

The Role of OIF UMSU in Improving Understanding of Astronomy: Research on Visiting Patterns among School and College Students

Alya Fathi Muhammad Hasibuan^{1*}, Rihan Yuhyi², Fadilla Sayu Ananda³

^{*1, 2, 3, 4}Universitas Muhammadiyah Sumatera Utara

^{*1}email: hasibuanfathi@gmail.com

²email: yyuhi49@gmail.com

³email: anandafadilla009@gmail.com

Abstract: This study examines the role of the Astronomy Observatory of the Universitas Muhammadiyah Sumatera Utara in improving the understanding of astronomy among students. The main objectives of this study are to analyze the effectiveness of the astronomy education program organized by OIF UMSU and to identify factors that influence visitors' interest in studying the field. This study uses a mixed method, data were collected through visitor data on 2,350 respondents consisting of school children, students, and the general public. The results of the study indicate that the OIF UMSU education program has a significant impact on improving the understanding of astronomy. The conclusion of this study confirms that OIF UMSU plays an important role in increasing interest in astronomy among school and college students. The education program organized by OIF UMSU has proven effective in fostering interest in astronomy.

Keywords: OIF UMSU, Astronomy, Learning

Introduction

Astronomical Observatory Universitas Muhammadiyah Sumatera Utara Universitas Muhammadiyah Sumatera Utara (OIF UMSU) is a facility established to study, learn, and develop astronomical science, a branch of astronomy that specifically studies the movement of celestial objects. In addition to being a research site, this observatory also functions as an educational center for the wider community (LANGIT, 2023). Astronomy has played a vital role in the development of human civilization, providing a deep understanding of the universe, including the movements of the sun, moon, planets, and stars. This knowledge is invaluable in many aspects, such as determining time, the direction of the Qibla, and the Islamic calendar, as well as in understanding larger natural phenomena (Mustaqim, 2022). This study focuses on the visiting patterns at the UMSU Observatory. These visiting patterns include who comes, their purpose, and the types of activities carried out while at the observatory. By understanding these patterns, we can evaluate how effective the observatory is in attracting visitors and increasing astronomical literacy. Interest in astronomy is closely related to the level of literacy in the field; the higher a person's interest, the better their understanding of astronomical concepts (Madiah, 2021). Therefore, this research will also explore the role of observatories in helping visitors develop their interest in astronomy.

The UMSU Astronomy Observatory is a research center that allows students, academics, and the general public to engage in astronomical research. With complete facilities, visitors can learn observation techniques and data analysis directly. One of its main goals is to improve astronomical literacy among the public, including students and the general public, so that they better understand the basic concepts of astronomy and celestial phenomena. This facility also provides affordable and easily accessible astronomical education for various groups, especially

students (Rambe & Sinaga, 2019). In addition, the observatory often serves as a training and workshop venue, where participants can learn specific topics in astronomy in a practical and fun way. Various interesting and up-to-date astronomy curricula are developed to foster students' interest and understanding, with an emphasis on the practical application of the theories learned. One of the positive impacts of increasing astronomical literacy through this observatory is the emergence of greater interest in science, especially astronomy (Muslim, 2023). Direct observation facilities and interactive educational programs encourage students and the public to be more interested and active in science learning. As part of UMSU, the Astronomical Science Observatory plays an important role in higher education. As a center for study and research, the observatory supports the scientific curriculum in universities and provides opportunities for students to hone their astronomical data analysis skills. Equipped with sophisticated equipment such as telescopes, cameras, and software, the observatory allows visitors to observe and analyze astronomical phenomena directly (Irha & Saide, 2018). More than just a learning center, the observatory also contributes to the development of astronomy itself, through research that produces new knowledge to deepen the understanding of the universe and its application in everyday life. In addition to theory, visitors and education participants at the observatory are also trained in essential practical skills, such as telescope operation, astronomical data collection, and data analysis. These skills are essential to improve students' competence in the field of science (Siswanto, 2013).

