

Numeracy and Growth Mindset Profiles as a Basis for Differentiated Guidance Service in Islamic Schools

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Article Information:

Received 2025-07-03

Revised 2025-09-21

Accepted 2025-11-03

Keywords:

Differentiated Guidance Service, Growth Mindset, Islamic School, K-Means Analysis, Numeracy

Abstract

Up to present, guidance and counseling (GC) services in Islamic schools tend to be homogeneous, often overlooking the diversity of students' characteristics. This practice overlooks the effectiveness of differentiated guidance. Key factors worth considering for differentiating guidance services are numeracy skills and growth mindset (GM). In this regard, this study aims to: (1) cluster students based on their numeracy skills and GM with K-means techniques; (2) interpret the clusters' characteristics; and (3) recommend data-driven GC service strategies. Quantitative method K-means clustering was applied to 321 grade VIII students from Islamic junior secondary schools in two provinces in Indonesia. Data from numeracy test and GM questionnaire were analyzed using the Elbow, Silhouette, Kruskal-Wallis, and Dunn post-hoc methods. The result of the study revealed three student clusters: (1) low numeracy and low GM (Double Susceptible); (2) high numeracy and moderate-to-high GM (Empowered); and (3) low numeracy but high GM (Affective Potential). Findings confirm that numeracy skills and GM do not always align, underscoring the need for integrated cognitive and affective interventions. Significant differences in numeracy skills and GM distribution were found between clusters. The different characteristics between clusters lead to diverse service strategies offered for each cluster. These strategies include a cognitive distortion journaling and belief disputes for double susceptible students; career visualization and leadership simulation for empowered students; and mathematical mindfulness and emotion regulation for affective potential students. Data-driven GC services are crucial in supporting students' academic and psychological development.

INTRODUCTION

Mathematics achievement is still a crucial problem in Islamic education across countries (Aba et al., 2022; Al-Mutawa et al., 2021; Kariadinata et al., 2019; Kusaeri et al., 2018, 2022; Kusumawati et al., 2023; Syaifuddin, 2022; Waswa et al., 2025). One of the reasons is the extensive religious curriculum load for religious lessons, such as *tafsir*, *fiqh*, *hadith*, and Arabic. In many cases, the curriculum places more emphasis on religious education, which results in reduced attention to mathematics (Imam et al., 2025; Moslimany et al., 2024). Such practice could hinder the development of basic mathematical competencies and contribute to students' low numeracy skills. This situation can be seen from the results of PISA (Programme for International Student Assessment) 2022, in which Indonesian students' average mathematical literacy or numeracy score was only reached, far below the OECD (Organization for Economic Cooperation and Development) average. Furthermore, around 82% of students did not reach

How to cite:

Setyaningrum, W., Nugroho, H., Sofiatun, I., & Wijaya, A. (2026). Numeracy and Growth Mindset Profiles as a Basis for Differentiated Guidance Service in Islamic Schools. *Islamic Guidance and Counseling Journal*, 9(1). <https://doi.org/10.25217/0020269700400>

E-ISSN:

2614-1566

Published by:

Institut Agama Islam Ma'arif NU (IAIMNU) Metro Lampung

the minimum competency level, i.e., Level 2, which indicates difficulties in understanding and applying basic mathematical concepts in the context of daily life (Kusaeri et al., 2022; OECD, 2023; Syaifuddin, 2022).

Low numeracy skills are not only influenced by the limited learning environment, but also by students' psychological factors, such as growth mindset (GM; Wijaya et al., 2023). GM is the belief that intellectual abilities and talents can develop through effort and perseverance (Dweck et al., 2014; Yeager & Dweck, 2012). Several studies show that GM is significantly related to students' mathematics learning outcomes and numeracy abilities (Dong et al., 2023; Huang et al., 2019; Kismiantini et al., 2021). Students with GM tend to be more persistent, able to face challenges, and achieve better academic success (Limeri et al., 2020; Polirstok, 2017). However, there are findings of students with high numeracy but have Fixed Mindset (FM), and students with high GM yet low numeracy skills. This shows that the relationship between GM and numeracy is not always linear but is influenced by contextual and individual factors (Wijaya et al., 2023).

In this context, guidance and counseling (GC) services play a strategic role in supporting students' academic and psychological development (Dahir, 2004). With this respect, the Differentiated Guidance Service (DGS), which was developed by Humphrey (1962) becomes relevant because it emphasizes the importance of guidance services tailored to the needs and characteristics of students, both in general groups and as individuals. This approach is in line with the comprehensive guidance and counseling program (Gysbers & Henderson, 2012), which is based on data and student needs. Studies have shown that GC services that are aligned to students' academic and psychological profiles can improve academic performance, self-resilience, and overall well-being (Galassi, & Akos, 2007; Sink, & Stroh, 2003).

