Studies in Philosophy of Science and Education
Homepage: https://scie-journal.com/index.php/SiPoSE
Email: sipose@scie-journal.com

p-ISSN: 2722-3523; e-ISSN: 2721-9267
SiPoSE, Vol. 5, No. 1, March 2024
Page: 18-25
©2024 SiPoSE

The Validity Analysis of Integration Between Science and Religion in Static Fluid Materials

***I Y Santoso[1], N Suprapto[1], H N Hidayatullah[1], W S M Sanjaya[2], K Turekhanova[3]**
[1]Department of Physics, Faculty of Mathematics and Natural Science, Universitas Negeri Surabaya, Indonesia
[2]Department of Physics, Faculty of Science and Technology, Universitas Islam Negri Sunan Gunung Djati Bandung, Indonesia
[3]Al-Farabi Kazakh National University, Kazakhstan

Article Info

Article history:

Received January 12, 2024
Revised January 26, 2024
Accepted February 28, 2024
Available Online March 31, 2024

Keywords:

Integration;
Religious science;
Static fluids;

ABSTRACT

Learning science and religion is a combination of knowledge or science with relevant verses of the Al-Qur'an. Education is not only a means of gaining general knowledge through subjects, but also covers aspects of life as a whole, including religious morals. Considering that natural phenomena are so vast, it would be a shame if students are not given enough integration between science and religion, one of which is in physics lessons. The researcher took the initiative to carry out the application of science and religion further in the hope of providing a solution, namely by teaching physics, fluid material, integrated with verses from the Al-Al-Qur'an. This study employs mixed or combined research (mixed methods) with the type of Explanatory Design. Specifically, data collection and analysis of quantitative data are done in the first stage, and then qualitative data are collected and analyzed in the second stage. The integration of science and religion for the fluid material used produces an average value that is categorized as very good. Apart from that, the material from the validation results uses 3 foundations, namely the theological basis (hadârat an-nas), philosophical basis (hadârat al-falsafah), and scientific basis (hadârat al-'ilm). So that the verses of the Al-Qur'an become the main source of the theological basis for the idea of integration by including religious elements, then the scientific or scientific basis which includes the basics of static fluid physics, and the philosophical basis which includes the field of philosophy to connect these two things.

https://doi.org/10.46627/sipose

INTRODUCTION

Learning science and religion is a combination of knowledge or science with relevant verses of the Al-Al-Qur'an. For Muslims, the Al-Al-Qur'an functions as a guide to life and can be used as a physics learning tool (Susanti et al., 2019). Material related to the Al-Al-Qur'an or hadith is able to provide awareness of the glorification and majesty of Allah through His creation (Agusti et al., 2019). The integration of science and religion is part of the process of preparing students to become human beings who are moral and believe in God Almighty. This is one of the goals outlined in the Regulations of the Ministry of Education, Culture, Research and Technology concerning Competency Standards for Graduates in Early Childhood Education, Basic Education Levels, and Secondary Education Levels for 2022.

Education is not only a means of gaining general knowledge through subjects, but also covers aspects of life as a whole, including religious morals (Rokhim et al., 2022). However, the

reality is that senior high school education is largely the same as regular high school education. Because most textbooks do not contain verses from the Al-Al-Qur'an or hadith, and teachers rarely connect physics lessons with verses from the Al-Al-Qur'an, even though in many physics lessons, if they do this, they can help students understand and appreciate the majesty of God's creation (Sri Anggoro et al., 2019). As in research conducted by Susanti (2019), interviews conducted by several teachers stated that the teaching materials used were still conventional teaching materials, so this made students less motivated to learn, one of which was studying physics, because the physics teaching materials used only contained material text, memorizing formulas and questions printed on opaque paper with black ink. In addition, in Islamic education institutions there are subjects of interpretation, hadith, fiqh, and other religious knowledge materials ranging from Madrasah Ibtidaiyah to Madrasah Aliyah, some of which never teach the Al-Al-Qur'an through explanations of natural phenomena. In fact, if we review it again, there are many connections between science and the Al-Al-Qur'an, one of which is physics.

