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Preparedness of Filipino Math Teachers for Generation Alpha: Development and Validation of a Readiness Scale

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Abstract This study aimed to develop and validate a readiness scale designed to assess the preparedness of Filipino mathematics teachers to teach Generation Alpha students, employing a mixed-method exploratory sequential design. The qualitative phase utilized a descriptive phenomenological approach to explore Generation Alpha students' perceptions of effective mathematics instruction. This exploration revealed three key themes: Positive and Supportive Teacher-Student Relationship, Student-Centered Learning through Games and Innovative Integration of Modern Technology, and Supportive and Non-Competitive Blended Learning Environment. Students emphasized the importance of teachers being empathetic, approachable, and engaging while integrating advanced technologies and fostering a supportive, non-competitive classroom. A 46-item readiness scale was developed based on these qualitative findings. The scale underwent expert review, pre-testing, and validation through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA, conducted on 250 responses, confirmed sample adequacy (KMO = 0.900, Bartlett's test: $p < 0.05$) and identified a two-factor structure explaining 52.0% of the variance. The scale was refined to 31 items, with Factor 1, "Compassionate Learning Environment" (22 items), and Factor 2, "Engaging and Advanced Technology-Driven Teaching" (9 items). CFA, conducted on an independent sample ($N = 202$), validated the structure, yielding strong fit indices (SRMR = 0.055, CFI = 0.976, RMSEA = 0.018, $\chi^2(461) = 433$, $p = 0.173$). The validated scale provides a reliable tool for assessing Filipino mathematics teachers' readiness for Generation Alpha students, highlighting the need for compassionate, engaging, and advanced technology-driven teaching approaches.

Keywords: *Confirmatory factor analysis, exploratory factor analysis, Filipino mathematics teachers, Generation Alpha, readiness scale*

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1. Introduction

The rapid advancement of technology, evolving student needs, and the emphasis on 21st-century skills are transforming education. Teachers must continuously adapt to meet the expectations of Generation Alpha, born from 2010 onward, who are highly skilled in using digital tools [1], prefer interactive learning, and seek instant access to information [2]. These traits present both challenges and opportunities, particularly in mathematics education.

In the Philippines, mathematics is a core subject aimed at developing students' analytical and problem-solving skills [3]. However, the readiness of math teachers to engage Generation Alpha remains largely unexplored. Many educators report difficulties in teaching this generation, citing issues such as short attention spans [4], low social skills [5], and over-reliance on digital information [6]. Addressing these challenges requires proactive planning rather than reactive measures [7].

This study aimed to develop and validate a scale to assess the readiness of Filipino math teachers to teach Generation Alpha. Just as students' preparedness is evaluated before new lessons, teachers must also assess their ability to effectively engage this generation. The scale is based on students' perspectives on effective teaching, including teacher personal qualities, teaching methodologies, and the learning environment. Aligning teaching strategies with students' values can enhance learning outcomes and improve engagement [8].

1.1. Characteristics of Generation Alpha

Generation Alpha, born in 2010 and beyond, is the most digitally connected generation in history. Growing up with technology as a constant part of their lives, they use it for learning, communication, and entertainment [9]. Their early years saw the rise of platforms like Instagram and the iPad, which have influenced their development [1]. The COVID-19 pandemic further highlighted their reliance on digital tools for education and social interaction [10].

Often called "screenagers" or "digital natives,"

Generation Alpha quickly adapts to new technology and shows strong curiosity and creativity [11,12]. They are also entrepreneurial, active on social media, and prefer online shopping—habits shaped by their Generation X and Y parents [13]. However, their frequent use of gadgets raises concerns about reduced physical activity, social isolation, and dependence on digital validation [14]. Traits such as impulsiveness, risk-taking, and the need for recognition highlight the importance of parental guidance [15].

Despite their creativity and confidence, Generation Alpha is sometimes seen as impatient, self-focused, and in need of instant results. Some studies suggest they lack qualities such as loyalty, compassion, and responsibility [16,17]. They also tend to share personal information more freely and challenge traditional social norms [18]. According to McCrindle [2], they are practical yet materialistic, often preferring efficiency over effort and struggling with attention spans.

In summary, while Generation Alpha is highly skilled with technology and confident in their abilities, their dependence on digital tools and individualistic mindset present challenges. Understanding their behaviors and values is essential to helping them develop into well-rounded individuals in a digital world.

1.2. Educational Opportunities and Challenges

Generation Alpha's education is shaped by rapid technological advancements, presenting both opportunities and challenges. Raised by Millennial parents, they possess strong tech skills, an entrepreneurial mindset, and a drive to create their own career paths [7]. They are expected to move away from traditional norms and achieve record-high university graduation rates [2].

Schools are adapting by integrating online education, advanced learning management systems, and global research collaborations, aligning with Generation Alpha's interactive and accessible learning preferences [19,20]. However, challenges persist, including teachers' digital skills, resistance to new teaching methods, and slow institutional adaptation [7].