Various studies have examined students' characteristics, including cognitive aspects, such as numeracy skills (Bonifacci et al., 2016; Dierendonck et al., 2021; Hidayah et al., 2025; Wahyudi, 2024), and psychological aspects, including GM (Djatmika et al., 2022; Lou et al., 2022; Saefudin et al., 2023). Investigating these aspects separately has provided valuable insights into how each domain contributes to students' development. However, examining them in isolation may overlook the interplay between cognitive and psychological factors. In fact, a holistic understanding of the relationship between cognitive and psychological aspects is crucial for students' self-development (Kibtiyah & Suud, 2024; Molnár & Csapó, 2019; Ningsih et al., 2023). Such an integrated perspective helps educators understand how cognitive and psychological factors influence motivation, confidence, and learning outcomes, ensuring more effective interventions for students' overall growth (Ningsih et al., 2023). Only one study has attempted to map student profiles based on a combination of numeracy and GM in general-based schools (Wijaya et al., 2023). However, the study was limited in both sample size and location contexts, which restricts the generalizability of its findings. More importantly, it did not extend the mapping results to the design of GC services, leaving a crucial gap in translating student profiles into systematic interventions. Therefore, this study aims to classify students based on numeracy and GM, interpret the characteristics of each cluster, and recommend relevant GC strategies. Furthermore, these findings provide a foundation for developing innovative learning media to support students' academic and GM.

Literature Review

Numeracy Skills

Organization for Economic Co-operation and Development (OECD, 2017) defines numeracy as a fundamental skill that enables students to interpret, use, and communicate mathematical information effectively in various everyday contexts. Meanwhile, Cockcroft (1982) describes numeracy as the ability to calculate, encompassing the use of numbers and mathematical skills to effectively and confidently meet the practical demands of daily life.

Based on these two definitions, it can be concluded that numeracy is a foundational skill that involves understanding mathematical concepts and applying them contextually in real-life situations, aiming to solve problems, make appropriate decisions, and communicate mathematical information effectively and confidently.

Growth Mindset

The concept of GM, first introduced by Dweck (2006), refers to the belief that individuals' fundamental abilities, including intelligence and academic skills, can be developed through effort, appropriate strategies, and environmental support. According to Dweck (2006), GM encompasses three core characteristics: intelligence plasticity, resilience and perseverance, and a positive attitude toward learning. Intelligence plasticity reflects the belief that intellectual capacity can be improved through dedication and hard work (Dweck, 2006). Meanwhile, resilience and perseverance are manifested in individuals' persistence when facing challenges and their tendency to view failure as an opportunity for growth (Dweck & Yeager, 2019; Jia et al., 2023). The third characteristic, a positive attitude toward learning, is demonstrated through enthusiasm for learning and readiness to embrace new challenges (Hecht et al., 2021; Yeager & Dweck, 2020).

Counseling Theories and Differentiated Guidance Service

Guidance and counseling (GC) services play a pivotal role in supporting students' academic and psychological development (Samudra & Wangid, 2024). Within this domain, the Differentiated Guidance Service (DGS) proposed by (Humphrey, 1962) emphasizes the importance of tailoring interventions to students' diverse needs and characteristics. This approach aligns with the comprehensive guidance and counseling program framework (Gysbers & Henderson, 2012), which advocates data-driven practices responsive to student profiles. In this study, the DGS framework is theoretically informed by Cognitive Behavioral Therapy (CBT) and its related approaches, including Cognitive Therapy (CT; Beck, 1976), Rational Emotive Behavior Therapy (REBT; Ellis, 2013), Multimodal Therapy (MMT) (Lazarus, 2005), and Dialectical Behavior Therapy (DBT; Linehan et al., 2002). These theoretical perspectives provide the conceptual foundation for designing differentiated interventions that address student development's cognitive and affective dimensions. A more detailed account of how these counseling theories inform the cluster-specific strategies is provided in the appendix section.

Purpose of The Study

Grounded in the rationale that both numeracy and GM represent key cognitive and psychological factors in student development, this study pursues three objectives: (1) to group students based on their numeracy and GM scores using clustering techniques; (2) to interpret the characteristics of each cluster within the context of GC services; and (3) to provide data-driven recommendations for differentiated GC strategies to support students' academic and psychological growth in faith-based schools. Based on the study's objectives, the findings provide a foundation for developing innovative learning media to support students' academic and GM.

METHODS

Research Design

This study used a quantitative method with a Clustering Analysis (CA) approach to group students into sub-groups based on their answer characteristics (numeracy test and GM questionnaire) (can be seen in Figure 1). According to Everitt et al. (2011), CA aims to classify subjects with similar characteristics. This technique allows the identification of each cluster's

characteristics and the analysis of similarities and differences between groups. Broadly, clustering methods are divided into two types: hierarchical clustering, which builds a tree-like structure to show nested groupings of data, and non-hierarchical clustering, which partitions data directly into a predetermined number of clusters (Everitt et al., 2011). This study employed the non-hierarchical k-means method because it is more efficient for grouping based on the predetermined number of clusters. Based on this technique, students were grouped into three clusters according to their numeracy and GM scores.