Considering that natural phenomena are so vast, it would be a shame if students are not given enough integration between science and religion, one of which is in physics lessons. As carried out by Nurokhmah (2019), pre-test and post-test analysis of students who used an integrated physics module with Al-Al-Qur'an verses showed an increase in cognitive learning outcomes in static fluid material. Apart from integrating science and religion, students are also able to apply the principles of physics to the verses of the Al-Al-Qur'an, so that faith and a sense of greatness in the interconnectedness of these things is formed. As research conducted by Zainuddin (2020) shows that apart from studying the principles of physics, students are also able to apply them to the verses of the Al-Al-Qur'an which strengthen their faith when they see the connection between the majesty of God, the creator of fluids static by connecting it.

Researchers took the initiative to carry out this application of science and religion further in the hope of providing a solution, namely by using fluid physics teaching materials integrated with verses from the Al-Al-Qur'an. As an innovation or update, this research adds density material by an Islamic scientist, namely Abu Rayhan Al-Biruni in his work Maqalah fi al-Nisab Allati Bayna al-Fillazzat wa al-Jawahir fi al-Hajm wa al-Wazn (Sanjaya et al., 2020). The aim of this research was none other than to describe the results of the integration between science and religion for fluid statistical material, in the form of data validity by sources and further studies.

RESEARCH METHOD

This research uses mixed or combined research (mixed methods) with the type of Explanatory Design. According to Creswell (2018), In addition to being an research technique, mixed methods research incorporates philosophical presuppositions into its design. Mixed method research is a research strategy that integrates or links qualitative and quantitative modes of data collection (Pane et al., 2022).

According to Pane (2022), First-stage data collecting and quantitative data analysis characterize explanatory design research. Then, in order to support the findings of the quantitative study conducted in the first stage, move on with the gathering and analysis of qualitative data in the second stage. Quantitative research focuses on testing material that has been validated by the resource person, namely Mada Sanjaya W. S., Ph. D., the resource person is an undergraduate and postgraduate graduate from the Bogor Agricultural Institute in 2007, then continued his doctorate at University Malaysia Terengganu in 2012. The reason the researcher used the sole validator is because the resource person is a book author as well as a translator of several books and papers by Muslim scholars from the Abbasid Caliphate era, including Algebra Al-Khwraizmi, Ibn Al-Haytham, Abu al-Wafa al-Buzjani, al-Jazari, al-Khayyam, al-Farabi, al-Biruni, with a total of 52 books. One of the resource persons' book works was used in this research as an innovation, with the title Al-Biruni's Pyknometer in Maqalah Fi Al-Nisab Allati Bayna Al-Filizzat Wa Al-Jawahir Fi Al-Hajm Wa Al-Wazn and its Implementation Based on an Arduino Microcontroller. There are 3 aspects assessed, namely

language, materials, scientific literacy and integration. The language aspect includes (1) grammar and spelling according to Indonesian, (2) the language used is easy to understand, (3) the use of communicative sentences. Meanwhile, the material aspects assessed are (4) the material presented is in accordance with the concept of statistical fluid, (5) the phenomena presented are in accordance with statistical fluid, (6) the material used is presented systematically, (7) the material presented is in accordance with everyday life days, (8) the material presented is in accordance with the indicators and learning objectives. For the scientific literacy aspect, the aspects assessed are (9) the material presented provides opportunities to apply natural and technological phenomena, (10) the material presented provides opportunities to build scientific explanation designs and interpret scientific data and evidence, (11) the material presented provides opportunities to research, disseminate and use knowledge to make decisions, (12) the methods used are appropriate to the students' abilities, (13) the methods used do not give rise to students' misconceptions. In the integration aspect, the assessment includes (14) a theological basis (hadârat an-nas) which is continuous with the sub-material used, (15) a philosophical basis (hadârat al-falsafah) capable of providing an understanding of integration and interconnection, (16) a scientific basis (hadârat al-'ilm) used is informative. The validation results on the integrated material are calculated by adding up the scores obtained from the sources and then calculated using the following equation:

$$\text{Validation results } \% = \frac{total\ score\ obtained}{maximum\ score} \times 100$$

With scoring guidelines:

Table 1. Material assessment score guidelines.

