Kinestetik : Jurnal Ilmiah Pendidikan Jasmani 7 (1) (2023)
Kinestetik : Jurnal Ilmiah Pendidikan Jasmani
https://ejournal.unib.ac.id/index.php/kinestetik/index
DOI : 10.33369/jk.v7i1.24291

Improving the Scientific Argumentation Skills of Physical Education Students Through the Argument Driven Inquiry Learning Model

Dian Pujianto[1], Yahya Eko Nopiyanto[2*], Syafrial[3], Bayu Insanistyo[4]
[1,2, 3, 4] Physical Education, Universitas Bengkulu, Bengkulu, Indonesia

Article Info

Article History :

Received : October 2022
Revised : March 2023
Accepted : March 2023

Keywords:

ADI,
Physical education,
Scientific argumentation,

Abstract

Improving scientific argumentation skills through the application of the ADI learning model is the main goal of this research. Classroom action research through cycle 1 and cycle 2 was applied to achieve the research objectives. The procedure in this study consisted of five stages, namely: planning, implementing actions, observing, and reflecting. A total of 50 students were involved as subjects in this classroom action research. The subjects are physical education students in the fifth semester who are taking research methodology lectures. Data collection was carried out in 2 cycles, the first cycle was carried out in August- October 2022. Data collection techniques and instruments in this classroom action research were used techniques such as observation, argumentation ability test, and interviews. From the results of the analysis of observational data, it is known that in cycle 1 there is an average value of 70.67% and in cycle 2 it increases to 84%. Scientific argumentation skills in cycle 1 are 68.4% and in cycle 2 are 82%. In cycle 1, it is known that student learning completeness is 72%, while in cycle 2, student learning completeness is 82%. So it can be concluded that applying the ADI learning model can improve the scientific argumentation skills of physical education students.

*Corresponding email: yahyaekonopiyanto@unib.ac.id
ISSN 2685-6514 (Online)
ISSN 2477-331X (Print)

INTRODUCTION

One of the soft skills that students need to possess in the 21st century is scientific argumentation skills (Nasution, 2019). Scientific argumentation is a process of proving an opinion accompanied by data, evidence, and explanations that support that opinion (Tuysuz et al., 2013). A person's skill in argumentation will help to easily understand a concept, make decisions, and solve problems correctly (Kuhn, 2010). Given the importance of scientific argumentation skills, as future teacher candidates, every physical education student is expected to have soft skills that will support success in navigating the competition in the world of advanced education and the world of work.

As an effort to improve scientific argumentation skills for students, the Physical Education study program has facilitated students through research methodology lectures. After attending this course, students are expected to be able to understand research concepts, types of research, research procedures, data collection techniques, and data analysis techniques, all of which must be done scientifically. However, based on observations during the research methodology learning process, it was found that students did not have good skills in arguing. This is evidenced by the fact that 70% of students are unable to show scientific evidence to support the opinions or arguments expressed. In addition, students also have not been able to refute answers from friends who have different opinions from theirs.

The way that needs to be done to overcome the problems that occur in students in scientific arguments is to use innovations through innovative learning models. One of the learning models that can improve scientific argumentation skills is Argument-Driven Inquiry (ADI). The ADI model is a model that emphasizes learning activities by conducting investigations to facilitate students in understanding concepts (Marhamah et al., 2017). The results showed that the application of ADI was able to improve scientific argumentation skills (Amielia et al., 2018). The ADI model is designed to make activities informative and includes the development of scientific arguments through research questions (Demircioglu & Ucar, 2015). Given the success of implementing the ADI learning model, researchers are interested in applying the ADI learning model to improve scientific argumentation skills for physical education students in attending research methodology lectures.

METHODS

The research method used is classroom action research, namely research carried out to solve problems in the classroom (Cohen et al., 2017). So, what is meant by classroom action research in this paper is research conducted in the classroom to improve the scientific argumentation skills of physical education students in research methodology lectures. The procedure in this study consisted of four stages, namely: planning, implementing actions, observing, and reflecting (Kemmis et al., 2014). A total of 50 students were involved as subjects in this classroom action research. The subjects are physical education students in the fifth semester who are taking research methodology lectures. Data collection was carried out in 2 cycles, from August-October 2022. Data collection techniques and instruments in this classroom action research were used techniques including observation, argumentation ability tests, and interviews.

RESULT

Observations were carried out when students were following the learning process by applying the adi model. The indicators that become the focus of observation include teamwork, confidence, and thoroughness. Each indicator observed is presented in the following table.

