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Students' Grit and Willingness to Communicate In English as Predictors of Critical Thinking Skills

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ABSTRACT

Using a quantitative correlational design, this study investigated the relationship between students' grit, their willingness to communicate in English, and their critical thinking skills. Three validated instruments to measure the constructs of grit, WTC, and critical thinking were administered to 379 college students in a private educational institution in Davao City. Spearman's rho correlation was used to analyze the relationship among variables and multiple regression analysis to determine if grit and WTC predict critical thinking. Furthermore, regression analysis confirmed grit and WTC as important predictors of critical thinking skills, underlining the need to develop non-cognitive and conventional cognitive skills to improve critical thinking skills in learning environments. Implications suggest integrating targeted interventions that develop grit and communication skills within curriculum frameworks to better prepare students for complex problem-solving and decision-making in their professional and personal lives.

INTRODUCTION

Critical thinking is a higher-order thinking skill essential in the 21st century (Anggraeni *et al.*, 2023; Al-Mahrooqi & Denman, 2020). However, one of the factors contributing to the country's poor performance in mathematics on local, regional, national, and even international assessments is the low level of critical thinking skills among Filipino students (Benedicto & Andrade, 2022; Artuz & Roble, 2021), and few studies stated that Philippine schools have acknowledged the lack of critical thinking among learners who are entering college or university (Nasir & Singh, 2023; Lopez *et al.*, 2023). Students can develop their critical thinking skills through mathematics. Yet, many find it challenging to engage profoundly with the subject because of an emphasis on rote memorization rather than problem-solving. These statements are aligned with Filipino students' low performance on PISA 2022 and SEA-PLM 2019 evaluations in mathematics (OECD, 2023; UNICEF, 2021), and these tests are administered in English language despite Filipino students not primarily speaking this language at home (Second Congressional Commission on Education, 2024).

Moreover, there is recent research that highlights mixed findings about the connections between grit, willingness to communicate in English and critical thinking skills. Studies have shown that grit positively influences critical thinking (Sari *et al.*, 2022; Putri & Ghufron, 2019; Khan *et al.*, 2025), but there is also other research arguing that their effects have negative correlation (Mallahi, 2023). On the other hand, Smith (2019) found that a student's willingness to communicate in English has a moderate positive relationship with critical thinking skills.

Given today's need for more adaptable and analytical learners, it is important to understand how grit and

willingness to communicate in English support critical thinking development. Even though prior research shows some connections among these factors, it is still inconsistent, which makes their predictive power unclear. This result raises an evidence gap indicating that educators need deeper insights into how these traits can improve student outcomes and inform better classroom strategies. To address the existing gap, this study is grounded in Paul's (1989) critical thinking theory, which sees learners as active participants in building their knowledge. It also draws from Bandura's (1989) social cognitive theory, Piaget's (1964) constructivism, and Lave and Wenger's (1991) situated learning theory. All of these suggest that noncognitive factors can shape students' thinking and learning. Furthermore, this study aims to: (1) examine their levels and analyze relationships among these variables; (2) explore whether grit and willingness to communicate in English can predict critical thinking skills; (3) test whether the indicators of these variables predict critical thinking skills. Thus, this research supports Sustainable Development Goal 4: Quality Education by helping learners develop the critical thinking skills needed to thrive in a fast-changing world.

LITERATURE REVIEW

Critical thinking is one of the most important aspects of higher-order thinking skills, which go beyond simply memorizing facts. It requires students to evaluate information, draw conclusions, and approach problems with a deeper level of understanding. In today's world, where everyone is constantly faced with complex challenges and an overload of information, the ability to think critically has become more important, especially among students (Erdoğan, 2019; Basri *et al.*, 2019).

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However, the lack of these skills among Filipino students is evident in their poor performance in various academic assessments, both in the Philippines and internationally. Based on the PISA 2022 result, the Philippines garnered an average score of 355 points, which falls below the average mean score of other countries, placing the Philippines in the sixth lowest rank in Mathematics with the result shows that 16% of students attained at least Level 2 proficiency, and almost no students were top performers in mathematics (OECD, 2023); the Filipino students' performance in PISA assessments is similar to the SEA-PLM 2019 evaluation results, where they scored below the average mean score of all participating countries in mathematical literacy (UNICEF, 2021).

Moreover, developing critical thinking skills can enhance students' learning and creativity, which in turn can improve their academic performance (Fitriyah, 2024; Alsaleh, 2020). It assists students in evaluating knowledge using logic, reflection, and deductive thinking, which improves efficiency and interest in the subject (Syamsiar *et al.*, 2024; Okulicz-Kozaryn, 2021; Din, 2020). It is also considered a set of skills that should be taught and widely endorsed to foster students' success in college (Duterte, 2025; Bates *et al.*, 2024; Van der Zanden *et al.*, 2020). Studies suggest that developing students' critical thinking abilities must be a primary emphasis of education (Perez & Andrade, 2023; Bezanilla *et al.*, 2019). In addition, professionals have ranked the development of these skills as one of the highest educational priorities and public needs in modern societies (Thornhill-Miller *et al.*, 2022; Pasquinelli *et al.*, 2021) as it is the key in improving daily life outcomes, general problem solving, intelligence, adaptability, and academic achievement (Halpern & Dunn, 2021; Hitchcock, 2020; Ren *et al.*, 2020).