This generation is preparing for careers in emerging fields such as big data, robotics, and cybersecurity, requiring continuous upskilling and adaptability [21]. Universities play a crucial role in equipping them with the necessary skills to navigate a technology-driven future.

Despite their technological strengths, Generation Alpha faces social and behavioral challenges. Teachers report difficulties in engaging them, with concerns over short attention spans, lack of discipline, and social isolation [15,22]. Some educators even describe them as difficult to teach, leading to frustration and attrition [23,24].

Given these complexities, further research is essential to understand their educational needs. While technology offers immense potential, education systems must balance digital integration with strategies to address social and behavioral issues. With the right approach, Generation Alpha can thrive and make meaningful contributions in an evolving world.

1.3. Preparing Mathematics Teachers for Generation Alpha

Generation Alpha's deep engagement with technology is shaping their learning preferences, making AI integration a key focus for modern mathematics classrooms [1]. Researchers emphasize the role of robotics [25], gamification [26], AI-supported teaching, and virtual reality [27] in enhancing students' critical thinking and problem-solving skills. However, challenges such as infrastructure limitations [28], data privacy concerns [29], and ethical considerations [9] must be addressed.

In the Philippines, digital literacy is hindered by limited technology access, weak internet infrastructure, and misinformation. Many students rely solely on smartphones for online learning, further complicating their educational experience [30]. Additionally, the country struggles with widespread disinformation, which affects the effective preparation of teachers for Generation Alpha [31].

Despite these obstacles, progress is evident. The Philippine government is gradually integrating AI into education through initiatives like the National AI Roadmap and university collaborations [32]. Some institutions are adopting smart campus technologies, improving operational efficiency and personalized learning environments [33]. These efforts align well with Generation Alpha's learning needs.

Beyond technology, addressing behavioral and social challenges is equally vital. Teachers must create a supportive learning environment, promote emotional intelligence, and establish clear behavioral expectations [34]. Since many students come from cognition-poor homes, teachers play a crucial role in helping them develop communication and emotional management skills [6].

Despite Generation Alpha's rising influence, research on math teachers' readiness remains scarce. No existing scale evaluates their preparedness to teach this digital-native generation. This study aims to fill this gap by developing and validating a scale to assess the readiness of Filipino mathematics teachers, ensuring they are equipped to navigate the challenges of teaching Generation Alpha.

1.4. Research Questions

This study sought to address the following questions:

1. What key themes emerge from the perceptions of Generation Alpha students regarding the most effective mathematics instruction, focusing on teacher personal qualities, teaching methodologies, and the learning environment?
2. What teacher readiness scale can be developed based on the emerging indicators?
3. Does the newly developed readiness scale demonstrate acceptable reliability and validity?

By delving into these questions, the study aims to contribute to the development of a validated assessment tool that can help measure and enhance the readiness of mathematics teachers in effectively teaching Generation Alpha students.

2. Method

2.1 Research Design

This study used an exploratory sequential design, a mixed-method approach that begins with qualitative data collection and analysis, followed by quantitative data collection and analysis [35]. In the qualitative phase, in-depth interviews with Generation Alpha students were conducted to explore their perceptions of effective mathematics instruction, focusing on teacher personal qualities, teaching methods, and the learning environment. The qualitative data were analyzed using a phenomenological approach, which seeks to understand experiences from the participants' perspectives.

Based on the qualitative findings, a measurement scale was developed to assess teachers' readiness to teach Generation Alpha. The scale was then tested through quantitative methods, including Item Analysis, Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA), to validate the scale and ensure its accuracy in assessing the necessary factors for teacher preparedness.

2.2. Development Phase

The development phase of this study focused on creating a scale based on qualitative findings. To ensure diverse perspectives, maximum variation sampling was used to select 15 Grade 9 Generation Alpha students from two schools in Dipolog City, Zamboanga del Norte—one public and one private school—during the 2023-2024 school year. The participants were chosen based on their mathematics grades from the first and second grading periods, ensuring a range of performance levels, from "Outstanding" to "Did Not Meet Expectations." Interviews continued until data saturation was reached.

The interview guide, which explored students' perceptions of effective mathematics instruction, was reviewed by the study adviser and validated by three phenomenological experts to ensure its validity. Interviews were conducted in the participants' most comfortable language (Cebuano, English, or a combination) to facilitate clear communication.

Items for the scale were generated using an inductive method based on the qualitative data from the interviews. The data were analyzed using a descriptive phenomenological approach to identify key themes and factors related to effective mathematics instruction. This analysis followed Braun and Clarke's thematic analysis guidelines [36], ensuring rigorous data coding and validation through member checking and peer debriefing.

For scale construction, Price's guidelines were followed to ensure clarity and simplicity [37], with items appropriate for students aged 11-13. A five-point Likert scale was used for responses, ranging from "never true" to "always true," ensuring accessibility and alignment with the participants' cognitive level.

