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Strengthening students' scientific literacy through scientific coaching programs

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ABSTRACT

The scientific literacy of madrasa students currently shows a very proud trend. This is shown by the achievements in the field of science obtained in various science competitions. Scientific achievements are obtained through a long and continuous process, including through science coaching. By using qualitative methods, this study aimed to describe the science coaching model at State Madrasah Aliyah (MAN) 2 Malang City. The results showed that the science coaching model in MAN 2 Malang City includes four main aspects. First, strengthening the management aspect through establishing the olympic and research program and fulfilling adequate infrastructure. Second, strengthening students' concepts and abilities through matriculation and programmed guidance. Third, empowering the olympic class and the olympic club through a rigorous selection and the implementation of periodic tests and tryouts. Fourth, synergy with other parties, such as Ma'had Al-Qalam, state universities, and National Achievement Center (*Pusat Prestasi Nasional*/Puspresnas). The success of scientific development cannot be separated from the interest and motivation of students to learn, adequate infrastructure, a conducive learning environment, and the support of the madrasa principal, committee, and parents.

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1. INTRODUCTION

Science and technology have an important role in the development of human civilization. The rapid development of science and technology has helped facilitate human life through the birth of various kinds of innovations that are very useful. For example, how the application of the concepts of optics and light in physics can be used in the world of optics to help people with eye defects/sightedness. Furthermore, radiation physics can be used for cancer radiation therapy [1]. Not only that, the role of science and technology is also very useful in the lives of Muslims, including the application of astronomy in determining the beginning of prayer times [2]. There are many more benefits of science and technology in human life.

The importance of the role of science and technology in human civilization needs to be balanced with the ability and scientific literacy. Even in the measurement of the program for international student assessment (PISA), the three literacy skills measured include reading literacy, mathematical literacy, and scientific literacy. Scientific literacy is defined as the ability to engage with science-related issues and with

scientific ideas [3]. In the context of PISA 2015, scientific literacy is measured from the content of science, including physical systems, living systems, and earth and space systems. In the context of learning, scientific literacy can be measured through the material being studied in the school curriculum [4]. It is important to develop scientific literacy for school and madrasa students as a provision to engage in the world of science and technology.

The scientific literacy of Indonesian students has not achieved encouraging results. Based on the results of the PISA 2018 measurements, Indonesia is in the bottom 10 of the 79 participating countries. The average science performance of Indonesian students is 37 points below the average of ASEAN students. When viewed from the level of performance, there are only 34% of Indonesian students have a minimum level of science competence or more, and most of them are below the level of science performance [5]. The still low scientific literacy of Indonesian students is a serious problem that needs to be paid attention to by the government and education providers. At the school/madrasa level, students' low scientific literacy can be overcome by various strategies, including sustainable science coaching.

Good scientific literacy does not just appear and develop in students, but through a long process that must be passed. At State Madrasah Aliyah (MAN) 2 Malang City, the strengthening of scientific literacy has been initiated since 2009 by recruiting alumni, students, and graduates of state universities to become coaches in science coaching. In addition, the selection of excellent students has been carried out since the beginning of the selection of new student admissions. The long journey that MAN 2 Malang City went through to foster the spirit of scientific literacy in students was able to create a positive atmosphere for all students. This is evidenced by most of the students at MAN 2 Malang City 85% being accepted at state universities, and some students even continuing their studies in other countries.

The ability of the students of MAN 2 Malang City in the field of science is the result of the scientific development efforts given to students. How the madrasa principal's policies and strategies are applied in scientific development certainly greatly contributes to the success of students in achieving rankings in various competitions. This article aims to describe the scientific coaching model applied at MAN 2 Malang City. As described previously, the selection of MAN 2 Malang City was based on the many achievements in the field of science so that its reputation was able to compete with MAN Insan Cendekia and other favorite schools.

