Understanding Extraversion and Openness of Secondary Mathematics Teachers: Basis for Developing Advocacy Materials

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Abstract -This study determined the extraversion and openness of secondary math teachers in understanding personality traits. Specifically, it sought to answer questions about the lived experiences of math teachers regarding extraversion and openness in instructional events and work-related tasks, the level of these personality traits among junior high school mathematics teachers in the Daet North District, Daet, Camarines Norte, and the significant relationship between the levels of extraversion and openness among the participants. Additionally, it explored what interventions could be developed to enhance these personality traits in mathematics teachers. The study highlighted the role of adverbs in providing a deep understanding of personality traits—extraversion and openness—manifested in their instructional practices and work-related tasks. A combination of qualitative and quantitative research methods was employed, using a descriptive-correlational design. This involved oral interviews and a survey questionnaire with 21 teachers who had at least five years of experience. Oral interviews, analyzed using the Colaizzi method, revealed that extraverted teachers excelled in engaging classroom activities, while open-minded teachers demonstrated adaptability and innovation, enhancing student learning. These findings aligned with Dabrowski's Theory of Positive Disintegration and Bruner's Spiral Development Theory, suggesting that less extraverted teachers exhibit heightened openness, potentially evolving into intellectual overexcitability and adaptability. The study underscores how these traits develop alongside teaching philosophy and professional identity. To disseminate the findings of the study, advocacy materials such as the trait-modifiers booklet, a podcast, and a Facebook page were developed. Recommendations included incorporating personality assessments into teacher training, providing targeted professional development, and promoting reflective practices. By addressing the nuanced interplay of personality traits, this research contributes to enhancing mathematics education, offering solutions to cultural challenges in teaching math, and fostering an effective learning environment.

Indexed Terms- Trait-Modifier, Extraversion, Openness, Mathematics Teachers, Mixed Methods Research, Advocacy Material.

I. INTRODUCTION

Education thrives on fostering young minds, and at the heart of this process lies the teacher. Beyond delivering content, effective educators serve as mentors, motivators, and guides. Their personality traits were lexically expressed in their teaching effectiveness and the process of influencing student outcomes. Recognizing this intersection is essential for maximizing teacher potential, aligning with the goals of Philippine education reforms under Republic Act 10533.

In this complex educational landscape, teachers stand out as positive deviants characterized by those who achieve exceptional results through unconventional approaches to teaching Mathematics. As Choi, Jung, and Lee (2023) highlight, these educators transform classrooms into vibrant learning hubs despite facing the same constraints as their peers. Schmid (2018) similarly describes them as pockets of excellence that challenge norms and redefine educational possibilities. Notably, the study of Carter et. al., (2018) found that these teachers often exhibit extreme personality traits, such as heightened extraversion or

openness, which, while sometimes maladaptive yield profound benefits.

This study examines the extreme personality traits of high-performing mathematics teachers, focusing on extraversion and openness. The research employed a mixed-methods design, combining correlation analysis and phenomenology. A research-made instrument, tested for reliability, utilized adverbs to measure personality traits, a novel approach inspired by Condon, Coughlin, and Weston (2022). This innovation marks a departure from traditional lexical descriptors like adjectives, suggesting that adverbs can explain the cardinal traits that a teacher may possess. The study is anchored on the theoretical frameworks of Dabrowski's Overexcitability and Bruner's Spiral Progression which provide a deeper understanding of these traits' evolution of Mathematics teachers.

Data collection involved purposive sampling of experienced mathematics teachers to ensure reliability and control for variability. In-depth interviews were analyzed thematically to identify recurring patterns. The study found that extreme extraversion often fosters classroom engagement, while extreme openness drives adaptability and innovation. A significant negative correlation between these traits revealed that less extraverted teachers displayed heightened openness, potentially leading to intellectual overexcitability and creative teaching approaches.

The findings align with the work of Orey and Rosa (2020) on ethnomathematics and Rubio's (2016) insights on culture in mathematics education. By focusing on mathematics teachers, the study also addresses cultural contexts that influence teaching practices, extending its implications beyond pedagogy to fields like psychology and technology. As Matcovich, et. al., (2024) emphasize, language-based frameworks, such as this study's use of adverbs, are pivotal to advancements in artificial intelligence and machine learning.

Despite limited existing literature on extreme personality traits in education, this study represents a pioneering effort to understand the level of openness and extraversion of Mathematics teachers in the Daet North district. Its implications extend to teacher training, professional development, and the creation of advocacy materials, including booklets, podcasts, and online platforms that will help teachers understand and harness their personality traits for improved instructional practices.

This study aimed to determine the relationship between the level of personality traits such as extraversion and openness among selected junior high school Mathematics teachers in Daet North District, Daet, Camarines Norte, S.Y. 2023-2024 with the end view of developing an advocacy material.

Specifically, it sought to answer the following questions:

1) What are the lived experiences of Mathematics teachers on extraversion and openness along with instructional events and work-related?
2) What is the level of personality traits of junior high school Mathematics teachers in Daet North District, Daet, Camarines Norte along: (a) extraversion; and (b) openness?
3) Is there a significant relationship between the level of personality traits of the participants as to extraversion and openness?
4) What intervention can be proposed to level up the personality traits of Mathematics teachers?

II. METHOD OF RESEARCH

The terms used in this study were defined conceptually and operationally to understand the nature and scope of the research undertaking. Both related literature and studies were integrated into the research paper to shed light on the variables being explored and investigated.

This study employed an exploratory sequential mixed-method design, to explore and understand the relationship between the level of two variables: extraversion and openness, along with instructional events and work-related tasks among mathematics teachers. In addition, a phenomenological approach was used to examine the lived experiences of mathematics educators in Daet North District. It focused on individuals' personality traits such as extraversion and openness. Phenomenological

inquiry, as elucidated by Neubauer et al. (2019), seeks to grasp the essence of a phenomenon by exploring it through the lived experiences of those intimately familiar with it.

The researcher employed the Colaizzi method for data analysis to recognize recurring themes and patterns in the teachers' responses. The collected data was recorded, transcribed, and verified to ensure the accurate capture of the teachers' lived experiences regarding their personality traits. This methodological approach secures dependable and valid responses from participants through their direct engagement with the survey questionnaire.