2.3. Validation Phase

The validation phase focused on assessing the quality and psychometric properties of the scale developed in the previous phase. Initially, the scale items were evaluated by five experts in mathematics education to ensure content relevance and appropriateness. These experts, all with PhDs in Mathematics Education, reviewed the items for clarity and relevance to the target population. They provided feedback, categorizing items as "Accept," "Reject," or "Modify". This step was crucial for ensuring the items accurately represented the factors being measured.

After expert evaluation, the next step was pre-testing the scale. A group of ten 4th-year BSED Mathematics students participated in cognitive interviews, a pre-testing technique that helps refine questions by asking respondents to articulate their thought processes. This process allowed the researcher to clarify any questions and modify them to align better with the study's goals, ensuring that participants understood the items correctly [38].

For the final validation phase, the developed scale was administered to a large and representative sample to evaluate its psychometric properties, including reliability and validity. The target population consisted of 4th-year BSED Mathematics students and unemployed BSED Mathematics graduates, individuals preparing to teach Generation Alpha students. The survey initially targeted participants in Zamboanga del Norte, but when the sample size was insufficient for statistical analysis, the researcher extended the recruitment process across the Philippines using social media platforms, successfully reaching over 400 respondents from more than 100 colleges and universities across Luzon, Visayas, and Mindanao. In total, 508 qualified respondents participated in the survey.

To validate the underlying factors of the scale, Exploratory Factor Analysis (EFA) was conducted. EFA is a statistical method used to identify the core dimensions of a scale by grouping related items into meaningful factors [39]. Following EFA, Confirmatory Factor Analysis (CFA) was performed to confirm the factor structure derived from the EFA results. CFA tests the hypothesized relationships between the observed variables and their underlying constructs, ensuring that the scale accurately measures the readiness of mathematics teachers to teach Generation Alpha students [40].

3. Results and Discussions

3.1. Qualitative Exploration of Generation Alpha Students' Perceptions Regarding the Most Effective Mathematics Instruction

The study employed a descriptive phenomenological approach and thematic analysis to explore Generation Alpha students' perceptions of the most effective mathematics instruction. This analysis uncovered three key themes, as shown in Table 1: Positive and Supportive Teacher-Student Relationship, Student-Centered Learning through Games and Innovative Integration of Modern Technology, and Supportive and Non-Competitive Blended Learning Environment.

Main Theme 1: Positive and Supportive Teacher-Student Relationship

This main theme highlights the significance of fostering

a positive and emotionally supportive learning environment for Generation Alpha students, who, as digital natives, thrive in interactive and engaging classrooms. Research underscores that teachers who create a welcoming atmosphere significantly impact students' motivation and perceptions of mathematics. One participant noted, *"The best math teacher finds joy in teaching, as this attracts students to love the subject despite its difficulty."* Another emphasized the importance of a teacher's demeanor: *"A math teacher becomes more effective if he/she wears a happy and enthusiastic expression during classes."* These insights illustrate how a supportive teacher-student relationship shapes students' attitudes toward learning.

Table 1. Thematic table

Main Themes	Subthemes: codes
Positive and Supportive Teacher-Student Relationship	**Positive Disposition and Interaction with Students** (i) Joy in Teaching (ii) Approachable, Friendly, and Gentle (iii) Use of Humor to Reduce Stress (iv) Warm and Inviting Expression (v) Fun and Engaging Teaching Style **Supportive and Understanding Approach** (i) Empathetic (ii) Empowering Affirmation (iii) Encouraging (iv) Understanding and Patient (v) Compassionate and Respectful Discipline (vi) Persistent Support for Learning (vii) Gentle and Respectful Communication (viii) Responsible Classroom Presence
Student-Centered Learning through Games and Innovative Integration of Modern Technology	**Student-Centered Differentiated Learning** (i) Engaging Examples with Personalized Examples (ii) Learning Readiness Awareness (iii) Empowering Students with Personalized Solutions (iv) Differentiated Learning Support **Use of AI and Innovative Technology in Learning** (i) Technology and AI-Assisted Learning (ii) Use of Digital Visual Aids (iii) Online Lecture Accessibility (iv) State-of-the-Art Educational Technology **Contextualized and Simplified Step by Step Learning** (i) Use of Real-World Examples (ii) Focus on Lectures over Assessments (iii) Learning Step by Step **Gamification in Teaching**
Supportive and Non-Competitive Blended Learning Environment	**Inclusive and Supportive Atmosphere** (i) Creating an Optimistic Atmosphere (ii) Safe Space for Student Voices (iii) Positive Connection with Teacher (iv) Encouraging Peer Mentorship **Feedback and Motivation** (i) Consistent Teacher Feedback (ii) Opportunity for High Grades (iii) Rewarding Academic Progress **Non-competitive Environment** (i) Non-Competitive Learning Environment (ii) Relaxed Learning Atmosphere **Preference for Blended Learning Environment and Targeted Collaboration** (i) Preference for Blended Learning, Face-to-Face Lectures and Online Assessments (ii) Targeted Collaboration with Committed Peers

This theme is divided into two key subthemes: (1) Positive Disposition and Interaction with Students and (2) Supportive and Understanding Approach. The first subtheme highlights the impact of teachers who integrate enthusiasm, humor, and warmth into their instruction, aligning with Generation Alpha's preference for dynamic and engaging classrooms. Studies [41,42,43] suggest that a joyful and stimulating classroom enhances student motivation, while humor serves as an effective tool for reducing stress and making complex mathematical concepts more accessible.

