Inovasi Pendidikan Fisika *Vol. 07 No. 02, Juli 2018, 259-262*
ISSN: 2302-4496

IMPLEMENTATION OF GUIDED INQUIRY BASED PEER TUTOR TO IMPROVE STUDENT LEARNING OUTCOMES ON DYNAMIC FLUID

Nia Rahmawaty and Zainul Arifin Imam Supardi
Physics Department, Faculty of Mathematics and Science, State University of Surabaya
Email: niarahmawaty@mhs.unesa.ac.id

Abstract

Physics learning that only fixed on definition and formula causing low student learning outcomes. Therefore, this study aims to describe the results of learning activities and student learning outcomes when applying guided inquiry based peer tutor learning model on dynamic fluid. This type of research is experimental research with one-group pretest-posttest design with replication. This research was conducted in XI IPA 1 (experiment), XI IPA 3 (1st replication), and XI IPA 4 (2nd replication) in SMAN 1 Ngronggot. The research instruments are learning activities sheet, pre-test and post-test sheets and skill assessment sheets. The increased of student learning outcomes were analyzed using paired t-test and n-gain analysis. Based on the study, it shows that the learning activities is done 100% with the quality is in good category. Student learning outcomes is improved with high n-gain scores in all three classes. Therefore, guided inquiry based peer tutor can improve student learning outcomes on dynamic fluid.

Keywords: guided inquiry based peer tutor, learning outcomes.

PRELIMINARY

Physics is a lesson that less desirable by students. Based on initial study in SMAN 1 Ngronggot on January 4, 2018, students have difficulty in learn physics. The most difficulty is physics concept that difficult to understand and the number count in physics. This difficulties have impact on student less understanding and interest in physics.

The result of dynamic fluid test on 29 students in SMAN 1 Ngronggot on January 2018 shows that the student learning outcomes on dynamic fluid are quite low. It can be showed by the value of dynamic fluid test on XII IPA 3 students, all of them are under KKM with an average of 27,24 from scale of 100, and the highest score is 50 from scale of 100. This learning difficulty is not only experienced by students in 2018, but the problem is found similar too in previous years based on questionnaire given to alumni.

The low student learning outcomes is influenced by several factors that is student less understanding on dynamic fluid, inadequate learning media, and the teacher learning method that is not maximum. Another factor is teacher who can't create an interactive learning atmosphere so that students can understand the material and increase interest of learning.

To help student understand physics concept, needed learning model that can support the learning process that involves students in learning activities. Guided inquiry learning model is learning model which emphasizes on student activeness do investigation in looking for information related problem for earn learning experience. Students can get information related concept learned through investigation activities with teacher guidance. Through this activities, students can develop their knowledge and get meaningful learning and stored in length period memory (Arifin & Sunarti ,2017). Guided inquiry learning also give students chance for learn find concepts, facts, or information through their learn experience (Alfazriyah & Supardi, 2018).

Based on previous study from Firda May Nur Uyun Sirkanti (2016) conducted in SMAN 1 Gedangan, guided inquiry learning model can improve student learning outcomes. Students who previously 89,7% of their value is under KKM or in other words their learning outcomes haven't complete, after given guided inquiry learning, they can complete their learning outcomes.

Three research previous from Almuntasheri et al (2016) in Arabia, Bakke M. Mathew and Igharo O. Kenneth (2013) in Nigeria, and Kitot , Ahmad, and Seman (2010) in Malaysia delivers similar results that is guided inquiry learning can improve students ability such as understanding and explain concept ability, high order thinking skills as well student learning outcomes.

In learning activity, the peer role also take effects on student understanding and learning outcomes. Take student who has more ability to work together in a group, is expected to help other students in understanding concept learned (Hermawati & Arief, 2016). Sometimes student feel more comfortable to ask their friend than ask to the teacher, so that more ability students can be used as peer tutors for the other students so it is easier to direct the learning process and teacher as facilitator to control learning activities.

From previous study by Hermawati and Alimufi (2016), peer-based tutor learning has an effect on student learning outcomes. From this study, it shows that student learning outcomes which is given by peer-based tutor learning are higher than student learning outcomes in control class with conventional learning.

It could be assumed that guided inquiry based peer tutor learning can also improve student learning outcomes on dynamic fluid in SMAN 1 Ngronggot.

Based on the problems above, research conducted author is "Implementation of Guided inquiry based peer tutor Learning to Improve Student Learning Outcomes on Dynamic Fluid" that aims to describe the result of learning activities and student learning outcomes after applied peer-tutor based guided inquiry on dynamic fluid.

