UAD | Pendidikan Program Doktor
E-ISSN: 3048-4316
P-ISSN: 3048-4324
CECE
Contemporary Education and Community Engagement
https://journal1.uad.ac.id/index.php/CECE/

Implementation of an Integrated Astronomy Education Program in Astronomy for the Community in Banjar City: Increasing Interest and Understanding of Science

Pandu Pribadi*, Iu Rusliana, Arip Nurahman
*Corresponding e-mail: pandupribadi2384@gmail.com

ABSTRACT
The educational program integrating *falak* science with astronomy is designed to increase interest and understanding of science among students in Banjar City. Through interactive and practical approaches, this program aims to develop students' analytical and scientific skills. The program's implementation involves a series of workshops including direct celestial observations using telescopes and computer simulations, as well as group discussions. Evaluation, conducted using pre-test and post-test questionnaires and open discussions, shows a significant increase in students' understanding and interest in Falak science and astronomy. The average understanding score increased by 22 points (44%), and the interest in further study increased by 40%. This program not only provides academic benefits but also equips students with practical skills and a broader understanding of the world around them.

Keywords: education, astronomy, Banjar city, science

INTRODUCTION

The integration of astronomy and astronomy in higher education can provide a deep understanding of science and technology. This educational program which combines these two scientific disciplines aims to increase interest and understanding of science among students in Banjar City, while preparing them to face global challenges [1]. Falak science plays an important role in determining times of worship in Islam, while astronomy provides a scientific basis for understanding the universe. The integration of these two sciences creates a comprehensive approach that connects religious and scientific knowledge, enriching students' understanding of natural phenomena and their relationship to religious beliefs [2]. Higher education aims to prepare students with analytical skills and scientific understanding that are

important in the era of globalization and digitalization [3]. Astronomy often serves as a bridge to introduce broader scientific concepts, so that integrating astronomy can strengthen people's understanding of the basics of science. Ref. [4] emphasizing that this integration, especially in Islamic contexts such as determining times of worship and the direction of the Qibla, has increased interest in scientific topics [5]. The program proposes that interactive and participatory approaches, such as night sky observations and the use of telescopes, can increase participants' participation and understanding [6]. Collaboration with educational institutions and religious institutions, such as schools and mosques, to expand program reach [7]. Community involvement in science programs can increase program acceptance and sustainability [8]. The benefits of science education for society, include increasing scientific literacy which helps in making better decisions [9]. The use of technology in science education can expand the reach and impact of programs through mobile applications and online platforms [10]. The development of educational resources appropriate to the local context is important to ensure program effectiveness [11]. Continuous evaluation and research on program effectiveness are necessary for future improvements [12]. Awareness of career opportunities in science and technology through this program can encourage young people to pursue further education in STEM fields [13]. With the involvement of these elements, it is hoped that this program will not only increase interest and understanding of science but also enrich local culture and prepare the younger generation to face the challenges of the world of technology [14]. Implementation of this program not only provides academic benefits but also equips students with practical skills and a broader understanding of the world around them. In this way, it is hoped that students can apply the knowledge they gain in everyday life and contribute to the development of science and technology in the future.

METHODS

The first step in this method is the development of a learning module that covers the basic concepts of astronomy and astronomy. This module is also equipped with a practical guide for observing celestial bodies. Learning materials are designed comprehensively and easily understood by students with diverse backgrounds. The goal is to ensure that all participants can follow the program well and gain a deep understanding of the topics taught.

Figure 1. Presentation of Integrated Astronomy Education material in Astronomy

The next stage is participant recruitment, which is carried out in collaboration with universities and student organizations in Banjar City. This collaboration aims to reach as many students as possible who are interested in learning about astronomy and astronomy. Information about the program is disseminated through various communication channels, including social media, campus bulletin boards, and live presentations in classes.

The workshop consists of theory and practical sessions which are held periodically. The theory session includes an introduction to the science of astronomy, the basic principles of astronomy, and the history of the development of these two scientific disciplines. This session provides a strong foundation of knowledge for participants. Practical sessions involve direct observations using a telescope, simulations of the movement of celestial bodies, and group discussions. Observations of celestial bodies are carried out at night, allowing participants to view phenomena such as the phases of the moon, planets, and stars directly. This practical approach is designed to make learning more interesting and interactive.