The study of Seo and Lee (2023) concluded that grit moderates the relationship between critical thinking and creativity. Additionally, existing studies reveal that interest in learning significantly influences the student's critical thinking skills and emphasize that low interest can strongly influence low critical thinking skills (Khan *et al.*, 2025; Sari *et al.*, 2022; Putri & Ghufron, 2019). However, Mallahi (2023) found that grit and critical thinking have a low negative correlation, while the study of Gallardo-Estrada (2024) shows no significant cross-predictive relationship between grit and critical thinking scores. Wawan and Pamungkas (2021) also have similar results, stating that students' interest in learning does not affect their critical thinking skills. On the other hand, a study discovers a significant moderate correlation between willingness to communicate and critical thinking skills (Smith, 2019).

This study is anchored on the critical thinking theory by Paul (1989) and supported by Bandura's (1989) social cognitive theory, Piaget's (1964) constructivist learning theory, and the situated learning theory of Lave and Wenger (1991). Critical thinking theory emphasizes that learners are responsible for their learning and knowledge construction, suggesting that a strong sense

of critical thinking is obtained by integrating personal experience and social interaction and that fair-minded critical people have traits of mind; one of these traits is intellectual perseverance. In addition, social cognitive theory suggests that noncognitive factors that influence cognitive processes, such as resilient self-efficacy, strong perseverance, and interest, will affect the desired performance accomplishments and could change learning performance results (Ryan, 2012). Similarly, the social cognitive theory of mass communication mentioned that people acquire knowledge of causal relationships and extend their wisdom by employing symbolic operations on the plethora of data obtained from firsthand and vicarious experiences (Bandura, 2001). These concepts are also aligned with the constructivist learning theory and situated learning, which emphasizes the ability of the students to construct their knowledge through their meaningful experiences, social interactions, and language use—which influences the learning process (Hein, 1991). These theories raise possibilities of noncognitive predictors that could affect the student's critical thinking, which could be grit and willingness to communicate in English that needs consideration.

In addition, grit is the combination of passion and perseverance for long-term objectives (Halperin & Regev, 2021), and it is considered a crucial noncognitive factor that is essential for academic learning (Sebial & Mirasol, 2023; Bibi *et al.*, 2023; Halperin & Regev, 2021; Lam & Zhou, 2019). Existing studies reveal that grit can influence academic and mathematical achievement (Eryiğit & Kılıç, 2022; Lam & Zhou, 2022). These findings are supported and strengthened by other studies that conclude people with strong grit do not give up on reaching their goals in the face of setbacks, difficulties, or inadequate support, and they can stay committed to one objective for a long time (Yüce, 2023; Burke *et al.*, 2022; Bozgün & Akın-Kösterelioğlu, 2021).

The grit's indicators are perseverance-commitment (PC), interest-passion (IP), and goal-directed resilience (GR). The perseverance-commitment is a commitment to persistently engage in goal-directed action over a prolonged period (Gorenak *et al.*, 2024; Caldwell & Anderson, 2024; Gella & Quines, 2022); interest-passion refers to a goal-focused interest that gradually motivates the person (Herdian, 2022; Verner-Fillion *et al.*, 2020; Lee & Durksen, 2020), and the noncognitive resilient reactions that sustain tenacity and interest in the face of a variety of challenges are referred to as goal-directed resilience (Montas *et al.*, 2021; Kuruveettissery *et al.*, 2021; Sharif & Woolley, 2020; Smith *et al.*, 2020). The indicator of grit plays a vital role in overcoming learning difficulties and boosting willpower to pursue educational goals (Zhao & Wang, 2023).

On the other hand, willingness to communicate (WTC) is a dynamic state of communicative readiness (Mbau *et al.*, 2024; Henry *et al.*, 2021; Lee *et al.*, 2021; Subekti, 2019). The willingness to use language authentically does not focus on just linguistics. Still, it goes beyond other issues

(Hu & Wang, 2023) as it is widely related to students' reading comprehension (Purnama & Ramdhani, 2024). It also plays a pivotal role in developing language learners' communicative competence (Sarwari, 2024; Apat *et al.*, 2023; Budiman *et al.*, 2023; Lee & Hsieh, 2019).