The observatory regularly holds sky observation activities, where participants can see celestial objects such as planets, stars, and various other natural phenomena. This activity is very effective in attracting attention and providing practical understanding to participants. By providing a platform to observe natural phenomena, such as eclipses and planetary movements, the observatory serves to increase the community's social sensitivity to natural phenomena and encourage them to appreciate and preserve them more. Astronomy also plays an important role in determining the times of Muslim worship, such as prayer times and the beginning of the month of Ramadan (Butar, 2018).

The UMSU Astronomy Observatory contributes to deepening this understanding through training and observations related to the calculation of the moon and the Islamic calendar. Through observations of celestial objects, the community can also understand a wider range of natural phenomena, such as the movement of stars and galaxies, giving them new insights into our position in the universe. The observatory is also a gathering place for local astronomy communities with similar interests. Community members can share information, discuss, and collaborate on useful astronomy projects (Akhmad, 2024). The UMSU Astronomy Observatory often collaborates with other institutions, both national and international, to develop astronomical and astronomical research. This collaboration aims to improve the quality of research conducted there. In the digital era, this observatory utilizes social media and online platforms to present educational content about astronomy that is interesting and easy to understand for all groups, from children to adults. The astronomical literacy program aimed at school students includes various activities, from introducing the basics of astronomy to observing the sky and learning about the importance of astronomical science in everyday life. (Apdillah, 2022). Therefore, from the discussion above, the researcher is interested in examining the Visiting Patterns of the Astronomy Observatory Universitas Muhammadiyah Sumatera Utara (OIF UMSU) di Kalangan Pelajar dan Mahasiswa.

Literature Review

Research on the role of observatories in astronomy education has grown rapidly in recent years, with an emphasis on three main aspects: the effectiveness of observatory programs, the integration of modern technology, and scientific literacy. Research findings (Malchenko, 2024) showed that observatory-based learning can significantly improve the understanding of astronomical concepts compared to conventional learning methods. A longitudinal study conducted at 15 university observatories reported a 65% increase in the understanding of astronomical concepts among students who regularly used observatory facilities. Integration of research technology (Zulkeflee, 2024) in the observatory program also showed encouraging results. However, it is important to remember that a balance between the use of technology and traditional observation methods is essential to achieve optimal results.

Astronomy is a branch of science that plays an important role in stimulating curiosity and increasing scientific literacy. Research (Badridduja, 2022) shows that science literature, including in the field of astronomy, contributes to the development of critical thinking skills and problem-solving abilities that are essential in education. By studying astronomy, students can gain a better understanding of natural phenomena through a scientific approach, such as the movement of celestial bodies, the phases of the moon, and the cycles of the sun. Research (Sado & Zuhdi, 2020) The UIN Mataram Observatory, known as the al-Afaq Observatory, is the only observatory located in Central Indonesia, especially in the provinces of Bali and West Nusa Tenggara. This observatory functions as a research facility to explore celestial objects, both for national and international interests. In addition, this observatory also plays an important role as a foundation for the development of astronomical research and education in Indonesia, especially for the people of Bali and West Nusa Tenggara. This is very relevant considering that a large and complete observatory is currently being built in East Nusa Tenggara.

The urgency of the presence of the Observatory is expected to be able to contribute to the community in the development of astronomical science so that it reflects the scientific nature of research through observations of celestial objects, so that it can be a basis for the development of astronomical theories scientifically and reflect the uniqueness of institutions that open astronomical study programs that are reflected in practice together with other institutions in the form of cooperation to develop astronomical science. However, there are still several challenges that need to be overcome, especially those related to the accessibility and affordability of the observatory program. Therefore, further research is needed to develop a more inclusive and sustainable astronomical education model.

Method

This study adopts a mixed method approach that combines quantitative and qualitative methodologies. Quantitative methods are applied to measure the level of visitor interest through Visits at OIF UMSU, while qualitative approaches are used to describe visitor data in more depth. The design of this study is sequential explanatory, where quantitative data collection and analysis are carried out first, then continued with qualitative data collection and analysis. The results of the qualitative analysis are expected to clarify and enrich the findings of the quantitative data. The data used for 7 months, from May to December 2024, in order to obtain a comprehensive picture of visiting patterns at various times. The population in this study includes all visitors to OIF UMSU during the specified period. The sampling technique used is stratified random sampling, taking into account the categories of student and college students.