Complementing this, the second subtheme emphasizes the importance of patience, empathy, and personalized support. Generation Alpha students, who are particularly responsive to immediate feedback and encouragement, benefit from teachers who acknowledge their efforts and struggles. One participant shared, *"When I was in Grade 6, I learned to love math because my teacher used to call me 'our future engineer.' This made me feel that my dream of becoming an engineer was possible and motivated me to love math even more."* Such affirmations contribute to building students' confidence and sustaining their engagement in mathematics. Research [44,45,46] supports the notion that teachers who demonstrate care and consistency create an environment where students feel valued and motivated to succeed.

In summary, fostering a positive and supportive classroom environment is essential for enhancing both students' mathematical performance and overall learning experience. For Generation Alpha—who value engagement and emotional connection—meaningful teacher-student relationships make math more accessible, enjoyable, and inspiring.

Main Theme 2: Student-Centered Learning through Games and Innovative Integration of Modern Technology

This main theme highlights the importance of engaging, creative, and technologically enhanced teaching methods to meet the unique learning needs of Generation Alpha students. The findings are categorized into four subthemes: (1) Student-Centered Differentiated Learning, (2) Use of AI and Innovative Technology in Learning, (3) Contextualized and Simplified Step-by-Step Learning, and (4) Gamification in Teaching.

The first subtheme emphasizes the need for creative and flexible teaching approaches to sustain student engagement and prevent disengagement. Participants highlighted the importance of ensuring students fully grasp a lesson before moving forward. Personalized instruction, tailored to individual learning needs, was seen as crucial for enhancing comprehension and retention. One participant noted, *"The effective math teacher ensures that students understand and have a good comprehension of the current lesson before proceeding to the next one."* This aligns with research by Deyo et al. [47] and Prakash [48], which stress that student preparedness is fundamental to academic success. Similarly, Ivory [49] underscores the role of differentiated instruction in fostering inclusivity and engagement, ultimately improving educational outcomes.

Building on this, the second subtheme highlights the integration of advanced digital tools, such as artificial intelligence, online resources, and visual aids, to enhance mathematics instruction. Participants expressed a strong preference for incorporating state-of-the-art technologies,

to create an interactive learning experience aligned with the expectations of digital-native students. One student shared, *"We should be allowed and taught how to use math applications and Artificial Intelligence (AI) because it helps us solve math problems."* This perspective is reinforced by Winter [50] and Chen et al. [51], who emphasize the transformative impact of AI and technology on student learning.

Complementing the use of technology, the third subtheme focuses on the importance of simplifying mathematical concepts through a structured, step-by-step approach. Participants emphasized that breaking down complex topics into manageable steps, along with incorporating real-world applications, makes math more accessible and meaningful. This method ensures that all students, regardless of their learning pace, can develop a strong conceptual understanding. Research by Arranz [52] supports this view, indicating that simplifying math concepts and linking them to real-life scenarios enhances engagement and comprehension. Additionally, Goulet-Lyle et al. [53] advocate for structured, sequential teaching to improve mastery and performance.

Finally, the fourth subtheme highlights the role of gamification in maintaining student interest and making mathematics a more engaging and enjoyable experience. Participants noted that integrating games into lessons helps transform math from a traditionally challenging subject into an interactive and rewarding learning experience. As one participant explained, *"For me, it's about games. I know math is different from the P.E. subject, but it's really effective to have math-related games during classes."* Research by Kim & Castelli [54] and Klock et al. [55] supports this claim, showing that gamification enhances motivation and improves learning outcomes.

Overall, these four interrelated subthemes demonstrate that a combination of differentiated instruction, technology integration, structured teaching methods, and gamification fosters a dynamic and engaging learning environment tailored to the needs of Generation Alpha students. By adopting these innovative strategies, educators can enhance student comprehension, motivation, and long-term success in mathematics.

Main Theme 3: Supportive and Non-Competitive Blended Learning Environment

This main theme highlights the importance of creating a classroom where Generation Alpha students feel safe, supported, and motivated. It consists of four interrelated subthemes: (1) Inclusive and Supportive Atmosphere, (2) Feedback and Motivation, (3) Non-Competitive Environment, and (4) Preference for Blended Learning and Targeted Collaboration.