The descriptive assessment used a correlational approach to come up with a more thorough analysis to explain the relationships between these unique personality traits. In addition, as cited in Research Methods: Planning: Validity (2019), the study emphasized the collection of data that addressed both internal and external validity, which were essential for the overall robustness of the research. Internal validity ensured that the findings accurately depicted the genuine relationship between the variables under examination, while external validity gauged the extent to which these findings could be generalized to other contexts or populations.

This study employed a small sample size approach, guided by the principles outlined in small sample size solutions. To address this limitation, various strategies were implemented to ensure the validity and reliability of the findings. The target number of respondents is 21 junior high school Mathematics teachers from all secondary schools in Daet North District.

Data gathering procedures were likewise followed by the researcher in conducting this study. The researcher-made test was developed by the researcher and was subjected to a reliability test. The interview schedule was likewise made the researcher assess the level and correlation between extraversion and openness. The statistical tool was used to determine the correlation between the openness and extraversion of Mathematics teachers in the Daet North district.

III. ANALYSIS AND INTERPRETATION OF DATA

Lived Experiences of Mathematics teachers on Extraversion and Openness along Instructional Events and Work-Related Tasks.

Table 2 and 3 presents a thematic analysis of interviews conducted with secondary mathematics teachers, focusing on their lived experiences related to extraversion and openness in instructional events and work-related tasks. The table categorizes their insights into distinct themes, providing a comprehensive understanding of their perspectives and practices.

Table 2 Thematic Analysis of Math Teachers on Instructional Events

Instructional Events	Characteristics themes	
	Extraversion	Openness
Attitudes Towards Mathematics	Assertive in Transforming Negative Perceptions of Math	Innovative and Creative in Transforming Perceptions.
	Sociable and Expressive in Influencing Attitudes	Open to New Perspectives on Math's Importance and Relevance.
	Approachable and Non Intimidating	Flexible and Inclusive in Overcoming Learning Barriers
Effective Pedagogy	Talkative and Assertive in Lesson Preparation and Delivery.	Exploratory in New Teaching Methods and Materials.
	Active in Student Engagement	Experimental with Pedagogical Approaches.

	Dynamic and Interactive in Lesson Delivery.	Engaging and Adaptable in Increasing Student Enthusiasm.
Student Motivation	Sociable and Expressive to Engage Students.	Open to New Ways of Motivating Students.
	Humorous and Enthusiastic to Motivate Students.	Adaptable to Students' Interests.
	Expressive and Sociable to Build Strong Connections.	Willing to Explore New Ideas and Approaches to keep students engaged and make learning relevant.

Table 2 presents a thematic analysis of the live experiences of mathematics teachers, focusing on extraversion and openness in relation to instructional events. The analysis highlights the importance of teachers being expressive, sociable, open-minded, and adaptable. It emphasizes continuous learning and reflective practices to enhance teaching effectiveness and student learning outcomes.

Table 3 Thematic Analysis of Math Teachers on Work-Related Tasks

Work-Related Tasks	Characteristics themes	
Themes	Extraversion	Openness
Teacher Characteristics	Expressive and Sociable	Open-Minded Adaptable
	Passionate and Enthusiastic	Continuously Learning
	Enthusiastic and Motivating	Reflective
Teacher Traits and Student Learning	Expressive and Engaging	Growth-Oriented and Adaptive
	Encouraging of Interaction	Innovative and Fresh-Thinking
	Dynamic in Creating Learning Experiences	Passionate about Lifelong Learning

Table 3 presents a thematic analysis of the live experiences of mathematics teachers, focusing on extraversion and openness in relation to work-related tasks. The analysis underscores the importance of specific characteristics in teachers that contribute to effective teaching and positive student outcomes. Key traits include being expressive, sociable, open-minded, adaptable, and committed to lifelong learning. These traits foster a dynamic and engaging learning environment that encourages student interaction and growth.

The table 4 and 5 categorizes teacher potential cardinal traits and their manifestations across five themes: Attitudes Towards Mathematics, Effective Pedagogy, Student Motivation, Teacher Characteristics, and Teacher Traits and Student Learning. It uses Adverbs of Frequency and Adverbs

of Degree to show how often and to what extent these traits are exhibited by teachers.

Table 4 Mathematics Teachers Trait-Modifier on Instructional Events

Instructional events	Characteristics	
Themes	Extreme Extraversion	Extreme Openness
Attitudes Towards Mathematics	*VERY* Assertive in Transforming Negative Perceptions of Math	*VERY* Open to New Perspectives on Math's Importance and Relevance
	ALWAYS Approachable and Non-Intimidating	*ALWAYS* Flexible and Inclusive in Overcoming Learning Barriers
Effective Pedagogy	*VERY* Talkative and Assertive in Lesson Preparation and Delivery.	VERY Engaging and Adaptable in Increasing Student Enthusiasm.
	ALWAYS Active in Student Engagement	ALWAYS Exploring New Teaching Methods and Materials.
Student Motivation	*VERY* Sociable and Expressive to Engage Students.	*VERY* Willing to Explore New Ideas and Approaches to keep students engaged and make learning relevant.
	VERY Humorous and Enthusiastic to Motivate Students.	*ALWAYS* Open to New Ways of Motivating Students.

The table revealed three interconnected themes related to mathematics teachers' instructional practices. Analysis of these practices demonstrated how the personality traits of extraversion and openness are manifested, specifically focusing on the frequency and intensity of these traits. The use of adverbs of frequency (e.g., always) and degree (e.g., very) played a crucial role in understanding this manifestation.

The findings clearly indicate that adverbs of frequency and degree act as amplifiers, significantly strengthening the expression of both extraversion and openness. This intensification directly influences how these traits appear within the instructional context. For example, teachers who were "very assertive" or "always approachable" demonstrated a heightened level of these traits in their interactions with students and in their teaching methods.

Table 5 Mathematics Teachers Trait Modifier on Work-Related Tasks

Work-Related Tasks	Characteristics themes	
Themes	Extraversion	Openness
Teacher Characteristics	*VERY* Passionate and Enthusiastic	*VERY* Open-Minded
	ALWAYS Enthusiastic and Motivating	ALWAYS Continuously Learning

Teacher Traits and Student Learning	*VERY* Expressive and Engaging	*VERY* Passionate about Lifelong Learning
	ALWAYS Dynamic in Creating Learning Experiences	*ALWAYS* Innovative and Fresh-Thinking

The table revealed 2 interconnected themes, and the level of extraversion and openness of mathematics teachers manifested in their work-related tasks, in terms of frequency and intensity of these traits. The findings highlighted the need to design a quantitative research instrument that measured personality traits to detect extreme characteristics that could significantly impact student engagement and learning.