Previous research that is relevant to the study of scientific literacy is generally divided into two, namely studies that discuss methods of improving student literacy through and studies of scientific coaching models. Methods that can be used to improve scientific literacy include developing problem-solving-based modules [6], [7], and developing online learning media [8]. While the model of scientific coaching can be done is through strengthening school management [9]. In addition, strengthening students' science literacy can be done through empowering science clubs as an after-school science/mathematics enrichment program for students supported by graduate students. Science club empowerment has a positive influence on students' attitudes towards science learning [10]. This article fills the gaps in the literature on how the process of developing science works in madrasas, starting from student selection, matriculation, and the process of developing science, to participation in science competitions. The novelty aspect of the research is very useful for adding to the literature on the process of developing science to strengthen the scientific literacy of students in high school.

2. LITERATURE REVIEW

2.1. The scientific literacy

According to the Cambridge dictionary, literacy is defined as "the ability to read and write; a basic skill or knowledge of a subject" [11]. While science is defined as "the study of the structure of natural things and the way that they behave, a particular type of science (chemistry, physics, and biology are all sciences)" [12]. Thus, a simple definition of scientific literacy is an individual's ability related to his knowledge of science. More comprehensively, PISA defines scientific literacy as "an individual's science knowledge and use that knowledge to identification questions, to acquire new knowledge, to explain scientific phenomena, and to draw an evidence-based conclusion about sciences-related issues" [13]. Science literacy is one of the parameters that can describe the human development index from the aspect of education quality [14].

Every student needs to have adequate scientific literacy. Scientific literacy includes scientific knowledge, scientific process skills, and scientific attitudes [15]. Scientific literacy consists of knowledge and understanding of scientific concepts and scientific processes needed by a person in decision-making, and cultural and economic productivity. Laugsch [16] stated that the development of scientific literacy is very important because it can contribute to social and economic life, as well as improve decision-making skills at the community and personal levels. Furthermore, another study stated that students' science process skills affect critical thinking in learning science [17]. Previous researchers [14] mentioned that critical thinking

skills can be built through finding-based learning using a scientific literacy approach. To realize sufficient scientific literacy for students, it is necessary to develop science in schools, especially at the senior high school level as a provision for students to continue their studies at universities with more specific scientific choices.

Improving students' scientific literacy can be done in several ways, including by developing problem-solving-based modules [6], [7], and developing online learning media [8]. Science coaching to improve students' scientific literacy can be done by adjusting the abilities and carrying capacity of the school. Science coaching can be given regardless of the social status of students. One study showed that students' motivation for math and science did not differ by gender, race/ethnicity, or socioeconomic status [18]. Science coaching for students is important so that students can think critically in learning.

2.2. The science coaching program

Coaching is a process that runs intensively and continuously over a semester or a year, is context-specific, and focuses on discrete skills [19]. In education, coaching often serves the purpose of personal support and professional learning, where students are helped to take responsibility and develop skills related to learning [20]. Coaching can be used as a management tool that helps create sustainable competitive advantage, supports the implementation of organizational goals and positively influences the organization's work climate [21]. Coaching provides greater clarity of purpose, better alignment with roles in the organization [22]. From some of the previous definitions, coaching can be interpreted as a planned, systematic, and sustainable process to realize the goals to be achieved, either to obtain, improve, or perfect certain results. In the context of the scientific competence of madrasa students, coaching is defined as a planned, systematic, and sustainable process carried out by madrasa administrators to improve student competence in the field of science.

Science according to the Cambridge Dictionary means "the careful study of the structure and behavior of the physical world, especially by watching, measuring, and doing experiments, and the development of theories to describe the results of these activities" [12]. Science is not about learning facts that have been established long ago; it's about knowing how to ask questions and move forward [23]. Furthermore, the most obvious sciences involved in this scientific research are geology, biology, zoology, botany, chemistry, physics, and geography [24]. While the basic sciences studied with Mathematics at school are physics, chemistry, and biology. To prepare students who are proficient in the field of science, some schools and madrasas have organized science coaching activities.

If coaching on teacher competence is the responsibility of the madrasa principal and supervisor, then coaching the scientific competence of madrasa students is the responsibility of the madrasa principal, supervisor, teacher, and parents. The synergy of the four components is necessary to realize the objectives of the scientific development process, which needs to be carried out continuously and continuously. This is because the increase in student competence in the field of science cannot be obtained instantly, but it takes a fairly long process.

