International Journal of Latest Engineering Science (IJLES) E-ISSN: 2581-6659
DOI: 10.51386/25816659/ijles-v9i1p103
Volume: 09 Issue: 01 January to February 2026 www.ijlesjournal.org

# Assessing the Students' Intellectual Value in Promoting Human Flourishing and Performance in Mathematics

Daryl A. Alivio[1], Dr. Arlene Castillo[2], Russel E. Panugan[3], Joshua Ariel B. Ronda[4], Psyrel M. Rosas[5]

[1]*Faculty at La Salle Academy, Iligan City, Philippines*
[2]*Professor at Mindanao State University - Naawan, Naawan, Philippines*
[3]*Faculty at Iligan Medical Center College, Iligan City, Philippines*
[4]*Faculty at Iligan Medical Center College, Iligan City, Philippines*
[5]*Teacher 1 at Himaya National High School, El Salvador, Philippines*

***Abstract:*** *This study investigated the relationship between senior high school students' intellectual values and their academic performance in Mathematics, emphasizing the role of these values in promoting human flourishing. Utilizing a mixed-methods design, quantitative data were collected through a Likert-scale survey measuring students' perceived intellectual virtues, including open-mindedness, intellectual autonomy, critical thinking, curiosity, and attentiveness, while qualitative insights were obtained through open-ended questions. The participants consisted of Grade 11 STEM students from La Salle Academy – Iligan City. Results revealed that students generally perceived themselves as possessing moderate to high levels of intellectual values, with curiosity and attentiveness rated highest. Statistical analysis indicated significant positive correlations between all intellectual values and mathematics performance, suggesting that these virtues support deeper comprehension and problem-solving skills. Thematic analysis of qualitative responses further highlighted how students applied intellectual values in both academic and real-life contexts, contributing to personal growth, decision-making, and overall well-being. These findings underscore the importance of cultivating intellectual virtues within mathematics education as a pathway to both academic success and human flourishing.*

**Keywords:** *Intellectual values, human flourishing, mathematics performance, open-mindedness, intellectual autonomy, critical thinking, curiosity, attentiveness*

## INTRODUCTION

In recent years, character education has increasingly emphasized the development of intellectual virtues—traits such as curiosity, attentiveness, open-mindedness, critical thinking, and intellectual autonomy—that support meaningful learning and lifelong growth (Myra Bergman Ramos et al., 2000). These virtues not only facilitate cognitive engagement but are also linked to broader human flourishing, encompassing personal growth, well-being, and social development (Avakian Orona, Pritchard, & Eccles, 2023). In mathematics education, the cultivation of intellectual virtues has been shown to enhance problem-solving abilities, promote reflective thinking, and encourage persistence in learning complex concepts (Insorio & Librada, 2025; Bozkurt & Akcadurak, 2025).

Measurement tools, such as the Virtuous Intellectual Character Scale (VICS), have been developed to operationalize these traits, confirming both their distinct dimensions—curiosity, attentiveness, open-mindedness, carefulness, and autonomy—and their contribution to a unified construct of intellectual value (Avakian Orona et al., 2023). This allows researchers to rigorously quantify students' intellectual dispositions, moving beyond vague or unidimensional assessments. Studies also suggest that intellectual virtues are malleable and can be cultivated through targeted pedagogical interventions, inquiry-based learning, and value-rich classroom environments (Rakes, Wesneski, & Laws, 2023). For mathematics classrooms, these practices foster student engagement, autonomy, and reflective reasoning, ultimately influencing academic performance and holistic development.

Despite these insights, limited research has investigated the relationship between senior high school students' self-perceived intellectual values and their academic performance in mathematics, particularly in the context of promoting human flourishing. Therefore, this study aims to examine how Grade 11 STEM students perceive their intellectual values, how these values relate to their academic performance in mathematics, and how these values influence their learning experiences and approaches, with a focus on promoting human flourishing.

Specifically, it sought answers to the following questions:

1. What is the level of perceived intellectual values among Grade 11 STEM students in mathematics?
2. What is the academic performance of Grade 11 STEM students in mathematics?
3. Is there a significant relationship between students' perceived intellectual values and their academic performance in mathematics?
4. How do Grade 11 STEM students describe the ways in which intellectual values that promote human flourishing influence their learning experiences or approaches to mathematics?