METHOD

Type of this research is pre-experimental research with design is one group pretest-posttest design with replication. This research uses 1 experiment class that is XI IPA 1 and two replication classes that is XI IPA 3 and XI IPA 4. The design of this research is as the following:

Table 1. Design Research

Group	Observation 1	*Treatment*	Observation 2
Experiment	O_1	X	O_2
Replication 1	O_1	X	O_2
Replication 2	O_1	X	O_2

Description :

O_1 : Observation result pre-test which conducted before guided inquiry based peer tutor learning.

X : Learning with apply guided inquiry based peer tutor

O_2 : Observation result pre-test which conducted after guided inquiry based peer tutor learning.

Data collection method that used are observation method to get learning activity data and test method to get student learning outcomes data. The improvement of student learning outcomes data will be analyze by paired t-test and normalized gain analysis.

RESULT AND DISCUSSION

Result

The result of guided inquiry based peer tutor learning activity for two meeting is as the following:

Table 2. Learning Activity Result

No.	Aspect	XI IPA		
		1	3	4
1.	Orientation and problem formulation	3 (G)	3 (G)	3 (G)
2.	Formulate hypothesis	3 (G)	3 (G)	3 (G)
3.	Designing an experiment	3 (G)	3 (G)	3 (G)
4.	Collecting Data	3 (G)	3 (G)	3 (G)
5.	Analyzing Data	3 (G)	4 (VG)	4 (VG)
6.	Formulate conclusion	4 (VG)	4 (VG)	4 (VG)
7.	Closing	3 (G)	3 (G)	3 (G)
8.	Time Allocation	3 (G)	3 (G)	3 (G)
Conclusion		Good	Good	Good

Based on activity result data in table above, it can be known that guided inquiry based peer tutor learning done with good category.

The next analysis is student learning outcomes. Following is diagram of student learning outcomes:

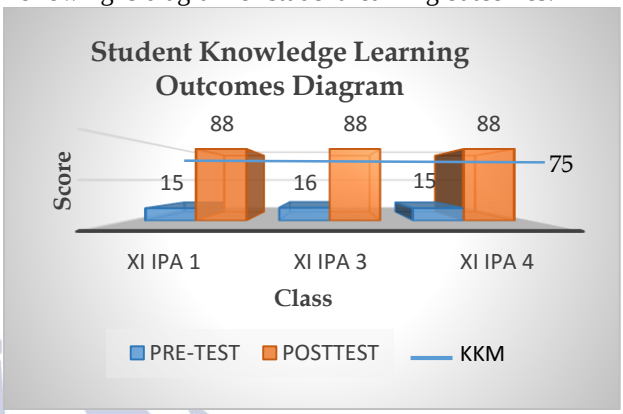

Figure 1. Student Knowledge Learning Outcomes Diagram

Based on diagram above, get it that the average result of student post-test in class XI IPA 1, XI IPA 3 and XI IPA 4 are higher than pre-test with the average grade are above KKM.

Besides knowledge learning outcomes, that is skill learning outcomes. Skill learning outcomes is rated during the learning process. In this research, there are two sub-materials used, that are continuity principle and Bernoulli's law. Skill learning outcomes diagram is as the following:

