



Self-Health Literacy Among Students in Islamic School Science Education: A Comparative Analysis Across Gender, Grade Level, and School Context

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ABSTRACT

This study explores students' self-health literacy within Islamic school science education by examining differences across gender, grade level, and school context. Using a cross-sectional survey approach, data were collected from junior high school students through an instrument grounded in the health literacy framework, encompassing access, understanding, processing, and application of health information. Students generally demonstrate a positive level of self-health literacy, with stronger performance in applying health knowledge compared to evaluating information critically. Relationships among all dimensions were found to be interconnected, highlighting the integrative nature of health literacy development. No significant differences emerged across gender and school context, while variations in information access were observed across grade levels. The study underscores the importance of integrating digital literacy and value-based education in strengthening students' health literacy.

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1. INTRODUCTION

Adolescence is a critical developmental stage characterised by rapid physical, cognitive, emotional, and social changes [1-3]. During this period, individuals begin to develop specific competencies and personal skills that support their transition into productive adulthood and contribute to broader socio-economic development [4]. It is also a formative phase in which values, habits, and behaviours (including those related to health) are established and tend to persist into later life [5]. However, insufficient awareness of personal health during adolescence has been associated with serious long-term consequences.

A substantial number of adolescents experience preventable health problems, including physical and mental health disorders, unhealthy dietary patterns, and limited engagement in healthy lifestyles [6]. In Indonesia, national data similarly highlight concerns regarding adolescent health behaviours, including high prevalence of overweight conditions and inadequate consumption of fruits and vegetables. Limited awareness and attitudes toward health may contribute to long-term risks, underscoring the need to strengthen self-health literacy from an early age.

Self-health literacy refers to an individual's beliefs, perceptions, and behavioural tendencies in managing personal health independently, including hygiene practices, nutrition, physical activity, stress management, and willingness to engage in health monitoring [7, 8]. It represents not only an individual's readiness to maintain well-being but also a foundational element for developing sustainable healthy behaviours [9].

Individuals with higher self-health literacy are more likely to recognise health risks, make informed decisions, and regulate their behaviours effectively. Nevertheless, students' health literacy levels remain relatively low, particularly in accessing, understanding, evaluating, and applying health information [10]. Such limitations may hinder the development of positive health attitudes and ultimately affect the quality of human resources.

Science education plays a central role in addressing this issue by providing essential knowledge and fostering critical thinking related to health [11]. From one perspective, science education serves as a foundation for understanding biomedical concepts, enabling students to interpret and evaluate health-related information critically [12, 13]. From another perspective, health issues can function as meaningful and relevant contexts for science learning, allowing students to connect scientific knowledge with real-life situations. These complementary perspectives highlight the importance of integrating health topics within science education to enhance both scientific and health literacy.

In Islamic schools, science education is uniquely positioned to integrate scientific knowledge with religious values that emphasise cleanliness, well-being, and personal responsibility as part of spiritual practice [14, 15].

This integration has the potential to shape students' attitudes toward health in distinctive ways compared to secular educational settings [16]. Science learning that incorporates both scientific reasoning and Islamic values provides a strategic opportunity to foster holistic awareness of health, encompassing physical, mental, and spiritual dimensions.

Demographic factors such as gender, grade level, and school location have been widely recognised as influential in shaping adolescents' health behaviours and attitudes. Gender differences, for instance, have often been associated with variations in health awareness and practices, with female students generally demonstrating greater concern for personal health

[17-19]. Grade level is also considered an important factor, as older students tend to possess more advanced cognitive abilities and greater exposure to scientific knowledge, which may influence their understanding and attitudes toward health issues [20]. Furthermore, school location may affect access to health information and services, with students in urban areas typically having more opportunities compared to those in rural settings [21].