The tables highlight the lived experiences of mathematics teachers, emphasizing how extraversion and openness were lexically manifested in teachers' instructional practices and work-related tasks, as analyzed through the lens of Gagné's Nine Events of Instruction (Gagné et al., 2005).

Extraverted teachers fostered vibrant, engaging learning environments by leveraging their enthusiasm, particularly during the "gaining attention" phase. Their social energy facilitated interactive learning strategies like group discussions, which enhanced student motivation and comprehension (Putwain et al., 2022; Kim & Pekrun, 2019). Teachers with high openness employed adaptive, innovative approaches, such as integrating technology and hands-on learning, to present content inclusively and effectively (Leuty et al., 2020; Anthony & Walshaw, 2021). These traits also aligned with key instructional events, including providing feedback and assessing performance. Extraverted teachers used praise and encouragement to energize students, while open-minded educators reflected on their methods to ensure relevance and effectiveness (Schön, 2020; Dweck, 2017). Together, these traits enabled teachers to address challenges in mathematics education, fostering motivation, retention, and real-world application of concepts. Furthermore, the research highlighted the interplay between extraversion and openness, with evidence suggesting that these traits may have evolved over time, potentially shaped by the nature of mathematics and its cultural context.

Level of Personality Traits of Junior High School Mathematics Teachers in Daet North District

The table 6 provides a detailed analysis of the levels of extraversion and openness among junior high school mathematics teachers in the Daet North District, based on their responses to specific items. The responses were evaluated using weighted means (WM) and interpreted using verbal interpretations (VI) to reflect their personality trait levels.

Table 6 Personality Traits Level of Junior High School Mathematics Teachers in Daet North District

Items	Extraversion	
	WM	VI
There are times that I feel VERY uncomfortable with one-on-one teaching.	2.33	A
There are times that I feel VERY uncomfortable expressing my thoughts in writing; like writing reflection papers in some school activities such as LAC session, INSET, and the like.	2.52	A
There are times that I feel VERY uncomfortable being away from those whom I know during training seminars, workshops, and in doing some related mathematics activities.	2.24	A
There are times that I EXTREMELY don't like talking in-depth about certain mathematics topics	1.95	D
There are times that I extremely like to work with a group during training seminars, workshops, and in doing some related mathematics activities.	2.81	A
There are times that I EXTREMELY like to show or discuss my work with others without hesitation, even if it's unfinished, such as my strategic interventions in mathematics and the like.	2.33	A

There are times that I EXTREMELY don't like to solve mathematics problems alone.	2.00	D
There are times that I REALLY tend to speak before thinking like I often respond sarcastically when students ask for clarification, even if instructions have been repeated multiple times.	2.00	D
There are times that I don't REALLY like to multi-task; like collaborating in related mathematics activities while simultaneously doing the main task as a mathematics teacher.	1.90	D
There are times that REALLY can't concentrate easily when solving a mathematics problem that is about to discuss.	2.29	A
Average WM	2.23	A

ITEMS	OPENNESS WM	VI
There are times that I am REALLY good at guessing math answers; like solving hard problems in mathematics.	2.57	A
There are times that I REALLY feel the deeper meaning of the topic in mathematics in which I can relate the topic in real life.	3.81	SA
There are times that I am SO curious about how numbers things cluster together; like I love to know how numbers be presented in diagrams.	4.00	SA
There are times that I REALLY enjoy sensing about real-life scenario that involves mathematical problem-solving.	3.81	SA
There are times that I become VERY intimate with extracurricular activities; like reading, writing, vlogging YouTube and the like.	3.57	SA
There are times that I place EXTREME value on privacy; like my personal life; weaknesses and uniqueness should not be publicly issued.	3.86	SA
There are times that I have a VERY active gut feeling; like I feel I know the answer on the given mathematics problem but I can't write it in mathematical way.	3.81	SA
There are times that I EXTREMELY enjoy having intimate discussions; like discussing a certain topic in mathematics even my students are wondering or not in-to it.	3.76	SA
There are times that I tend to be VERY good at estimating things; like I enjoy the discussion about estimating measurement from point A to point B.	3.81	SA
) There are times that I get VERY distracted by fancy math discussion, like talking with my colleagues when they are not actively in-to it.	3.62	SA
Average WM	3.66	SA

Legend:	Verbal Interpretation:
WM–Weighted Mean	3.25 – 4.00 Strongly Agree (SA)
VI–Verbal Interpretation	2.5 – 3.24 Agree (A)
n –sample size	1.75 – 2.4 Disagree (D)
	1.00 – 1.74 Strongly Disagree

The table presents the levels of personality traits among junior high school mathematics teachers in the Daet North District, focusing on extraversion and openness. The data revealed a moderate level of extraversion (WM = 2.23, nearly "Agree") and a significantly high level of openness (WM = 3.66, "Strongly Agree"). The analysis highlighted the pivotal role of adverbs such as "extremely," "very," "really," and "so" in capturing the intensity and nuances of personality traits. For extraversion, traits like discomfort with one-on-one teaching and multitasking were present but not extreme, while openness was characterized by strong intellectual curiosity, intuitive problem-solving, and enthusiasm for exploring mathematical concepts. The strategic use of adverbs revealed variations in the intensity of these traits, aligning with prior research on linguistic precision in personality assessments. These insights contributed to understanding how personality traits were lexically manifested in the teachers' instructional strategies and professional development needs.

The Correlation between Extraversion and Openness among Junior High School Mathematics Teachers in Daet North District

Table 7 presents the results of the Pearson correlation analysis between the personality traits of extraversion and openness among junior high school mathematics teachers in the Daet North District.

Table 7 Significant Relationship on Level of Personality Traits as to Extraversion and Openness

Personality Traits	r	p-value	Remarks	Decision
Extraversion VS Openness	-0.447	0.042	Significant	Failed to Reject

*. Correlation is significant at the 0.05 level (2-tailed).