The indicators of willingness to communicate are communicative self-confidence, integrative orientation, the situational context of L2 use, topical enticement, learning responsibility, and off-instruction communication. Communicative self-confidence refers to a personal belief that one can achieve goals, achieve results, or perform tasks competently (Fatima *et al.*, 2020; Nadiah *et al.*, 2019); an integrative orientation refers to the learner's positive attitude toward associating with English native speakers and their culture (McEown & Sugita-McEown, 2020; Oakes & Howard, 2019; Lamb *et al.*, 2019); the situational context of L2 describes how learners' communication behaviors are temporarily affected by immediate situational factors in the learning environment. (Feller *et al.*, 2020; Ghasemi *et al.*, 2020); topical enticement is concerned with how much the subject of spoken materials motivates the language learner to communicate (Mulyaningsih & Murtafi'ah, 2022; Amalia *et al.*, 2019); a learner's learning responsibility refers to how they apply their L2 knowledge to communication to develop that knowledge (Sabasaje & Oco, 2023; Khairallah *et al.*, 2020; Lightbown & Spada, 2019), and lastly, off-instruction communication specifies the extent of the learners willingness to engage in communication with other people outside the instructional process (Jelínková, 2024; Ramsey *et al.*, 2019).

Moreover, critical thinking is an advanced set of cognitive skills that students in higher education use to succeed academically (Dabpil *et al.*, 2025; Kleemola *et al.*, 2021; Haber, 2020), and it is emphasized by educators, businesses, and lawmakers as an essential skill to thrive in the 21st-century (Zhang *et al.*, 2022; Benbow *et al.*, 2020; Vista, 2020). Additionally, critical thinking is assessing ideas and analyzing data to make better decisions (Berg *et al.*, 2020; Turan *et al.*, 2019), and it has long been seen as an essential skill for young people (Spector & Ma, 2019). It contains indicators: interpretation, analysis, evaluation, and inference (Marni *et al.*, 2020). Interpretation is the ability to understand and change information from one form to another (Solikah & Novita, 2022; Fragkuo, 2021); analysis is understanding how pieces of information or data relate to each other and organizing them into a certain structure (Huinchahue *et al.*, 2021; Lindgren *et al.*, 2020; Sundler, 2019); evaluation is the process of determining whether or not statements are credible (Brentnall *et al.*, 2023; Hales *et al.*, 2020); and lastly, inference involves discovering and knowing areas that are needed to come up with a logical conclusion (Li *et al.*, 2023; Solikah & Novita, 2022; Setiana *et al.*, 2021; Kurshumlia & Vula, 2019).

A crucial component to developing critical thinking skills in today's globalized world is exploring how grit and willingness to communicate in English play a vital role in helping students develop their critical thinking skills.

However, despite evidence already showing a relationship between these variables (Ibrahim & Rakhshani, 2024; Ebn-Abbasi & Nushi, 2022; Lee, 2020), there is still a gap in their predicting effect on critical thinking skills. This gap must be filled, particularly in light of educators and school officials searching for ways to help the students. Exploring grit and willingness to communicate as predictors will provide new insights into curriculum design and teaching techniques. Lastly, this study attempts to improve knowledge of critical thinking qualities by providing a more thorough description of how these features may affect the students' critical thinking.

Moreover, the findings of this research will significantly improve the existing body of knowledge on noncognitive factors, including students' grit, willingness to communicate in English, and critical thinking skills inside the mathematics teaching-learning environment. The researchers aim to gain insights by examining these variables so that they provide students with information and data that will help them perform better in mathematics and develop 21st-century skills essential for academic success and employment success. Parental insights will be provided into how they can best understand, nurture, and support their child's educational development. It will also benefit teachers by providing necessary knowledge that can be utilized to improve their pedagogical approaches, classroom management, and lesson planning with a focus on the affective domain of student learning to further enhance students' cognitive capabilities. Schools can utilize this as a basis for improving programs and curricula that may aid children in developing these noncognitive aspects and also create learning environments promoting perseverance and effective communication that are crucial for obtaining critical thinking; school administrators can employ the result of this research as a guide on formulating policies that enhance educational outcomes by integrating these essential noncognitive components into a more holistic educational framework, and create programs and training that will support the development of these essential skills for both teachers and students.

The primary purpose of this study is to examine the relationship between students' grit and their willingness to communicate in English as predictors of critical thinking skills among students. It will also analyze the students' grit level, describe their communication level, and measure their critical thinking. The researchers also assess the significant relationship between students' grit and critical thinking skills and evaluate the significant relationship between willingness to communicate in English and critical thinking skills. The study will also test the predicting effect of the students' grit and willingness to communicate on their critical thinking and determine whether the indicators of students' grit and willingness to communicate can predict their critical thinking skills. This study will also verify the hypothesis that no significant relationship exists between students' grit and critical thinking in mathematics and no significant relationship between willingness to communicate and critical thinking

in mathematics at a .05 significance level.

MATERIALS AND METHODS

This section discusses the respondents who participated in the study, the instruments used, and the research design and procedure followed in conducting the study. It gives a clear and organized perspective of how the study was conducted to ensure that the data collected is reliable and accurate.

With regards to the respondents, the total population of first-year to third-year college students was 23,593, with 379 respondents selected from different programs enrolled in a private educational institution in Davao City. Adhering to the 5% margin of error and 95% confidence level—sample sizes of at least 300 are recommended for accurate parameter estimations (Aithal & Aithal, 2020). In choosing the respondents, the researchers used convenience sampling to select readily available respondents in the specific buildings on the gathering day (Turner, 2020; Andrade, 2020). Due to the large population size, the convenience sampling methods are suitable as they are highly economically feasible and accessible (Berndt, 2020; Andrade, 2020).