Despite the growing body of research on health literacy, studies focusing on the integration of science education and religious values, particularly in Islamic school contexts, remain limited. Most existing research has been conducted in secular or Western educational settings, often overlooking the role of cultural and spiritual dimensions in shaping health-related attitudes. Additionally, previous studies have typically examined demographic factors in isolation, rather than analysing their combined influence on self-health literacy.

Therefore, this study aims to address these gaps by examining self-health literacy among junior high school students in Islamic schools through a multidimensional perspective. Specifically, it investigates four key dimensions (access, understanding, processing, and application of health information) while simultaneously analysing differences based on gender, grade level, and school context. By integrating scientific and value-based perspectives, this study contributes to the development of more contextualised and holistic approaches to health education within Islamic school settings.

This study offers several key contributions to the literature on adolescent health literacy.

- (i) This study situates self-health literacy within the context of Islamic school science education, an area that remains underexplored in existing research, which has predominantly focused on secular and Western educational settings. By integrating scientific learning with Islamic values, this study provides a more holistic perspective on how health literacy is shaped through both cognitive and spiritual dimensions.
- (ii) This research adopts a multidimensional framework of health literacy, examining not only access and understanding but also the processing and application of health information. This comprehensive approach enables a deeper analysis of how different competencies interact in shaping students' health-related attitudes and behaviours.
- (iii) The study simultaneously analyses multiple demographic factors (gender, grade level, and school context), within a single model. Unlike previous studies that often examine these variables separately, this integrative approach allows for a more nuanced understanding of their combined influence on self-health literacy.
- (iv) The findings contribute to the development of value-based health education by demonstrating the role of integrated science and religious learning in fostering equitable health literacy outcomes across diverse student groups. This provides empirical support for designing more contextualised and inclusive health education interventions in Islamic school settings.

2. METHODS

This study employed a cross-sectional survey design to examine and compare students' self-health literacy in the context of Islamic school science education. A cross-sectional approach is appropriate for identifying relationships among variables without experimental manipulation and for comparing multiple demographic groups simultaneously.

2.1. Participants

Participants were selected from three junior high school settings in Central Java, Indonesia, representing different educational and geographical contexts: a public Islamic junior high school, a private Islamic boarding school, and a public junior high school. The selection of these sites was based on geographical stratification and accessibility considerations, following previous regional classification approaches [22].

A proportional stratified random sampling technique was used to ensure representation across grade levels and school locations. A total of 279 students participated in this study, consisting of both male and female students from different grade levels. The distribution of participants across demographic characteristics, including gender, grade level, school type, and school location, is presented in **Table 1**.

Table 1. Study sample characteristics.

CHARACTERISTIC	N	PERCENTAGE (%)
Gender		
Male	129	46.2%
Female	150	53.8%
Grade Level		
7 th grade	158	53%
8 th grade	131	47%
School Type		
Boarding	71	25.4%
Regural	208	74.6%
School location		
Suburban area	100	35.8%
Urban area	179	64.2%

2.2. Instrumentation

Self-health literacy was measured using a questionnaire adapted from Sørensen's health literacy framework [23]. The instrument encompasses four key dimensions: access to health information, understanding of health information, processing or evaluation of health information, and application of health information. The instrument was developed based on predefined indicators related to health care, disease prevention, and health promotion. The detailed structure of the instrument, including dimensions, aspects, sub-aspects, and indicators, is presented in **Table 2**.

Responses were collected using a four-point Likert scale ranging from strongly disagree to strongly agree. Content validity was established through expert judgment involving subject matter experts and educational practitioners to ensure the relevance, clarity, and appropriateness of the items. Following the validation process, the instrument was tested for reliability, resulting in a high Cronbach's alpha coefficient, indicating strong internal consistency.

2.3. Data Collection Procedure

Data were collected by administering the questionnaire directly to students in their respective schools. Before data collection, participants were informed about the purpose of the study, and their participation was voluntary. Responses were collected anonymously to ensure confidentiality and minimise potential response bias.