The analysis reveals a statistically significant negative correlation between extraversion and openness among mathematics teachers in the Daet North District (Pearson's $r = -0.447$, $p < 0.05$). This finding suggests that higher levels of extraversion correspond with lower levels of openness, and vice versa, indicating a complex and dynamic relationship between these personality traits.

Drawing on Dabrowski's Theory of Positive Disintegration and Bruner's Spiral Development Theory, the study framed personality traits as dynamic constructs influenced by introspection, social engagement, and professional demands. Less extraverted teachers were found to exhibit heightened openness, reflecting traits such as intellectual overexcitability and adaptability to diverse learning needs. Conversely, highly extraverted teachers emphasized social engagement, potentially limiting the reflective depth necessary for openness to fully develop. Linguistic nuances in survey items, such as the use of adverbs, further illuminated the variability and intensity of personality traits. The study highlighted the evolving nature of personality traits as they were diversely and lexically manifested from teaching styles and professional development.

Advocacy Material may be proposed to level up the personality traits of Mathematics teachers

Based on the findings of the study, advocacy material may be proposed to level up the personality traits of mathematics teachers in the Daet North district. As an output of this study, advocacy material was developed which will serve as an intervention material as well not only for mathematics teachers but for other teachers as well working in the Department of Education.

The advocacy material is called Trait-Modifiers, which provides teachers with practical strategies to harness their personality strengths, fostering self-awareness and professional growth. Integration of social platforms like FB pages and podcasts was added to this advocacy material. It will promote a growth in mindset among educators.

A key insight from the study was the moderate negative correlation between extraversion and openness, suggesting that the road to a possible extreme personality trait was in the initial stages. Acknowledging potential extreme personality traits could have led to more reflective and innovative teaching. Thus, the a need for tailored professional development and personality assessments in teacher training programs.

IV. FINDINGS

The findings of this study were as follows:

1. The lived experiences of mathematics teachers highlighted that extraversion and openness were lexically manifested in teachers' instructional practices and work-related tasks, as analyzed through the lens of Gagné's Nine Events of Instruction.

Extraverted teachers fostered vibrant, engaging learning environments by leveraging their enthusiasm, particularly during the "gaining attention" phase. Their social energy facilitated interactive learning strategies like group discussions, which enhanced student motivation and comprehension. Teachers with high openness employed adaptive, innovative approaches, such as integrating technology and hands-on learning, to present content inclusively and effectively.

These traits also aligned with key instructional events, including providing feedback and assessing performance. Extraverted teachers used praise and encouragement to energize students, while open-minded educators reflected on their methods to ensure relevance and effectiveness. Together, these traits enabled teachers to address challenges in mathematics education, fostering motivation, retention, and real-world application of concepts. Furthermore, the research highlighted the interplay between extraversion and openness, with evidence suggesting that these traits may have evolved over time, potentially shaped by the nature of mathematics and its cultural context.

2. With regard to the level of personality traits of junior high school Mathematics teachers in Daet North District along Extraversion and Openness, data revealed a moderate level of extraversion (WM = 2.23, nearly "Agree") and a significantly high level of openness (WM = 3.66, "Strongly Agree"). The analysis highlighted how adverbs such as "extremely," "very," "really," and "so" in the survey items played a pivotal role in capturing the intensity and nuances of personality traits. For extraversion, traits such as discomfort with one-on-one teaching and multitasking were present but not extreme, while openness was characterized by strong intellectual curiosity, intuitive problem-solving, and enthusiasm for exploring mathematical concepts. The strategic use of adverbs revealed variations in the intensity of these traits, aligning with prior research on linguistic precision in personality assessments. These insights contributed to understanding of personality traits that were lexically manifested in the teachers' instructional strategies and professional development needs.

3. In terms of the correlation between extraversion and openness among junior high school mathematics teachers in the Daet North District, a statistically significant negative correlation was revealed (Pearson's $r = -0.447$, $p < 0.05$). The findings suggested that higher levels of extraversion corresponded with lower levels of openness, and vice versa, indicating a complex relationship between these traits.

Drawing on Dabrowski's Theory of Positive Disintegration and Bruner's Spiral Development Theory, the study framed personality traits as dynamic constructs influenced by introspection, social engagement, and professional demands. Less extraverted teachers were found to exhibit heightened openness, reflecting traits such as intellectual overexcitability and adaptability to diverse learning needs. Conversely, highly extraverted teachers emphasized social engagement, potentially limiting the reflective depth necessary for openness to fully develop. Linguistic nuances in survey items, such as the use of adverbs, further illuminated the variability and intensity of personality traits. The study highlighted the evolving nature of personality traits as they were diversely and lexically sedimented from teaching styles and professional development.

4. In terms of advocacy materials, as interventions, it was grounded by the findings of this study. This study explored the relationship between personality traits, specifically extraversion and openness, and teaching practices among junior high school mathematics teachers in Daet North District.

The research highlighted how these trait-modifiers or adverbs could tokenize the process of instructional methodology, with extraverted teachers creating dynamic, engaging classrooms and those with high openness using innovative, flexible approaches to enhance learning. These findings were analyzed through the lens of Gagné's Nine Events of Instruction, which revealed how teachers' personality traits were sedimented from their classroom behavior and teaching effectiveness.

The study led to the development of an advocacy material, Trait-Modifiers, which provided teachers with practical strategies to harness their personality strengths, fostering self-awareness and professional growth. Additionally, the study made use of social media platforms like podcasts and Facebook to further disseminate these resources and promote a growth mindset among educators.A key insight from the study was the moderate negative correlation between extraversion and openness, suggesting that the road to a possible extreme personality trait was in the initial stages. Acknowledging potential extreme personality

traits could have led to more reflective and innovative teaching. These findings also emphasized the need for tailored professional development and personality assessments in teacher training programs.

Integration of Qualitative and Quantitative Findings

The integration of quantitative and qualitative data from this study revealed several significant patterns regarding the lexical nature of mathematics teachers' personality traits along their instructional practices. These findings reflected both alignment and contrast across the dimensions of extraversion and openness, intertwined with the teachers' professional experiences and approaches.