In practice, the science coaching model can differ from one madrasa to another. This depends on the policy of the madrasa principal, the potential of teachers and students, and the availability of supporting infrastructure. Based on previous research studies, there are several kinds of science coaching strategies, including strengthening management aspects, developing science teachers [15], and developing science teacher competencies [25]. In addition, science coaching strategies can be carried out by maintaining the quality of professional relationships between teachers, science coaches, and students [26].

There are not many studies on science coaching models in madrasas, either in the form of theses, journals, or other scientific writings. However, several research results are quite relevant to this study, which are related to how the strategies used by madrasas in science coaching for students, especially to prepare students for science competitions. This study provides information that scientific development can be carried out through the empowerment of science clubs conducted after school activities by coaches who generally come from postgraduate students [10]. The intensity of science coaching provided by the coaches to their students is strongly correlated with increasing competence, and the most important thing is the quality of their professional relationships [26].

This research seeks to enrich the study of scientific development in madrasa, with the novelty of the research in the availability of information about the model of scientific development in madrasa aliyah, a school characterized by Islamic religion at the high school level. This research departs from the argument that a planned and sustainable model of scientific development is needed to improve the scientific competence of madrasa students so that they can make achievements in science competitions. The study of scientific development at MAN 2 Malang City is interesting considering the many achievements obtained by madrasa students, both at the national and international levels.

3. RESEARCH METHOD

This article departs from qualitative research conducted in September 2021, coinciding with the implementation of science guidance in preparation for the national science competition (KSN) and madrasa science competition (KSM). As with qualitative research in general, this research uses several data collection techniques, such as interviews, observations, and documentation studies. Interviews were addressed to madrasa principals, teachers, Olympiad and research program heads, science coaches, and students to obtain data and information related to policies and practices of science development in madrasas. Observations are made through direct observation of the ongoing scientific development process.

Meanwhile, the documentation study was conducted to obtain data related to scientific development, both madrasa documents and other relevant documents. The research was conducted at MAN 2 Malang City as a representation of outstanding madrasas in Indonesia. One of the achievements that have been MAN 2 Malang City is to become the overall champion of the KSN in 2021 and become the fourth-best madrasa version of the higher education entrance test institute (LTMPT). MAN 2 Malang City has pioneered a science coaching program since 2009 so that it can compete with the best high schools in Indonesia.

Data analysis uses the theory developed by Miles and Huberman, which divides the flow of qualitative data analysis into three stages, namely data reduction, data presentation, and conclusion drawing [27]. The data reduction stage is carried out by organizing data related to scientific development in madrasas according to the previously designed sub-themes. The data presentation stage is carried out after being sure that the data has been reduced properly so that the conclusion drawing stage as the last stage can be carried out correctly and is representative of the research findings.

4. RESULTS AND DISCUSSION

4.1. Olympic class recruitment as a science coaching strategy

Scientific achievements achieved by students of MAN 2 Malang City are not instantaneous but are the result of a structured and continuous process of scientific development. Science coaching has been initiated in 2009 starting with the establishment of an olympic class for outstanding students. From year to year, more and more students are interested in joining the olympic class, so it requires a very strict selection process, especially in each generation, only one Olympic class is opened. The tightness of the Olympic class recruitment process has implications for the achievements of the students of MAN 2 Malang City. This is in line with past research that in many countries, students are selected for higher education based on their achievements, measured by the scores given by their teachers and obtained on national final exams [28]. They also stated that teacher assessment and national exam results at the previous level are two measures that can be used as student recruitment policies. The Olympic class recruitment process has resulted in brilliant achievements for students of MAN 2 Malang City as presented in Table 1 [29].