The first subtheme underscores the importance of a safe, inclusive classroom where students feel comfortable expressing their thoughts. Participants emphasized that positive teacher-student relationships and peer mentorship foster confidence and engagement in mathematics. Research by Holley and Steiner [56] shows that supportive teachers who handle classroom dynamics well create a secure learning space, while Knowles and Parsons [57] highlight the positive impact of peer mentoring. One participant noted, *"The best math teacher creates a positive vibe with students, allowing them to feel comfortable during classes."*

Building on this, the second subtheme highlights the role of feedback and motivation. Participants emphasized that regular feedback and encouragement inspire confidence and help students recognize their potential. Al-Halwachi [58] supports this, stating that constructive feedback helps students track progress and set realistic goals, while Tala [59] emphasizes that recognizing academic achievements boosts self-esteem and encourages effort. One participant shared, *"I had a math teacher in Grade 6 who would consistently give me feedback and say, 'You can do it, you have so much potential in you, you just have to work harder!' This truly boosted my self-esteem."*

Closely related, the third subtheme focuses on reducing competition in learning. Participants felt that excessive academic competition creates unnecessary pressure and distracts from actual learning. MindSage [60] found that unhealthy competition leads students to prioritize grades over understanding, while Watson [61] warns that academic pressure can negatively affect mental health. A participant shared, *"An effective environment doesn't involve competition among students, especially regarding grades, because I have competitive classmates who bully others."*

The final subtheme explores students' preference for blended learning and targeted collaboration. Participants favored a mix of face-to-face instruction and online assessments, as well as forming smaller study groups with dedicated peers. Research [62,63] highlights the effectiveness of blended learning. One participant noted, *"Collaboration only works well when everyone in the group is willing to participate and meet deadlines."*

By fostering inclusivity, providing constructive feedback, minimizing competition, and embracing blended learning, educators can create a dynamic and supportive environment that enhances the academic success of Generation Alpha students.

3.2. Emergent Scale Assessing the Readiness of Filipino Math Teachers to Teach Generation Alpha

The qualitative exploration of Generation Alpha students' perceptions of effective mathematics instruction informed the development of a 46-item scale designed to assess the readiness of Filipino mathematics teachers to teach this new generation of learners. The scale items were systematically derived from narratives and codes identified through qualitative analysis, with the emergent themes serving as the foundational factors.

Anchored in the perspectives of Generation Alpha students, the readiness scale provides a structured framework for evaluating the preparedness of mathematics teachers. Beyond assessment, it serves as a diagnostic tool, identifying areas requiring further development and professional support. However, while the scale is grounded in qualitative findings, it requires rigorous validation through empirical testing to establish its reliability and validity.

3.3. Validation of the Readiness Scale

The validation of the readiness scale followed a rigorous process, including expert evaluation, pre-testing,

and statistical validation through Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA).

The initial 46-item scale underwent expert review for content validity. Five mathematics education specialists, each holding a PhD and experienced in scale validation, evaluated the items for clarity and relevance. While no items were removed, two were modified for improved clarity. Pre-testing was conducted with ten fourth-year BSED Mathematics students via Zoom, ensuring the comprehensibility and applicability of the items. Feedback confirmed the scale's clarity and relevance, warranting its advancement to statistical validation.

EFA was conducted following data screening protocols, including checks for outliers, sample adequacy, and multicollinearity. The dataset of 250 responses met the required sample size threshold, with no missing data, ensuring robust factor extraction. The Kaiser-Meyer-Olkin (KMO) test yielded a value of 0.900, affirming sampling adequacy [64], while Bartlett's test of sphericity was significant ($p < 0.05$), validating the suitability for factor analysis [65].

Table 2. Eigenvalues and % Variance of the 2-Factor Readiness Scale

Factor	Eigenvalue	% of Variance	Cumulative %
1	12.81	41.33	41.3
2	3.30	10.64	52.0

Principal Component Analysis (PCA) with direct oblimin rotation was used to determine the factor structure. Parallel Analysis guided factor retention, and a factor loading threshold of >0.40 was applied [66]. The iterative refinement process led to the elimination of 15 items, resulting in a 31-item scale with a two-factor solution that explains 52.0% of the variance as shown in Table 2, indicating an acceptable model [67]. Factor 1, labeled *"Compassionate Learning Environment,"* encapsulated 22 items emphasizing inclusivity, student support, and emotional sensitivity. Factor 2, *"Engaging and Advanced Technology-Driven Teaching,"* comprised nine items focusing on integrating modern technology to enhance learning engagement.

CFA was conducted on an independent dataset ($N = 202$) to validate the EFA-derived structure. The sample met the recommended size, with no missing data. To ensure stability, a separate EFA was performed on this dataset, reaffirming the two-factor structure. Covariance-Based Structural Equation Modeling (CB-SEM) was employed to evaluate convergent and discriminant validity, confirming the construct validity of the 31-item scale. The results demonstrated strong factor loadings and alignment with theoretical expectations, substantiating the readiness scale presented in Table 4 as a valid and reliable measure for assessing Filipino mathematics teachers' preparedness for Generation Alpha students. Table 3 presents the fit indices that measured the overall fit of the 2-factor readiness scale.