This study only included college students taking 18 units at minimum for a semester. The researcher excluded fourth-year students, College of Business Administration Education (CBAE), College of Hospitality Education (CHE), graduate and law school students, students who are not attending class, and students with disabilities because these exceed the scope of the study. They also have the right to withdraw, refuse participation, or modify their responses before or during the survey.

Moreover, the researchers employed three modified survey questionnaires to measure the variables. First, the Three-Dimensional Grit scale (Kuruveettissery *et al.*, 2021), which was used in measuring grit, has 17 items with three indicators: perseverance-commitment, interest-passion, and goal-directed resilience. Second, the Instructional Willingness to Communicate questionnaire (Khatib & Nourzadeh, 2014), which was employed to measure the students' WTC, has 27 items and six indicators, namely communicative self-confidence, integrative orientation, situational context of L2 use, topical enticement, learning responsibility, and off-instruction communication. Lastly, the Critical Thinking questionnaire (Marni *et al.*, 2020), which was employed to measure critical thinking, has 25 items and four indicators: interpretation, analysis, evaluation, and inference. All the modified questionnaires were validated and obtained excellent reliability values of 0.932, 0.940, and 0.966, respectively.

A Likert-type scale with five points was used for the grit, willingness to communicate in English, and critical thinking questionnaire, on which 5 represents 'strongly agree and strongly willing' and 1 represents 'strongly disagree and strongly unwilling' to indicate to what extent each item described them. A reference based on the study of Abu-Baker *et al.* (2019), a mean score between 4.21 to 5.00 (very high) indicates that a student demonstrates unwavering grit, a robust willingness to engage in

communication and a solid foundation in independent thinking; a mean score between 3.41 to 4.20 (high) suggests the student has strong grit, generally enthusiastic about communicating and possess the critical thinking skill to some extent. A mean ranging from 2.61 to 3.40 (moderate) suggests that the learner has fairly low grit with potential for improvement, fairly willing to converse in the discussion, and uncertain about their skills; a mean score between 1.81 to 2.60 (low) means the student may have minimal grit, reluctance to communicate and partially lack critical thinking skill, and lastly, a mean score between 1.00 to 1.80 (very low) suggests that the student lacks attributes of grit, avoids communication and needs extra support and instruction.

A thorough testing procedure was conducted to ensure the data collection tools' validity and reliability. Researchers first needed the approval of two specialists to validate their adapted three questionnaires. Following this, the researchers conducted an initial reliability test through pilot testing of the questionnaires on a limited number of respondents who were not included in their target respondents. After the data was gathered, the researchers collated the data and consulted with a statistician to determine whether the questionnaire demonstrated internal consistency.

This study utilized a quantitative research design, specifically a descriptive-correlation approach, appropriate for meeting the study's primary purpose. The descriptive-correlation research design determines and examines relationships between and among variables (Aprecia *et al.*, 2022). This design was used since the study's main purpose is to determine which indicators of students' grit and willingness to communicate in English best predict the students' critical thinking skills.

The researchers undertook several steps to gather the necessary information for the study. Before conducting the study, the researchers asked for permission from authorized personnel. Once granted, the researchers utilized the informed consent document to give the respondents all the information they needed about the study. This document clarified the purpose of the study, estimated time, and research procedures. Following this, the consent form was distributed; the researchers disseminated the survey questionnaire to the respondents, who were then requested to complete the provided questionnaires. After completing and collecting the questionnaires, the researchers transmitted the gathered data to the statistician, who analyzed and verified the results and returned them to the researchers for interpretation.

Furthermore, the researchers surveyed the respondents—ensuring they adhered to their privacy and did not threaten them to avoid harm. The study's respondents were respected based on their judgment, and the researchers acknowledged their right to withdraw their consent under unusual circumstances. The researchers ensured that the respondents' values and interests were respected and protected upon their permission during the study by maintaining confidentiality. The data gathered

were analyzed using mean and standard deviation for measuring the level of grit, willingness to communicate, and critical thinking of students; to ascertain the relationship between grit and willingness to communicate on critical thinking—Spearman- rho was used since the data were not normally distributed. While regression analysis is employed to assess the predictive impact of the indicators of grit and WTC on critical thinking.

RESULTS AND DISCUSSIONS

This section presents and analyzes data on students’ grit, willingness to communicate in English, and critical thinking skills. It discusses their relationships, the independent variables’ predictive effects on critical thinking, and the regression analysis results examining the impact of the indicators of grit and willingness to

communicate in English on critical thinking.

Grit

Table 1 presents that the overall mean of students’ grit scales is 3.59 (SD = .71). It indicates the high grit rate when engaging in academic work, and most responses cluster close to the mean. The strong level of grit indicates that students demonstrate considerable grit, willingness, and perseverance in their education regardless of difficulty in learning math and strive towards long-term educational success. It suggests that students constantly challenge themselves to develop math skills and study hard despite barriers. They are also well aware of their academic goals and learn from their mistakes.