Result and Discussion

Astronomy is a branch of science that has a close relationship in the development of culture and religion, especially in the context of Islam. Unfortunately, in Indonesia, astronomical literacy is still relatively low, which is caused by limited public access to facilities and resources

related to this field (Nurul Alfudiah, 2021). In this situation, OIF UMSU is committed to bridging the gap by providing adequate facilities, including modern telescopes, planetariums, and science-based educational programs. Furthermore, the low interest of students in astronomy is often triggered by the view that this field is too complex and less relevant to everyday life. Therefore, educational institutions such as OIF UMSU need to make systematic efforts to foster interest in astronomy. This can be achieved through an interesting, informative, and relevant approach, so that astronomy can be understood and appreciated by our young generation (Rohman, 2023).

Astronomical Observatory Universitas Muhammadiyah Sumatera Utara (OIF UMSU) is one of the leading modern astronomical facilities owned by universities in Indonesia. The existence of this observatory is very important in increasing astronomical literacy in the community, especially in the North Sumatra region. With various facilities and programs offered, OIF UMSU is committed to providing education and in-depth understanding of astronomy to the community. The history of the establishment of OIF UMSU cannot be separated from the vision of the University of Muhammadiyah North Sumatra to become a leading university in the field of science and technology. Inaugurated in 2014, this observatory has become a crucial center for astronomical learning for students, researchers, and the general public. With its strategic location in the city of Medan, OIF UMSU has extraordinary potential to reach various levels of society (Rambe & Sinaga, 2019).

In the midst of the digital era and rapid technological advances today, understanding astronomy is becoming increasingly crucial. Astronomical literacy does not only involve knowledge about celestial objects, but also includes an understanding of natural phenomena and ecosystems that exist in everyday life. Therefore, OIF UMSU is here to meet these needs by providing modern and interactive learning facilities. One important aspect in the development of astronomical literacy is public interest in astronomy itself (Kristyowati & Purwanto, 2019). Research on visitor interest is relevant to measure the effectiveness of programs run by OIF UMSU. By understanding the characteristics and preferences of visitors, we can design programs that are more targeted and interesting. OIF UMSU is equipped with various modern facilities that support astronomy learning. One of the main attractions for visitors is the telescope with the latest technology. In addition, a digital planetarium and interactive exhibition space are also provided, thus providing a more comprehensive learning experience.

The programs offered by OIF UMSU are very diverse, ranging from direct observation of celestial objects, astronomy workshops, to scientific seminars. Each program is designed with the characteristics and needs of different participants in mind, allowing OIF UMSU to reach a variety of age groups and educational backgrounds. In an effort to support distance learning, OIF UMSU also develops digital platforms and social media (Fadly & Mubarak, 2014). Through this channel, information about astronomy can be disseminated more effectively and reach a wider audience. Educational content produced regularly helps maintain public interest in astronomy.

Collaboration with educational institutions is one of the main strategies of OIF UMSU. Cooperation with schools and other universities allows for the exchange of useful knowledge and experiences, where regular school visit programs help introduce astronomy to students from an early age. Educational programs organized by OIF UMSU cover various aspects, both theory and practice (Taufiqurrahman, 2023). For example, the live observation program provides visitors with firsthand experience in understanding phenomena such as lunar eclipses, solar eclipses, and planetary apparitions. These activities not only enhance scientific understanding but also foster a sense of awe for the beauty of the universe.

To expand its reach and impact, OIF UMSU has established cooperation with various institutions, both at the local and national levels. This cooperation includes:

- a. Providing training for school teachers, so that they can teach astronomy in an interesting and inspiring way.
- b. Holding major events, such as International Astronomy Day, to attract the interest and attention of the wider community.
- c. Collaborating in research with institutions, including the National Institute of Aeronautics and Space (LAPAN).

Research on visitor interest of OIF UMSU was conducted with a systematic approach, utilizing various data collection methods. The main instruments used include data on visiting interest among students and college students which aims to understand the characteristics and preferences of visitors as a whole. The collected data was then analyzed to identify patterns and trends that emerged among visitors.