Table 1. The Results of Observation

Indicator	Cycle 1	Cycle 2
Teamwork	70%	84%
Confident	68%	86%
Accuracy	74%	82%
Mean	70.67%	84%

Through table 1 it can be seen that in cycle 1 the average value is 70.67% and in cycle 2 has an average value of 84%.

Table 2. Scientific Argumentation Skills

Level	Indicator	Cycle 1	Cycle 2
1	Claim	62%	78%
2	Data	72%	82%
3	Warrant	70%	86%
4	Rebuttals	70%	84%
5	Qualifiers	68%	80%
Mean		68.4%	82%

Based on table 2, it can be seen that the average value of students' scientific argumentation skills is 68.4% in cycle 1, and the average value is 82% in cycle 2. It means that there is an increase in scientific argumentation skills through the application of the ADI learning model. The application of the ADI learning model can provide classical completeness which can be seen in Figure 1 below.

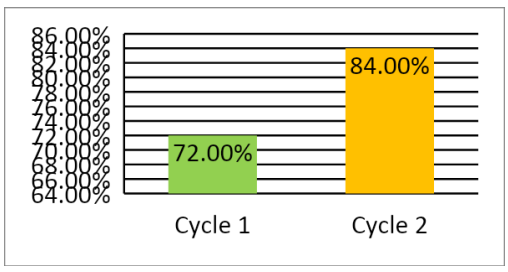

Figure 1. Classical completeness

From Figure 1, it can be seen that classical completeness in cycle 1 was 72%, and an increase in cycle 2 was 84%.

DISCUSSION

From the observations presented in table 1, it is known that in cycle 1 there are as many as 70% of students able to work in teams to produce ideas that are outlined in the form of scientific arguments. This means that there are still 30% of students who have not been able to work together in teams when the ADI model was applied. This is the focus of attention for researchers to do reflection. The reflection process is carried out by conducting interviews with students who experience obstacles in working together. The results of the interview concluded that students had difficulty working in teams for several reasons, including students taking longer to adapt to the ADI model, and having not been given the opportunity to group leaders to contribute ideas. The results of these interviews became the basis for discussions with colleagues as the next stage in the reflection process. From the results of discussions with colleagues, in cycle 2 students are given more discussion time, provide intensive personal motivation to students who experience learning barriers, and provide opportunities for each student to contribute ideas as a consideration in arguing. Increased learning motivation has been proven to be able to improve students' skills in scientific argumentation because the two variables have a significant positive relationship (Bestiantono, 2020). With the improvements made, it can be seen that there is an increase in the ability of students to work together in teams.

The second indicator that is part of the observations in this study is the students' confidence in scientific arguments. The table shows that as many

as 68% of students have dared to voice their opinions in the discussion process. However, there are still 32% of students who do not dare to express their opinions and are less active in participating in the discussion process in class. Confidence is one of the factors that affect students' skills in argumentation (Tamelab et al., 2021). Therefore, the self-confidence of each student needs to be increased so that students as future teacher candidates have a high sense of confidence in expressing an argument. The reflection process is also carried out to get answers from students who have not shown confidence in the learning process or discussion. The results of the interview concluded that students had not mastered the material that was the topic of discussion so they did not dare to argue, and students were not used to expressing arguments in front of the class. After conducting the interview, the reflection stage was followed by a discussion with colleagues. From the results of the discussion, it was found that several alternatives can be applied to increase student confidence, including providing greater opportunities for students who have less confidence to argue in front of the class. The second alternative is to provide rewards and reinforcement to students who have shown a sense of confidence in scientific argumentation. Giving rewards to students has proven to be effective in increasing student learning activities (Effendi, 2017). After the alternative was implemented, it was found that in cycle 2 students experienced an increase in confidence in scientific arguments with a percentage of 86%.

The last indicator that becomes the focus of observation is the ability of students to find and show references that are used as references or the basis for scientific argumentation. Reference indicators in cycle 1 of 74% have been able to find and show references or 26% of students have not been able to find and show valid references as a source of reference in arguing. The ability of students to find valid references is one of the abilities that must be possessed by students because references will help to find ideas, add insight, and improve vocabulary in compiling arguments. References used by students will make it easier to compose vocabulary (Alawiyah, 2020). To help students, reflection is carried out as in the previous indicator. From the results of interviews with students, it is known that students do not know the various search engines that can be used as a medium in finding references, and there are still students who do not have laptops which hinder students from looking for references. Peers were also involved by researchers to provide input on the problems faced by students.

