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RESEARCH ARTICLE

Development of dimensions of family functionality among rural students: A fuzzy delphi method study

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ABSTRACT

This study aimed to develop dimensions of family functionality among rural students using the Fuzzy Delphi Method. A panel of seven experts, comprising teachers, Malaysian Ministry of Education officials, and counselors, participated in the assessment process. The research utilized the Fuzzy Delphi Logic Software (FUDELO) to analyze and synthesize expert opinions, resulting in the identification of eight key constructs for the questionnaire. These constructs encompass: (1) Motivational Aspiration, (2) Empathy for the family, (3) Willingness to sacrifice and be responsible for the family, (4) Confusing attention and love for the family, (5) Need for guidance and advisors, (6) Good communication, (7) Self-reliance, and (8) Psychological well-being. The Fuzzy Delphi Method, a sophisticated technique for achieving consensus among experts, allowed for the incorporation of linguistic variables and fuzzy set theory in the decision-making process. This approach enabled the researchers to capture the nuanced perspectives of the experts while mitigating the ambiguity often associated with human judgment. By focusing on rural students, this study addresses a critical gap in understanding family dynamics within specific socio-geographic contexts. The developed dimensions offer a comprehensive framework for assessing family functionality, potentially informing educational policies, counseling strategies, and interventions tailored to the unique needs of rural students and their families. Future research could validate these dimensions through empirical studies and explore their applicability in diverse cultural and socioeconomic settings.

Keywords: family functionality; motivation; empathy; guidance; communication; self-reliance; psychological well-being; fuzzy delphi method

1. Introduction

Family functionality can be defined as the degree to which a family performs as a unit to manage conditions, activities, external stimuli, or events that cause stress[1]. It encompasses various dimensions,

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including relationship dynamics, personal growth, and system maintenance[2]. The relationship dimension involves cohesion, expression, and conflict management within the family unit [3]. Personal growth focuses on fostering independence, achievement, intellectual pursuits, active recreation, and moral-religious values[4]. System maintenance addresses control and organization within the family structure. A healthy family function is characterized by higher levels of cohesion, warmth, and expressiveness, coupled with lower levels of conflict, rigidity, and affectionless control[5,83]. Effective family functioning occurs when family members successfully perform their respective roles, accomplish practical tasks, and maintain relationships both within and beyond the family context[6]. Family functionality has a significant influence on individual well-being across the course of life. Research has consistently demonstrated a strong relationship between family functioning and psychological distress[7]. Studies have shown that depression is negatively correlated with family functioning, highlighting the importance of a supportive family environment for mental health.

The impact of family functionality extends to various aspects of individual well-being. Firstly, mental health. For example, a study conducted in China revealed that stronger family support can help improve the mental health of pregnant women[8]. Perinatal women with lower family function were more likely to experience depression symptoms. Secondly, child development. Family education has a crucial impact on children's physical and psychological development. The family serves as the child's first school, with parents acting as the primary teachers. A positive family environment lays the foundation for children's social and emotional development, influencing their ability to form healthy relationships later in life[9]. Thridly, adolescent autonomy. For example, research has shown a significant positive relationship between adolescent autonomy and the personal growth dimension of family function[10]. This suggests that family interactions fostering self-confidence, competitive spirit, and moral values contribute to the development of adolescent autonomy. Fourthly, general well-being. Several studies have demonstrated a correlation between family functioning and general well-being[7,11,12]. Higher levels of family functioning are associated with improved overall well-being and lower psychological distress.

It is crucial to understand the unique cultural and socioeconomic context of rural Malaysia when examining family functionality. Rural areas in Malaysia are characterized by distinct social structures, economic challenges, and cultural traditions that differ significantly from urban settings. These areas often face issues such as limited access to educational resources, healthcare facilities, and employment opportunities[13]. The traditional Malay family structure in rural areas typically emphasizes strong family ties, respect for elders, and collective decision-making[14]. However, these traditional structures are increasingly challenged by modernization, economic pressures, and changing social norms. Understanding how family functionality operates within this specific context is essential for developing effective interventions and support systems for rural Malaysian students and their families.

The importance of family functionality extends beyond individual well-being, having broader societal implications. For example, understanding the influence of illness on family functioning is central to the provision of patient- and family-centered care. Healthcare professionals should pay attention to evaluating family function constantly across various life stages and implement partner-inclusive interventions to lower the risk of mental health issues, such as perinatal depression[15]. Family functionality is particularly crucial in rural communities facing unique socioeconomic challenges. Restricted by geographical conditions and economic levels, family education in rural areas often receives insufficient attention, potentially leading to problems in children's social behavior. Regarding family functioning acts as a mediator between social support and individual well-being[16,17], this highlights the importance of fostering strong family relationships as a means of enhancing overall societal well-being. Family functionality influences intergenerational support exchanges, which are integral to the lives of both parents and adult children. These relationships become

increasingly important as individuals' age and caregiving increase. Lower socioeconomic status can produce and exacerbate family strains, highlighting the need to address structural constraints that create greater stress for less advantaged groups.