Table 3. Fit Measures of the 2-Factor Readiness Scale

			Chi-Square Statistic		
SRMR	CFI	RMSEA	X^2	df	p
0.055	0.976	0.018	461	433	0.173

4. Conclusion and Recommendation

Table 4. The Validated Readiness Scale Assessing the Preparedness of Filipino Mathematics Teachers for Generation Alpha

Directions: Please rate the following statements using the scale below: 5 Always true in my case. 4 Often or usually true in my case. 3 Sometimes true in my case. 2 Rarely or often never true in my case. 1 Never true in my case.
Factor 1: Compassionate Learning Environment
1. I encourage my students to embrace challenges and grow from them.
2. I enforce discipline among my students with respect and empathy.
3. I prioritize attending all of my classes to be there for my students.
4. I promote an open and inclusive classroom culture where students feel empowered to share their viewpoints and emotions.
5. I present my students with opportunities to perform well and achieve high grades.
6. I strive to maintain a positive connection with my students.
7. I walk my students through problem-solving with step-by-step guidance.
8. I promote an atmosphere where students support each other instead of fostering competition over grades.
9. I use empowering affirmations to uplift my students.
10. I am approachable to my students.
11. I repeatedly go over the lessons until my students understand them completely.
12. I assign tasks to students only after ensuring that they have fully understood the lesson.
13. I communicate with my students gently and with respect.
14. I cultivate a classroom environment where students support each other by encouraging advanced students to mentor peers facing challenges.
15. I am understanding and patient when supporting students who find the lessons challenging.
16. I make efforts to prevent students from feeling pressured in my classroom.
17. I foster an optimistic atmosphere with my students to ensure they don't give up when they struggle to learn complex math lessons.
18. I am committed to ensuring that no student is left behind.
19. I am sensitive to my students' emotions.
20. I provide students with simplified explanations to help them better understand complex lessons.
21. I put on a warm and inviting expression for my students while in class.
22. I make certain that students consistently get feedback from me about their class performance.
Factor 2: Engaging and Advanced-Technology Driven Teaching
1. I am up-to-date with the modern approaches to teaching math, including the use of math apps and AI tools.
2. I have recorded lectures available online so my students can access them anytime.
3. I make my teaching style enjoyable and engaging for students.
4. I prefer a blended learning approach for my students.
5. I incorporate math apps and AI tools into my teaching strategies to enhance my students' comprehension of the lessons.
6. I work at a school where students benefit from advanced educational technology resources.
7. I use real-life situations to help students understand the lesson's relevance and stimulate their curiosity.
8. I am knowledgeable about the latest methods of teaching math using games.
9. I incorporate games into my teaching strategies to stimulate students' interest.

The study's exploration of Generation Alpha students' perceptions of effective mathematics instruction and the

subsequent development and validation of a readiness scale for Filipino mathematics teachers have provided valuable insights. The qualitative phase emphasized the importance of fostering a positive and supportive teacher-student relationship, implementing student-centered learning through innovative use of technology and games, and creating a supportive, non-competitive blended learning environment. These findings highlight the necessity for teachers to adopt a compassionate and engaging approach to teaching mathematics, integrating modern technologies to accommodate the unique learning preferences of Generation Alpha students.

The quantitative phase resulted in the development of a robust 31-item readiness scale, validated through rigorous statistical analyses. This scale comprises two primary factors—Compassionate Learning Environment and Engaging and Advanced Technology-Driven Teaching—providing a comprehensive measure of the readiness of Filipino mathematics teachers to effectively teach Generation Alpha students. The validation process confirmed the scale's reliability and validity, establishing it as a valuable tool for identifying areas where teachers may require further development and support.

Based on the findings, future research should focus on assessing the long-term effectiveness of the readiness scale and its impact on student outcomes through longitudinal studies. Additionally, exploring the scalability of the readiness scale across different educational contexts and subject areas would further validate its applicability. Investigating other factors that influence teacher readiness, such as cultural differences and socio-economic contexts, would also contribute to a more comprehensive understanding of effective mathematics instruction for Generation Alpha. Overall, this study provides significant contributions to the field and offers practical solutions for enhancing teacher readiness in an evolving educational landscape.

References

[1] Amrit, K. J. (2020). Understanding Generation Alpha. OSF. https://osf.io/d2e8g/download.

[2] McCrindle, M., & Fell. A. (2020). Understanding Generation Alpha. McCrindle Research.

[3] Ngiwas, F. D. C. A., Mariano, D. L. F., Barsana, J. G., Cruz, M. P., & Elipane, L. (2022). Example–conclusion map in teaching simple interest: A lesson study. International Journal of Evaluation and Research in Education (IJERE), 11(1), 377-384.

[4] Tan, C. (2023). Generation Alpha — how much worse will this get? Medium.

[5] Lee, H. R. (2020). New report on Generation Alpha – Characteristics of the youngest generation.

[6] Kato, J. (2024). What Educators Need to Know about Generation Alpha. EdSurge.

[7] Romero, A. (2017). Colleges need to prepare for Generation Alpha. CUNY Bernard M Baruch College Publications and Research.