The data shows that grit’s indicator goal-directed resilience achieved the highest mean score of 3.93 (SD = .77),

Table 1: Students’ Level of Grit

Indicators	Mean (M)	Standard Deviation (SD)
Perseverance-commitment	3.47	.77
Interest-passion	3.37	.88
Goal-directed resilience	3.93	.77
Overall	3.59	.71

which falls within a high level, implying that students are highly determined to pursue their academic goals despite encountering numerous challenges. This outcome reveals that students are open to constructive criticism, willing to learn from their mistakes and have a positive attitude when facing complex math problems to achieve their goals. On the other hand, the indicator interest-passion obtained the lowest mean score of 3.37 (SD = .88). It is categorized as moderate, suggesting that students showed intrinsic desire and interest in studying math but not as strong as their resilience and perseverance. This moderate interest-passion shows that pupils have relatively low curiosity and excitement in learning mathematical ideas; moreover, they could have less optimism and inventiveness in solving math problems and want more help to cultivate these mindsets.

The results of this study reflect those of Sebial and Mirasol (2023), Bibi *et al.* (2023), and Burke *et al.* (2022), where students were able to attain a high degree of grit. This finding strengthens the conclusion of Burke *et al.* (2022) that students from different backgrounds could possess intense grit and the same capabilities to withstand

challenges and avoid burnout while obtaining their goals. Also, this finding aligns with the study of Bibi *et al.* (2023) that students were capable of decision-making, self-control, and establishing their goals for the future. Additionally, it is supported by the studies of Montas *et al.* (2021) and Smith *et al.* (2020), who emphasize that diverse students manifest high resilience in overcoming various challenges to achieve success. Moreover, the finding of the lowest mean corresponds with the discovery of Herdian (2022), where students obtain a moderate level of interest in learning, which inferred that students may sometimes lose interest and cannot maintain enthusiasm for learning once they face failures and setbacks.

Willingness to Communicate in English

Based on Table 2, the overall mean score for students’ willingness to communicate in English is 3.53 (SD = .68). It indicates that the respondents have a high level of willingness to engage in English communication in various contexts, and the responses are not too scattered relative to the mean. A high level represents students’ confidence, motivation, and enthusiasm for engaging in

Table 2: Students’ Level of Willingness to Communicate in English

Indicators	Mean	Standard Deviation (SD)
Communicative self-confidence	3.53	.82
Integrative orientation	3.25	.92
Situational context of L2 use	3.37	.88
Topical enticement	3.53	.92
Learning responsibility	4.00	.78
Off-instruction communication	3.51	.91
Overall	3.53	.68

English-related discussions and activities, particularly in mathematical contexts. This suggests they are comfortable expressing themselves, seeking help, or sharing ideas in English—even when faced with challenges. Students who demonstrate a high willingness to take responsibility for their learning are more likely to engage in opportunities for English communication actively.

Among the indicators of willingness to communicate in English, learning responsibility obtained the highest mean of 4.00 (SD = .78), indicating that students are highly inclined to take charge of their learning process by engaging in discussions, seeking clarification when students do not understand a concept, and asking insightful questions to enhance their understanding. This suggests a profound sense of responsibility and involvement in their academic development. On the other hand, integrative orientation had the lowest score with a mean of 3.25 (SD = .92), implying a comparatively lower inclination among students to connect their English communication skills to cultural or integrative motivations, such as discussing historical or mathematical concepts with a broader perspective. Thus, a high score in willingness to communicate in English indicates active participation and confidence. In contrast, a low score suggests areas where motivation or comfort in specific contexts needs improvement.

The study's findings achieved a similar result to the study of Subekti (2019) and Mbau *et al.* (2024), where the learners are highly willing to communicate in English. Moreover, Sarwari (2024) and Lee and Hsieh (2019) stated that students' willingness to communicate in English, driven by their confidence and desire to speak both inside and outside the classroom, helps them develop their language skills and open up opportunities requiring English proficiency. Their study's respondents exhibited a significant commitment

and responsibility in learning mathematics as their capacity to articulate their views in English enabled them to participate more actively in discussions.

Similarly, the research conducted by Khairallah *et al.* (2020) and Sabasaje and Oco (2023) corroborates with the results of this study by noting that fostering a sense of learning ownership encourages students to take greater responsibility for their mathematical development. Using a second language (L2) to communicate helps them acquire new knowledge, and sharing ideas and making comprehension evident is essential in learning mathematics. Additionally, the results of the integrative orientation study support the findings of Lamb *et al.* (2019), which suggest that integrative orientation is positively associated with more self-driven forms of extrinsic motivation; this correlation implies that students who are actively involved in discussions regarding mathematical concepts are more likely to cultivate a more profound and culturally enriched comprehension of mathematics.