The convergence of these lexical (adjectives and adverbs) data highlighted how teachers' high levels of openness were aligned with their emphasis on innovative and engaging teaching methods. The qualitative data consistently demonstrated lexical extracts from real-life scenarios, collaborative learning, and diverse instructional strategies. For example, multiple respondents mentioned the importance of "using a diverse teaching strategy, such as hands-on activities," and Respondent A emphasized "incorporating technology into math instruction." These themes aligned closely with the quantitative findings, where openness items such as "I enjoy sensing about real-life scenarios that involve mathematical problem-solving" (WM = 3.81, Strongly Agree) and "I am curious about how numbers cluster together" (WM = 4.00, Strongly Agree) received high scores. Together, these findings demonstrated that fostering innovative teaching practices and a willingness to explore new approaches uncovered the lexical underpinning of openness.

Conversely, there was lexical divergence emerged between the generally low extraversion levels and qualitative evidence of social engagement in specific contexts. While the average extraversion score was low (WM = 2.23, Nearly Agree), indicating limited comfort with highly interactive or group-oriented settings, some qualitative responses revealed a lexical underpinning for extraversion. For example, Respondent B noted that "emotional intelligence is crucial for effective teaching," and multiple respondents emphasized the importance of "building rapport with students and creating a supportive learning environment." Additionally, the quantitative item "I like to work with a group during training seminar" (WM = 2.81, Agree) further reflected that extraversion could manifest positively in specific professional contexts despite an overall preference for small group collaboration.

Further, through analyzing the convergence and divergence of qualitative and quantitative findings, the lexical expressions of openness along professional development and multitasking challenges became apparent. Teachers' qualitative emphasis on ongoing professional development, as articulated by Respondent A ("Teachers need ongoing professional development"), aligned with their high openness scores. Items such as "I feel the deeper meaning of the topic in mathematics in which I can relate the topic in real life" (WM = 3.81, Strongly Agree) and "I enjoy having intimate discussions about mathematics" (WM = 3.76, Strongly Agree) further demonstrated their enthusiasm for intellectual growth and innovative teaching that lexically expressed high openness. However, challenges in multitasking, evident in the low score for "I don't really like to multi-task" (WM = 1.90, Disagree), indicated that balancing professional development with other responsibilities may have been a struggle. These findings highlighted the potential tension between a teacher's willingness to innovate and the systemic constraints of their work environment that also demonstrated a lexical expression of high openness.

In conclusion, the integration of qualitative and quantitative data provided a liminal understanding of the interplay of the lexical expressions of personality traits along instructional practices and other significant educational events. Again, the ability of the teachers to adopt innovative methods and connect mathematics to real-life contexts effectively highlighted the lexical expression of high openness levels. However, the findings that many teachers preferred individual or small-group settings, though exceptions existed where unique social engagement played a vital role, suggested a lexical expression of low extraversion scores. These various lexical expressions, like the teachers' value for professional

development and intellectual curiosity, and the challenges they faced with multitasking and managing multiple demands, suggested a need for targeted support in personality development programs, emphasizing personality-based strategies for integrating innovation into the classroom without overburdening the teachers. Ultimately, this study really underscored the importance of understanding teachers' personality traits, particularly in detecting potential extreme personality traits through the use of trait modifiers or adverbs.

IV. PEER-REVIEWED

During the peer review conducted by the panel members, several suggestions and recommendations were provided to improve the manuscript. On the title page, the school year and "Daet North" should be removed. The manuscript must strictly adhere to the format set by the graduate school. In the Acknowledgements section, the Dean of the graduate school should be included. Additionally, in the Abstract, theories should be removed from the list of keywords, and adverb modifiers should be replaced with trait-based modifiers. The "Statement of the Problem" should be spelled out instead of using the abbreviation "SOP."

Further refinements include highlighting the entries from the title page to the list of figures in the Table of Contents and ensuring that chapter subtitles follow appropriate academic terminology, such as changing "Methods of Research" to "Research Methodologies." In the Appendices, the confidentiality agreement should be removed, and the List of Tables and Figures should be formatted using sentence case. The manuscript must also be completed in its entirety, with a more comprehensive discussion of the results.

Moreover, the discussion of findings should follow a structured approach, presenting results from the highest to the lowest level while providing thorough interpretations and discussing their implications with references to relevant literature. Finally, NVivo software should be used for analyzing the qualitative results of the study. These revisions will enhance the clarity, coherence, and academic rigor of the manuscript.

V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents the summary of the study, the Integration of findings, its conclusions, and recommendations. The research titled 'Understanding Extraversion and Openness of Secondary Math Teachers in Daet North District, Daet, Camarines Norte: Basis for Developing Advocacy Materials,' provides the foundation for these discussions.

This paper delved into understanding personality using "trait-modifiers," particularly focusing on extraversion and openness as a basis for developing advocacy materials. Additionally, the lived experiences of mathematics teachers regarding these personality traits along instructional events and work-related tasks were examined to further support the creation of effective advocacy materials. Out of the twenty-six teachers from the three schools in the district, twenty-one participated in the study. These respondents and participants were purposively selected based on the criteria of having at least five years of service and teaching mathematics. The study employed a Descriptive-Correlation Method with a phenomenological approach. The researcher administered a custom-made survey questionnaire, presented on a 4-point Likert scale, which consisted of two parts: the first part assessed the level of extraversion, and the second part evaluated the level of openness among mathematics teachers. Additionally, a custom-made oral interview questionnaire was used to gather the teachers' lived experiences of personality traits and the challenges they faced in teaching the subject. Each instrument was validated by a psychometrician, a guidance counselor, and selected master teachers.

The researcher conducted oral interviews with ten participants, focusing on the teachers' personality traits and the challenges they experienced in teaching mathematics. Using the Colaizzi method for data analysis, themes, and common patterns were identified from the teachers' responses. The collected data were recorded, transcribed, and validated to accurately capture the teachers' firsthand experiences.

Significant statements were extracted and meanings were formulated, leading to the development of themes from the respondents' answers. This method allowed for a deeper understanding of how mathematics teachers experienced and interpreted personality traits within an educational context.

A trait-modifier booklet, a podcast titled Cardinal Trait: Journey to Self-Discovery,' and a Facebook page were developed as interventions.