Percentage (%)	Category
0%< x ≤ 20%	Not good
21%< x ≤ 40%	Not enough
41%< x ≤ 60%	Enough
61%< x ≤ 80%	Good
81%< x ≤ 100%	Very good

(Riduwan, 2015)

RESULTS AND DISCUSSION

Analysis of the Results of the Integration of Science and Religion for Fluid Materials

Referring to the views and concepts of interconnection integration developed by Amin Abdullah in Amri's research (2017), in formulating the foundation or basis for interconnection integration it must be based on three foundations, namely the theological basis (hadârat an-nas), philosophical basis (hadârat al-falsafah), and scientific basis (hadârat al-'ilm). Regarding this, this research uses static fluid material containing sub-materials, namely Density, hydrostatic, Pascal's, Archimedes', Surface tension, Capillarity, and viscosity, integrated with related verses of the Al-Al-Qur'an. The explanation can be seen in table 2.

Table 2. Al-Qur'an verses used in integration.

Sub-matter	Al-Al-Qur'an verses used
Density	Al-Qamar Verse 49.
Hydrostatic	An-Nur verse 40.
Pascal	Az-Zumar verse 21, Al-Qamar verse 12.
Archimedes	Al-Jatsiyah verse 12, An-Nahl verse 14.
Surface tension	Al-Furqan Verse 2.
Capillarity	Ar-Rahman Verse 19-20.
Viscosity	Az-Zukhruf Verse 11.

https://doi.org/10.46627/sipose.v5i1.395

The science and religion integration material that had been prepared was observed and assessed to determine its suitability as assessed by one of the expert lecturers in the physics department from Uin Sunan Gunung Djati Bandung, namely Mada Sanjaya W.S., Ph. D. Data from the integration analysis are shown in Figure 1.

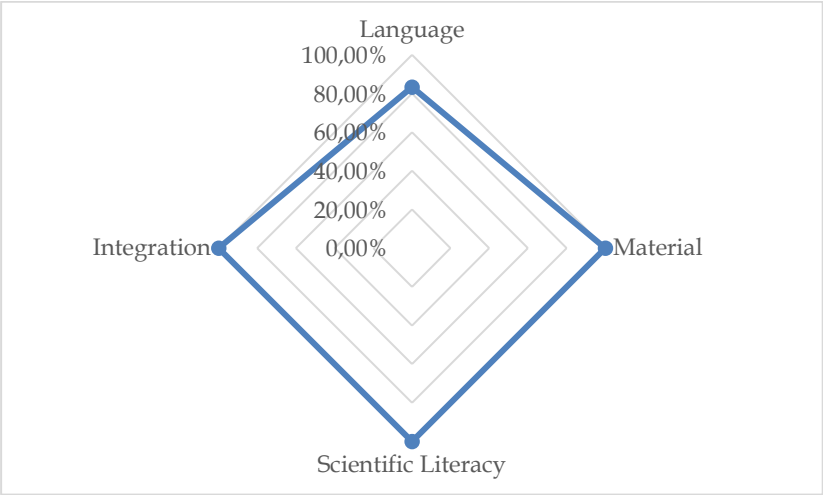


Figure 1. Data from Source Validity Results.

According to Figure 1. It can be seen from the validation of the sources that the values and percentage results obtained can be concluded that everything described in the material used is very good. Meanwhile, for the aspect of religious science integration itself, the resource person gave an average rating of 4 with a percentage of 100%, so it was categorized as very good.

Discussion of the Integration of Science and Religion for Fluid Materials

In language the word "integrate" means creating a whole by connecting, and "integration" means creating a whole by combining (Muslih et al., 2023). In the meantime, the Sanskrit term for religion is derived from two words: gama, which means to go, and a, which indicates no (Muslih et al., 2023). Religion in English means belief in God, with a particular belief and worship system (Sunardin, 2021). Meanwhile, according to researchers themselves, religion comes from the Arabic word (addin) which means pillar, handle, principle of life. Between religion and science, unity or integration refers to efforts to bring the two together, but not necessarily combining or mixing them as a whole, because each object has its own identity that must be maintained (Aini & Astutik, 2023).