In cycle 2, various improvements were made such as providing various learning resources or types of search engines that can be used by students in finding various references needed to compose arguments, and dividing students in various ways so that students have various tools used to find references. Learning resources owned by students will improve the quality of learning (Samsinar, 2020). After this was applied in cycle 2, it was found that 82% of students had been able to find various valid references. From the results of the application of the ADI model, it was found that there was an increase in the scientific argumentation skills of physical education students in participating in research methodology lectures. Seen in table 2 shows that each indicator has increased in cycle 2. This can happen because the ADI learning model is one of the learning models designed to provide opportunities for students to develop their methods of obtaining data, conducting investigations, and using data to answer an inquiry, writing, and reflective thinking questions. By applying

the ADI learning model, it can help students understand conceptual learning so that learning materials are easy for students to accept (Eskin & Bekiroglu, 2013).

The application of ADI increases students' active participation in conducting research or finding a problem (Amin & Corebima, 2016). Learning that emphasizes arguing activities makes physical education students more active because through this activity students connect ideas and evidence that they use to validate ideas and communicate them in the learning process. Through habituation of discussion accompanied by scientific argumentation, it can improve students' skills for scientific argumentation (Probosari et al., 2016). Physical education students' argumentation skills increase because through the application of the ADI model students have the opportunity to build ideas that are poured into quality arguments through argumentation sessions and make conclusions based on investigative evidence and valid references.

The ADI model is designed to help students understand how to explain problems scientifically, using data or references in answering various questions so that they can reflect on the work done (Ginanjar, 2015). In the learning process, students will tend to try to convince someone about their arguments so that they will improve their skills in communicating verbally, socially, rationally, cognitively, and emotionally (Putri et al., 2020). The ability to communicate well will help students in solving problems encountered during learning (Minarti & Nurfauziah, 2016). Through the ADI learning process, when giving arguments, students are guided to get used to using various references as a basis for giving arguments and presenting their arguments (Cetin & Eymur, 2017). The arguments explained by students are based on reliable data. In the learning process, students are also allowed to give rebuttals if they feel that the answer from a friend is still not right. At the next level students can make valid conclusions.

CONCLUSION

The results of the study concluded that there was an increase in scientific argumentation skills in physical education students in participating in research methodology lectures. From the results of interviews conducted, it is known that physical education students still have learning barriers such as media or learning resources that have not been varied. Therefore, it is recommended for further researchers to use various variations of media or learning resources so that it will make it easier for students to achieve scientific argumentation skills at the desired level.

ACKNOWLEDGEMENT

We would like to thank the Bengkulu University Teacher Training and Education Faculty for providing support for research through the Bengkulu University PPKP Research scheme in 2022.

REFERENCES

Alawiyah, S. (2020). Pembelajaran Online dan Hasil Menulis Karangan Argumentasi di Era Big Data. Justek: Jurnal Sains dan Teknologi, 3(1), 32-41. https://doi.org/10.31764/justek.v3i1.3697

Amielia, S. D., Suciati, S., & Maridi, M. (2018). Enhancing Students' Argumentation Skill Using an Argument Driven Inquiry-Based Module. Journal of Education and Learning (EduLearn), 12(3), 464–471. https://doi.org/10.11591/edulearn.v12i3.

8042

Amin, & Corebima. (2016). Analisis Persepsi Dosen terhadap Strategi Pembelajaran Reading Questioning and Answering (RQA) dan Argument-Driven Inquiry (ADI) pada Program Studi The effect of PDEODE (Predict-Discuss-Explain-Observe-Discuss-Explain) Learning Strategy In The Different Aca. Researchgate.Net, March.

Bestiantono, D. S. (2020). Students' Responses Toward Scientific Argumentation with ADI Learning Model to Physics Literacy: a Case of Indonesian Senior High School Students. Studies in Learning and Teaching, 1(1), 3-11. https://doi.org/10.46627/silet.v1i1.18

Çetin, P. S., & Eymur, G. (2017). Developing students' scientific writing and presentation skills through argument driven inquiry: an exploratory study. Journal of Chemical Education, 94(7), 837-843. https://doi.org/10.1021/acs.jchemed.6b00915

Cohen, L., Manion, L., & Morrison, K. (2017). Action research. In Research methods in education (pp. 440-456). Routledge.