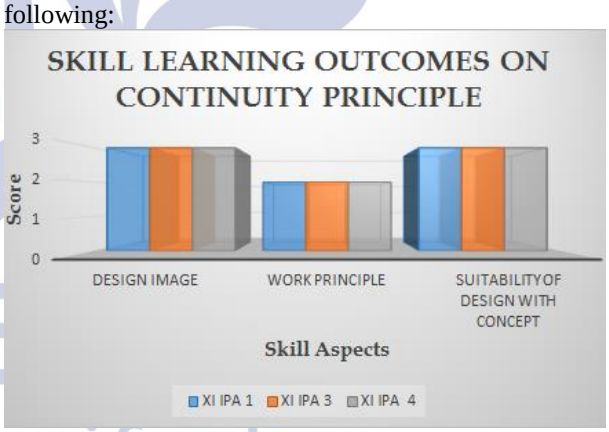

Figure 2. Skill Learning Outcomes on Continuity Principle

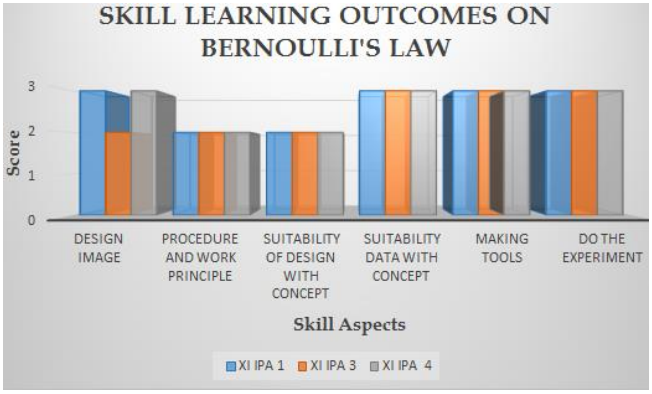

Figure 3. Skill Learning Outcomes on Bernoulli's Law

Discussion

Observation of learning activity is doing by two observers that included of one physics teacher and one physics student. Based on observation result, it was found that learning was done with good category in all classes. At the orientation stage and the formulation of the problem and convey the purpose of learning, obtained the results of implementation with good category in the three classes. But there are constraints on the stage of formulating the problem. This is due to the students who need more time to associate the phenomenon with the concept that will be the formulation of the problem so that requires more guidance from the teacher. At the stage of formulating hypotheses and designing experiments, good calibration results are obtained. This is because students who have been mentored by teachers and tutors about the formulation of the problem so they can formulate hypotheses and design experiments. In addition, phenomena and experiments are simple and easy to understand making students easy to understand and do what is ordered. In the phase of collecting data, obtained the results of the implementation of good category in the three classes. This good practice is due to a full-fledged tutor during the process of collecting data and also experiments that are simple and easily understood by students so that most students can collect data well. The next phase is to analyze the data. Obtained the results of the implementation of the category is very good for the whole class. This indicates that the guidance activities by peer tutors accompanied by teachers took place with the maximum. In the formulation of conclusions also obtained the results of implementation with very good category. This is easy because the conclusions are related to the problem formulation and data analysis they have understood. In closing activities, the results obtained with good category. In this phase, the learning obstacles faced is the start time of learning is more backward than the usual learning time so that the learning time becomes truncated so that the material review and exercise questions become less maximal.

The appropriateness of time allocation is obtained with good category results. However, there is a time allocation that is less in line with the syntax of learning that can be seen in appendix 3. This constraint is in accordance with the research of Hermawati (2016) who also experience time management constraints on peer tutoring. This is due to a longer learning time compared to the one planned in the syntax, especially on core activities. The length of time this learning due to some students who have the initial ability is low enough so that requires longer guidance despite the existing role of tutor in it.

The next discussion is learning outcomes. Learning outcomes in this research are knowledge learning outcomes and skill learning outcomes. Based on figure 1, post-test results are higher than pre-test in all classes. It shows that there is increase in student learning outcomes on knowledge aspect. This improvements of learning outcomes are gotten by pre-test and post-test results which are analyzed by paired T-test and normalized gain analysis. The result of paired T-test shows that there is difference between *pre-test* and *post-test* result. Furthermore, in the normalized *gain* test obtained results that occur with a high category increase in all students completed in all three classes. This suggests that inquiry-based learning based on peer tutors can improve student learning outcomes.

On skill learning outcomes, there are two sub-materials used in this research that are continuity principle and Bernoulli's law. The skill observed is the skill in designing projects that fit the basic competencies of the skills aspect on dynamic fluid materials that is creating and testing simple projects that apply fluid dynamics principles. On continuity principle, teachers only asses the abstract skills of students. This is due to the basic competence that demands to design the work, while the application of the principle of continuity is very difficult to do if it has to make a tool, so that students only design theshape of a water hose when pressed similar to different sized pipe on the material of the principle of continuity. Learning outcomes on continuity principles on three aspects in class XI IPA 1, XI IPA 3, and XI IPA 4 are same with the average of skill score is 3 and above the KKM. It shows that the average of three classes skills on continuity principles are complete.

On Bernoulli's law experiment, there are two aspects of skills: concrete skills and abstract skills. Based on diagram 4.4, it can be seen that the aspect of the concrete skills of the average student is 3 that is the maximum value of the skill aspect. This is because the tools created and experiments performed tend to be easy to understand and simple so that most students can make tools and experiment well. In the aspect of abstract skills, there are differences in learning outcomes between the three classes on aspects of designing experiments. The lowest score is in class XI IPA 3, this is because students only draw the experimental design but not accompanied by the caption. Overall, the result of learning skills on the Bernoulli principle is thorough.

CONCLUSION

Based on research data, analysis, and discussion obtained, can be formulated conclusion as follows:

1. Guided inquiry based peer tutor learning activity results on dynamic fluid in this research is done with good category in all classes.
2. Student learning outcomes after applied guided inquiry based peer tutor learning on dynamic fluid in this research increase with high – n-gain values in all classes.

SUGGESTION

1. On guided inquiry based peer tutor learning, appropriate timing is required so that learning can runs optimally.
2. In order for the role of peer tutor can be maximized, students who become tutor should be trained first so that when learning process take place, peer tutors are ready to guide their friends in a group.

REFERENCE

Alfazriyah, O., & Supardi, Z. A. (2018). Implementation of Inquiry Based-Physics Learning to Improve Student Scientific Process Skills on Momentum and Impuls in Grade X on Senior High School. *Jurnal Inovasi Pendidikan Fisika (JIPF), 07*, 34-36.