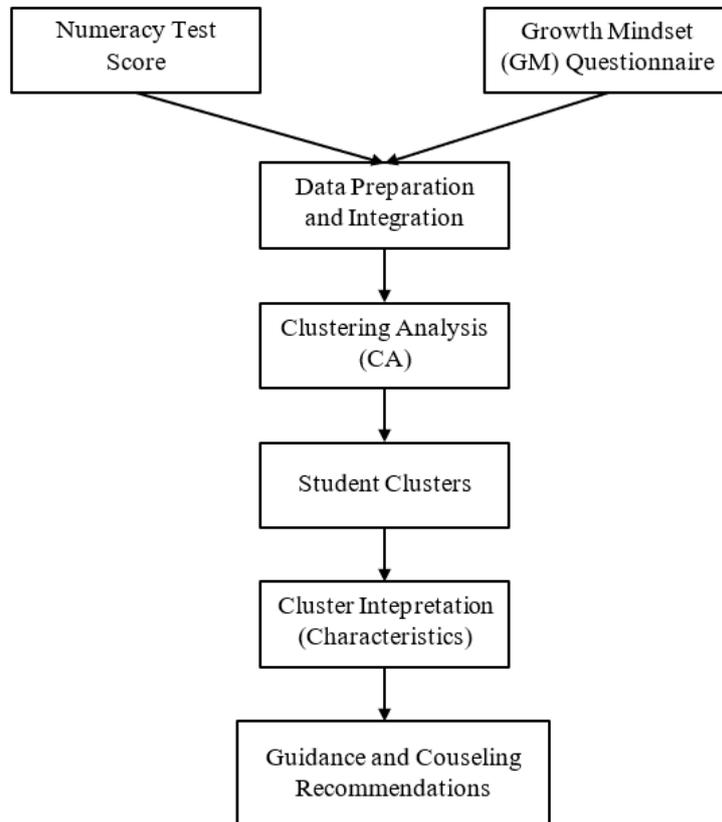


Figure 1. Research Design

Participants

The population in this study was all Islamic Junior High School students from two provinces in Indonesia, namely the Special Region of Yogyakarta and Central Java, during the 2023/2024 school year. From this population, 321 eighth graders were selected as a sample using purposive sampling techniques. This sample comprised 114 male students (35.51%) and 207 female students (64.49%). The selection of samples considered specific factors relevant to the research objectives. First, schools were stratified based on their 2022/2023 mathematics test scores to ensure diversity in academic achievement, categorized as high ($X \geq 48$), medium ($33 \leq X < 48$), and low ($X < 33$), where X represents the school's average mathematics score. Second, students were selected to represent a range of socioeconomic backgrounds (urban and rural) based on their availability and willingness to participate.

Data Collection

Data were collected through two techniques: test and non-test. The test technique was a numeracy test that measured students' numeracy abilities. The non-test technique involved distributing questionnaires to collect data on students' GM level. The tests and questionnaires were given to pre-determined students as research samples.

Data Collection Instruments

The numeracy test in this study was prepared based on the AKM (*Asesmen Kompetensi Minimum* or Minimum Competence Assessment) Framework 2021 (Pusmendik, 2022). The test included four content domains (numbers, geometry and measurement, algebra, and data and uncertainty), three contexts (personal, socio-cultural, and scientific), and three cognitive levels (knowing, applying, and reasoning). It originally consisted of 20 questions in various forms (multiple-choice, matching, short answer, and essay) but was reduced to nine questions due to time constraints. The instrument was developed through grid preparation, validation, trial, and reliability analysis stages, with an assessment score ranging from 0 to 100. The blueprint of numeracy skills is presented in Appendix 1.

The GM questionnaire consisted of 12 items that measured four main aspects: belief in ability development (A1), positive outlook on challenges (A2), confidence in effort (A3), and acceptance of criticism (A4; Wijaya et al., 2023). The rating scale used is 1 to 4. The blueprint of the GM questionnaire is presented in Appendix 2.

Validity and Reliability of Data Instruments

The instruments were validated – both content validity and construct validity – by experts in the field of mathematics education. The result of the Gregory index (Gregory, 2000) of 1 for both instruments (numeracy test and GM questionnaire) showed a very high content validity. The construct validity of the instruments was performed by Confirmatory Factor Analysis (CFA), yielding a model fit index value of 0.033, indicating the model's conformity to the data. Lastly, the reliability of the instruments was calculated using Cronbach's Alpha formula (Cronbach, 1951), with a result of 0.836 for the numeracy test and 0.607 for the GM questionnaire. These values show that both instruments have adequate reliability (Arikunto, 2010).