[8] Hill, H. C., & Chin, M. J. (2018). Connections Between Teachers' Knowledge of Students, Instruction, and Achievement Outcomes. American Educational Research Journal, 55, 1076 - 1112.

[9] Al-Sa'di, A., & Ahmad, E. (2023). The future of New Zealand tertiary education: Embracing online courses and AI tools. https://nzqri.co.nz/wp-content/uploads/2023/04/The-Future-of-Tertiary-Education-Embracing-Online-Courses-and-AI-Tools.pdf.

[10] Arora, A., Jha, A. K., Alat, P., & Das, S. S. (2020). Understanding coronaphobia. Asian journal of psychiatry, 54, 102384.

[11] Tootell, H., Freeman, M., & Freeman, A. (2014). Generation alpha at the intersection of technology, play and motivation. In 2014 47th Hawaii International Conference on System Sciences (pp. 82-90). IEEE.

[12] Apaydin, C., Kaya, F. (2020). An analysis of the preschool teachers' views on alpha generation. European Journal of Education Studies, 6(11): 124-141.

[13] Schawbel, D. (2014). Gen Z employees: The 5 attributes you need to know. Entrepreneur.

[14] Fadlurrohim, I., Asmar Husein, L. Y., Wibowo, H., & Raharjo, S. T. (2019). Understanding the development of Alpha Generation children in the industrial era 4.0. Focus: Journal of Social Work, 2, 178-186.

[15] Jha, A. K. (2020, June 20). Understanding Generation Alpha.

[16] Bonchiș, E. (2021). De la tradiționaliști la Generația Z [From traditionalists to Generation Z]. In E. Bonchiș (Ed.), Generația Z (pp. 17-82). Polirom.

[17] Selvi, V., Bhuvaneswari, M., & Sandra, S. (2022). Stories: A tool to rejuvenate the culture of Generation Z and Generation Alpha. YMER Digital, 21(1), 267-276.

[18] Barkowitz, D. (2016). 13 Things to know about the Alpha Generation: The newest generation has no purchasing power yet, but will soon take over the world. AdAge.

[19] Glenn, M. (2008). The future of higher education: How technology will shape learning. Austin, Texas: The New Media Consortium. https://www.learntechlib.org/p/182088/.

[20] Raja, R., Nagasubramani, P. C. (2018). Impact of modern technology in education. Journal of Applied and Advanced Research, 3(S1). 31-35.

[21] McCrindle, M., Fell, A., & Buckerfield, S. (2021). Generation Alpha: Understanding our children and helping them thrive. Headline.

[22] Cirilli, E., Nicoini, P., & Mandolini, L. (2019). Digital skills from silent to alpha generation: An overview. Proceedings of EDULEARN19 Conference, Palma, Mallorca, Spain.

[23] Gatollari, M. (2023). The students are unteachable. Teachers warn that horrible parenting has rendered Gen Alpha hopeless. Distractify.

[24] Oxford High School. (2024). Alpha generation learning cause for concern.

[25] Mohamed, M. Z. B., Hidayat, R., Suhaizi, N. N. B., Sabri, N. B. M., Mahmud, M. K. H. B., & Baharuddin, S. N. B. (2022). Artificial intelligence in mathematics education: A systematic literature review. International Electronic Journal of Mathematics Education, 17(3), em0694.

[26] Hwang, G. J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles and research issues of artificial intelligence in education. Computers and Education: Artificial Intelligence, 1, 100001.

[27] Qiu, Y., Pan, J., & Ishak, N. A. (2022). Effectiveness of artificial intelligence (AI) in improving pupils' deep learning in primary school mathematics teaching in Fujian Province. Computational Intelligence and Neuroscience, 2022, Article 1362996.

[28] Helbing, D. (2019). Societal, economic, ethical and legal challenges of the digital revolution: From big data to deep learning, artificial intelligence, and manipulative technologies. In Helbing D. (Ed.), Towards digital enlightenment (pp. 47–72). Springer.

[29] Kerry, C. (2020). Protecting privacy in an AI-driven world. Brookings.

[30] Fabito, B., Trillanes, A., & Sarmiento, J. (2021). Barriers and challenges of computing students in an online learning environment: Insights from one private university in the Philippines. International Journal of Computing Sciences Research, 5, 441-458.

[31] Roxas-Chua, G. (2019). Only 30% of Filipinos have basic digital skills - Google, Temasek study. BusinessWorld.

[32] Estrellado, C. J. P., & Miranda, J. C. (2023). Artificial intelligence in the Philippine educational context: Circumspection and future inquiries. International Journal of Scientific and Research Publications, 13(5), 16. ISSN 2250-3153.

[33] Philippine Information Agency (PIA). (2021, July 25). UNP adopts smart campus concept; Receives P25M CHED grant.

[34] Pigache, H. (2021). "Uncomfortable" Lessons for Generation Alpha. LinkedIn.

[35] Harvard Catalyst (2023). Mixed methods research/basic mixed methods research design.