In this case, in Indonesia, the majority of Muslims are Muslim, according to Aini and Astutik (2023), In Islam, the view is that science and the hadith of the Qur'an are both based on monotheism or the Oneness of Allah so that there is the possibility of a connection or integration of the two. He stated that the aim of the Qur'an Hadith and Science in Education is so that students are able and motivated to understand, study and apply scientific principles and religious teachings. Discussing the relationship between science and Al-Qur'an Hadith, it can be seen that the breadth of Hadith includes balance, harmony and harmony in human interactions with Allah SWT, with oneself, with other people and with the environment (hablum minallah wa hablum minannas) (Asyafah, 2019). So that Muslims can use the Koran as a source of life guidance and at the same time understand science, especially physics (Susanti et al., 2019). In this way, students will be able to understand that the phenomena they see and study in physics are evidence of the greatness of Allah SWT, making their study of science and religion relevant (Zainuddin et al., 2020).

In the paradigm between religion and science, religion is a basic position that has an absolute or static nature, meaning that the foundation of religion, such as in Islam, namely the words of the Al-Qur'an, cannot be changed, whereas in science itself it is dynamic, this means changing continuously according to the latest problems and keeping up with the times. If these

https://doi.org/10.46627/sipose.v5i1.395

two things cannot be reconciled, then there is no mistake between religion and science itself, but the method of interpretation or philosophy of science and religion that needs to be developed. This is different from the research conducted by Zainuddin (2020) and Nurokhmah (2019), namely that the material used contains Al-Al-Qur'an verses to determine the connection between physics and the Al-Al-Qur'an, there is no integration method, so this research uses the interconnection integration method developed by Amin Abdullah as the basis for preparing the material.

'Ulum al-din (Kalam, Fiqh, Tafsir, 'Ulum Al-Al-Qur'an, Hadith) or Islamic religious knowledge that is brought together and dialogued seriously is expressed by Amin Abdullah (2020) in the integration-interconnection paradigm. Dirasat Islamiyyah (Islamic Studies) is then integrated and interconnected by taking into consideration input and using the thinking and methods of modern science, social sciences, and contemporary humanities as a tool for analysis and religious thinking. Muqarabah al-takamuliyyah li alma'rifah (complementary scientific approaches between various scientific disciplines); ushul murakkabah muta'adidatu al-takhassus (a layered foundation of knowledge consisting of various scientific disciplines or scientific specializations); al-tamazuj al-ma'rify baina mukhtalafi al-takhassusat (mixing knowledge between different specialties or expertise) are some of the terms used by Muhammad Almistiry to formulate the concepts that are the basis of this paradigm (Abdullah, 2020). Amin Abdullah then simplified this paradigm in studies at UIN Sunan Kalijaga Yogyakarta, namely by connecting, linking, or if possible uniting the two sciences, namely religious science and general science, through a triangular dialect: text tradition (hadarah al-nas), academic-scientific tradition (hadarah al-'ilm), and the critical-ethical tradition (hadarah al-falsafah) (Masyitoh et al., 2020). In here, ḥadārah al-'ilm refers to learning the information found in the Holy Book, ḥadārah al-falsafah deals with ethics and reality, and Hadārah al-naṣṣ denotes believing in the Holy Book. This study employs a scientific viewpoint through critical scientific and philosophical literacy between verses from the Al-Al-Qur'an and fluid physics. According to Amin Abdullah (2020), Islamic education must keep in mind three fundamental ideas from three perspectives: the textual perspective, the scientific and knowledge perspective, and the critical and transformative philosophical perspective. This is because Islamic education aims to foster diversity of study and science at the same time.