Table 1. Science achievements of MAN 2 Malang City students

No	Academic year	Provincial level						National level						International level				Sum
		C1	C2	C3	C4	C5	C6	C1	C2	C3	C4	C5	C6	C1	C2	C3	C4	
1	2009-2010		4	4	1	8	1										0	18
2	2010-2011	5	4	5	1	1					1						0	17
3	2011-2012	8	10	7	4	3	1	2		4	1						0	40
4	2012-2013	7	9	7	3	1			3			1					0	31
5	2013-2014	8	8	6	4	1		3	2	1	1		1		1		1	37
6	2014-2015	13	16	6	4	3		8	3	4	4	1					0	62
7	2015-2016	6	9	11	8			8	10	15	1	1	3		1		1	74
8	2016-2017	20	6	6	2	2	2	14	13	9	4	3	2					83
9	2017-2018	18	1	5		1		31	24	33	7	9	7	1				137
10	2018-2019	17	13	4	2	2	1	22	33	18	3	1	1	1	3	3		124
11	2019-2020	9	4	4				21	7	7	4	2	1	1	1			61
12	2020-2021	5	3	5	4	3		25	23	18	2	1		1	2	3	1	96
13	2021-2022							5	9	12						2	1	29
	Sum	69	27	24	8	8	3	118	109	97	20	16	11	4	6	8	2	530

Table 1 shows that the scientific achievements of MAN 2 Malang City students tend to increase from year to year. Students of MAN 2 Malang City have obtained many scientific achievements since 2009 in various competitions. Even in 2021, MAN 2 Malang City won the KSN overall champion and won four gold medals, one silver medal, three bronze medals, and one special award. The scientific achievements obtained by the students of MAN 2 Malang City can be seen in Figure 1.

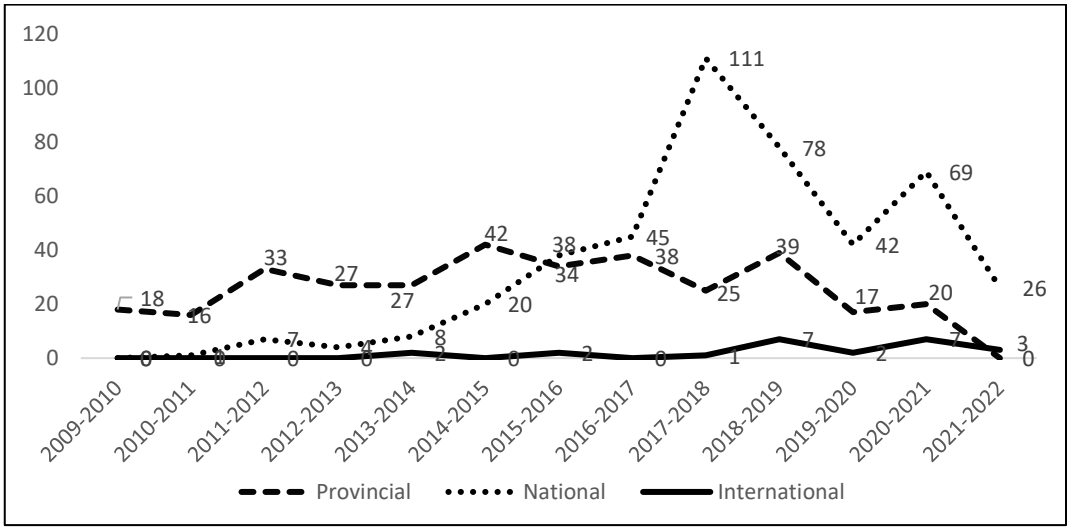

Figure 1. Achievements of MAN 2 Malang City by level of organizer

Figure 1 shows the scientific achievements of the students of MAN 2 Malang City based on the level of the organizer. From the beginning of the pioneering year 2009, MAN 2 Malang City was able to improve performance at the provincial, national, and international levels. The stretch of achievements at the international level began to appear in 2013-2014 until 2021 being able to achieve 7 achievements at international events. Meanwhile, in the first semester of the 2021-2022 academic year, MAN 2 Malang City has won 45 achievements, consisting of 16 provincial levels, 26 national levels, and 3 international levels.