Critical Thinking Skills

As presented in Table 3, the overall mean level of critical thinking skills is 3.53 (SD = .70). This score is described as high, indicating that the students have great critical thinking skills regarding mathematical problems. A student with high critical thinking skills can easily answer a mathematical problem with an accurate answer, associate two concepts in mathematics to solve a problem, and quickly determine if a mathematical statement is true or false. It implies that the students can interpret mathematical concepts in various contexts and can analyze, evaluate, and infer different challenges in mathematics.

Among the four indicators of critical thinking skills, the highest is inference, with a mean of 3.87 (SD = .71),

Table 3: Students' Level of Critical Thinking Skills

Indicators	Mean	Standard Deviation (SD)
Interpretation	3.36	.76
Analysis	3.45	.80
Evaluation	3.44	.81
Inference	3.87	.71
Overall	3.53	.70

which indicates a high level, suggesting that students are highly skilled at concluding the information that is given to them, which is a crucial aspect of reasoning and solving math problems. It shows a strong ability to look beyond easily accessible data to find deeper insights, which is crucial when solving difficult problems. In contrast, analysis has the lowest indication, with a mean of 3.45 (SD = .80); it still indicates a high level, showing a relatively good ability to dissect mathematical issues into comprehensible parts and see their relations. This average score suggests improving how students analyze and handle mathematical material to enhance their overall critical thinking capacity.

The findings of this study align with the results of Dabpil *et al.* (2025), which also indicated that students demonstrated a high level of critical thinking skills. In addition, this study adds further evidence supporting the assertions of Syamsiar *et al.* (2024) and Din (2020), who believed that students with good critical thinking skills might assess and reflect on objects rationally and deductively. It also improves learning efficiency while increasing student involvement and interest in the subject, resulting in students' academic achievements. Moreover, the quality of the student from the highest indicator supports the work of Kurshumlia and Vula (2019), therefore stressing the need for such abilities in dealing

with difficult mathematical settings and suggesting that having a high inference makes the students achieve better results in mathematical word problem-solving. On the other hand, the outcome of the lowest indicator is consistent with the results of Huincahue *et al.* (2021), who discovered that students who thrive in this area frequently grasp mathematics best when employing internal visualizations and a step-by-step method. This approach helps with immediate problem-solving and gives students the tools for lifetime learning and more advanced thinking.

Correlation Between Grit and Critical Thinking Skills
In Table 4, it is shown that the overall correlation

coefficient ($r = .806, p < .05$) signifies a strong and statistically significant relationship between the two variables. This means that when students' grit level increases, their critical thinking skills also increase—indicating that students who exhibit determination and enthusiasm in their approach also tend to show stronger problem-solving and reasoning abilities. Their ability to persist through challenges, maintain focus, and apply structured thinking appears to contribute to their capacity for deeper analysis and logical decision-making.

Consequently, the correlation between grit and critical thinking skills, with the highest correlation observed

Table 4: Correlation Matrix of Students' Grit and Critical Thinking Skills

Grit	Critical Thinking Skills				
	Interpretation	Analysis	Evaluation	Inference	Overall
Perseverance-commitment	.702* (.000)	.675* (.000)	.671* (.000)	.570* (.000)	.728* (.000)
Interest-passion	.741* (.000)	.707* (.000)	.710* (.000)	.584* (.000)	.767* (.000)
Goal-directed resilience	.557* (.000)	.560* (.000)	.577* (.000)	.612* (.000)	.636* (.000)
Overall	.758* (.000)	.734* (.000)	.740* (.000)	.660* (.000)	.806* (.000)

* $p < 0.05$

between interest-passion and interpretation ($r = .741, p < .05$), suggests that students who are passionate about mathematics are more likely to interpret mathematical problems effectively, as their enthusiasm drives them to engage deeply with concepts, seek creative solutions, and persist through challenges. On the other hand, the indicator which got the lowest correlation value is between goal-directed resilience and interpretation ($r = .557, p < .05$). Although there is still a positive correlation between the two indicators, it is the lowest observed, suggesting that simply being resilient does not necessarily lead to a strong ability to interpret mathematical information.

Numerous studies provide strong support for the current research findings, emphasizing the validity of the observed relationship. For instance, the findings of Khan *et al.* (2025) affirm the relationship between the independent and dependent variables that there is a positive correlation between grit and critical thinking, which students' interest and persistence in dealing with mathematics problems contribute to the development of critical thinking skills. In addition, the Social Cognitive Theory of Bandura (1989) supports that noncognitive factors, such as resilience, strong perseverance, and interest, can drive individuals to change their learning performance.

However, several studies also contradict the study's correlation finding. The study of Mallahi (2023) suggests a negative correlation, resulting in an inverse proportion between the two variables. Similarly, Gallardo-Estrada's

(2024) research also refutes the idea that grit and critical thinking have a relationship and argues that different elements independently influence grit and critical thinking since they do not predict one another. Hence, when individuals persist through challenges and stay engaged with math tasks, they are more likely to improve their performance and develop higher-order thinking skills.

In conclusion, grit and critical thinking have a direct and evident relationship. Particularly in challenging tasks, high levels of interest-passion among the students show better critical thinking. This connection suggests that an individual's capacity to engage in critical thinking is improved by acquiring characteristics such as resiliency and a strong desire to learn.