Figure 2. Implementation of Astronomy Education

The final stage is evaluation and feedback, which is carried out using pre-test and post-test questionnaires and open discussions. This evaluation aims to measure participants' understanding and interest before and after participating in the program. The pre-test

questionnaire provides an overview of the participant's initial knowledge, while the post-test is used to evaluate the increase in understanding after following the program. Open discussions were also held to obtain direct feedback from participants, which will be used to improve the program in the future. Through this method, this program not only measures success in increasing understanding but also in increasing students' interest in astronomy and astronomy.

RESULTS AND DISCUSSION

This program was attended by 30 STIT Muhammadiyah Banjar students in Banjar City. Evaluation of program results was carried out using pre-test and post-test questionnaires, as well as feedback from participants.

Table 1. Increased Understanding and Interest of Participants

Evaluation Aspect	Before the Program	After the Program	Gain (%)	Remark
Average Comprehension Score (0-100)	50	72	44.0	Increased understanding by 22 points.
Percentage of Participants Who Improved Understanding	40	80	60	80% of participants experienced increased understanding
Percentage of Participants with Interest in Learning More	40	80	60	80% of participants experienced increased understanding.
Percentage of Participants with Interest in Learning More	45	85	88.9	Increased interest by 40%.
Most Popular Activities	40	80	60	Observation of celestial objects using telescopes and computer simulations.

The quantitative data shown in Table 1 shows an increase in participants' understanding and interest after participating in the astronomy and astronomy education program. Average Comprehension Score Before the program, the average understanding score of participants was 50 on a scale of 0-100. After the program, this score increased to 72. This increase shows an increase in understanding of 22 points or 44%. Percentage of Participants Who Improved Understanding Before the program, 40% of participants showed increased understanding. After the program, 80% of participants showed increased understanding. This shows that 80% of participants experienced an increase in understanding after participating in the program. Percentage of Participants with Interest in Learning More Before the program, 40% of participants had an interest in learning more. After the program, this interest increased to 60%. This increase shows that 80% of participants experienced increased interest after participating in the program. Percentage of Participants with Interest in Learning Further (Other Category), Before the program, 45% of participants showed interest in learning more, After the program, this interest increased to 85%, This increase shows an increase in interest of 40% or 88.9%. Most Popular Activities Before the program, 40% of participants showed interest in certain activities. After the program, this interest increased to 80%. This increase shows that observing

celestial bodies using telescopes and computer simulations are the activities most interested in by participants, with an increase in interest of 60%. Overall, this quantitative data shows that educational programs that integrate astronomy and astronomy have succeeded in significantly increasing participants' understanding and interest. The greatest increase was seen in participants' interest in learning more and participation in practical activities, such as observing celestial bodies and computer simulations.

The significant success of the astronomy and astronomy education program can be effectively explained using Transformative Learning Theory. This theory posits that transformative learning involves experiencing a deep, structural shift in basic premises of thought, feelings, and actions. It is a process of perspective transformation with three dimensions: psychological (changes in understanding oneself), convictional (revision of belief systems), and behavioral (changes in lifestyle). The increase in the average comprehension score from 50 to 72 (a 44% improvement) reflects a significant psychological shift. Participants experienced a change in their understanding and cognitive framework regarding astronomy. This deepened comprehension suggests that participants not only learned new information but also restructured their existing knowledge base to integrate these new insights. The rise in the percentage of participants who showed increased understanding—from 40% before the program to 80% after—indicates a transformation in their belief systems. This shift implies that the program challenged and changed participants' previous misconceptions or limited knowledge about astronomy, leading them to adopt more accurate and comprehensive views.