In addition to the achievements, MAN 2 Malang City also managed to enter the top 1,000 schools with the highest computer-based writing exam (UTBK) scores in Indonesia according to the LTMPT. The determination of the top 1,000 is carried out through measurements of schools/madrasas participating in the 2021 UTBK with a minimum number of 40 students. A total of 23,110 schools participated in the UTBK, and 4,432 schools met the criteria for determining the top 1,000, where MAN 2 Malang City was ranked 34th, a sharp increase from the previous year which was in the 61st position. Still according to the Top 1000 LTMPT, MAN 2 Malang City ranks 4th as the best madrasa after MAN Insan Cendekia Serpong, MAN Insan Cendekia Gorontalo, and MAN Insan Cendekia Pekalongan. This is following the graduates of MAN 2 Malang City in 2021 who are accepted at state universities reaching 85%, continuing abroad 1%, state Islamic universities 7%, private universities 6%, and tahfidz in Islamic boarding schools 1%.

Management of infrastructure facilities at MAN 2 Malang City is very supportive of the science coaching process. Currently, there is an integrated science Olympiad laboratory building which was built through State Sharia Securities (SBSN) 2020 funds. This building was built as a government award to MAN 2 Malang City for scientific achievements. The 1st floor is a living room, trophy display, physics laboratory, chemistry laboratory, and biology laboratory. The 2nd floor consists of the geography laboratory, the economics laboratory, the earth laboratory, and the KIR laboratory. The 3rd floor consists of a mathematics laboratory, an astronomy laboratory, and a computer laboratory. While the 4th floor is an auditorium.

4.2. Strengthening students' scientific literacy through scientific coaching programs

The science coaching at MAN 2 Malang City consists of recruitment, scientific guidance, selection of delegates, quarantine, to the implementation of competitions. Post-recruitment, Olympic class students will receive matriculation and ongoing science guidance. Science mentorship activities are carried out outside of teaching and learning activities which are attended by students of the Olympic class and the Olympic club, which are held twice a week. This activity was guided directly by science coaches from several leading state universities such as Universitas Gadjah Mada (UGM), Universitas Indonesia (UI), Universitas Airlangga, Institute Teknologi Sepuluh November (ITS), Universitas Negeri Malang, Universitas Brawijaya, and others.

The process of coaching science is carried out from semester one (class X) to class XII. In preparation for the competition, science coaching is applied to all interested students (usually students who are members of the olympic class and olympic club), whether it is done by teachers and coaches, alumni, and peers. During the coaching process, there are interactions and discussions between subject teachers and science coaches in the context of aligning and strengthening coaching materials. There are several models of scientific coaching, including strengthening school management [9], developing of science supervising teachers [15], and science club empowerment [10].

The science coaching model at MAN 2 Malang City includes four main aspects, namely strengthening school management aspects, strengthening student concepts and abilities, empowering olympic classes and olympic clubs and synergizing with other parties. First, strengthening school management aspects is carried out through the establishment of the olympic and research program and appointing competent teachers to sit as administrators. The olympiad and research program is strengthened by 32 science coaches, consisting of four coaches for the scientific article writing group, one coach for historical science, four coaches for mathematics, three coaches for physics, four coaches for biology, four coaches for chemistry, three coaches for economics, three coaches for geography, one coach for earth science, four coaches for astronomy, and one coach for computer.

In addition to the olympic and research program, strengthening the management aspect is also carried out by providing infrastructure including the integrated science laboratory building, the shared learning resource center (*Pusat Sumber Belajar Bersama*/PSBB), and Ma'had Al-Qalam. The laboratory building has functioned optimally for scientific development and has been equipped with supporting facilities such as computers, laboratories for biology, chemistry, astronomy, and earth science. Meanwhile, PSBB functioned as a quarantine place for students and instructors, and Ma'had Al-Qalam as a place for fostering Islamic values for MAN 2 Malang City students.

Second, strengthening students' scientific literacy through practice questions is carried out through matriculation activities and programmed guidance which are carried out classically and privately. Classical guidance is carried out during programmed science coaching for XI and XII grades outside the classroom. Meanwhile, private tutoring is carried out during quarantine, which is given by coaches to students who are selected as competition delegates. Concept reinforcement is given by teaching science material by the coach until students can absorb and understand the material. After that, the coach will provide practice questions that are solved independently by students, except for difficult questions that will be guided and discussed with the coach. Practice questions are carried out intensively and continuously accompanied by the coach. Even during the quarantine period, practice questions run all day and into the night. The questions given to students come from questions from previous competitions and questions from the internet that are relevant to the guidance material. For example, questions on astronomy are sourced from the international olympiad on astronomy and astrophysics (IOAA) website.