Data Analysis Techniques

The data analysis in this study was carried out in several sequential stages. First, students' responses from the numeracy test and GM questionnaire were summarized, coded, and checked for completeness. Second, a descriptive analysis was conducted to obtain the minimum, maximum, mean, and standard deviation values. Third, the optimal number of clusters was determined using the Elbow and Silhouette methods by considering the within-cluster sum of squares (WCSS). Fourth, the K-means clustering procedure was applied, which involved selecting the initial centroids, calculating the distance of each data point to the centroids, assigning points to the nearest cluster, updating the centroids, and repeating the process until the clusters became stable. Fifth, the Kruskal–Wallis's test was used to examine whether there were significant differences in numeracy and GM scores between clusters. Sixth, the Dunn post-hoc test was carried out if significant differences were found. Finally, all statistical analyses were performed using RStudio (RStudio Team, 2023).

RESULTS AND DISCUSSION

Results

Descriptive Statistics

Table 1 presents the demographic information of the 321 participating students. Based on school type, most students attended private schools (193 students, 60.12%), while 128 students (38.88%) came from public schools. Regarding gender, the sample was dominated by female students (207 students, 64.49%), compared to male students (114 students, 35.51%). Regarding school location, the majority were from urban areas (235 students, 73.21%), while 86 students (26.79%) came from rural schools. This distribution indicates that the study sample was more

represented by private schools, female students, and urban locations, which should be considered when interpreting the findings.

Table 1. Demographic Information of Participants

Category	Sub-category	N	Percent (%)
School Type	Public	128	38.88%
	Private	193	60.12%
Gender	Male	114	35.51%
	Female	207	64.49%
School Location	Urban	235	73.21%
	Rural	86	26.79%

Table 2. Descriptive Statistical Analysis Results

Variable	N	M	Maximum	Minimum	SD
Numeracy	321	15.02	76.92	0	15.54
GM	321	32.2	44	11	5.28

Table 2 presents descriptive statistics for numeracy skills and GM of the 321 students. The numeracy scores show a mean of 15.02 with a standard deviation of 15.54, on a scale of 0–100. The highest score was 76.92, and the lowest score was 0, which indicates a wide range of performance. The large standard deviation relative to the mean suggests a high variability, with most students scoring at the lower end, reflecting generally low numeracy achievement across the sample. In contrast, the mean score of GM is 32.2 (scale range from 11 to 44) and a standard deviation of 5.28. These results indicate that the GM was relatively homogenous among students, as seen from the lower data spread. These descriptive findings provide evidence of a noteworthy pattern: while students demonstrate relatively high GM, their numeracy skills remain considerably low.

Cluster Analysis

The determination of the optimal number of clusters is carried out using the Elbow method, which evaluates the within-cluster sum of squares (WCSS) values. The Elbow graph shows a significant decrease in WCSS up to $k = 3$, after which the decline begins to level off at $k = 4$, forming a "square point" that indicates three clusters are the optimal number (see Figure 2). To reinforce these findings, a Silhouette analysis was also performed, which showed that the highest average silhouette width value was obtained at $k = 3$, corresponding to a value of approximately 0.43 (see Figure 3). This demonstrates good separation between clusters, supporting using three clusters as a representative data structure.

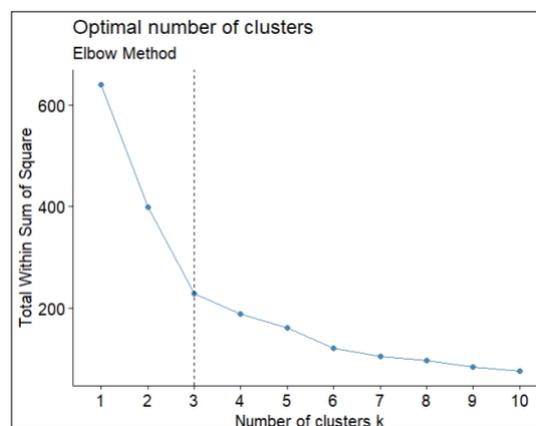


Figure 2. Elbow Method Results

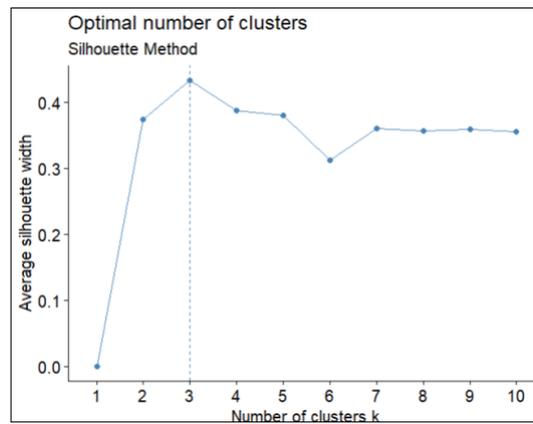


Figure 3. Silhouette Method Results

Table 3 presents the results of clustering students into three groups based on their characteristics. Cluster 1 (113 students) comprises students with low numeracy skills and low GM, who require special attention in academic and affective learning. Cluster 2 (68 students) covers students with high numeracy skills and GM, indicating a group with high academic potential and a positive attitude towards learning. Lastly, students in Cluster 3 (140 students) have medium-to-low numeracy skills but high GM. This indicates that, although these students are not cognitively optimal, they possess the affective readiness to develop further if supported by appropriate learning strategies.