Amin Abdullah's interconnection integration theory requires several models to implement this idea because the theoretical framework is not limited to the conceptual domain. The model required is one of three models: (1) confirmatory, meaning that science needs to obtain validation from other scientific domains to build a strong theory; (2) informative, meaning that science needs to be expanded with data from other scientific fields to obtain a more comprehensive point of view; and (3) corrective, meaning that scientific theories need to be compared with religious knowledge or vice versa (Zahro' et al., 2023). In this case, the use of Islamic concepts in education, such as the science-based discovery model of religion, uses the verseization of relevant information by utilizing the verification model. The most common practice in the field of scientific interpretation of the Al-Qur'an is verseization, or efforts to present the verses of the Al-Al-Qur'an through social, scientific or other information deemed appropriate to the context of the Al-Qur'an (Zahro' et al., 2023). So that the verses of the Al-Qur'an can be precise and consistent with scientific discoveries, as well as the greatness of the Al-Qur'an but also always in harmony with scientific discoveries.

Surah Al-Mujjadi Verse 11 contains one of the key expressions created in the implementation of interconnection integration.

يَٰٓأَيُّهَا ٱلَّذِينَ ءَامَنُوٓا۟ إِذَا قِيلَ لَكُمْ تَفَسَّحُوا۟ فِى ٱلْمَجَٰلِسِ فَٱفْسَحُوا۟ يَفْسَحِ ٱللَّهُ لَكُمْ ۖ وَإِذَا قِيلَ ٱنشُزُوا۟ فَٱنشُزُوا۟ يَرْفَعِ ٱللَّهُ ٱلَّذِينَ ءَامَنُوا۟ مِنكُمْ وَٱلَّذِينَ أُوتُوا۟ ٱلْعِلْمَ دَرَجَٰتٍ ۚ وَٱللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ

Alphabetical version: *Yā ayyuhallażīna āmanū iżā qīla lakum tafassaḥụ fil-majālisi fafsaḥụ yafsaḥillāhu lakum, wa iżā qīlansyuzụ fansyuzụ yarfa'illāhullażīna āmanụ mingkum wallażīna ụtul-'ilma darajāt, wallāhu bimā ta'malụna khabīr.*

https://doi.org/10.46627/sipose.v5i1.395

Meaning: “O you who believe, if it is said to you: "Majlis be spacious", then be spacious and Allah will make room for you. And when it is said: "Stand up", then stand up, surely Allah will raise those who believe among you and those who have been given knowledge by several degrees. And Allah is All-Knowing of what you do”.

According to Amin, three important things that form the framework of a Muslim's existence are faith, knowledge and charity. These three terms are used as a result of a study of the term "majâlis" (Amri M Nurhadi et al., 2017). In philosophy, there are 3 pillars that are used as the basis of theory or science, namely ontological, epistemological and axiological. From an ontological point of view, the aim of religious knowledge is revelation, while the object of general science is the natural universe and its contents, because both come from God (Allah SWT), there is a fundamental relationship between religious science and general science (Amri M Nurhadi et al., 2017). Normative methods are used in the epistemological construction of religious (Islamic) sciences, but an empirical approach is used in the construction of general sciences, so that truly accurate revelation is based on factual facts (Amri M Nurhadi et al., 2017). Thus, the development of general sciences and religious sciences uses normative and empirical approaches. As can be seen in Figure 2 which shows how science can further be developed in line with the integration and connectivity between the Al-Al-Qur’an and Sunnah. From an axiological perspective, religious science seeks to advance human welfare both in the world and in the afterlife, while general science seeks to advance the welfare of life in the universe (Amri M Nurhadi et al., 2017). Therefore, in order for science and technology to provide complete benefits, science and technology must be understood from the complexity of human life in a comprehensive and integrated manner as illustrated in figure 2 by (Salim & Mukhibat, 2020).

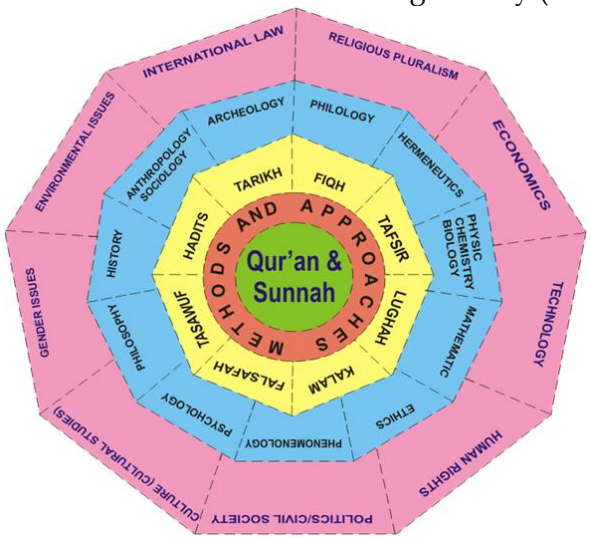


Figure 2. Central science of integration-interconnection (Salim & Mukhibat, 2020)