Strengthening students' scientific literacy is strongly supported by the existence of alumni of MAN 2 Malang City and the application of peer tutoring methods. The empowerment of alumni of MAN 2 Malang City in developing science has been going very well. This is evidenced by the enthusiasm of alumni who are currently pursuing undergraduate or postgraduate studies and have even graduated from state universities to provide scientific guidance to their underclassmen. In addition to involving alumni, science coaching also applies the principle of peer tutoring, where students who have high abilities can share and provide learning assistance to their friends.

Third, the empowerment of science clubs [10] has been carried out by MAN 2 Malang City through the recruitment of the olympic class and the olympic club. Students in these two groups routinely receive science coaching outside the classroom. Thus, the competition delegates do not only come from the Olympic class but there are opportunities for students who are in the olympic club to compete in science competitions. Strengthening scientific literacy through empowering the olympic class and the olympic club is very effective and proven to be able to improve the scientific literacy of the students of MAN 2 Malang City. This is evidenced by the many awards achieved by students, whether they are members of the olympic class or the olympic club.

Fourth, synergy with other work units or agencies. The success of the scientific development process cannot be separated from the synergy between MAN 2 Malang City with other work units or agencies. Synergy with the Ma'had Al-Qalam work unit is carried out in fostering Islamic values, such as congregational prayers, a night prayer that is offered to attain mental strength and peace (*tahajjud*), Monday-Thursday fasting, and other religious activities. Cooperation with other agencies, including the National Achievement Center (*Pusat Prestasi Nasional*/Puspresnas) in preparation for the 2020 international physics olympiad in Moscow. Meanwhile, cooperation with several state universities is carried out in preparation for the competition. State universities that have collaborated with MAN 2 Malang City include the Universitas Indonesia, Universitas Brawijaya, and Universitas Negeri Malang. In addition to the preparation for the competition, the cooperation of MAN 2 Malang City with universities is in the form of recommendations for science coaches and information on competition activities. In terms of recommendations, supervisors usually take advantage of the alumni network who are still studying bachelor's degree or master degree, and several lecturers who teach at state universities.

4.3. Determinants of the success of scientific coaching MAN 2 Malang City

The process of scientific coaching at MAN 2 Malang City is inseparable from the supporting factors so that it can produce a series of achievements in various competitions. Several identified factors have supported the success of science development at MAN 2 Malang City. First, students' interests and motivation affect student achievement. Many studies have proven that interest and motivation to learn have a positive influence on student achievement [30]. The interest and motivation of MAN 2 Malang City students in the process of scientific coaching are proven by the high desire of students to enter the olympic class even though they must go through a strict selection. This is shown by excerpts from interviews with prospective participants of the 2021 Provincial KSN, science coaches, and one of the administrators of the olympic and research program.

> "*I have joined the Olympic class from the beginning. When I was in junior high school, I participated in the English and Science Olympiads. When I was in junior high school, the coaching was still less than when I was in elementary school. In the end, I asked which schools in Malang had good coaching. Finally, my friends and teachers at elementary school recommended MAN 2 Malang City. Then I took part in the selection to enter the computer science Olympiad class.*" (R, interview, September 13, 2021).
> "*The enthusiasm of the students of MAN 2 Malang City in participating in the coaching is high compared to other schools, the students are much more enthusiastic here. I coach in several high schools, some are favorites, some are not. The ability of the students of MAN 2 Malang City is much better here because, from the beginning, students have been looking for good seeds. Students also have the spirit and motivation from the start*." (I, interview, September 13, 2021).

Second, the support of adequate facilities and infrastructure greatly contributes to the success of science development at MAN 2 Malang City. This is in line with several research results which found that infrastructure support affects student achievement and learning outcomes [30], [31]. MAN 2 Malang City provides excellent facilities in the process of fostering science with the construction of the integrated science olympiad laboratory building complete with supporting equipment. In addition, the existence of the PSBB building and Ma'had Al-Qalam also contributes positively to the scientific coaching programs.