## METHODOLOGY

This study employed a mixed-methods design to investigate the relationship between Grade 11 STEM students' intellectual values and their academic performance in mathematics, as well as how these values contribute to human flourishing. The participants were 57 Grade 11 STEM students from La Salle Academy – Iligan City during the 2025–2026 academic year. Data were collected using a self-administered survey adapted from the Virtuous Intellectual Character Scale (VICS), measuring curiosity, attentiveness, critical thinking, intellectual autonomy, and open-mindedness on a five-point Likert scale, along with three open-ended questions capturing students' experiences applying these values in mathematics and daily life. Academic performance was measured using students' recent mathematics grades. The survey was pilot-tested to ensure clarity and reliability. Quantitative data were analyzed using descriptive statistics and Pearson correlation, while qualitative responses were subjected to thematic analysis to identify patterns and themes reflecting the role of intellectual values in learning and personal growth. Ethical considerations, including parental consent, student assent, confidentiality, and voluntary participation, were strictly observed.

## RESULTS & DISCUSSIONS

This section presents the statistical analysis and interpretation of data collected to examine Grade 11 STEM students' intellectual values, their relationship with human flourishing, and academic performance in Mathematics.

### Level of Students' Intellectual Values

Students demonstrated a generally positive disposition toward open-mindedness in Mathematics. They were particularly receptive to revising their beliefs and methods when presented with stronger evidence or reasoning, as indicated by the high agreement on statements such as willingness to change approaches (4.25 on a 5-point scale). However, some students reported challenges in applying flexible thinking across unfamiliar problems, with slightly lower agreement on flexibility in problem-solving (3.23). Overall, the findings suggest that students are capable of considering multiple perspectives and collaborating effectively, consistent with prior research linking open-mindedness to deeper learning and critical reasoning (Baehr, 2013; Mesurado & Vanney, 2024).

Table 1. *Mean Distribution of Students' Intellectual Values on Open-mindedness*

| Intellectual Values | | |
|---|---|---|
| Open-mindedness | Mean | Description |
| I am open to considering new ways of solving mathematical problems when I find new evidence or explanations. | 4.12 | Agree |
| I am a flexible thinker when approaching mathematical concepts and problem situations. | 3.23 | Somewhat Agree |
| I enjoy hearing and understanding different solution methods or perspectives from my classmates. | 3.98 | Agree |
| I am willing to change my mathematical beliefs or methods when presented with better reasoning or proof. | 4.25 | Strongly Agree |

| | | |
|---|---|---|
| I enjoy learning why other students or teachers approach mathematical problems differently. | 3.91 | Agree |
| Mean | 3.90 | Agree |

Students displayed moderate to high levels of intellectual autonomy, relying on logical reasoning and independent judgment when solving mathematical problems. They tended to think through explanations and evaluate solutions critically (4.05 and 4.04, respectively). Some hesitancy was observed in exploring alternative problem-solving methods (3.60), reflecting occasional reliance on peers or teachers. These results emphasize the importance of fostering independent reasoning to promote both academic growth and human flourishing (Mesurado & Vanney, 2024; Fabio et al., 2025).

Table 2. *Mean Distribution of Students' Intellectual Values on Intellectual Autonomy*

| Intellectual Values | | |
|---|---|---|
| Intellectual Autonomy | Mean | Description |
| I form my own conclusions in Mathematics based on my understanding and reasoning. | 3.86 | Agree |
| I explore my own ways of solving mathematical problems even when my classmates use different methods. | 3.60 | Agree |
| When someone explains a math solution, I think it through myself to decide if it makes sense. | 4.05 | Agree |
| I try solving math problems independently before asking anyone for help. | 3.81 | Agree |
| I rely on logical reasoning and evidence when deciding whether a mathematical answer is correct. | 4.04 | Agree |
| Mean | 3.87 | Agree |

Critical thinking emerged as a strong feature of students' mathematical engagement. Students consistently verified the reliability of information (4.00), analyzed solutions systematically (3.84), and considered alternatives when necessary (3.89). Slightly lower scores in assessing the value and relevance of each piece of information (3.68) indicate that complex problems still pose challenges. These findings suggest that critical thinking supports informed decision-making and meaningful learning, integral to cognitive and personal development.