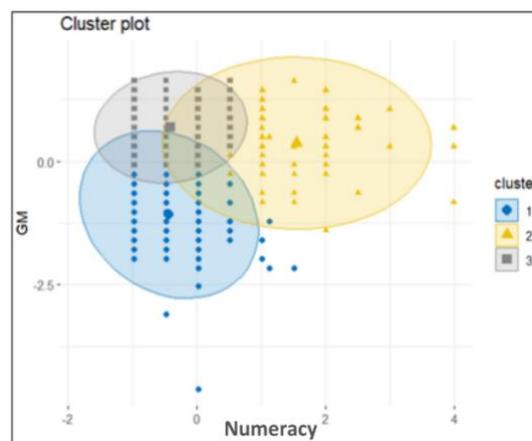


Figure 4. Cluster Plot Visualization

Table 3. Cluster Analysis Results

Cluster Comparison	Number of Students	Average Numeracy	Average GM
Double susceptible	113	8.34	29.71
Empowered	68	39.06	37.34
Affective potential	140	8.73	39.04

In terms of internal homogeneity, the analysis of WCSS values shows that Cluster 3 has the lowest WCSS value (60.54), compared to Cluster 1 (87.44) and Cluster 2 (79.04) clusters. This indicates that, compared to Double Susceptible and Empowered, Affective Potential tends to have similar characteristics among its members, making it the most consistent cluster in group formation. Figure 4 shows the distribution of numeracy and GM scores in each cluster. Empowered dominates the graph's upper right area, indicating a positive relationship between numeracy skills and GM, although not very high. Double Susceptible is concentrated in the

lower left, which implies the students in this cluster have low values on both variables. In contrast, Affective Potential is located in the lower right, indicating high GM but low-to-medium numeracy skills.

The results of CA reinforce the findings of K-means analysis; three clusters with different characteristics were obtained. Cluster 1: low numeracy and low GM, which is called ‘Double Susceptible Group’. The students in this group face a double challenge: low cognitive ability in understanding numeracy concepts, and a lack of confidence in their ability. Cluster 2: high numeracy and moderate to high GM, or ‘Empowered Group’. This cluster is interesting because, although the students do not stand out academically, they effectively demonstrate psychological readiness. Cluster 3: low numeracy but high GM or ‘Affective Potential Group’. Most students in this cluster are students with a potential independent learner profile.

Kruskal-Wallis Analysis

Prior to the inferential analysis, the assumptions of normality and homogeneity of variance were tested for both numeracy and growth mindset (GM) scores across the three clusters. The Shapiro-Wilk test indicated that the data for both numeracy ($W = 0.836$; $*p* < .001$) and GM ($W = 0.954$; $*p* < .001$) were not normally distributed. Levene’s test further revealed that the variances between clusters were not homogeneous for numeracy ($F = 4.776$; $*p* = .009$) or for GM ($F = 8.443$; $*p* < .001$). Consequently, the non-parametric Kruskal-Wallis test was employed to examine differences across clusters. The Kruskal-Wallis test revealed a statistically significant difference in both numeracy skills, $\chi^2 = 159.64$, $df = 2$, $p < 0.001$, and GM, $\chi^2 = 159.64$, $df = 2$, $p < 0.001$, among the three clusters. Post-hoc analyses using the Dunn test with Bonferroni correction were conducted to compare all pairwise cluster combinations for each variable. The comprehensive results are presented in Table 4.

Table 4. Differences in Significance of Score Distribution Between Clusters Based on Numeracy Skills and GM

Cluster Comparison	Variable	Z-value	p-value (adjusted)	Description
Double Susceptible vs Empowered	Numeracy	-11.66	< 0.001	Significant
	GM	-9.20	< 0.001	Significant
Double Susceptible vs Affective Potential	Numeracy	-0.99	0.971	Not Significant
	GM	-14.13	< 0.001	Significant
Empowered vs Affective Potential	Numeracy	11.26	< 0.001	Significant
	GM	-2.54	< 0.034	Significant

The post-hoc comparisons revealed distinct patterns for each variable (see Table 4). For numeracy skills, significant differences were found between Double Susceptible and Empowered and between Empowered and Affective Potential. However, no significant difference was detected between Double Susceptible and Affective Potential, indicating that these two groups, despite their contrasting GM levels, possess comparable levels of low numeracy ability. In contrast, for GM scores, all pairwise comparisons between clusters were statistically significant. The most pronounced difference was observed between Double Susceptible and Affective Potential ($Z = -14.13$, $*p* < .001$), underscoring the stark contrast in mindset between the Double Susceptible and Affective Potential groups. The significant difference in GM even between the high-achieving Empowered and the high-GM Affective Potential ($Z = -2.54$, $*p* = .034$) further validates the distinct psychological profiles of the three clusters identified by the K-means analysis.