Relationship Between Willingness to Communicate in English and Critical Thinking Skills

Table 5 illustrates the general correlation coefficient ($r = .769, p < .05$) between students' willingness to communicate in English and critical thinking skill performance. This indicates that there is a strong correlation between students' willingness to communicate in English and the development of their critical thinking skills. Budiman *et al.* (2023) provide similar findings, claiming that allowing students to communicate in English improves their critical thinking and language proficiency.

Upon examining the relationship between the willingness to communicate in English and critical thinking skills, it was

Table 5: Correlation Matrix of Students’ Willingness to Communicate in English and Critical Thinking Skills

Willingness to Communicate in English	Critical Thinking Skills				
	Interpretation	Analysis	Evaluation	Inference	Overall
Communicative self-confidence	.512* (.000)	.488* (.000)	.488* (.000)	.440* (.000)	.539* (.000)
Integrative orientation	.536* (.000)	.555* (.000)	.568* (.000)	.431* (.000)	.581* (.000)
Situational context of L2 use	.628* (.000)	.606* (.000)	.608* (.000)	.530* (.000)	.661* (.000)
Topical enticement	.576* (.000)	.537* (.000)	.572* (.000)	.514* (.000)	.604* (.000)
Learning responsibility	.451* (.000)	.458* (.000)	.458* (.000)	.631* (.000)	.545* (.000)
Off-instruction communication	.590* (.000)	.567* (.000)	.574* (.000)	.575* (.000)	.638* (.000)
Overall	.707* (.000)	.690* (.000)	.705* (.000)	.660* (.000)	.769* (.000)

* $p < 0.05$

found that the highest correlation occurs in the situational context of L2 use, specifically with the interpretation aspect of critical thinking skills ($r = .628, p < .05$). This implies that students are more ready to communicate in English when the context is directly related to their personal experiences, which improves their capacity to comprehend information. It aligns with situated learning, which suggests that learning is most effective when it takes place in meaningful, real-world contexts (Lave & Wenger, 1991). Conversely, the lowest correlation was noted in integrative orientation with inference skills ($r = .431, p < .05$), indicating a moderate link between students’ willingness to integrate English into their inferential critical thinking skills. Students may enjoy discussing math in different cultural settings, but this does not constantly improve their ability to draw logical inferences. Being exposed to a range of languages and cultures can help one encourage participation; nevertheless, this does not continually deepen the acquisition of skills like analysis and logical thinking. Furthermore, the findings of this study are consistent with the research of Smith (2019), which highlighted a significant link between students’ willingness to communicate and their critical thinking skills. This relationship is crucial because it suggests that as students become more open to expressing themselves in English, they also develop stronger analytical and evaluative skills—key components of critical thinking. This correlation is further supported by Paul’s (1989) critical thinking theory, which suggests that critical thinking is most effective when it involves personal experiences and social interactions. Moreover, this supports the affirmations of Apat *et al.* (2023) that when students use language in practical and meaningful ways, they develop better language skills, become more engaged, and take a more active role in their learning experience. It suggests that educational strategies integrating real-world interactions and language use can

significantly improve language proficiency and critical thinking capabilities.

In summary, this reveals a clear correlation between how willing students are to communicate in English and how well they do in critical thinking tasks. It emphasizes the need to develop confidence in communication in learning environments since it enhances vital thinking capacity and linguistic skills. Boosting these skills in educational settings could provide lasting benefits to students’ academic and professional futures.

Regression Analysis of the Independent Variables on Critical Thinking Skills

The regression analysis investigates the predictive relationship between grit, willingness to communicate in English, and critical thinking skills. Based on Table 6, the model demonstrates a firm fit and reveals that the two variables explained 76.4% of the variance in critical thinking skills; however, there exists a 23.6% variance that cannot be defined by the model [$R^2 = .764, F(2,376) = 610.021, p < .001$]. Both grit and willingness to communicate in English positively predict critical thinking skills with $\beta = 0.505$ ($p < .001$) and $\beta = 0.440$ ($p < .001$), respectively. These results indicate that students with a higher level of grit and willingness to communicate in English tend to have stronger critical thinking skills, and any change in the unit of grit and desire to communicate in English has a corresponding impact on critical thinking skills by .495 and .454, respectively. In particular, grit has a slightly more substantial positive predicting effect on critical thinking skills than willingness to communicate.

The result of the analysis is supported by Mallahi’s (2023) and Smith’s (2019) conclusion, highlighting that grit and willingness to communicate significantly influence students’ critical thinking development. These findings are further reinforced by the critical thinking theory, which

Table 6: Regression Analysis of the Effects of Grit and Willingness to Communicate in English on Critical Thinking Skills

Variable	B	SE	β	t	p
Grit	.495	.035	.505	14.250	.000
Willingness to Communicate in English	.454	.037	.440	12.412	.000

Note: Constant = .147, R2 = .764, F(2,376) = 610.021, p = .000

emphasizes the importance of consistent perseverance in seeking knowledge and social interaction to cultivate a strong critical mind. Additionally, Bandura's (1989) social cognitive theory suggests that noncognitive factors play a crucial role in learning. Furthermore, learners' continuous engagement in constructing knowledge and communication changes the desired learning outcomes according to the constructivist learning theory (Hein, 1991; Piaget, 1964).

