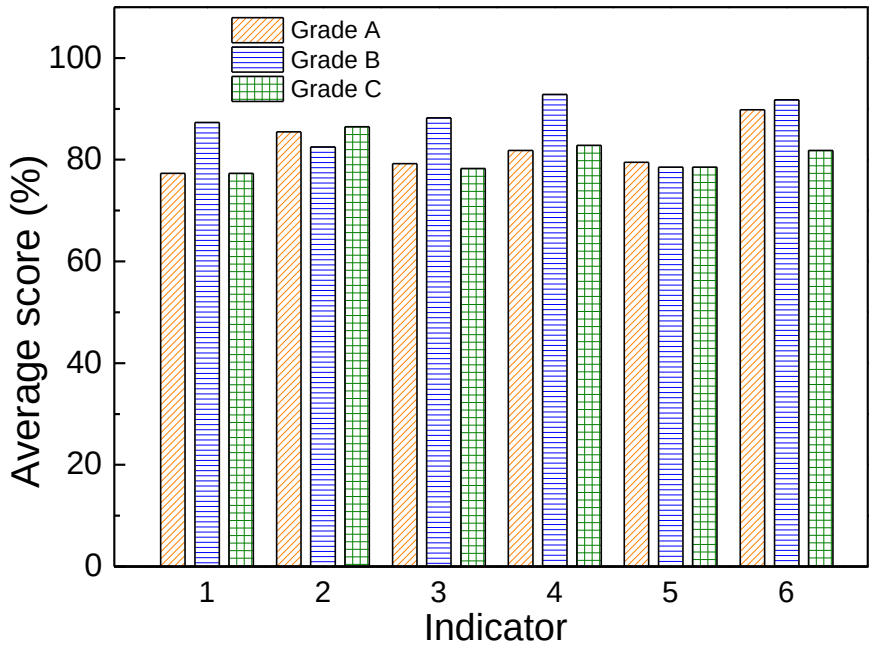
Furthermore, for student activities in the whole cycle, the one learning process has been going well. In cycle two, student activity increases compared to cycle 1. At the meeting in cycle 2, students' readiness to learn is perfect, before the learning process takes place the students are already in their seats, enthusiastically following the learning. Students have displayed more active learning activities in collaboration with their group friends. Students are more willing to express their opinions. Students initially appear

passive to become more active in the learning process (Nallen et al. 2018). This is because teachers always guide students and provide motivation for students who feel difficulties in learning. So that learning takes place well. The increase in student activity in cycle two was caused by the self-confidence that began to grow from students so that knowledge could be carried out well than the previous meeting (Suárez et al. 2018).

The occurrence of an increase in the percentage of learning outcomes in each of these cycles is because the teacher has improved the things that have not been optimal that occur in every learning carried out. In addition to the improvements made by the teacher, the guided inquiry learning model also provides a role in increasing student learning outcomes. Learning with guided inquiry learning models students independently think or solve problems calmly in groups and share thoughts or solutions. Each student member works together to address a question contained in the LKS at each meeting. Group discussions make the material delivered more natural for students. If students experience difficulties with the specific subject matter, students can ask their partners before asking the teacher directly (Voet & Wever, 2018).



(a)



(b)

Figure 2. The results of student learning on cycle (a) 1 and (b) 2

The mindset of students in social class is different from the mindset of science students. Social class students have considered chemistry difficult, so their interest in learning at the beginning of the meeting is meagre (Louga et al. 2013). But the guided inquiry learning model that is applied to the colligative properties of the solution can increase student interest. Learning models that involve students actively in the discovery process make students more enthusiastic in learning. The advantages of guided inquiry learning models that can prepare students to learn with their learning style but remain with the direction and guidance of the teacher make students more creative in the learning process (Stenbom, 2018).