Discussion

Current guidance and counseling (GC) services in Islamic schools often adopt a one-size-fits-all approach, lacking the differentiation needed to address the complex interplay between

students' cognitive abilities, such as numeracy skills, and psychological dispositions, like growth mindset (GM). While these factors have been studied independently, a significant gap remains in profiling students based on their combined cognitive-affective characteristics and, crucially, translating such profiles into actionable, differentiated GC strategies. This study aimed to bridge this gap by employing K-means clustering to identify distinct student profiles based on numeracy and GM data collected from 321 Islamic junior high school students. The following discussion interprets the characteristics of the resulting clusters and explores their implications for designing targeted GC interventions.

This study reveals that most students have a high GM but low numeracy skills. This finding contradicts the results of previous studies (Dong et al., 2023; Huang et al., 2019; Kismiantini et al., 2021; Limeri et al., 2020; Polirstok, 2017) that students with high GM tend to have better academic achievement. This apparent contradiction likely stems from context-specific factors. The relationship between a growth mindset and academic achievement is not automatic; in this context, it may be mediated by insufficient instructional support, limited opportunities to develop effective learning strategies, or a curriculum that heavily prioritizes religious subjects, thereby restricting the time and resources needed to convert positive beliefs into mathematical proficiency.

The cluster analysis identified three groups of students: (1) low numeracy and low GM, (2) high numeracy and moderate-to-high GM, and (3) low numeracy and high GM. The characteristics of Double Susceptible create a dead loop because low numeracy skills deepen FM's beliefs, but on the other hand, FM hinders efforts to increase numeracy. Students in this cluster are at high risk of sustained academic failure and decreased psychological well-being (Luo, 2022). Empowered includes students who have high numeracy skills, supported by moderate-to-high GM. These two aspects form a positive cycle because GMs encourage effective practices that improve numeracy skills and consequently build resilient and independent learners (Boonma, 2025; Nugroho et al., 2025; Yeager & Dweck, 2012). Affective Potential is characterized by low numeracy skills but high GM. The main potential of this cluster lies in its high positive learning attitude, which is a valuable foundation for the future development of numeracy skills (Valeriu, 2015).

The Kruskal-Wallis and Dunn tests post-hoc confirmed significant differences in the distribution of numeracy skills and GM scores between clusters. There was a significant difference in GM scores between Double Susceptible and Affective Potential, but interestingly numeracy skills of these two clusters do not differ significantly. This shows that high GM is not necessarily actualized in better cognitive performance (Blackwell et al., 2007). This may be due to ineffective learning strategies or a lack of environmental learning support (Yeager & Dweck, 2012). The existence of high GM without adequate numeracy achievement indicates that interventions are not enough to focus only on motivational aspects, but need to be accompanied by learning that is differentiated and based on mapping students' factual needs (Tomlinson, 2014).

Generally, the literature indicates a positive correlation between GM and academic achievement. For example, PISA data shows that students with a high GM have higher average math scores than their FM peers (OECD, 2018). However, recent research (Bates et al., 2019; Macnamara & Burgoyne, 2023; Sun et al., 2021) reveal a complex relationship between GM and academic achievement. In some contexts, GM does not directly predict achievement, but is mediated by motivation, attribution, and self-efficacy (Sun et al., 2021) because the effects of GM interventions on academic achievement tend to be low (Macnamara & Burgoyne, 2023). These findings align with the notion that GM should be supported by learning strategies and other motivational factors to make a significant contribution to academic achievement (Dong et al., 2023; Yeager & Dweck, 2020).

Implications for Differentiated Guidance Service Strategy Based on Cluster Characteristics

This study demonstrates the critical need for Differentiated Guidance Services (DGS) in Islamic schools, moving beyond uniform approaches to address students' diverse cognitive-affective profiles. The three identified clusters require distinct intervention strategies tailored to their specific characteristics. For Double Susceptible, DGS should prioritize 'cognitive-behavioral interventions. Techniques such as cognitive distortion, journaling, and belief disputation exercises can help break the negative cycle where poor numeracy reinforces fixed mindset beliefs. The significance lies in simultaneously addressing cognitive and affective barriers, creating a foundation for academic recovery. For Cluster 2 (Empowered), DGS should focus on 'strength-based development'. These students can connect their strong numeracy skills to real-world applications through career visualization and leadership simulations. This approach is important in leveraging their existing advantages to foster peer leadership and prevent academic complacency. Finally, for Cluster 3 (Affective Potential), DGS must bridge the 'affective-cognitive gap'. Mathematical mindfulness and emotion regulation techniques can help channel their positive mindset into improved numeracy performance. This strategy is significant for translating psychological readiness into tangible academic achievement. These differentiated approaches highlight the necessity of collaboration between counselors and teachers, along with ongoing assessment to ensure effective implementation. The findings advocate for policy changes supporting specialized guidance programs addressing cognitive and affective learning dimensions in Islamic education.