CONCLUSION

The integration of science and religion for the fluid material used produces an average value that is categorized as very good. Apart from that, the material from the validation results uses 3 foundations, namely the theological basis (hadârat an-nas), philosophical basis (hadârat al-falsafah), and scientific basis (hadârat al-'ilm). So that the verses of the Al-Qur’an become the main source of the theological basis for the idea of integration by including religious elements, then the scientific or scientific basis which includes the basics of static fluid physics, and the philosophical basis which includes the field of philosophy to connect these two things. The recommendation is that it is hoped to develop static fluid material integrated with Al-Al-Qur’an verses using LKPD (Learner Worksheets) and teaching modules and in the teaching media it can use technology such as mobile application-based or similar to suit the scientific literacy indicators used.

ACKNOWLEDGEMENTS
Thank you to: Prof. Nadi Suprapto, Ph.D who has guided, facilitated, directed, provided input and suggestions in the preparation of this research and also as an academic supervisor who has guided throughout the lecture period, Mada Sanjaya W. S., Ph.D as resource person and validator for this research, Hasan Nuurul Hidayatullaah, M.Ed who has assisted in this research.

REFERENCES

Abdullah, M. A. (2020). Mendialogkan nalar agama dan sains modern di tengah pandemi Covid-19. *MAARIF*, *15*(1), 11–39. https://doi.org/10.47651/mrf.v15i1.75

Agusti, D., Rahmatan, H., & Sulastri. (2019). Pengembangan modul pembelajaran sistem reproduksi berazaskan al-quran/hadis untuk meningkatkan motivasi dan hasil belajar peserta didik. *Edusains*, *1*(11), 132–140. https://doi.org/10.15408/es.v11i1.10270

Aini, I., & Astutik, A. P. (2023). Integrasi pembelajaran al qur ' an hadits dan sains melalui model discovery learning. *Munaddhomah: Jurnal Manajemen Pendidikan Islam*, *4*(2), 284–296. https://doi.org/https://doi.org/10.31538/munaddhomah.v4i2.383

Anggoro, B. S., Bidayati Haka, N., & Hawani, H. (2019). Pengembangan majalah biologi berbasis Al-qur'an hadist pada mata pelajaran biologi untuk peserta didik kelas X di tingkat SMA/MA. *BIODIK*, *5*(2), 164–172. https://doi.org/10.22437/bio.v5i2.6432

Asyafah, A. (2019). Menimbang model pembelajaran (Kajian teoretis-kritis atas model pembelajaran dalam pendidikan Islam). *TARBAWY : Indonesian Journal of Islamic Education*, *6*(1), 19–32. https://doi.org/10.17509/t.v6i1.20569

Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGA.

Masyitoh, D., Mustika, R. D., Alfaza, A. S., & Hidayatullah, A. F. (2020). Amin Abdullah dan paradigma integrasi-interkoneksi. *JSSH (Sains Sosial Dan Humaniora)*, *4*(1), 81–88. https://doi.org/10.30595/jssh.v4i1.5973

Muslih, M., Himaya, N. N., & Masturoh, F. (2023). Integrasi agama dan sains: Telaah pemikiran Holmes Rolston. *Risalah: Jurnal Pendidikan Dan Studi Islam*, *9*(1), 151–160.

Nurhadi, A. M., Rasyidin A., & Ali, I. (2017). Integrasi nilai-nilai keislaman dalam pembelajaran biologi di SMA Islam Al Ulum Terpadu Medan. *Edu Riligia*, *1*(4), 487–501.