Table 2. Self-health literacy instrument. Data was adopted from reference [23].

DIMENTION	ASPECT	SUB ASPECT	INDICATOR	N
Dimension 1	Access/obtain information relevant to health	Health Care	Ability to access information on medical and clinical issues	2
		Disease prevention	Ability to access information on risk factors for health	3
		Health Promotion	Ability to self-renew on determinants of health in the social and physical environment	2
Dimension 2	Understand information relevant to health	Health Care	Ability to understand medical information and derive meaning	2
		Disease prevention	Ability to understand information about risk factors and derive meaning	2
		Health Promotion	Ability to understand information about the determinants of health in the social and physical environment and derive its meaning	2
Dimension 3	Process/ appraise information relevant to health	Health Care	Ability to interpret and evaluate medical information	2
		Disease prevention	Ability to interpret and evaluate health risk factors	2
		Health Promotion	Ability to interpret and evaluate information about determinants of health in the social and physical environment	2
Dimension 4	Apply/use information relevant to health	Health Care	Ability to make informed decisions about medical issues	2
		Disease prevention	Ability to make informed decisions about health risk factors	2
		Health Promotion	Ability to make informed decisions about determinants of health in the social and physical environment	2
TOTAL				25

2.4. Data Analysis

Data were analysed using descriptive and inferential statistical techniques. Descriptive statistics were used to summarise students' self-health literacy across the measured dimensions. Pearson correlation analysis was conducted to examine relationships among the dimensions of self-health literacy. Furthermore, Multivariate Analysis of Variance (MANOVA) was employed to analyse differences based on gender, grade level, and school location.

3. RESULTS AND DISCUSSION

This section presents the main findings regarding students' self-health literacy, which is analysed through four primary indicators: access or acquisition of health information, understanding of health information, processing or assessment of health information, and application or use of health information. Each indicator was analysed descriptively using the mean, standard deviation (SD), skewness, and kurtosis to provide an overview of data

distribution as well as the tendency of students' attitudes in these aspects. The results are presented in **Table 3**. Based on the results of the descriptive analysis displayed in **Table 3**, students' literacy towards self-health is generally in the good enough category, as reflected in the overall mean value of 2.7342 with a standard deviation of 0.31780, skewness -0.726, and kurtosis 2.735, which shows that data distribution tends to cluster at high scores. In the access or acquisition of health information indicator, the mean value was recorded at 2.6861 with a standard deviation of 0.39767, skewness of -0.191, and kurtosis of 0.992, indicating that the majority of students were able to access health information. However, there were still variations in their responses.

The indicator of understanding health information has a mean value of 2.6740, a standard deviation of 0.41175, a skewness of -0.326, and a kurtosis of 0.976, which indicates a relatively good level of understanding; however, there is still diversity in the level of understanding among respondents.

In the health information processing or assessment indicator, the mean value was 2.6541, the standard deviation was 0.38758, the skewness was -0.377, and the kurtosis was 1.053, indicating that students were relatively lower in critically assessing information compared to other aspects. Meanwhile, the indicator of application or use of health information obtained the highest mean value of 2.9308 with a standard deviation of 0.45593, skewness -0.442, and kurtosis 1.173, reflecting students' better ability to apply health information in daily life.

Table 3. Descriptive statistics of self-health literacy.

VARIABLES	MEAN	SD	SKEWNESS	KURTOSIS
Self-health literacy	2.7342	0.31780	-0.726	2.735
Access/obtain information relevant to health	2.6861	0.39767	-0.191	0.992
Understand information relevant to health	2.6740	0.41175	-0.326	0.976
Process/ appraise information relevant to health	2.6541	0.38758	-0.377	1.053
Apply/use information relevant to health	2.9308	0.45593	-0.442	1.173