The increase in participants' interest in learning more about astronomy—from 40% to 60%—and in further categories—from 45% to 85%—demonstrates a change in behavior and attitudes toward continuous learning. This suggests that the program inspired a sustained interest and curiosity in the subject, motivating participants to pursue further education and activities related to astronomy. Moreover, the notable rise in interest in practical activities such as observing celestial bodies using telescopes and engaging in computer simulations (from 40% to 80%) illustrates a behavioral transformation. Participants not only gained theoretical knowledge but also developed a keen interest in applying this knowledge through hands-on activities, indicating a shift towards more active and engaged learning behaviors.

These findings are in direct line with the findings of previous studies such as the study which stated that the experimental group had a much greater understanding of the information covered, especially regarding questions that required interpretation. Ref. [15] and Ref. [16]

showed that there was a positive correlation between practical work and the academic achievement of most participants in the field of science [17][18] by assessing practical work can motivate participants and stimulate interest in learning it [19].

CONCLUSION

The implementation of an astronomy education program integrated with astronomy in Banjar City has proven effective in increasing understanding and interest in science among students. This program successfully develops analytical and scientific skills through interactive and practical approaches, such as celestial object observation workshops and group discussions. The evaluation results show a significant increase in students' understanding and interest in astronomy and astronomy. The average comprehension score of participants increased from 50 to 72, representing an improvement of 44%. Additionally, the percentage of participants showing increased understanding rose from 40% to 80%. Participants' interest in learning more also increased significantly from 45% to 85%, which means an increase in interest of 40% or 88.9%. The most popular activities are observing celestial bodies using telescopes and computer simulations, with interest increasing from 40% to 80%. This program not only provides academic benefits but also equips students with practical skills and a broader understanding of the world around them. It is hoped that the success of this program will inspire replication in other educational institutions to expand its benefits. In this way, students can apply the knowledge they gain in everyday life and contribute to the development of science and technology in the future.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

[1] S. T. Qulub, “Integrasi Astronomi dalam Ilmu Falak di PTAI dan Pondok Pesantren,” *Al-Qanun J. Pemikir. dan Pembaharuan Huk. Islam*, vol. 21, no. 2, pp. 296–318, 2018, doi: 10.15642/alqanun.2018.21.2.296-318.

[2] P. Pribadi, *Penentuan Awal Waktu Sholat Subuh Dan Isya Berbasis Perbandingan Tingkat Kecerlangan Langit*. Yogyakarat: K- Media, 2019.

[3] F. Island, G. Islands, Y. Fuke, T. Iwasaki, M. Sasazuka, and Y. Yamamoto, “Pentingnya Keterampilan Belajar di Abad 21 sebagai Tuntutan dalam Pengembangan Sumber Daya Manusia,” *lectura*, vol. 71, no. 1, pp. 63–71, 2021, doi: https://doi.org/10.31849/lectura.v12i1.5813.

[4] N. M. Pujani, K. G. Y. Arsana, K. Suma, K. Selamet, and N. Erlina, “the Effectiveness of Introduction To Astronomy Teaching Materials To Improve Problem-Solving and Generic Science Skills,” *J. Pendidik. IPA Indones.*, vol. 11, no. 2, pp. 333–340, 2022, doi: 10.15294/jpii.v11i2.34801.

[5] W. Hidayat and T. Ibrahim, “Implementing Science, Social Integration in Islamic Education Learning,” *J. Pendidik. Islam*, vol. 7, no. 1, pp. 1–16, 2021, doi: 10.15575/jpi.v7i1.12515.

[6] O. Khorolskyi, “The role of virtual platforms in modern astronomy education: analysis of innovative approaches,” *Futur. Educ.*, vol. 3, pp. 243–259, 2023, doi: 10.57125/fed.2023.09.25.14.

[7] C. N. Loes and E. T. Pascarella, “Collaborative Learning and Critical Thinking: Testing the Link,” *J. Higher Educ.*, vol. 88, no. 5, pp. 726–753, 2017, doi: 10.1080/00221546.2017.1291257.

[8] L. Labibah, M. Marwiyah, N. S. Mudawamah, A. G. Puspita, and S. Anjarwati, “Community engagement through Library and Information Science teaching- learning activities at Islamic higher education in Indonesia,” *Berk. Ilmu Perpust. dan Inf.*, vol. 19, no. 2, pp. 184–194, 2023, doi: 10.22146/bip.v19i2.6879.