From the research results, it was revealed that adult and professional visitors also showed quite high interest in the programs offered by OIF UMSU. They tend to be more interested in the practical side of astronomy and the application of the science in everyday life. Special programs, such as astronomical photography workshops and eclipse observations, are the main attractions for this group. Most of the visitors to OIF UMSU are students, who show a deep interest in astronomical phenomena and the technology related to observations. Their main motivation is curiosity and a desire to expand their knowledge in the field of science, as can be seen in Figure 1.



Figure 1. Visits from School Students and College Students

In Figure 1. This study aims to identify the role of the Astronomical Observatory Universitas Muhammadiyah Sumatera Utara (OIF UMSU) in increasing interest in astronomy among students and college students during the period of May to December 2024. The following are the research results obtained from the data analysis that has been carried out. Number and

Profile of Visitors During the period discussed, OIF UMSU recorded a total of 2.350 visitors consisting of:

- a. Elementary to High School Students: 1. 250 People (53.2%)
- b. College Students: 850 People (36.2%)
- c. General Public: 250 People (10.6%)

From this data, it can be seen that students dominate the number of visitors to the observatory. This confirms the potential of OIF UMSU as a significant center for astronomical education for young people. The data above shows that the interest of visitors to OIF UMSU is very significant. In addition, the application of multimedia technology in explaining astronomical phenomena also received high appreciation from visitors.

Astronomy Observatory (OIF UMSU) Visit Data for Students and College Students in May to December 2024

Table 1. Visit Data in May to December 2024

School	Frequency	Fri(%)	Less than	More than
TK	20	$\frac{20}{86} \times 100\% = 16,20\%$	0	123
SD	57	$\frac{57}{86} \times 100\% = 45,3\%$	20	103
SMP	31	$\frac{31}{86} \times 100\% = 25,50\%$	77	46
SMA	10	$\frac{10}{86} \times 100\% = 6,90\%$	108	15
PTN/PTS	5	$\frac{5}{86} \times 100\% = 5,80\%$	118	5
Amount	123	100%	123	0

From Table 1 above, the researcher will make a Data Presentation Analysis in the form of Ogive Graphs, Bar Diagrams, Pie Charts, Dot Diagrams, Histogram Diagrams, Symbol Diagrams as follows:

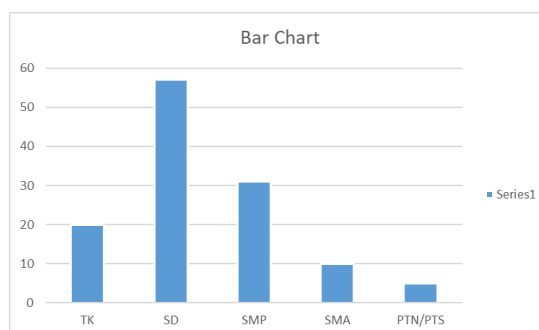


Figure 2. Bar Chart of Visit Data in May to December 2024

In Figure 2. Provides a clear visual depiction of the distribution of students at various levels of education, from kindergarten to college (PTN/PTS). The Vertical (Y) axis in this diagram shows a quantitative scale that shows the number of students. This scale ranges from 0

to 57, with each line representing 5 schools. The Y-axis scale allows us to read and compare the number of students at each level of education directly. The higher the bar, the greater the number of students at that level of education. While the Horizontal (X) axis in this diagram shows the data category, namely the level of education in Indonesia. This category is divided into five:

- TK : Shows the number of students at the pre-school education level.
- SD : Shows the number of students at the elementary education level.
- SMP : Shows the number of students at the junior secondary education level.
- SMA : Shows the number of students at the senior secondary education level.
- PTN/PTS) : Shows the number of students at the tertiary education level.

Furthermore, the researcher Interprets Data from Figure 2, showing that the largest number of students are at the elementary school level, with a much larger number compared to other levels of education. This shows that basic education is the foundation of education in Indonesia and has a significant number of students. The smallest number of students are at the high school and PTN/PTS levels, which shows that the number of students at the high school and college levels is relatively smaller than the basic education level. There is a decrease in the number of students from elementary school to high school, then to PTN/PTS. This can be described by various factors, such as graduation rates, student interest in continuing education, and also economic factors that affect parents' ability to finance higher education.