The negative skewness pattern in all indicators suggests that the distribution of data tends to lean towards a positive attitude. The positive kurtosis value in each indicator indicates data that is more conical around the average, indicating that most respondents fall into the category of good attitudes towards self-health literacy. Correlations between indicators of self-health literacy are presented in **Table 4**. Pearson correlation analysis showed that all indicators were significantly related to each other, with the highest relationship occurring between the ability to process and apply health information ($r = 0.438$; $p < 0.01$), confirming that the critical ability to assess information sources directly affects students' ability to apply this knowledge in real life. This positive relationship supports the theory, which posits that critical health literacy is a crucial factor in informed decision-making and effective preventive behaviour. In addition, these results confirm that improving one aspect of health literacy has a positive impact on other aspects, indicating that a holistic and integrative educational approach is necessary to enhance students' overall health attitudes [24].

The interpretation of the results from Pearson correlation analysis on data with a total number of respondents (N) of 279 students revealed a statistically significant relationship between the four indicators of self-health literacy: access, understanding, processing, and application. The correlation between access and understanding, $r = 0.468$ ($p < 0.01$), shows a moderate positive relationship, indicating that the better students' access to health

information, the higher their understanding of the information. The correlations between access and process ($r = 0.382$, $p < 0.01$) and access and application ($r = 0.284$, $p < 0.01$) were also significant. However, in the weak to moderate category, it is reflected that access to information contributes to students' ability to assess and apply health information, but not as strongly as the relationship with understanding.

Table 4. Correlations between the indicator and self-health literacy.

	ACCESS	UNDERSTAND	PROCESS	APPLY
Access	1.000			
Understand	0.468**	1.000		
Process	0.382**	0.415**	1.000	
Apply	0.284**	0.406**	0.438**	1.000

Note: * $p < 0.01$

The relationships between understand and process ($r = 0.415$, $p < 0.01$) and understand and apply ($r = 0.406$, $p < 0.01$) were also significant and in the moderate category, indicating that understanding health information is positively correlated with the ability to assess and apply the information. The highest correlation other than access-understand was between process and apply ($r = 0.438$, $p < 0.01$), indicating that students' ability to assess health information is strongly related to their ability to apply the information in their daily lives.

All significant relationships at the $p < 0.01$ level indicate a close and mutually supportive relationship between aspects of students' self-health, such that strengthening one aspect has the potential to positively impact other aspects in the context of students in Islamic schools. Differences in students' self-health literacy based on gender are presented in **Table 5**. In terms of more in-depth statistical analysis, the MANOVA results showed that there were no significant differences in self-health literacy between male and female students in Islamic schools, either overall or on specific indicators such as access, comprehension, processing, and application of information. This finding is consistent with several studies that confirm that, in the context of value-based education and spirituality, gender factors have no significant effect on adolescents' health attitudes and behaviours [18].

Curriculum and learning approaches in Islamic schools that instil the principles of equality and collective responsibility in maintaining health, as well as instil universal spiritual values, can minimise these gender disparities. Therefore, intervention programs designed to improve health literacy in Islamic schools should be universal and not differentiated by gender; instead, they should focus on strengthening the critical thinking capacity of all students through participatory methods, value-based discussions, and enhancing digital literacy competencies. A set of values in value-based education and bioethics must be included in the current curriculum to produce good and inclusive education [25].

Based on the results of the MANOVA presented in the table, there is no statistically significant difference between male and female students in Islamic schools on all aspects of self-health literacy tested. Specifically, on the overall self-health literacy variable, the F value of 0.326 with a significance of $p = 0.569$ ($p > 0.05$) indicates that there is no significant difference between genders, with very minimal variance contribution ($R^2 = 0.001$ or 0.1%). Similarly, in the health information access indicator, the value of $F = 0.342$ with $p = 0.559$ indicates that there is no significant gender disparity, with the variance explained by gender accounting for only 0.1%.

Table 5. Differences in literacy toward self-health according to gender.