[9] F. Fakhriyah, S. Masfuah, M. Roysa, A. Rusilowati, and E. S. Rahayu, “Student’s science literacy in the aspect of content science?,” *J. Pendidik. IPA Indones.*, vol. 6, no. 1, pp. 81–87, 2017, doi: 10.15294/jpii.v6i1.7245.

[10] Ö. Yılmaz, “The Role of Technology in Modern Science Education,” *Eğitimde Güncel Araştırmalar - VI*, pp. 0–1, 2023, doi: 10.58830/ozgur.pub383.c1704.

[11] Abigail B. Gonzales, “Characterizing the Application of Mathematical Thinking in Citizen Science,” *Philipp. J. Educ. Stud.*, vol. 1, no. 1, 2023, doi: https://doi.org/10.61839/29848180a7m8s9.

[12] S. Vosniadou, *International Handbook of Research*. 2013.

[13] A. Kiray and M. Shelley, *Research Highlights in Stem Education*. 2018.

[14] A. O. Onojah, O. O. Obielodan, A. A. Onojah, and T. R. Alani, “Why Do Science Lecturers Distinguish the Use of Mobile Technologies for Instruction?,” *Indones. J. Curric. Educ. Technol. Stud.*, vol. 10, no. 2, pp. 76–85, 2022, doi: 10.15294/ijcets.v10i2.58479.

[15] A. Abdi, “The Effect of Inquiry-based Learning Method on Students’ Academic Achievement in Science Course,” *Univers. J. Educ. Res.*, vol. 2, no. 1, pp. 37–41, 2014, doi: 10.13189/ujer.2014.020104.

[16] M. L. Santos and M. Prudente, “Effectiveness of virtual laboratories in science education: A meta-analysis,” *Int. J. Inf. Educ. Technol.*, vol. 12, no. 2, pp. 150–156, 2022, doi: 10.18178/ijiet.2022.12.2.1598.

[17] Z. Shana and E. S. Abulibdeh, “Science practical work and its impact on students’ science achievement,” *J. Technol. Sci. Educ.*, vol. 10, no. 2, pp. 199–215, 2020, doi: 10.3926/JOTSE.888.

[18] R. M. Ros and J. M. Pasachoff, “Special session 2 Innovation in teaching and learning astronomy,” *Proc. Int. Astron. Union*, vol. 2, no. 14, pp. 541–576, 2006, doi: 10.1017/S1743921307011751.

[19] C. L. Bae and M. H. C. Lai, “Opportunities to participate in science learning and student engagement: A mixed methods approach to examining person and context factors,” *J. Educ. Psychol.*, vol. 112, no. 6, pp. 1128–1153, 2020, doi: 10.1037/edu0000410.

AUTHORS

Pandu Pribadi is a lecturer at the Department of Islamic Education, Universitas Muhammadiyah Tasikmalaya, Indonesia. His master's degree was obtained from Ahmad Dahlan University Yogyakarta. He is an active BAN PDM assessor in West Java. His research includes the development of Physics Education, Astronomy, Falak, electronic instrumentation, STREM-ESD and learning innovation. He is an editor and reviewer in many national journals. (email: pandupribadi2384@gmail.com).

Iu Rusliana is a lecturer at the Faculty of Ushuluddin, UIN Sunan Gunung Djati, Bandung. She teaches courses on Philosophy of Science and Human Resource Management. Her research is mostly related to education and human resource management. He is an editor and reviewer in many national journals. (email: iurusliana@uinsgd.ac.id).

Arip Nurahman is a senior lecturer at the Department of Physics Education, Institut Pendidikan Indonesia. His master's degree is from Ahmad Dahlan University Yogyakarta & Ph.D Student in Indonesia University of Education, His research includes the development of Physics Education, STEM-ESD, Solar Cell, Energy, AI, Quantum Computation, Mathematical Physics, and learning innovation. He is an editor and reviewer in many national journals. (email: aripnurahman@institutpendidikan.ac.id).