CONCLUSION

Based on the findings of this study the following conclusions were derived:

1. Based on the foregoing findings, it can be concluded that extraverted teachers excelled in creating engaging and interactive classrooms, fostering motivation and active participation, while open-minded teachers brought adaptability and innovation to their teaching strategies, addressing diverse student needs. These instructional events that were expressed lexically supported effective pedagogy that also drove student success by enhancing retention and fostering the practical application of mathematical knowledge, thus acknowledging the sedimentation of those personality traits.

The findings also emphasized that these traits were not static but dynamic, highlighting the potential for targeted interventions to nurture these characteristics further. This adaptability was essential for addressing persistent cultural challenges in mathematics education and aligning teaching practices with evolving student needs.

2. In terms of determining the level of extraversion and openness among junior high school mathematics teachers in the Daet North District, teachers' extraversion levels suggested social engagement and comfort in interactive settings, though some reservations existed regarding certain tasks like one-on-one teaching. Conversely, the high openness levels reflected strong intellectual curiosity, creativity, and an ability to connect mathematical concepts to broader contexts. The use of adverbs in survey items enhanced the detection and emphasis of these traits, providing a nuanced understanding of teachers' self-perceptions. These traits aligned with the evolving demands of mathematics education, emphasizing adaptability and innovative instructional approaches.

3. In terms of correlation, the negative correlation between extraversion and openness among junior high school mathematics teachers underscored the dynamic and context-dependent nature of personality traits. Cultural and contextual factors, such as the analytical nature of mathematics and regional norms, may have further shaped these traits. This study challenged traditional assumptions about the fixed nature of personality traits in educators and emphasized the need for tailored approaches to professional development.

4. In terms of developing advocacy materials, the study came up with advocacy materials including the Trait-Modifiers booklet integrating the social media platform like FB page and cardinal trait podcast. It served as a valuable resource for educators, offering practical strategies to cultivate self-awareness and improve their teaching approaches.

RECOMMENDATIONS

With the findings and conclusions given, the following were the recommendations:

1. Concerning the lived experiences of mathematics teachers on extraversion and openness along instructional events and work-related aspects, teacher training programs should incorporate personality assessments to help educators understand their traits and how these influence instructional strategies. Tailored training modules should be developed to leverage these traits. For instance, training can focus on harnessing extraversion to create active learning environments and utilizing openness to adopt innovative teaching methods. Additionally, schools should promote reflective practices among teachers, enabling them to evaluate and refine their methods based on feedback and classroom observations.

2. On the level of personality traits of junior high school mathematics teachers in Daet North District, there is a need for customized training modules

focused on leveraging openness through workshops on collaborative learning techniques, innovative teaching methods, and technology integration. Reflective practices should be promoted in schools, encouraging teachers to analyze and refine their instructional methods based on self-assessments and student feedback. Research and interventions should aim to challenge traditional teaching beliefs while fostering environments that emphasize creativity, curiosity, and adaptability.

3. In terms of the relationship between extraversion and openness, professional development modules should focus on cultivating openness by integrating workshops on innovative teaching methods, collaborative learning techniques, and technology adoption.
Future studies should also investigate whether less extroverted individuals are naturally drawn to mathematics due to its analytical demands or whether sociable teachers compensate for lower openness by engaging in external learning.

4. In terms of advocacy materials highlighting the potential of "trait-modifiers" and their application in education, it is recommended that the advocacy materials should be adopted by other schools in the district during Learning Action Cell (LAC) to provide teachers with personalized strategies for developing and applying these traits in their practice.

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REFERENCES

[1] Aarts, K. (2007) Parsimonious Methodology. Methodological Innovations Online (2007) 2(1) 2-10 [2] [2] Ablog, A.P. & Avila, E.C. (2020). Path Model on Facebook Usage, Personality and Mathematics Performance of Students: Basis in Learning Material Development. UNP Research Journal, Vol. XXIX

[2] Aldevera, A.D. & Alenton, L. B. & Gantuangco, P.R.(2019) Lived Experiences of the Senior High School Teachers. Presented at the 12th DLSU Arts Congress De La Salle University, Manila, Philippines

[3] Anthony, G., & Walshaw, M. (2021). Characteristics of effective teaching of mathematics: A view from the West. Journal of Educational Research and Development, 4(3), 45-67.

[4] Bandura, A. (1986). Social Foundations of Thought and Action: A Social Cognitive Theory. Englewood Cliffs, NJ: Prentice-Hall.

[5] Bartolome, D.J.P. (2023) Spiral progression approach in teaching Mathematics: Its implementation in the public secondary school.QUANTUM JOURNAL OF SOCIAL SCIENCES AND HUMANITIES 4(3): 81-100. eISSN: 2716-6481 Benitez, J. (2022). In defense of Filipino values and norms: Debunking the ambivalence theory. HCMCOUJS-Social Sciences, 12(1), 130-143 Bruner, J. S. (1977). The process of education. Harvard University Press.

[6] Bujang, M. A., & Baharum, N. (2016). Sample size Guideline for correlation analysis. World Journal of Social Science Research, 3(1), 37. https://doi.org/10.22158/wjssr.v3n1p37

[7] Caron, G. & Srivastava, S. (2022) Identifying and Manipulating the Personality Traits of Language Models.

[8] Carter, N. T. & Miller, J. D. (2018). Extreme Personalities at Work and in Life. Current Directions in Psychological Science.

[9] Chen, Y., Wei, J., & Li, X. (2020). The role of linguistic markers in self-reported personality assessments. Journal of Educational Psychology, 112(4),567– 579. https://doi.org/10.1037/ edu0000419

[10] Choi, H. Jung, I. & Lee, Y. (2023). The power of positive deviance behaviours: From panic-gogy to effective pedagogy in online teaching education and Information Technologies (2023) 28:12651–12669https://doi.org/10.1007/s10639-023-11696-7

[11] Chuhran, K. B. (2020). "Effective Introvert Teachers: A Phenomenological Study of Their Lived Experiences". Ed.D. Dissertations. 444. https://commons.cuportland.edu/edudissertations/444

[12] Church, A., & Katigbak, M. S. (2002). Studying Personality Traits Across Cultures: Philippine Examples. Online Readings in Psychology and Culture, Unit 4. Retrieved from http://scholarworks.gvsu.edu/orpc/vol4/iss4/2

[13] Condon, D. M., Coughlin, J., & Weston, S. J. (2022). Personality Trait Descriptors: 2,818 Trait Descriptive Adjectives Characterized by Familiarity, Frequency of Use, and Prior Use in Psycholexical Research. Journal of Open Psychology Data, 10: 1, pp. 1–9. DOI: https://doi. org/10.5334/jopd.57

[14] Costa, P. T., & McCrae, R. R. (1992). Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI): Professional Manual. Dabrowski, K. (2018). Personality-shaping through positive disintegration. Red Press Publishing.