CONCLUSIONS

Increased teacher activity during the learning process has improved by using guided inquiry learning models in all classes. In the teacher activity, the different values were seen in class C with a percentage of 76.28% (excellent) in the first cycle to 92.55% (outstanding) in the second cycle. Increases also occur in the affective, cognitive, and psychomotor aspects of students. Profile scores of the learning outcomes of the three classes achieved completeness scores in cycle 2, although in cycle 1 class A had achieved completeness with graduation reaching 85.71%. Furthermore, through guided inquiry learning models can improve students' affective, cognitive, and psychomotor. Student learning outcomes classically have achieved indicators of success.

ACKNOWLEDGEMENT

The authors are grateful for support from the Research Institutions And Community Service (LPPM) of Serambi Mekkah University. Furthermore, also thanks to the Ministry of Research and Higher Education (RISTEKDIKTI), which has provided support for the success of this research.

REFERENCES

Akbar, S. A. (2016). Profil Kemampuan Analisis Respon Siswa Sekolah Menengah Atas Melalui Hypothetical Learning Trajectory (HLT) Pada Materi Sifat Koligatif Larutan, *Serambi Akademica*, *4*(2), 85-90.

Byrne, A., McNeill, J., Rogers, K., & Porter, S. (2018). Impact of Enquiry Based Learning (EBL) on student midwife praxis, *Midwifery*, *58*, 83-85

Cho, M. H., Kim, Y., & Choi, D. H. (2017). The effect of self-regulated learning on college students' perceptions of community of inquiry and affective outcomes in online learning, *The Internet and Higher Education*, *34*, 10-17.

Deluca, C., Bolden, B., & Chan, J. (2017). Systemic professional learning through collaborative inquiry: Examining teachers' perspectives, *Teaching and Teacher Education*, *67*, 67-78.

Lange, C. D. (2018). Problem and inquiry-based learning in alternative contexts: Using museums in management education, *The International Journal of Management Education*, *16*(3), 446-45

Luoga, N. E., Ndunguru, P. A., & Mkoma, S. L. (2013). High school students' misconceptions about colligative properties in chemistry, *Tanzania Journal Of Natural And Applied Sciences*, *4*, 575-581.

Mardhiah, A., & Akbar, S. A. (2018). Efektivitas Media Pembelajaran Terhadap Hasil Belajar Kimia Siswa SMA Negeri 16 Banda Aceh, *Lantanida Journal*, *6*(1), 49-58.

Nallen, K., Spence, D., & Porter, S. (2018). Does Enquiry Based Learning (EBL) impact on clinical practice? A qualitative exploration of midwifery graduates' perceptions, *Midwifery*, *63*, 17-19.

Pinarbasi, T., Sozbilir, M., & Canpolat, N. (2009). Prospective chemistry teachers' misconceptions about colligative properties: boiling point elevation and freezing point depression, *Chemistry Education Research and Practice*, *10*, 273–280.

Sriarunrasmee, J., Suwannatthachote, & P., Dachakupt, P. (2015). Virtual Field Trips with Inquiry learning and Critical Thinking Process: A Learning Model to Enhance Students' Science Learning Outcomes, *Procedia - Social and Behavioral Sciences*, *197*, 1721-1726.

Stenbom, S. (2018). A systematic review of the Community of Inquiry survey, *The Internet and Higher Education*, 39, 22-32.

Suárez, A., Specht, M., Prinsen, F., Kalz, M., & Ternier, S. (2018). A review of the types

of mobile activities in mobile inquiry-based learning, *Computers & Education, 118,* 38-55.

Voet, M., & Wever, B. D. (2017). Preparing pre-service history teachers for organizing inquiry-based learning: The effects of an introductory training program, *Teaching and Teacher Education, 63,* 206-217.

Wickware, C. L., Day, C. T. C., Adams, M., Ramirez, A. O., & Snyder, A. B. (2017). The Science of a Sundae: Using the Principle of Colligative Properties in Food Science Outreach Activities for Middle and High School Students, *Journal of Food Science Education, 16*(3), 92-98.