Third, the learning environment at MAN 2 Malang City is very supportive of the achievement of student achievement, which is confirmed by several research results that prove there is a positive influence of the learning environment on student achievement [30], [32], [33]. The existence of olympic classes and study clubs creates a dynamic learning environment for achievement in the field of science. This is indicated by the increasing number of graduates of MAN 2 Malang City who are accepted at state universities. The existence of the olympic class was recognized by the chairperson and one of the members of the olympic and research program who was able to create a good atmosphere for all students of MAN 2 Malang City to compete in goodness, as the following interview:

> "*Almost all students of MAN 2 Malang City are accepted at state universities. The point is that the Olympic class gives positive viruses. So, when we people want to ripen a mango, it can also be from a ripe mango which will transmit its ripeness to other mangoes. From there we can learn that positive viruses can be given to other students. The positive virus given by students who have achieved excellence finally creates a climate of fastabiqul khoirot. The atmosphere in MAN 2 Malang City has been formed. One of them is shown by the tendency of many students to continue to the Faculty of Medicine*." (W, interview, September 14, 2021).

Fourth, the support of the madrasa principal, committee, and parents. The support from the head of MAN 2 Malang City in the process of developing science is very good, starting from the beginning of the formation of the olympic class (in 2009) until now. The leadership of madrasa principals has been shown to have a positive influence on student achievement [34], [35]. One of the supports from the madrasa principal is the programmed scientific development activities in each preparation of the madrasa work plan and budget (RKAM) which has implications for the availability of a coaching budget sourced from the budget implementation list (DIPA). In addition, the madrasa principal's policy of giving rewards to outstanding students is a separate motivation for students to continue to achieve.

In addition to the support of the madrasa head, the success of the scientific coaching process at MAN 2 Malang City is also inseparable from the support provided by the committee. Operational needs in the coaching process, starting from the honorarium for the coaches, registration of competitions, coaching and quarantine activities, to the implementation of competitions are fully supported by the committee, by providing adequate budget allocations. This is known from the quote from the head of the Olympic and research program which stated:

> "*...the committee is very supportive of the science and research program, by providing the maximum allocation of funds for the cost of fostering science and research*...." (W, interview, September 14, 2021).

Another support was provided by the family who gave full support to the activities programmed by the madrasa, resulting in brilliant achievements. Several studies have proven that family support has a positive influence on student achievement [36], [37]. Parents also motivate their children in carrying out all series of activities during the coaching process. Even one of the parents of students who advanced to provincial KSN level in the field of Astronomy wanted their students only at school (not online) because at school they were also accustomed to praying *tahajjud*. In addition, parental support is also manifested in the form of financial assistance for competitions held outside the city, outside the province, and even abroad.

5. CONCLUSION

The strengthening of scientific literacy of madrasa students has been carried out well at State Madrasah Aliyah 2 Malang City. Science guidance given to students by coaches who are brought in from reputable state universities can strengthen students' literacy as evidenced by the many achievements in the field of science. The success of MAN 2 Malang City in strengthening scientific literacy through science development programs can be imitated by other madrasas.

Many factors support the success of science development at MAN 2 Malang City. Among them are the high interest and motivation in student learning, support for adequate infrastructure, and a conducive learning environment. In addition, the support of many parties contributed to the achievement of students in MAN 2 Malang City. Support from the head of the madrasa, committees, and parents went well, especially support in the form of financing science development activities.

This article has a novelty about strategies for increasing students' scientific literacy through science coaching. This strategy is considered successful in increasing students' scientific literacy, especially in MAN 2 Malang City. This success is evidenced by the many achievements in various science competitions. However, this article also has some limitations. This article is still limited to a description of strengthening scientific literacy in one madrasa so that there are still opportunities for further research with broad research objects, not only in madrasas but in high schools in general. In addition, studies on strengthening and developing scientific literacy models at the elementary and junior high school levels need to be carried out to create learning innovations that can increase PISA scores, both in aspects of reading literacy, mathematical literacy, and scientific literacy.

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