Almuntasheri, S., Gillies, R., & Wright, T. (2016). The Effectiveness of a Guided Inquiry-based, Teacher's Professional Development Programme on Saudi Student Understanding of Density. *International Council of Association for Science Education (ICASE), 27*(1), 16-39. Retrieved November 20, 2017, from https://files.eric.ed.gov/fulltext/EJ1100181.pdf

Al-Tabany, T. I. (2014). *Mendesain Model Pembelajaran Inovatif, Progresif, dan Kontekstual.* Jakarta: Prenada Media Group.

Anderson, L., & Krathwohl, D. (2001). *REVISED Bloom's Taxonomy Action Verb.* Retrieved from Azusa Pacific University: https://www.apu.edu/live_data/files/333/blooms_taxonomy_action_verbs.pdf

Arifin, L., & Sunarti, T. (2017). The Improvement of Student Scientific Literacy Through Guided Inquiry Learning Model on Fluid Dynamic Topic. *Jurnal Penelitian Fisika dan Aplikasinya (JPFA), 07*, 68-78. doi:10.26740/jpfa.v7n2.p68-78

Fatmaryanti, Suparmi, Sarwanto, & Ashadi. (2015). Implementation of Guided Inquiry in Physics Learning at Purworejo's Senior High School. *International Conference of Mathematics, Sciences, and Education (ICMSE)*, PE-12 - PE-13. Retrieved November 20, 2017, from http://icmseunnes.com/2015/wp-content/uploads/2016/03/72_PE.pdf

Hake, R. (1998). Interactive-Engagement Versus Traditional Method : A Six-Thousand Student Survey of Mechanics Test Data for Introductory Physics Courses. *American Journal of Physics*, 64-74. doi:10.1119/1.18809

Hermawati, M., & Arief, A. (2016). Pengaruh Praktikum Berbantuan Tutor Sebaya Terhadap Hasil Belajar Siswa pada Materi Kalor. *Pros.Seminar Nasional Pendidikan IPA Pasca Sarjana UM, 1*, 334-338. Retrieved September 13, 2017, from pasca.um.ac.id/wp-content/uploads/2017/02/Mafida-Hermawati-334-338.pdf

Kitot, A., Ahmad, A., & Seman, A. A. (2010). The Effectiveness in Inquiry Teaching in Enhancing Student Critical Thinking. *Elsevier*, 264-273.

Kuhlthau, C., Maniotes, Leslie, K., & Caspari. (2007). *Guided Inquiry : Learning in 21st Century.* London: Libraries Unlimited,Inc.

Kurnia, F., Zulherman, & Faturrohman, A. (2014). Analisis Bahan Ajar Fisika SMA Kelas XI di Kecamatan Indralaya Utara Berdasarkan Kategori Literasi Sains. *Jurnal Inovasi dan Pembelajaran Fisika (JIPF), 1*(1), 43-47. Retrieved Januari 13, 2018, from http://ejournal.unsri.ac.id/index.php/jipf/article/download/1263/419

Kurniasih, I., & Sani, B. (2016). *Ragam Pengembangan Model Pembelajaran untuk Peningkatan Profesionalitas Guru.* Jakarta: Kata Pena.

Matthew, B., & Kenneth, I. (2013). Study on the Effect of Guided Inquiry Teaching Method on Students Achevement in Logic. *International Researches*, 134-140.

Sabariasih, D. P., Jamzuri, & Rahmasari, L. (2015). Remediasi Pembelajaran Fisika dengan Model Snowball Throwing pada Materi Fluida Dinamis Kelas XI di SMA Negeri 6 Surakarta. *Prosiding Seminar Nasional Fisika dan Pendidikan Fisika (SNFPF)*, 160-165.

Safrudin, Kamaluddin, & Haerudin. (2014). Penggunaan Tutor Sebaya untuk Meningkatkan Hasil Belajar Fisika Kelas X B di SMA Negeri 1 Gumbasa. *Junal Pendidikan Fisika Tadulako (JPFT)*, 45-49. Retrieved January 14, 2018, from http://download.portalgaruda.org/article.php?article=164190&val=717&title=Penggunaan%20Tutor%20Sebaya%20untuk%20meningkatkan%20Hasil%20Belajar%20Fisika%20Kelas%20XB%20di%20SMA%20Negeri%201%20Gumbasa

Sirkanti, F. M. (2016). *Penerapan Model Pembelajaran Inkuiri Terbimbing untuk Menuntaskan Hasil Belajar Siswa di SMAN 1 Gedangan (Skripsi).* Surabaya: Universitas Negeri Surabaya.

Sriyanto, M. W. (2016). *Pengembangan Lembar Kerja Siswa (LKS) Terintegrasi dengan PhET untuk Meningkatkan Keterampilan Berfikir Kritis Siswa pada Materi Fluida Dinamik.* Surabaya: Universitas Negeri Surabaya.