Table 3. *Mean Distribution of Students' Intellectual Values on Critical Thinking*

| Intellectual Values | | |
|---|---|---|
| Critical Thinking | Mean | Description |
| I can assess the value and relevance of each piece of information given in a math problem. | 3.68 | Agree |
| I make sure that the information I use in solving a math problem is reliable before putting it together. | 4.00 | Agree |
| I conclude Mathematics through logical and systematic analysis. | 3.84 | Agree |
| When something in a math solution does not convince me, I examine all possible alternatives before deciding. | 3.89 | Agree |
| I can connect new mathematical ideas with concepts I already understand. | 3.70 | Agree |
| Mean | 3.82 | Agree |

Curiosity was a prominent trait, particularly in students' eagerness to try new strategies or methods (4.14). Interest in exploring different topics (3.81) and wondering why concepts work (3.89) also scored high, while the engagement of curiosity in regular classes (3.53) was slightly lower. These results highlight the role of curiosity in stimulating exploration, inquiry, and lifelong learning, fostering both intellectual growth and human flourishing (Mesurado & Vanney, 2024; Fabio et al., 2025).

Table 4. *Mean Distribution of Students' Intellectual Values on Curiosity*

| Intellectual Values | | |
|---|---|---|
| Curiosity | Mean | Description |
| I am interested in exploring different topics in Mathematics. | 3.81 | Agree |
| I am eager to try new methods or strategies to solve mathematical problems. | 4.14 | Agree |
| I often wonder why mathematical concepts work the way they do. | 3.89 | Agree |
| My Math classes often leave me curious to learn more about the topics we discuss. | 3.53 | Agree |
| I enjoy discovering new patterns and ideas in Mathematics. | 3.72 | Agree |
| Mean | 3.82 | Agree |

Students showed moderate to high attentiveness, enjoying close observation during problem-solving (4.14) and noticing important details (3.81). Slightly lower attention to careful examination of steps (3.53) suggests room for improvement in consistent focus. Attentiveness supports systematic learning, persistence, and personal growth, contributing to academic competence and holistic development.

Table 5. *Mean Distribution of Students' Intellectual Values on Attentiveness*

| Intellectual Values | | |
|---|---|---|
| Attentiveness | Mean | Description |
| I notice important details in math problems that could affect the solution. | 3.81 | Agree |
| I enjoy paying close attention when solving mathematical problems. | 4.14 | Agree |
| I tend to notice mathematical patterns or steps that others might miss. | 3.89 | Agree |
| I like to carefully examine the steps and methods in solving a problem. | 3.53 | Agree |
| I can focus on a challenging math problem for a long time without getting distracted. | 3.72 | Agree |
| Mean | 3.65 | Agree |

**Academic Performance in Mathematics**

Analysis of students' grades indicates that most achieved scores within the Fairly Satisfactory range (75–79, 43.86%). A smaller portion achieved Outstanding (7.02%) or Very Satisfactory (12.28%), while 14.04% scored below 75, signaling a need for additional support. These results suggest that although students meet basic academic expectations, fostering intellectual values could enhance performance further.

Table 6. *Frequency and Percentage Distribution of Students' Academic Performance in General Mathematics*

| Rating Scale | Frequency | Percentage | Adjectival Description |
|---|---|---|---|
| 90 - 100 | 4 | 7.02% | Outstanding |
| 85 - 89 | 7 | 12.28% | Very Satisfactory |
| 80 - 84 | 13 | 22.81% | Satisfactory |
| 75 - 79 | 25 | 43.86% | Fairly Satisfactory |
| 74 and below | 8 | 14.04% | Need Improvement |

**Relationship Between Intellectual Values and Academic Performance**

Correlation analysis revealed statistically significant relationships between all measured intellectual values and mathematics performance. Intellectual autonomy showed the strongest correlation ($r = 0.567$, $p = 0.001$), followed by moderate correlations for open-mindedness and critical thinking ($r = 0.410$, $p = 0.002$). Curiosity ($r = 0.278$, $p = 0.036$) and attentiveness ($r = 0.288$, $p = 0.030$) were also positively related to performance. These findings suggest that intellectual values aligned with human flourishing enhance academic achievement, reinforcing the role of cognitive dispositions beyond procedural knowledge.