Nurokhmah, L. (2019). *Pengembangan modul fisika terintegrasi ayat-ayat Al-qur'an guna meningkatkan hasil belajar kognitif dan sikap spiritual peserta didik kelas XI MA* [Undergraduate honors thesis, Universitas Negeri Yogyakarta]. ePrints@UNY http://eprints.uny.ac.id/id/eprint/62888

Pane, I., Hadju, V. A., Maghfuroh, L., Akbar, H., Simamora, R. S., Lestari, Z. W., Galih, A. P., Wijayanto, P. W., Waluyo, Uslan, & Aulia, U. (2022). Desain penelitian mixed method. In N. Sapu (Ed.), *Desain penelitian mixed method desain penelitian mixed method*. Yayasan Penerbit Muhammad Zaini.

Riduwan. (2015). *Skala pengukuran variabel-variabel dalam penelitian*. Alfabeta.

Rokhim, D. A., Dzikrulloh, M. H. A., & Septiani, M. O. (2022). Analisis kebutuhan aplikasi literasi sains berbasis qur'ani & socio-scientific issues untuk meningkatkan kemampuan ilmiah siswa MTs. *Tatar Pasundan: Jurnal Diklat Keagamaan*, *16*(1), 13–24. https://doi.org/10.38075/tp.v16i1.191

Salim, A., & Mukhibat, M. (2020). Interkoneksi pendidikan agama Islam dan sains di SMA Islam Al Azhar 09 Yogyakarta. *Edukasia*, *1*(2), 161–173.

Sanjaya, W. S. M., Anggreyani, D., & Saadah, T. (2020). *Pyknometer al-Biruni dalam Maqalah fi al-Nisab Allati Bayna al-Fillazzat wa al-Jawahir fi al-Hajm wa al-Wazn serta implementasinya berbasis mikrontoler arduino.* Bolabot.

Sunardin. (2021). Manusia membutuhkan agama di masyarakat. *Misykat Al-Anwar: Jurnal Kajian Islam dan Masyarakat*, *4*(1), 1–28. https://doi.org/10.24853/ma.4.1.1-28

Susanti, E. D., Astuti, B., Syarifah, B. A., Popilaya, P., & Azizah, N. (2019). Analisis motivasi

belajar siswa terhadap penggunaan bahan ajar fisika terkomplementasi ayat Al-Quran. *Jurnal Pendidikan Fisika*, *7*(2).

Zahro', A., Muzazzinah, M., Ramli, M., & Wulandari, E. (2023). Literature study of Islamic values integration in biology subject in SMA/MA (Senior High Schools/Islamic Senior High School). *Biosfer: Jurnal Tadris Biologi*, *13*(2), 163–172. https://doi.org/10.24042/biosfer.v13i2.14109

Zainuddin, Astuti, D. R., Misbah, M., Wati, M., & Dewantara, D. (2020). Pengembangan modul pembelajaran generatif materi fluida statis terintegrasi ayat-ayat Al-Qur'an. *Jurnal Pendidikan Informatika dan Sains*, *9*(1), 1–12. https://doi.org/10.31571/saintek.v9i1.1539

Author (s):

* Irsyad Yusuf Santoso (Corresponding Author)
Department of Physics, Faculty of Mathematics and Natural Science,
Universitas Negeri Surabaya,
Jl. Ketintang, Surabaya 60231, Indonesia
Email: irsyadyusuf.19081@mhs.unesa.ac.id

Nadi Suprapto
Department of Physics, Faculty of Mathematics and Natural Science,
Universitas Negeri Surabaya,
Jl. Ketintang, Surabaya 60231, Indonesia
Email: nadisuprapto@unesa.ac.id

Hasan Nuurul Hidayatullaah,
Department of Physics, Faculty of Mathematics and Natural Science,
Universitas Negeri Surabaya,
Jl. Ketintang, Surabaya 60231, Indonesia
Email: hasannuurulh@gmail.com

Mada Sanjaya W.S.
Department of Physics, Faculty of Science and Technology,
Universitas Islam Negri Sunan Gunung Djati Bandung,
Jl. AH Nasution, Bandung 40614, Indonesia
Email: madasanjaya@uinsgd.ac.id

Kunduz Turekhanova
Al-Farabi Kazakh National University, Kazakhstan
Email: kunduz@physics.kz