VARIABLES	TYPE III SUM OF SQUARES	DF	MEAN SQUARE	F	SIG.	R ²
Self-health	0.033	1	0.033	0.326	0.569	0.001
Acces	0.054	1	0.054	0.342	0.559	0.001
Understand	0.008	1	0.008	0.046	0.830	0.000
Process	0.149	1	0.149	0.992	0.320	0.004
Apply	0.00008404	1	0.00008404	0.000	0.984	0.001

The indicator of understanding health information (understand) yielded consistent results, with a value of $F = 0.046$ and $p = 0.830$, indicating that gender had no significant effect on students' understanding ability ($R^2 = 0.000$). In the aspect of processing health information (process), although it showed a relatively higher F value ($F = 0.992$), it was still not statistically significant ($p = 0.320$) with a variance contribution of 0.4%. Finally, the indicator of applying health information (apply) showed a very low F value ($F = 0.000$) with a significance of $p = 0.984$, which confirmed the absence of gender differences in the ability to apply health information.

These findings suggest that gender is not a significant determinant in differentiating students' self-health literacy in Islamic schools; therefore, interventions or programs to improve health literacy can be designed without considering gender differences as a primary factor. Differences in students' self-health literacy by grade level are presented in **Table 6**. In terms of grade level, the analysis revealed a significant difference only in the health information access indicator between grade 7 and 8 students ($F = 6.107$; $p = 0.014$), with grade 8 students demonstrating better access skills.

This finding aligns with the theory of cognitive development and digital literacy, which posits that with age and learning experience, students become increasingly adept at accessing and navigating digital information sources effectively [20]. Every individual needs to have skills that allow them to access and select trusted sources of information [26]. However, the aspects of understanding, processing, and applying information did not show significant differences between classes, indicating that increased access to information has not automatically improved students' analytical and critical capacity in assessing and applying the information. This phenomenon emphasises the need to develop educational interventions that not only focus on increasing access but also on strengthening critical and reflective thinking skills through media literacy training and Islamic values-based discussions relevant to the local context. This approach is expected to transform access to information into practical and sustainable health actions [27].

Based on the results of the MANOVA analysis, the interpretation of the differences in self-health literacy between Grade 7 and Grade 8 students in Islamic schools showed varied findings across the indicators tested. Overall, there was no statistically significant difference in the self-health literacy variable between the two grades ($F = 0.287$, $p = 0.593 > 0.05$), with minimal variance contribution ($R^2 = 0.001$ or 0.1%).

However, analysis at the indicator level shows disparities that are interesting to study in more depth. In the access to health information indicator, there was a statistically significant difference between Grade 7 and Grade 8 students ($F = 6.107$, $p = 0.014 < 0.05$), with grade level explaining 2.2% of the variance ($R^2 = 0.022$).

Table 6. Differences in literacy toward self-health according to grade level.

VARIABLES	TYPE III SUM OF SQUARES	DF	MEAN SQUARE	F	SIG.	R ²
Self-health	0.029	1	0.029	0.287	0.593	0.001
Acces	0.948	1	0.948	6.107	0.014*	0.022
Understand	0.042	1	0.042	0.248	0.619	0.001
Process	0.069	1	0.069	0.459	0.499	0.002
Apply	0.139	1	0.139	0.666	0.415	0.002

*Note: $p > 0.05$

This finding indicates that there is a difference in the ability to access health information between the two grade levels, which may be related to the development of students' cognitive and digital literacy skills as they progress through the education levels. Grade 8 has received material related to the digestive system and nutrition, whereas Grade 7 still received general material and knowledge from elementary school. Meanwhile, in the indicator of understanding health information (understand), no significant difference was found ($F = 0.248$, $p = 0.619$), as well as in the aspect of processing health information (process) with $F = 0.459$ and $p = 0.499$, and the application of health information (apply) with $F = 0.666$ and $p = 0.4151$.