Table 7. *Significant Relation Between the Perceived Intellectual Values and Performance in Mathematics*

| Variables | Performance in Mathematics | p | Significance |
|---|---|---|---|
| | r | | |
| Open-mindedness | 0.410 | 0.002 | Significant |
| Intellectual Autonomy | 0.567 | 0.001 | Significant |
| Critical Thinking | 0.410 | 0.002 | Significant |
| Curiosity | 0.278 | 0.036 | Significant |
| Attentiveness | 0.288 | 0.030 | Significant |

**Students' Perceptions of Intellectual Values in Learning**

The thematic analysis of students' responses indicates that intellectual values play a crucial role not only in enhancing learning experiences in Mathematics but also in promoting human flourishing. First, curiosity and critical thinking encourage students to explore concepts deeply, analyze problem steps, and draw meaningful connections beyond rote memorization. Students reported that curiosity motivated them to "dig deeper," while critical thinking helped them "break hard problems into smaller parts," fostering a sense of mastery, self-efficacy, and intellectual growth, key components of flourishing.

Second, attentiveness contributes to sustained focus, persistence, and confidence. By carefully observing problem details and following step-by-step procedures, students reduced errors and strengthened their problem-solving skills, which enhances both academic competence and self-regulation, contributing to personal well-being. Third, intellectual autonomy and open-mindedness emerged when students approached problems independently and considered alternative methods or peer suggestions, reinforcing self-confidence, resilience, and adaptability—qualities central to human flourishing. Finally, students highlighted how applying these intellectual values in real-life situations, such as budgeting, financial decision-making, and solving everyday problems, nurtures responsible behavior, practical wisdom, and personal growth. Collectively, these findings

suggest that cultivating intellectual values in Mathematics supports not only academic success but also holistic development, empowering students to thrive cognitively, emotionally, and socially.

Table8. *Thematic Analysis of How Intellectual Values Promote Human Flourishing*

| Theme | Description | Initial Codes | Sample Student Statements |
|---|---|---|---|
| 1. Deeper Understanding Through Curiosity and Critical Inquiry | Curiosity motivates students to explore concepts, while critical thinking enables them to analyze steps, assess evidence, and draw meaningful connections. These values deepen comprehension and support meaningful learning. | "Dig deeper" "Break into smaller parts." "Interested in the topic." "Connect experiences" | "My curiosity helps me dig deeper into lessons instead of just memorizing formulas." "Critical thinking helped me break a hard problem into smaller parts." "Reflecting on my experiences, curiosity helps me be more interested in the topic and grow as a learner." |
| 2. Strengthening Focus, Persistence, and Confidence Through Attentiveness | Attentiveness helps students notice important details, follow steps, and reduce mistakes. It also builds persistence and confidence, especially when solving challenging problems. | "Remember steps" "Step-by-step solving" "Follow steps clearly." "Focus on detail." | "It helps me remember steps depending on the problem and given concept." "I tried to solve step by step because I couldn't remember the formula." "Attentiveness helped me follow the steps clearly during discussions." |
| 3. Exercising Autonomy and Open-Mindedness in Problem-Solving | Students demonstrate autonomy by solving independently and trusting their reasoning. Open-mindedness appears when they consider multiple solution methods, learn from peers, and adapt strategies. | "Try different methods." "Learn from others." "Work independently." "Flexible solutions." | "Trying different methods helped me find the right solution." "Being open-minded about others' techniques also helps in real life." "Working independently boosted my confidence as a learner." |
| 4. Applying Intellectual Values to Real-Life Situations and Personal Growth | Students describe how intellectual values transfer beyond the classroom, helping them in budgeting, decision-making, evaluating financial options, and handling daily challenges. These values promote well-being and responsible behavior. | "Budgeting money." "Choosing banks." "Make wise decisions." "Succeed in daily life." | "I applied my learnings when helping my family choose banks with better interest rates." "Math helps me budget my money and decide wisely." "These values help me succeed in daily life because they teach me to think clearly and solve problems calmly." |

## CONCLUSIONS

The findings of this study indicate that Grade 11 STEM students generally exhibit moderate to high levels of intellectual values, including open-mindedness, intellectual autonomy, critical thinking, curiosity, and attentiveness. These cognitive dispositions were positively associated with academic performance in Mathematics, with intellectual autonomy showing the strongest correlation. The results also reveal that students perceive these values as integral not only to learning mathematics but to their broader personal growth and everyday decision-making.

The thematic analysis further demonstrates that intellectual values promote deeper understanding, sustained focus, reflective problem-solving, and practical application in real-life contexts. Students' descriptions highlight that traits such as curiosity, attentiveness, and autonomy foster self-confidence, resilience, and responsible decision-making—qualities that extend beyond academic achievement and support holistic development.