Clearly, parents are human beings as they deserve and are fully responsible for ensuring the level of cognitive improvement or development of children from early stages to adulthood[18]. The involvement of parents in the process of children's development is very important and it coincides with Bronfenbrenner's Ecological Theory[19] which is known as the theory of human development which states that the process of children's growth is through an environmental process that includes two-way interaction. This theory has five systems that are influential in the growth of each child, namely the microsystem (for example, the interaction between children with family members and neighbours), mesosystem (for example, the environment in the home can influence the behavior and attitude of a student when in the environment at school), chronosystem (for example, children are more interested in electronic games that involve the latest technology), macrosystem (for example, involvement in a person's development that is influenced by local community practices) and ecosystem (for example, a person's experience or history with the environment where it will be affected to children and a person through decisions taken in the environment without involving them directly). From this system it can be concluded that parents play a very important role in the process of their child's academic achievement so that this process takes place perfectly[18].

Although the previously mentioned process is crucial for improving educational achievement, it is important to recognize that other factors also play significant roles. Self-resilience and parental influence are two such factors that warrant consideration. Self-resilience is a critical factor in educational success. Nor Shafrin et al.[20] defined self-resilience as the human ability to overcome difficulties and adapt to new changes when facing stressful events or threats[21]. Seok et al.[22] noted that individuals with high self-resilience can overcome life stress and recover from past difficulties. Conversely, those with low self-resilience may be at risk of depression[20]. Langeland et al.[23] further defined resilience as the ability of systems or individuals to maintain integrity while facing dramatically changing conditions. Parental influence is another crucial factor. Anne Roe's[84] study concluded that parents' education level, career orientation, and parenting style can shape children's personalities, influencing their future life choices and decision-making processes[24,25]. However, Maheran's[26] study presented a contrasting perspective, finding that parents and family members with low education levels may lack awareness about the importance of education. This can result in reduced support, concern, and involvement in their children's learning activities, significantly impacting academic achievement and future career choices.

Studies indicate that the socioeconomic status of parents, including their career level and income, can significantly impact their children's academic achievement. Specifically, family problems, poverty, lack of awareness and support, and the absence of a positive educational culture at home can hinder children's academic progress[26,27]. Moreover, insufficient family income often limits expenditure to basic necessities, potentially impeding students' career development opportunities[28]. To mitigate these challenges, parents should actively engage in their children's educational journey, providing guidance and support to enhance their academic achievement and prevent educational disengagement.

Dropout rates in Malaysian schools have shown a complex trend in recent years, with implications for educational policy and socioeconomic development. Statistics from 2016 to 2018 reveal a decrease in secondary school dropout rates from 1.50% to 1.21%, indicating an improvement in student retention[29]. However, this positive trend masks underlying challenges, particularly in the transition between school years. For instance, in 2018, 0.29% of students who were in Form 1 (equivalent to 7th grade) in 2017 did not continue

to Form 2, while 0.53% of Form 2 students did not progress to Form 3, and 1.01% of Form 3 students did not advance to Form 4[29]. These statistics highlight the need for a deeper understanding of the factors influencing student retention in Malaysian schools. Research suggests that socioeconomic background plays a significant role in educational outcomes. A study by Zainal et al.[30] found that students from rural areas and low-income families in Malaysia face greater challenges in educational attainment, often due to limited access to resources and lower parental education levels. This aligns with broader research on educational inequality in Southeast Asia, which indicates that rural-urban disparities and socioeconomic factors significantly impact educational outcomes[31].

The impact of family environment on educational outcomes is also noteworthy. While older studies like Glasgow's[32], suggested a link between household conditions and truancy, more recent and culturally relevant research provides nuanced insights. For instance, a study by Vellymalay[33], in Malaysia found that parental involvement and home educational resources significantly influence students' academic achievement, particularly in rural areas. This underscores the importance of considering cultural and contextual factors specific to Malaysia when addressing educational challenges. Addressing these educational disparities requires a multifaceted approach. Efforts to improve educational outcomes in Malaysia should focus on enhancing access to quality education in rural areas, providing support for low-income families, and promoting parental involvement in education[30]. Furthermore, understanding the unique cultural and socioeconomic context of Malaysian rural communities is crucial in developing effective interventions to reduce dropout rates and improve overall educational attainment.

The issue of student stress and academic underperformance also arises when it starts from feeling marginalized, isolated, friendless and not cared about by the family. These negative emotions result from the family system itself which cannot function properly, causing stress and creating loose relationships between members of a family. Students also usually find it difficult to admit that they have a problem, and it is difficult for them to share the stress they face with family members when the family system is not working well. So, it is not surprising when there are researchers who claim that if the aspect of self-reliance among students is not given attention, students may be stuck with various other problems that make them more stressed and thus affect their thinking and behavior in a negative direction[34]. This shows that the environment applied by a family is very important in increasing their tendency towards psychological well-being and good academic achievement so as to be able to mold them into good and knowledgeable people**.** If this issue of family dysfunction and its impact on students' well-being is taken lightly and there are no interested parties looking at the causes and dealing with this problem, the increase in cases of deviant misconduct may cause major problems for society and the country in the future.