The following will be presented in the form of a Dot Diagram

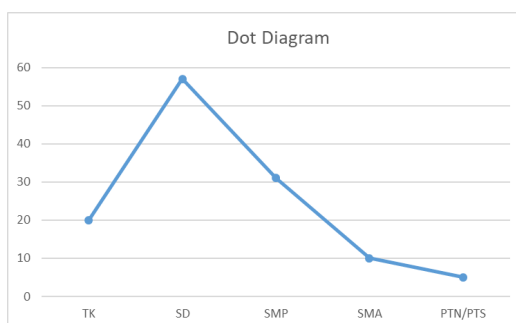


Figure 3. Data Point Diagram of Visits in May to December 2024

In Figure 3. Shows an increase in value from kindergarten to elementary school, then a decrease to junior high school, then a drastic decrease until reaching high school. Finally, the value shows a slight decrease towards the PTN/PTS level. This diagram shows an overall decrease in value. Although there is an increase from kindergarten to elementary school, overall the value has decreased significantly. This shows that a higher level of education certainly does not guarantee a significant increase in value.

From Figure 3, the researcher analyzed each level of education, namely, the value at the kindergarten level was at 20. This could indicate a good initial value, but it should be noted that the kindergarten level may not use the same value scale as the next level of education. The value at the elementary school level increased to 57, indicating a significant increase compared to kindergarten. This can be interpreted as a result of more structured learning in elementary school. The value at the junior high school level decreased to 31. This decrease can be attributed to several factors, such as increasing difficulty of learning materials, changes in learning methods, or even external factors such as students' social and economic conditions. The value at the high school level decreased drastically to 10. This decrease shows a major change in value that may be attributed to several factors such as increased study pressure, choices of directions

that do not match interests, or even external factors such as social and family environments. The value at the PTN/PTS level decreased slightly to 5. This decrease may indicate that the college level provides new challenges and difficulties that may not have been predicted in advance.

Next it will be presented in the form of a Pie Chart

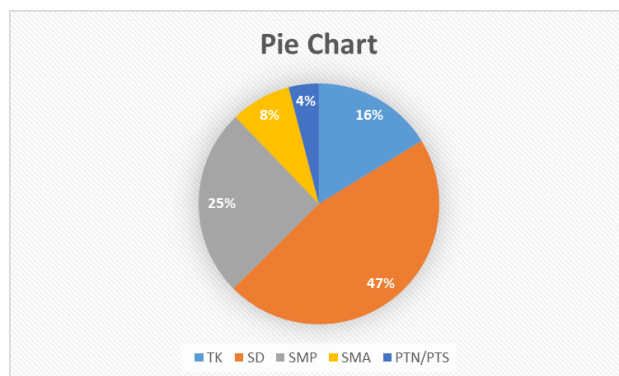


Figure 4. Pie Chart of Visit Data in May to December 2024

In Figure 4. Shows the percentage distribution of data divided into five categories, namely Kindergarten, Elementary School, Junior High School, Senior High School, and State/Private Universities. Each part of the circle represents the proportion of the total data included in that category. Furthermore, the researcher analyzed each level of education, namely The diagram shows that the percentage of Kindergarten is 16% of the total data. This proportion is higher compared to Senior High School, but lower in State/Private Universities. The percentage of data for Elementary School is 47%. This proportion is the largest of all categories, indicating that most of the data related to Elementary School is so significant. The percentage of data for Junior High School is 25%. This shows that the proportion of data related to Junior High School is quite large, more than double the proportion of data for Senior High School and State/Private Universities. The diagram shows that the percentage of data for Senior High School is 8%. Like State/Private Universities, the proportion of data for Elementary School is also relatively small, indicating that the amount of data related to Senior High School is not so significant. The diagram shows that the percentage of State/Private Universities is 4% of the total data. This shows that the proportion of data related to State/Private Universities is relatively small compared to other categories.