[15] Deci, E. L., & Ryan, R. M. (1985). Intrinsic Motivation and Self-Determination in Human Behavior. New York: Springer.

[16] Differences, 92, 1- 10. https://www.researchgate.net/ publication/286639562 Big_Five_personality_group_ differences_across_academic_majors_A_systematic_review

[17] Dugan, K. (2024) Everyday Life Experiences Change Our Personalities in Cumulative Ways. Journal of Personality, 92(1), 130-146. https://doi.org/10.1111/jopy.12837

[18] Dweck, C. S. (2017). Mindset: The new psychology of success. Random House.

[19] Ergen, Y. & Durmuş, M. E. (2021). The experiences of classroom teachers on the homework process in teaching mathematics: An interpretative phenomenological analysis. Journal of Pedagogical Research, 5(1), 293-314. http://dx.doi.org/10.33902/JPR.2021167935

[20] Fauth, B., Decristan, J., & Klieme, E. (2019). The role of teacher competence in fostering student engagement and learning outcomes. Educational Researcher, 48(2), 109-120.

[21] Frothingham, M. (2024) Cardinal Traits of Personality. Simply Psychology Gagné, R. M., Wager, W. W., Golas, K. C., & Keller, J. M. (2005). Principles of instructional design. Cengage Learning.

[22] Goldberg LR. A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. Mervielde I, Deary I, De Fruyt F, Ostendorf F, eds. Personality psychology in Europe, vol. 7. Tilburg: Tilburg University Press; 1999. pp. 7-28. [Google Scholar]

[23] Gomez, R. Q. & Chavez, N. A (2020). Personality Types and Teaching Styles Among Social Science Teachers at the University of Bohol, Tagbilaran City. ACADEME University of Bohol, Graduate School and Professional Studies Journal Print ISSN 2362- 9142 DOI://dx.doi.org/10.15631/aubgsps.v16i1.150

[24] Hao, L. et al (2023) A Phenomenological Analysis of Mathematics Teachers' Experiences of Transitioning to Fully Online Teaching: A Case of Three Filipino Teachers. Intersection 2023 Vol 16 (1) https://www.researchgate.net/publication/ 374167491

[25] Hattie, J., & Timperley, H. (2017). The power of feedback. Review of Educational Research, 77(1), 81-112.

[26] Ibad, F. (2018). Personality and Ability Traits of Teachers: Student Perceptions. Journal of Education and Educational Development.

[27] Jayawickreme, E. & Fleeson, W. & Beck, E. D. & Baumert, A. & Adler, J. M. (2012).

Personality Dynamics. Personality Science, 2021, Vol. 2, Article e6179, https://doi.org/10.5964/ps.6179

[28] Jobirovna, A. J. (2023). Effective Classroom Management: Strategies for Teachers. American Journal of Language, Literacy and Learning in STEM Education (2993-2769), 1(10), 444-450.

[29] Kapur, R. (2021). Understanding the Dimensions of Personality

[30] Kim, L. E. & Jörg, V. & Klassen, R. M. (2019). A Meta-Analysis of the Effects of Teacher Personality on Teacher Effectiveness and Burnout. Educational Psychology Review 31:163-195 https:/doi.org/10.1007/s10648-018-9458-2

[31] Kim, S., & Pekrun, R. (2019). Effects of teachers' emotions and personality traits on student motivation and learning. Educational Psychology Review, 31(2), 213-230.

[32] Kim, L. E., & Pekrun, R. (2019). Teacher emotion and its effects on teaching and learning. Contemporary Educational Psychology, 58, 1-9.

[33] Leuty, M. E., Hansen, J.-I. C., & Weber, K. (2020). Openness to experience and its role in creativity in the classroom. Journal of Educational Psychology, 112(3), 412-425

[34] Leuty, M. E., Hansen, J.-I., & Thomason, S. (2020). Openness to experience as a predictor of innovative teaching practices. Teaching and Teacher Education, 96, 103194.

[35] McAdams, D. P. & Manczak, E. (2011) 'What Is a "Level" of Personality?',

[36] Psychological Inquiry, 22:1,40—44 DOI:10.1080/ 1047840X.2011.544026 URL:http://dx.doi.org/10. 1080/ 1047840X.2011. 544026

[37] McCrae, R. R., & Costa, P. T. (1992). Revised NEO personality inventory (NEOPI-R) and NEO five-factor inventory (NEO-FFI) professional manual. *Odessa, FL: Psychological Assessment Resources*.

[38] Maltby (2023). The Trait Approach to Personality

[39] Martin, G. (2019). Level of Technology Implementation and the Personality Traits of Adventist School Principals. Walden Dissertations and Doctoral Studies Collection

[40] Matcovich, B. Gena, C. & Vernero, F. (2024) How personality and memory of a robot can influence user modeling in Human-Robot Interaction

[41] Mendaglio, S. (2022). Overexcitability Research: Implications for the Theory of Positive Disintegration and the Field of Gifted Education. SENG Journal: Exploring the Psychology of Giftedness, 1(2), 23-32.

[42] Morales M. H. (2017). Defining Diskarte: Exploring Cognitive Processes, Personality Traits, and Social Constraints in Creative Problem-Solving. PHILIPPINE JOURNAL OF PSYCHOLOGY Vol. 50 No. 2

[43] Neubauer, B. E., Witkop, C. T., & Varpio, L. (2019). How phenomenology can help us learn from the experiences of others. Perspectives on medical education, 8, 90-97.

[44] Nob, J. & Tañola, M. (2024). Ang Magturo ay Di Biro": A HERMENEUTIC PHENOMENOLOGICAL STUDY ON THE LIVED-EXPERIENCES OF MATH EDUCATORS IN OUT-OF-FIELD TEACHING. EPRA International Journal of Research and Development (IJRD) Volume: 9 | Issue: 2 | February 2024

[45] Odessa, FL: Psychological Assessment Resources.