Limitations and Suggestions for Further Research

This study provides insight into the design of DGS based on students' numeracy skills and GM. However, some limitations need to be considered. First, the identified numeracy-GM profiles are highly contextual to Islamic schools due to their distinctive religious curriculum, which limits the generalizability of the findings to secular or non-faith-based educational settings. Second, the GM questionnaire, with a reliability coefficient of $\alpha = .607$, may lack the sensitivity to fully capture mindset nuances within an Islamic educational context, where concepts such as *ikhtiar* (effort) and *tawakal* (reliance on God) may interact complexly with standard GM constructs. Third, the numeracy assessment consisted of only 9 items due to time constraints, which may limit the comprehensiveness and validity of the numeracy skill measurement. Fourth, the proposed DGS strategies remain hypothetical and require empirical testing to prove their efficacy, particularly in converting the affective potential of Cluster 3 into cognitive gains and breaking the negative cycle in Cluster 1.

These limitations open avenues for future research. Accordingly, we recommend: (1) replicating this study in diverse school types (e.g., public, private, or local culture-based schools) to test the external validity and contextual boundaries of the student profiles; (2) employing a mixed-methods approach that integrates in-depth interviews and classroom observations to gain a richer, more nuanced understanding of the cognitive and affective dynamics within each cluster; (3) developing and validating more robust instruments, including a more comprehensive numeracy test and a GM scale adapted for cultural-religious contexts, to improve measurement accuracy; and (4) conducting experimental studies or school action research to empirically test the effectiveness of the proposed DGS strategies, assess their suitability, and identify potential obstacles to their implementation in real-world settings.

CONCLUSIONS

This study revealed a significant disparity between numeracy skills and GM in students in Islamic junior high schools. Although most students have high GM, their numeracy skills are generally very low. The cluster analysis found three groups: (1) low numeracy and low GM (double susceptible), (2) high numeracy and moderate to high GM (empowered), and (3) low

numeracy and high GM (affective potential). These findings suggest high GM does not automatically guarantee numeracy achievement, so a contextual and comprehensive intervention is needed. Through DGS, guidance services can be adjusted to the needs of each cluster. These results make a practical contribution to teachers and counselors and encourage educational policies that are adaptive to student diversity. Further research is required to test the effectiveness of this service model in real and long-term. Furthermore, these findings provide a foundation for developing innovative learning media to support students' academic and GM.

ACKNOWLEDGEMENT

The authors would like to thank Universitas Negeri Yogyakarta 2025 for supporting this study.

AUTHOR CONTRIBUTION STATEMENT

The authors in this study have roles and contributions in accordance with their expertise. WS was the leader of the research project who was responsible for designing the main structure of this study, developing research instruments, and reviewing the intellectual and academic content of the study. As research members, NH, IS, and AW contributed to analyzing data, drafting the initial manuscript, developing research instruments, and collecting data. All authors contributed to the refinement of the manuscript.

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Islamic Guidance and Counseling Journal

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Appendix 1. Numeracy Skills Test Blueprint

Domain Content	Sub Domains Content	Context	Cognitive Level	Question Form
Numbers	Operation	Scientific	Knowing	Short Answer
	Operation	Scientific	Applying	Complex Multiple Choice
Algebra	Relationships and Functions (including number patterns)	Personal	Applying	Short Answer
	Relationships and Functions (including number patterns)	Personal	Reasoning	Essay
Geometry And Measurement	Measurement	Scientific	Knowing	Matching
	Measurement	Scientific	Reasoning	Essay
Data and Uncertainty	Data and Its Representation	Socio-Cultural	Reasoning	Essay
	Uncertainty and Opportunity	Personal	Knowing	Multiple Choice
	Uncertainty and Opportunity	Personal	Knowing	Short Answer

Appendix 2. Growth Mindset Questionnaire Blueprint

Aspects	Stimulus and Questions
Belief that Intelligence, talent, and character can be developed	<ol style="list-style-type: none"> 1. Vioni's father was a math teacher, and his mother was a merchant. Vioni excels at applying social arithmetic concepts in the context of trading. There is an assumption that Vioni is smart because of the intelligence passed down from her parents. What is your response? 2. Andi wants to become an architect. He excelled at algebra but struggled with learning geometry. According to him, he is not talented in geometry, despite its importance for an architect. What is your response? 3. Rizky always memorizes every mathematical formula and procedure without understanding the concepts and is reluctant to do contextual mathematical problems. According to him, this is his way of learning that cannot be changed. What is your response?
Believing that challenges or difficulties, and failures are important for self-development	<ol style="list-style-type: none"> 1. You love learning geometry material. During the hour in class, the teacher told me that geometry is widely applied in daily life. The teacher then challenges the students to discover and explain how geometry is applied in everyday life. What is your response? 2. When learning mathematics, students must be able to apply mathematical concepts to solve problems and engage in mathematical reasoning in daily life. Many students find it difficult. What is your response? 3. When you take the AKM simulation in the field of numeracy, it turns out that you failed to achieve the minimum score set. What is your response?
Effort and hard work contribute to success	<ol style="list-style-type: none"> 1. You are selected to take the AKM Numeracy test. The Numeracy Test is a test that measures students' ability to do math problems in a daily context. You are not used to working on such problems. The teacher advises that with hard work, you will achieve good results. What is your response? 2. Currently, the National Exam has been replaced by the National Assessment. However, the National Assessment is not a benchmark for student graduation, so students do not have to try hard to pass. What is your response? 3. You and Vani participated in a numeracy competition at school. Vani is used to participating in the mathematics Olympiad. How did you try to participate in the competition?
Criticism and input from others can be used as feedback to push boundaries	<ol style="list-style-type: none"> 1. When learning about comparison, Kevin provided an example of comparison, specifically a comparison between the ages of two people. You know that the