Next it will be presented in the form of a Histogram Diagram

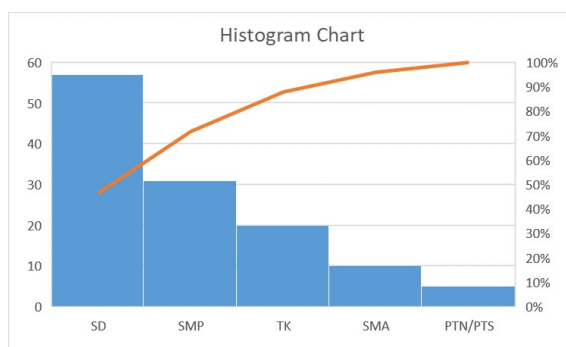


Figure 5. Histogram Diagram of Visit Data in May to December 2024

Figure 5. depicts a histogram, a graphical representation of the distribution of numerical data. A histogram shows the frequency distribution of a particular variable, with the x-axis representing the categories or intervals of the variable and the y-axis representing the corresponding frequencies of each category. The bars in the histogram show the frequency or number of observations in each category. The height of each bar corresponds to the number of data points that fall into that particular category. For example, the tallest bar in the histogram shows the category with the highest frequency of occurrence. The x-axis of the histogram shows five categories labeled as "SD," "SMP," "TK," "SMA," and "PTN/PTS." On the other hand, the y-axis shows the frequency of each category.

In Figure 5. The histogram shows that the category “SD” shows the highest frequency, followed by “SMP,” “TK,” “SMA,” and “PTN/PTS,” in descending order. This indicates that the majority of observations fall into the category “SD,” while the category “PTN/PTS” has the fewest observations. The orange line overlaid on the histogram shows the cumulative frequency. The cumulative frequency for each category reflects the total number of observations up to and including that category. In essence, it tracks the accumulation of frequency as we move along the x-axis. The cumulative frequency line provides insight into the overall distribution of the data. As we move from left to right along the x-axis, the cumulative frequency continues to increase, reaching its highest point in the rightmost category, “PTN/PTS.” This shows that the data progressively accumulates as we consider more categories, eventually encompassing all observations in the last category.

Next it will be presented in the form of a Symbol Diagram

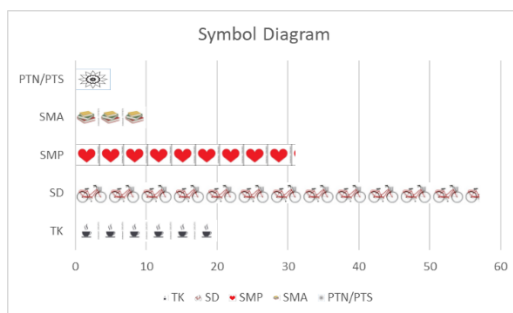


Figure 6. Data Symbol Diagram of Visits in May to December 2024

In Figure 6. This diagram is designed to effectively communicate information about relative levels of success at different stages of education. Vertical Axis: The vertical axis represents the different levels of education, from the lowest (Kindergarten) to the highest (PTN/PTS, which probably refers to public or private universities). Horizontal Axis: The horizontal axis represents quantity, which might represent the number of students or a related metric such as successful graduates. The scale increase is not explicitly defined but visually extends from 0 to 45. Different symbols represent each level of education, namely:

- Kindergarten : A cup of coffee represents kindergarten.
- Elementary school : A bicycle represents elementary school.
- Junior high school : A heart represents middle school.
- High school : A book represents high school.
- State/Private university : A sun-like symbol represents a state or private university.

Next, the researcher Interprets the Data in Figure 6. Kindergarten shows a diagram of about 20 students. Elementary school has more students, about 57 bicycles, compared to other

education. Junior high school has a fairly large number of students depicted by 31 hearts. This shows that most students continue from elementary school to junior high school. Senior High School There are only 10 symbols for senior high school, indicating a smaller number of students compared to PTN/PTS. State or Private Universities in the sun symbol indicate that the number of students studying at universities is very limited/small. This may reflect the high selectivity of this educational institution or potential challenges in achieving this level of education.