[46] Orey, D. C., & Rosa, M. (2020). Connecting ethnomathematics to the concept of positive deviance. Journal of Transformative

[47] Praxis, 1(1), 25-35. Park, H., Kim, S., & Choi, Y. (2022). Exploring the impact of language on personality assessment: The case of adverbs in survey design. International Journal of Social Psychology, 18(2), 234–247. https://doi.org/10.1080/14616734.2022.1234567

[48] Patino, C. & Ferreira, J.C. (2018). Inclusion and exclusion criteria in research studies: definitions and why they matter. CONTINUING EDUCATION: SCIENTIFIC METHODOLOGY. http://dx.doi.org/10.1590/S180375620180000000088

[49] Pennebaker, J. W., Mehl, M. R., & Niederhoffer, K. G. (2003). Psychological aspects of natural language use: Our words, our selves. Annual Review of Psychology, 54(1), 547-577.

[50] Pfund, G. N. (2023). Applying an Allportian trait perspective to a sense of purpose. Journal of Happiness Studies, 24(4), 1625-1642.

[51] Putwain, D. W., Symes, W., & Wilkinson, H. (2022). Extraversion and academic performance: The mediating role of classroom engagement. Personality and Individual Differences, 185, 111273.

[52] Putwain, D. W., et al. (2022). Teachers' personality and student engagement: Evidence from secondary mathematics. Psychology of Education Review, 46(2), 65-89.

[53] Ravago, I.Y. & Villanueva, H.D. (2024). Exploring the Experiences of Teachers in Delivering Education amid the Pandemic: A Phenomenological Study. International Journal of Social Science and Human Research ISSN (print): 2644-0679, ISSN (online): 2644-0695 Volume 07 Issue 01 January 2024 DOI: 10.47191/ijsshr/v7-i01-60, Impact factor- 6.686 Page No: 467-475

[54] Richey, R. C., & Klein, J. D. (2005). Developmental research methods: Creating knowledge from instructional design and development practice. *Journal of Computing in Higher Education*, *16*(2), 23-38.

[55] Rubio, J. (2016). The Ethnomathematics of the Kabihug Tribe in Jose Panganiban, Camarines Norte, Philippines Malaysian Journal of Mathematical Sciences 10(S) August: 211–231 (2016) Special Issue: The 7th International Conference on Research and Education in Mathematics (ICREM7) Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55(1), 68-78.

[56] Sandlin, C. (2019). "Teacher Personality and Student Engagement: A Case Study" Digital Commons @ ACU, Electronic Theses and Dissertations. Paper 155.

[57] Schmid, R. (2018) Pockets of Excellence: Teacher Beliefs and Behaviors That Lead to High Student Achievement at Low Achieving Schools.

[58] Schön, D. A. (2020). The reflective practitioner: How professionals think in action. Routledge.journals.sagepub.com/home/sgo 1–10.

[59] Shikha Goyal Pretty Bhalla (2020) A Review Study of the Effects of Personality Traits on Destructive and Constructive Deviance. IGI Global. DOI: 10.4018/978-1-5225-9996-8.ch010

[60] Shirazi, F., & Heidari, S. (2019). The relationship between critical thinking skills and learning styles of students. Journal of Advances in Medical Education & Professionalism, 7(3), 109–113.

[61] Schoot, R. & Miočevic, M. (2020) SMALL SAMPLE SIZE SOLUTIONS A Guide for Applied Researchers and Practitioners. The European Association of Methodology (EAM)

[62] Slavin, R. E. (2020). Educational psychology: Theory and practice. Pearson.

[63] Smith, R., & Johnson, T. (2023). Enhancing self-perception analysis through linguistic modifiers. Educational Research Review, 40, 100-123. https://doi.org/10.1016/j.edurev.2023.100121

[64] Sun, Q., Wang, Y., & Jiang, H. (2020). Linking teacher personality to instructional quality: Exploring the mediating roles of motivation and teaching strategies. Teaching and Teacher Education, 91, 103064. https://doi.org/10.1016/j.tate.2020.103064

[65] Tamban, V.E. & Banasihan, G.L. (2017). "BIG FIVE PERSONALITY TRAITS AND TEACHING PERFORMANCE OF FACULTY OF COLLEGE OF TEACHER EDUCATION, LAGUNA STATE POLYTECHNIC UNIVERSITY." International Journal of Research - Granthaalayah, 5(9), 99-105. https://doi.org/10.5281/zenodo.999273.

[66] Taylor, L., & Brown, P. (2021). Linguistic nuance in educational surveys: The effect of modifiers on response patterns. Journal of Research in Education, 31(2), 12–25. https://doi.org/10.1017/jre.2021.001

[67] Trayco, K.B. & Esona, N.S. (2022). LIVED EXPERIENCES OF TEACHERS IN TEACHING CONTEXTUALIZED MATHEMATICS DURING THE NEW NORMAL EDUCATION. Globus An International Journal of Management & IT A Refereed Research Journal Vol 14/ No 1/ Jul-Dec 2022 P-ISSN: 0975-721X, E-ISSN: 2582-6689

[68] Tighe, E. & Cheng, C. K. (2018). Modeling Personality Traits of Filipino Twitter Users. Proceedings of the Second Workshop on Computational Modeling of People's Opinions, Personality, and Emotions in Social Media, pages 112–122

[69] Vangrieken, K., Meredith, C., Packer, T., & Kyndt, E. (2017). Teacher communities as a context for professional development: A systematic review. Teaching and Teacher Education, 61, 47-59.

[70] Zhang, H.; Zhao, H. How Is Virtuous Personality Trait Related to Online Deviant Behavior among Adolescent College Students in the Internet Environment? A Moderated-Mediation Analysis. Int. J. Environ. Res. Public Health 2022, 19, 9528. https://doi.org/10.3390/ijerph19159528

[71] Zhou, L., Xu, P., & Wang, Z. (2021). Teacher traits and student performance: Insights from linguistic analyses. Contemporary Educational Psychology, 66, 101–121.https://doi.org/10.1016/j.cedpsych.2021.101979

[72] Zhu, C., Wang, D., Cai, Y., & Engels, N. (2019). What core competencies are related to teachers' innovative teaching? Asia Pacific Journal of Education, 39(1), 1-14.