[36] Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77-101.
[37] Price, L. R. (2017). Psychometric Methods: Theory into Practice. The Guilford Press.
[38] Boateng, G. O., Collins, S. M., Mbullo, P., Wekesa, P., Onono, M., Neilands, T., & Young, S.L. (2018). A novel household water insecurity scale: Procedures and psychometric analysis among postpartum women in western Kenya. PLOS ONE.
[39] Worthington, R. L., & Whittaker, T. A. (2006). Scale development research: A content analysis and recommendations for best practices. The Counseling Psychologist, 34(6), 806-838.
[40] Suhr, D. (2006). Exploratory or confirmatory factor analysis? Proceedings of the 31st Annual SAS Users Group International Conference. (Paper Number: 200-31). SAS Institute Inc.
[41] Walker, R. (2008). Twelve characteristics of an effective teacher: A longitudinal, qualitative, quasi-research study of in-service and pre-service teachers' opinions. Educational Horizons, 87(1), 61-68.
[42] Mehrabian, F., Haji, A., Goudarzi, F., & Haghdoost, H. (2014). Characteristics of the capable teacher from the viewpoint of the students at Faculty of Health, Guilan University of Medical Sciences in 2013. Educational Research Medical Sciences, 2(3), 26-29.
[43] Pânişoară, I. O., Duță, N., Pânişoară, G., & Tomoaica, E. (2014). Teacher profile in Romania: Defining features and priorities of the training programs in teaching career. Procedia - Social and Behavioral Sciences, 140, 396-400.
[44] King, H. (2017). Teacher affective attitudes inventory: Development and validation of a Teacher self-assessment instrument. [Doctoral Dissertation, Antioch University].
[45] Moore, K. D. (2007). Classroom Teaching Skills (5th ed.). Eastern New Mexico University Press, Inc.
[46] National University. (n.d.). Constructivism in Education: What Is Constructivism?
[47] Deyo, Z. M., Huynh, D., Rochester, C., Sturpe, D. A., & Kiser, K. (2011). Readiness for self-directed learning and academic performance in an ability laboratory course. American Journal of Pharmaceutical Education, 75(2), 1-6.
[48] Prakash, J. (2012). Brief notes on the Thorndike's laws of learning. Preserve Articles.
[49] Ivory, A. (2022). Why is differentiated instruction important in the classroom? HMH Education Company.
[50] Winter, D. (2023). Gen Alpha: Everything brands need to know in 2023. Shopify.
[51] Chen, X., Xie, H., Zou, D., & Hwang, G. J. (2020). Application and theory gaps during the rise of artificial intelligence in education. Computers and Education: Artificial Intelligence, 1, 100002.
[52] Arranz, A. (2023). Math in the real world: everyday applications and example problems for your class. SOWISO.
[53] Goulet-Lyle, M. P., Voyer, D., & Verschaffel, L. (2020). How does imposing a step-by-step solution method impact students' approach to mathematical word problem-solving? ZDM Mathematics Education, 52(1), 139–149.
[54] Kim, J., & Castelli, D. (2021). Effects of gamification on behavioral change in education: A meta-analysis. International Journal of Environmental Research and Public Health, 18(7), 3550.
[55] Klock, A. C. T., Gasparini, I., Pimenta, M. S., & Hamari, J. (2020). Tailored gamification: A review of literature. International Journal of Human-Computer Studies, 144, 102495.
[56] Holley, L., & Steiner, S. (2005). Safe space: Student perspectives on classroom environment. Journal of Social Work Education, 41(1), 49-64.
[57] Knowles, C., & Parsons, C. (2009). Evaluating a formalised peer mentoring programme: Student voice and impact audit. Pastoral Care in Education, 27(3), 205–218.
[58] Al-Halwachi, A. (2023). The Power of Constructive Feedback in Education. LinkedIn.
[59] Tala, J. (2022). How education should reward academic success. LinkedIn.
[60] MindSage. (2021). Competition Culture in Schools: Healthy vs unhealthy competition + how to identify them in schools.
[61] Watson, K. J. (2024). Secondary teachers' perceived ability to support student mental health. Educational Research: Theory and Practice, 35(1), 233-247.
[62] Collopy, R. & Arnold, J. (2009). To blend or not to blend: online and blended learning environments in undergraduate teacher education. Issues in Teacher Education, 18, 85-101.
[63] Farley, A., Jain, A., & Thomson, D. (2011). Blended learning in finance: Comparing student perceptions of lectures, tutorials, and online learning environments across different year levels. Economic Papers, 30(1), 99-108.
[64] Netemeyer, R. G., Bearden, W. O., & Sharma, S. (2003). Scaling procedures: Issues and applications. Sage Publications.
[65] Tabachnick, B. G., & Fidell, L. S. (2001). Using multivariate statistics (4th ed.). Allyn & Bacon.
[66] Field, A. (2013) Discovering Statistics Using IBM SPSS Statistics. SAGE Publications Ltd.
[67] Shrestha, N. (2020). Detecting multicollinearity in regression analysis. American Journal of Applied Mathematics and Statistics, 8(2), 39-42.