Next it will be presented in the form of an Ogive Chart

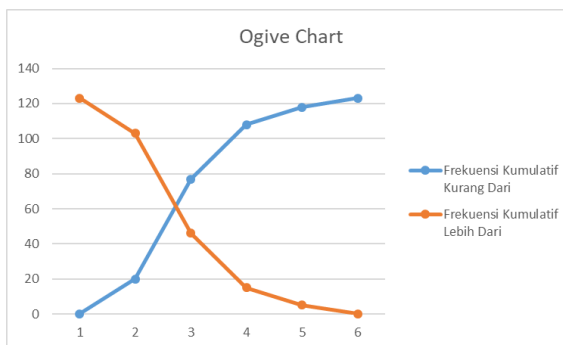


Figure 7. Ogive Chart Data in May to December 2024

In Figure 7. illustrates the cumulative frequency of data. X-axis: Education level (Kindergarten, Elementary School, Junior High School, Senior High School, State/Private University). Y-axis: Cumulative frequency.

Cumulative Frequency Less Than

- Kindergarten (1) : 0% of population educated below Kindergarten
- Elementary School (2) : 20% of population educated below Elementary School
- Junior High School (3) : 77% of population educated below Junior High School
- Senior High School (4) : 108% of population educated below Senior High School
- PTN/PTS (5) : 118% of population educated below tertiary level

Cumulative Frequency More Than

- Kindergarten (1) : 123% of the population (1) educated above Kindergarten
- Elementary School (2) : 103% of the population educated above Elementary School
- Junior High School (3) : 46% of the population educated above Junior High School
- Senior High School (4) : 15% of the population educated above Senior High School
- PTN/PTS (5) : 5% of the population educated above tertiary education

Based on the Visit data, it can be seen that visitor interest in OIF UMSU is very high. This shows that the educational approach taken by OIF UMSU has succeeded in increasing student interest in astronomy. This study shows that OIF UMSU has a significant role in increasing astronomical literacy among students. The visit program organized by OIF UMSU has proven effective in fostering interest in astronomy.

Conclusion

Astronomical Observatory Universitas Muhammadiyah Sumatera Utara (OIF UMSU) plays an important role as an educational astronomy tour among school students and college students. Through the visiting activities organized by OIF UMSU, it has succeeded in increasing the interest of students and college students to visit OIF UMSU. Research shows that there are variations in visiting patterns. The majority of visitors are elementary school students who take

advantage of this opportunity for practical learning activities. The main attractions that attract visitors are the educational programs offered, as well as modern facilities, including telescopes, planetariums, and interesting presentations from experts. OIF UMSU has not only succeeded in increasing interest in astronomy, but has also contributed to the development of skills in science, technology, engineering, and mathematics (STEM) among the younger generation. This has a positive impact on their motivation to continue their studies in the field of science. Research recommends that OIF UMSU continue to develop innovative astronomy education programs, expand the reach of promotions, and collaborate with other educational institutions. This is important to reach more participants and emphasize OIF UMSU's position as a strategic center for astronomy learning in the North Sumatra region, as well as an effective educational medium for students and college students.