Predictive Effects of the Indicators of the Independent Variables on Critical Thinking Skills

A more thorough regression analysis was conducted, incorporating the indicators of grit and willingness

to communicate further to understand their specific contribution to critical thinking skills. Table 7 presents a good model that explains 77.1 of the variance in critical thinking, leaving 22.9% of the variance unexplained by the model [R2 = .771, F(9,369) = 138.118, p < .001]. All the indicators of grit, which are perseverance-commitment ($\beta = .144$, p = .004), interest-passion ($\beta = .258$, p < .001), and goal-directed resilience ($\beta = .153$, p < .001), are significant positive predictors inferring that students who demonstrate persistence, maintain consistent interest in their goals, and exhibit resilience in goal-directed efforts are more likely to develop more profound critical thinking skills.

Similarly, several components of willingness to communicate in English positively predict essential thinking

Table 7: Predicting Effect of Grit and Willingness to Communicate in English Indicators to Critical Thinking Skills

Variable	B	SE	β	t	p
Perseverance-commitment	.130	.045	.144	2.896	.004
Interest-passion	.204	.041	.258	5.005	.000
Goal Directed Resilience	.138	.031	.153	4.423	.000
Communicative Self-confidence	.071	.027	.084	2.610	.009
Integrative Orientation	.051	.027	.068	1.897	.059
Situational Context	.101	.031	.126	3.286	.001
Topical Enticement	.011	.030	.015	.387	.699
Learning Responsibility	.112	.029	.125	3.805	.000
Off-instruction Communication	.131	.028	.171	4.591	.000

Note: Constant = .143, R2 = .771, F(9,369) = 138.118, p = .000

skills, including communicative self- confidence ($\beta = .084$, p = .009), situational context ($\beta = .126$, p = .001), learning responsibility ($\beta = .125$, p < .001) and off- instruction communication ($\beta = .171$, p < .001), which indicate that student who is more confident, open to communicate and active classroom engagement tend to have better critical thinking. However, integrative orientation and topical enticement are indicators of willingness to communicate in English that are not significant predictors; these indicators may have less direct impact on critical thinking skills.

Notably, among the indicators of grit that are significant predictors, interest- passion best predicts critical thinking skills with an unstandardized beta coefficient B = .204 (p < .001), and the changes in interest-passion may contribute to the increase or decrease of essential skills of thinking with .204. This data shows that students increase their critical thinking skills by exhibiting consistent interest and enthusiasm in learning. On the other hand, the component of willingness to communicate that best predicts critical thinking skills is Off-instruction communication, obtaining

an unstandardized beta coefficient of B = .131 (p < .001); this predictor contributes .131 increase or decrease in critical thinking skills as it changes. This result implies that students who consistently communicate with their peers and teachers outside class discussions are more likely to develop critical thinking skills.

The outcome of the regression analysis corresponds to the findings of Apriliani *et al.* (2023) and Sari *et al.* (2022) that interest in learning has a significant positive effect on students' mathematical critical thinking skills, implying that the more the students are enthusiastic about their education, the more their essential abilities of thinking improve. It also matches the finding of Putri and Ghufroon (2019) that a poor desire to study is closely related to a lack of critical thinking abilities. Moreover, the critical thinking theory underlined the influence of off-instruction communication on fundamental thinking abilities by stressing that students acquire critical thinking skills by participating in informal conversations, including casual talks outside formal education. These exchanges challenge

preconceptions, promote introspection, and expose students to different points of view, hence improving their critical thinking skills.

CONCLUSIONS

The study aimed to investigate the three key characteristics of the students, which revealed a high level of grit, willingness to communicate in English, and critical thinking skills in mathematics. The findings show that students' grit and willingness to communicate in English positively correlate with their critical thinking skills, and regression analysis confirmed that these two noncognitive traits and their indicators significantly predict students' critical thinking abilities. Additionally, the results strongly support the above-mentioned theory, which suggests that grit and willingness to communicate in English are crucial in enhancing students' critical thinking skills. Also, these findings emphasize the importance of fostering these noncognitive skills for students' overall cognitive development. Thus, the validity of the study's hypothesis shows how crucial it is to use these traits in learning environments so that students can develop strong analytical and problem-solving abilities. Furthermore, the researchers recommend that educators use interactive learning to address different learning styles and improve their interest-passion traits, integrative orientation, and analysis among students. They should apply project-based learning to engage students in real-world problems that build critical thinking skills, and parents must provide a conducive learning environment. Schools are encouraged to create programs that promote cultural research, especially about the origins of mathematical ideas. Lastly, school administrators can support these efforts by emphasizing teachers' professional development and hosting a creative and integrated pedagogy seminar to strengthen essential skills and improve the learning environment.

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