- example is wrong because in the context of the age of two people, what remains is the difference in age, while in the comparison, what remains should be the division. What is your response?
2. In mathematics learning, teachers ask students to complete a task in groups. After all the groups finished their work, the teacher asked each group to present their work, and the other group gave criticism and suggestions. What is your response to the learning process?
 3. The teacher assigns you and your group the task of identifying the mathematical concepts used by construction workers. This task is quite tricky for you. How do you handle it?

Appendix 3. DGS Strategy and Supporting Theories Based on Cluster

Cluster	DGS Strategy	Supporting Theories
Cluster 1 (Double susceptible)	<p>- Journal of Cognitive Distortion</p> <p>In this strategy, students are asked to write down their negative thoughts about math, such as <i>"I'll never be able to understand math"</i> or <i>"I'm bound to fail an exam later."</i> This journal helps students identify cognitive distortions, such as: (1) Overgeneralization (drawing broad conclusions from a single experience); (2) Labeling (negatively labeling oneself); and (3) Catastrophizing (considering the situation to be worse than reality). Therefore, by writing down these thoughts regularly, students will become more aware of their irrational, automatic mindset and can start to examine it critically.</p> <p>- Belief disputes</p> <p>This strategy involves challenging irrational thoughts with logic. Students are guided to answer questions such as: (1) <i>"What is the proof that you cannot thrive in math?"</i>; (2) <i>"Have you ever experienced a slight improvement?"</i>; and (3) <i>"Are your thoughts helping or hindering?"</i></p>	<p>These two strategies are based on the integration of two main cognitive psychotherapy approaches, namely Cognitive Therapy by Beck (1976) and Rational Emotive Behavior Therapy (REBT) by Ellis (2013), Beck emphasizes that cognitive distortion, i.e. unrealistic negative thought patterns, are at the root of many emotional and behavioral problems. Meanwhile, Ellis (2013) developed the A-B-C (Activating Event – Belief – Consequence) model, which explains that negative emotional responses do not arise from the event itself, but rather from the irrational beliefs individuals hold about the event. By replacing irrational beliefs with rational beliefs, emotional and behavioral consequences become more adaptive and healthy.</p>

<p>Cluster 2 (Empowered)</p>	<p>- Career visualization This strategy involves career visualization exercises, where students are invited to imagine and design their future roles in detail, for example, as data analysts, actuaries, or researchers in the field of technology. During this process, teachers guide and counsel students to imagine: (1) their work environment; (2) the type of tasks related to numeracy; (3) the impact of their work on society; (4) the steps to achieve a certain position in their career.</p> <p>- Leadership simulation This strategy encourages students to take on the role of leader in numeracy activities. Students will design simple study sessions, facilitate discussions, motivate group members, and collaborate to solve problems.</p>	<p>Both of these strategies are rooted in Multimodal Therapy (MMT) by Lazarus (2005), which emphasizes that effective behavior change is achieved through the reinforcement of various modalities within the framework of BASIC I.D.: Behavior, Affect, Sensation, Imagery, Cognition, Interpersonal relationships, and Drugs. Career visualization strategies contribute to the development of cognitive and imagery dimensions by helping students imagine their future in a structured and positive way. Meanwhile, leadership simulations strengthen behavioral and interpersonal aspects through leadership exercises in the context of numeracy learning. This approach is particularly relevant for strengthening the empowerment of students who have demonstrated positive potential in numeracy and GM.</p>
<p>Cluster 3 (Affective potential)</p>	<p>- Mindfulness Math This strategy aims to help students focus entirely on the process of working on math problems without being distracted by anxiety, negative self-judgments, or pressure to achieve results. Through math mindfulness exercise, students are invited to: (1) focus entirely on the steps of problem solving; (2) observe thoughts and emotions that arise without judgment; and (3) recognize when they start to lose focus and return attention to the problem.</p> <p>- Emotion regulation This strategy is used when students feel frustrated, depressed, or anxious when facing difficulties with math problems. The STOP</p>	<p>Dialectical Behavior Therapy (DBT), as developed by Linehan et al. (2002), focuses on core mindfulness skills to foster self-awareness and acceptance of current experiences, which is effective in managing academic stress and improving focus.</p>

(Stop, Take a breath, Observe, Proceed)
technique is a practical tool of the DBT
approach that helps students stop emotional
impulses before acting reactively.