Demircioglu, T., & Ucar, S. (2015). Investigating the effect of argument-driven inquiry in laboratory instruction. Educational Sciences, 15(1), 267–283. https://doi.org/10.12738/estp.2015.1.2324

Effendi, E. (2017). Pemberian Reward Pengaruhnya terhadap Aktivitas Belajar Mahasiswa pada Mata Kuliah Fisika Dasar. JIPFRI (Jurnal Inovasi Pendidikan Fisika Dan Riset Ilmiah), 1(1), 9-13. https://doi.org/10.30599/jipfri.v1i1.35

Eskin, H., & Ogan-Bekiroglu, F. (2013). Argumentation as a strategy for conceptual learning of dynamics. Research in Science Education, 43(5), 1939-1956. https://doi.org/10.1007/s11165-012-9339-5

Ginanjar, W. S., Utari, S., & Muslim, M. (2015). Penerapan model argument-driven inquiry dalam pembelajaran IPA untuk meningkatkan kemampuan argumentasi ilmiah siswa SMP. Jurnal Pengajaran MIPA, 20(1), 32-37. https://doi.org/10.18269/jpmipa.v20i1.36195.g15573

Kemmis, S., McTaggart, R., & Nixon, R. (2014). The action research planner: Doing critical participatory action research. In The Action Research Planner: Doing Critical Participatory Action Research. https://doi.org/10.1007/978-981-4560-67-2

Kuhn, D. (2010). Teaching and learning science as an argument. Science Education, 94(5), 810–824. https://doi.org/10.1002/sce.20395

Marhamah, O. S., Nurlaelah, I., & Setiawati, I. (2017). Penerapan Model Argument-Driven Inquiry (Adi) Dalam Meningkatkan Kemampuan Berargumentasi Siswa Pada Konsep Pencemaran Lingkungan Di Kelas X Sma Negeri 1 Ciawigebang. Quagga : Jurnal Pendidikan Dan Biologi, 9(02), 45. https://doi.org/10.25134/quagga.v9i02.747

Minarti, E. D., & Nurfauziah, P. (2016). Pendekatan Konstruktivisme dengan Model Pembelajaran Generatif Guna Meningkatkan Kemampuan Komunikasi dan Koneksi Matematis serta Self Efficacy Mahasiswa Calon Guru di Kota Cimahi. Jurnal Ilmiah P2M STKIP Siliwangi, 3(2), 68-83. https://doi.org/10.22460/p2m.v3i2p68-83.629

Nasution, E. S. (2019). Peningkatan Keterampilan Berargumentasi Ilmiah Pada Siswa Melalui Model Pembelajaran Argument- Driven Inquiry (ADI). Jurnal Eksakta Pendidikan (Jep), 3(2), 100. https://doi.org/10.24036/jep/vol3-iss2/375

Probosari, R. M., Ramli, M., Harlita, H., Indrowati, M., & Sajidan, S. (2016). Profil keterampilan argumentasi ilmiah mahasiswa pendidikan biologi fkip uns pada mata kuliah anatomi tumbuhan. Bioedukasi: Jurnal Pendidikan Biologi, 9(1), 29-33.

https://doi.org/10.20961/bioedukasi-uns.v9i1.3880

Putri, P. A. W., Rahayu, S., & Fajaroh, F. (2020). Efektivitas Argument-Driven Inquiry untuk Meningkatkan Keterampilan Berargumentasi Ilmiah pada Materi Laju Reaksi. Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan, 5(1), 57-64. http://dx.doi.org/10.17977/jptpp.v5i1.13132

Samsinar, S. (2020). Urgensi learning resources (sumber belajar) dalam meningkatkan kualitas pembelajaran. Didaktika: Jurnal Kependidikan, 13(2), 194-205. 10.30863/didaktika.v13i2.959

Tamelab, P., Ngongo, M. H. L., & Oetpah, D. (2021). Meningkatkan Kepercayaan Diri Mahasiswa Dalam Kemampuan Public Speaking Di Sekolah Tinggi Pastoral Keuskupan Agung Kupang. Selidik (Jurnal Seputar Penelitian Pendidikan Keagamaan), 2(1), 54-63. Retrieved from http://www.ejurnal.org/index.php/selidik/article/view/38

Tuysuz, C., Demirel, O. E., & Yildirim, B. (2013). Investigating the Effects of Argumentation, Problem and Laboratory Based Instruction Approaches on pre-service Teachers' Achievement Concerning the Concept of "acid and Base." Procedia - Social and Behavioral Sciences, 93, 1376–1381. https://doi.org/10.1016/j.sbspro.2013.10.047