These results suggest that although grade level affects the ability to access health information, it does not have significant implications for the comprehension, processing, and application aspects of health information. Therefore, health literacy intervention programs should consider strengthening access to information for lower-grade students. Differences in students' self-health literacy based on school location are presented in **Table 7**.

In terms of geographical factors, **Table 7**, the analysis revealed that neither urban nor suburban school location had a significant influence on students' self-health literacy ($F = 1.228$; $p = 0.269$). This finding confirms that geographical context is not a significant factor in shaping health attitudes and behaviours, in contrast to previous studies that have shown disparities in access to health services and information by region [21].

This phenomenon can be explained through a value-based education approach and curriculum integration that instils holistic and spiritual health principles, which can neutralise the impact of infrastructure and access inequalities in different regions [28]. This approach asserts that internal factors, such as curriculum, teaching quality, and individual student characteristics, are more influential in shaping positive attitudes towards health than external geographical factors. Thus, strengthening value-based education and student character development are the main strategies in improving self-health literacy, without relying on physical environmental factors.

Table 7. Differences in literacy toward self-health according to school location.

VARIABLES	TYPE III SUM OF SQUARES	DF	MEAN SQUARE	F	SIG.	R ²
Self-health	0.124	1	0.124	1.228	0.269	0.001
Acces	0.044	1	0.044	0.275	0.600	0.011
Understand	0.512	1	0.512	3.039	0.082	0.004
Process	0.148	1	0.148	0.983	0.322	0.007
Apply	0.377	1	0.377	1.817	0.179	0.004

Based on the results of the MANOVA analysis, the interpretation of the differences in self-health literacy between students in Islamic schools located in suburban areas and urban areas yielded consistent findings across the measured aspects. The aggregate self-health variable showed no statistically significant difference between the two school location groups ($F = 1.228$, $p = 0.269 > 0.05$), with a minimal variance contribution of only 0.1% ($R^2 = 0.001$). This finding suggests that school geographical location is not a significant determinant in differentiating students' overall literacy regarding self-health. At the specific indicator level, a similar pattern was consistent across the aspects tested. The access to health information indicator showed no significant difference between students in the two locations ($F = 0.275$, $p = 0.600$), with a variance explained of 1.1% ($R^2 = 0.011$).

The aspect of understanding health information (understand) showed a relatively higher F value ($F = 3.039$). Still, it did not reach the level of statistical significance ($p = 0.082 > 0.05$), although it showed a trend towards a marginal difference with a variance contribution of 0.4% ($R^2 = 0.004$). Meanwhile, the indicators of processing health information (process) and applying health information (apply) also did not show significant differences with F values of 0.983 ($p = 0.322$) and 1.817 ($p = 0.179$), respectively, and very low variance contributions of 0.7% and 0.4%.

The location of Islamic schools, whether in suburban or urban areas, does not have a significant influence on the formation of students' self-health literacy, so other factors, such as curriculum, teaching quality, or individual student characteristics, may play a greater role in determining self-health literacy than the geographical context of the school.

The self-health literacy of students in Islamic schools is generally in the satisfactory category, with an average score indicating a positive trend towards aspects of access, understanding, processing, and applying health information. This finding aligns with the theoretical framework of health literacy [23], which emphasises that simultaneous mastery of these aspects is the primary foundation for building sustainable health behaviours, as shown more clearly in **Figure 1**.

Finally, based on the results of this study, it is implied that the development of intervention programs should be multidimensional and value-based, with an emphasis on strengthening critical and digital literacy, as well as integrating spiritual and social values into the curriculum. This approach will not only enhance cognitive and behavioural aspects but also strengthen students' psychological and spiritual resilience in facing the challenges of the digital era and globalisation. Community-based health education programs have proven the effectiveness of participatory and collaborative approaches in improving healthy living behaviours. In addition, strengthening aspects of mental health based on Islamic psychology and developing students' moral character are integral parts of this strategy.