Collectively, these findings underscore that intellectual values serve as pathways to human flourishing, enabling students to thrive cognitively, emotionally, and socially. Fostering these virtues in the classroom can therefore enhance both academic success and overall well-being, highlighting the importance of educational strategies that cultivate intellectual dispositions alongside subject-matter competence.

## REFERENCES

[1] Avakian Orona, E., Pritchard, M., Eccles, J., Streets, A., & Higgins, A. (2023). *The development of epistemic virtue in higher education: A randomized pretest–posttest intervention study*. Journal for the Advancement of Scientific Thought and Academic Growth. https://jastag.org/Pubs/2024/Epistemic%20virtue%20in%20higher%20education.pdf

[2] Baehr, J. (2013). *Educating for intellectual virtues: From theory to practice*. Journal of Philosophy of Education, 47(2), 248–262. https://doi.org/10.1111/1467-9752.12023

[3] Bozkurt, İ., & Akcadurak, E. (2024). *The effect of values-based mathematics teaching on students' achievement and attitudes: A quasi-experimental study with eighth-grade learners*. Mathematics Teaching Research Journal, 16(6). https://mtrj.commons.gc.cuny.edu/volume-16-n-6/

[4] Fabio, R. A., Antonietti, A., Iannello, P., & Suriano, R. (2025). *Development and psychometric properties of the critical thinking attitude scale in Italian college students*. Frontiers in Psychology, 16, 1599920. https://doi.org/10.3389/fpsyg.2025.1599920

[5] Freire, P. (2000). *Pedagogy of the oppressed* (30th anniversary ed.). Bloomsbury Academic. Retrieved December 1, 2025, from https://files.libcom.org/files/Paulo%20Freire,%20Myra%20Bergman%20Ramos,%20Donaldo%20Macedo%20-%20Pedagogy%20of%20the%20Oppressed,%2030th%20Anniversary%20Edition%20(2000,%20Bloomsbury%20Academic).pdf

[6] Insorio, A. E., & Librada, V. M. (2025). *Enhancing students' academic performance by making the mathematics learning experience meaningful through differentiated instruction*. Contemporary Mathematics and Science Education. https://www.conmaths.com/article/enhancing-students-academic-performance-by-making-the-mathematics-learning-experience-meaningful-16332

[7] Mesurado, B. & Vanney, C.E. (2024). Assessing intellectual virtues: the virtuous intellectual character scale (VICS). *Int J Appl Posit Psychol 9*, 1803–1826. https://doi.org/10.1007/s41042-024-00193-y

[8] Park, S., Kim, M., Lee, H., & Choi, J. (2024). *Validating the Virtuous Intellectual Character Scale (VICS): A bifactor analysis of attentiveness, open-mindedness, curiosity, carefulness, and autonomy*. Journal of Moral Education. https://link.springer.com/article/10.1007/s41042-024-00193-y

[9] Pinkney, E., et al. (2024). Mathematical well-being across cultures: Insights from diverse students. *Mathematics Education Research Journal*. Advance online publication. https://doi.org/10.1007/s13394-024-00500-5

[10] Pizon, M. G., & Ytoc, S. T. (2023). *Relationship between school leadership, academic dispositions, and student academic performance: Meaning making of PISA 2022 results*. Education, *15*(4), Article 436. https://doi.org/10.3390/educsci15040436

[11] Quartey, S. A., Essel, G., & Kofi, N. (2025). *Mathematical values among senior high school teachers: A mixed-methods exploration of control, progress, and openness in classroom practice*. Journal of Mathematics Teacher Education. https://link.springer.com/article/10.1007/s44217-025-00457-y

[12] Rakes, C., Wesneski, A., & Laws, R. (2023). *Supporting mathematical problem-solving through Plan–Do–Study–Act (PDSA) student-generated data cycles in high school geometry*. Education Sciences, 13(9), 919. https://www.mdpi.com/2227-7102/13/9/919

[13] Samarita, R., & Arcilla, J. (2024). *Unlocking mathematical success: A qualitative case study on Grade 10 learners' challenges and triumphs with the DAMATH strategy*. International Journal of Research and Innovation in Social Science. https://rsisinternational.org/journals/ijriss/articles/unlocking-mathematical-success-a-qualitative-case-study-on-grade-10-learners-challenges-and-triumphs-with-the-damath-strategy/