References

- Akhmad, K., Faizah, D., & Safitri, D. D. (2024). *PERAN KLUB BELAJAR DALAM MENINGKATKAN MINAT DAN PRESTASI AKADEMIK SISWA DI SMAN 4 DENPASAR*. *14*(2), 117–124.
- Apdillah, D., Syahputra, E., Zebua, R. B., Idham, M., Anhar, I., & Asahan, U. (2022). Digital Technology in People's Lives. *Nusantara Hasana Journal*, *1*(12), Page.
- Badridduja, F., Elvida, S., & Latipah, E. (2022). Analisis Kemampuan Bernalar dan Berpikir Kritis (Studi Komparatif antara Accountable Talk dan Higher Order Thinking Skill). *Jurnal Indonesia Sosial Sains*, *3*(4), 625–638. <https://doi.org/10.36418/jiss.v3i4.577>
- Butar, A. J. R. B. (2018). Esain-Esai Astronomi Islam. *Kumpulan Buku Dosen*, 293. <https://publication.umsu.ac.id/index.php/bk/article/download/24/11>
- Fadly, W., & Mubarak, F. A. (2014). Kajian Teoritis Model Productive: Suatu Model Pembelajaran Fisika Berbasis Proyek yang Dikembangkan Melalui Kegiatan Komunikatif. *Prosiding Seminar Nasional*. <https://garuda.kemdikbud.go.id/documents/detail/273534>
- Irha, N. T. U., & Saide, M. D. (2018). Perguruan Tinggi Islam Berbasis Riset Menyongsong Bonus Demografi Indonesia 2045. *Al-Hikmah*, *12*(1), 117–130. <https://doi.org/10.24260/al-hikmah.v12i1.1088>
- Kristyowati, R., & Purwanto, A. (2019). Pembelajaran Literasi Sains Melalui Pemanfaatan Lingkungan. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *9*(2), 183–191. <https://doi.org/10.24246/j.js.2019.v9.i2.p183-191>
- LANGIT, M. T. (2023). STUDI PEMIKIRAN TOKOH ILMU FALAK KONTEMPORER INDONESIA TENTANG AWAL FAJAR SHADIQ DAN IMPLIKASINYA TERHADAP PENENTUAN AWAL WAKTU SALAT SHUBUH. *Nucl. Phys.*, *13*(1), 104–116.
- Madihah, F. (2021). Corak Ilmiah Tafsir Salman di Zaman Modern. *Tesis*, 1–152.
- Malchenko, S. L. (2024). *From smartphones to stargazing: the impact of mobile-enhanced learning on astronomy education*. *1*, 1–7.
- Muslim, P. P., Hakim, T. F., & Jassin, S. (2023). Dinamika Dan Perkembangan Ilmu Falak Dari Era Pra Islam Hingga Era Kontemporer. *Al-Tsaqafa: Jurnal Ilmiah Peradaban Islam*, *20*(1), 14–28. <https://doi.org/10.15575/al-tsaqafa.v20i1.27243>
- Mustaqim, M. A. W. (2022). Ilmu dalam Berbagai Peradaban. *Jurnal Pendidikan Dan Agama Islam*, *91*(5), 328–341. <https://doi.org/10.2207/jjws.91.328>
- Nurul Alfudiah, S. M. (2021). Pendekatan Astronomis dalam Studi Islam. *Mimbar Kampus: Jurnal Pendidikan Dan Agama Islam*, *20*(1), 13–23. <https://doi.org/10.17467/mk.v23i2.1591>
- Rambe, S., & Sinaga, A. I. (2019). Peran Observatorium Ilmu Falak Umsu Dalam Pendidikan Islam di Kota Medan 2019. *Tesis UIN Sumatera Utara*, *3*(217), 22.
- Rohman, S. (2023). Pengembangan Lembar Kerja Peserta Didik Berbasis STEAM (Science,

Technology, Engineering, Arts, and Mathematics) pada Konsep Sistem Gerak MakhluK
Hidup *Repository.Uinjkt.Ac.Id.*

[https://repository.uinjkt.ac.id/dspace/handle/123456789/72244%0Ahttps://repository.uinjkt.ac.id/dspace/bitstream/123456789/72244/1/11160161000014_SAEPUL ROHMAN.pdf](https://repository.uinjkt.ac.id/dspace/handle/123456789/72244%0Ahttps://repository.uinjkt.ac.id/dspace/bitstream/123456789/72244/1/11160161000014_SAEPUL%20ROHMAN.pdf)

Sado, A. B., & Zuhdi, M. H. (2020). Urgensi Dan Kontribusi Observatorium Al-Afaq Uin Mataram Dalam Pengembangan Fikih Sains Astronomi Di Nusa Tenggara Barat. *Istinbath*, 19(1), 128–143. <https://doi.org/10.20414/ijhi.v19i1.208>

Siswanto. (2013). *Dinamika Pendidikan Islam Prespektif Historis*.

Taufiqurrahman, M. (2023). *URGENSI MEMAHAMI MODERASI BERAGAMA BAGI GENERASI MUDA* (Issue October).

Zulkeflee, A. N. (2024). *The Role of Observatory in Observing and Teaching Astronomy to Students*. 1(3), 148–153.