Islamic principles emphasize cleanliness, well-being (physical and mental), constant prayer, and personal accountability. These principles emphasize that having enough self-health literacy is not only a helpful personal skill, but also a religious requirement for Muslims to fulfill their spiritual and societal responsibilities. Religious faith and religious spiritual practices are important for students to enhance their learning experience [29]. Thus, the success of improving self-health literacy in Islamic schools depends on the synergy between a value-based curriculum, digital literacy training, and cross-sector collaboration that supports the formation of young people who are physically, mentally, and spiritually healthy and able to become agents of change in society. This research is supported by some papers [30].

Stakeholders must focus further on increasing students' Health literacy to improve knowledge, attitudes, and practices. This study adds new information regarding health education, as reported elsewhere [31-37].

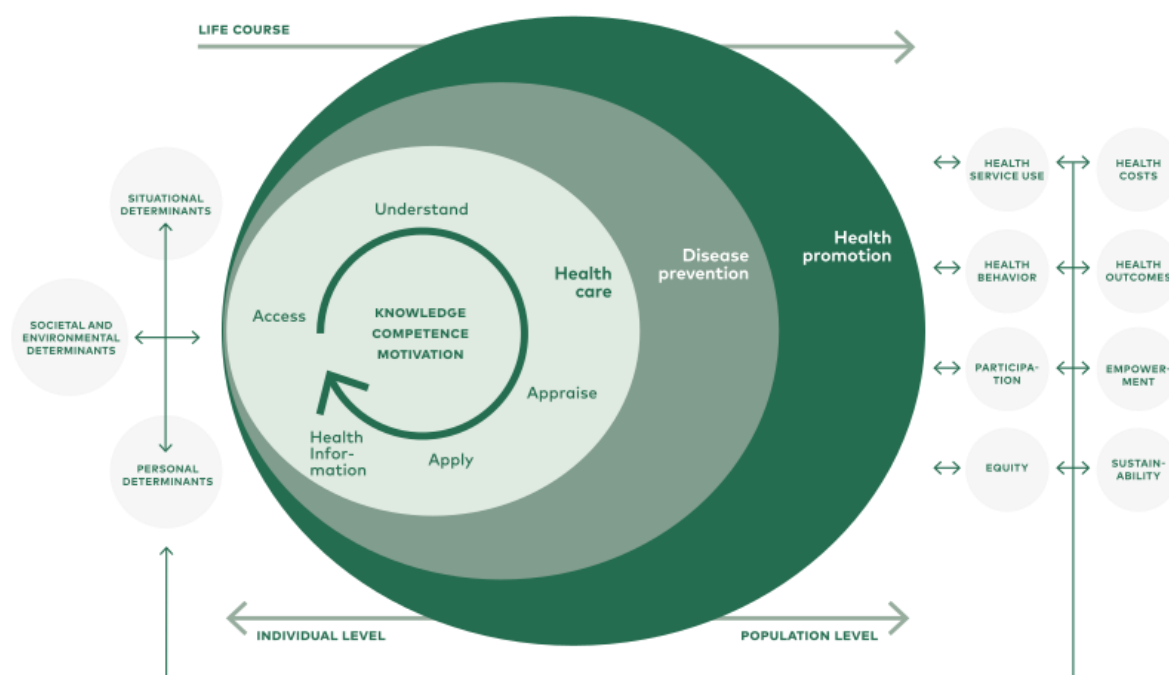


Figure 1. Self-health literacy indicator [23].

4. CONCLUSION

This study demonstrates that students in Islamic school science education generally exhibit a positive level of self-health literacy across the dimensions of accessing, understanding, processing, and applying health information. The strongest tendency is observed in the application dimension, while critical evaluation skills remain relatively less developed. The findings also indicate that gender and school location do not significantly influence students' self-health literacy, whereas differences in grade level are evident in information access. These results highlight the importance of strengthening critical and digital literacy through integrated science and value-based education to support more comprehensive health literacy development.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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