Therefore, the role of parents in the educational achievement process is very important because parents are an active link and also a source of reference for children if they need help or further knowledge about the scope of learning or their career. As the saying goes "The rubber of the leaves will flow to the trunk" shows that parents will be an example for their children to follow in terms of behavior and attitude if parents apply positive attitudes and practices.

2. Research question and objectives

The primary research question guiding this study is what are the key dimensions of family functionality among rural students in Malaysia? This study aims to develop a comprehensive framework for understanding family functionality in the context of rural Malaysian families, with a specific focus on its impact on students' educational outcomes and overall well-being. The objectives of this research are to identify and validate the key constructs of family functionality relevant to rural Malaysian students through expert consensus. By

addressing these objectives, this study seeks to fill a critical gap in the literature on family functionality in rural Malaysian contexts, providing valuable insights for educators, policymakers, and family support professionals.

3. Literature review

Family function, a multifaceted construct encompassing the interactions, relationships, and dynamics within the family unit, has been a subject of increasing interest in recent years. The evolving nature of family structures, coupled with societal changes and global events such as the COVID-19 pandemic, has necessitated a re-evaluation of how we conceptualize and study family function.

Recent research has expanded our understanding of family function beyond traditional nuclear family models, acknowledging the diversity of modern family compositions. Studies have consistently emphasized the importance of effective emotional bonding, communication, rule-setting, and management of external events as core components of family functioning[35,36]. The quality of family life at a systemic level, including wellness, competence, strengths, and weaknesses, has been recognized as central to understanding family function[37]. This holistic approach has allowed researchers to explore the dynamic interactions within family units and how they fulfil their functions in an ever-changing societal context.

The role of family functionality is consistent with cognitive development theory[38], sociocultural theory[39] and ecological system theory[19]. These three theories emphasize the role of parents' involvement in giving an impression of their children regarding the view of the real world and the external reality that needs to be faced in their environment. Based on Epstein's Model[40], six elements of parental involvement have been identified. First, the involvement of parents in helping and supporting and understanding the development of children and adolescents and setting home conditions to support learning at every age and class. Second, communication, which refers to communication with families about the program, progress and well-being of students. Third, volunteerism refers to increased recruitment, training, activities, and schedules to involve families as volunteers and as spectators at school or in other locations. Fourth, learning at home refers to engaging with children in academic learning at home, including homework, goal setting, and other activities related to the curriculum. Fifth, decision-making refers to families as participants in the school by involving them in any decision, governance, and advocacy activities through school councils, improvement teams, committees, and parent organizations. Sixth, working with the community refers to the coordination of resources and services for families, students, and schools with community groups, including businesses, agencies, cultural and civic organizations, and colleges or universities.

This proves that family functioning plays an important role in promoting emotional and behavioral adjustment among troubled students, and interventions to help students be more resilient will be more successful if they target adolescents' psychosocial skills and their relationships with family members. This at once supports the claims of[41], related to the influence of family relationships on the development of long-term self-resilience for bullied students, who found the warmth obtained from the love of parents and siblings, as well as a positive atmosphere at home has a relationship with the lack of emotional and behavioral problems such as depression and violence, compared to the expectations made on the victim of bullying, in the two years following the experience of being a victim of bullying. This study shows how important family functionality is in protecting students to be more resilient.

Therefore, the recommendations presented by theories are also supported by empirical studies. A study conducted by Azarnioshan et al.[42] on 395 high school students (females and males) from Babolsar city in Iran revealed that perceived parenting styles in terms of authoritative style, permissive style, and authoritarian style of behavior has a positive and significant relationship with self-resilience. While this study provides valuable

insights, it's important to note that its applicability to the Malaysian context may be limited due to cultural differences. Werner and Smith[43] presented findings that mothers who treat their children in a positive way with acceptance, kindness, control, and support, compared to children who do not have this experience, show high endurance. Ritter's[44] study found that the authoritative style of parents is associated with a high level of resilience, while the autocratic and permissive style of parents is often associated with children who have low resilience. This shows that the involvement of parents in their children's learning activities can help them master learning in stages so as to trigger resilience and high psychological well-being in their children. In addition, recent studies have also focused on the relationship between family functioning and the well-being of children and adolescents. Multiple studies have reported a positive association between family functioning and happiness, life satisfaction, and overall well-being in young people[45,46]. Family cohesion, adaptability, and effective communication have been identified as key predictors of positive outcomes for children and adolescents. While Epstein et al.[47] initially proposed this concept, more recent studies have continued to support and expand upon these findings[48]. These findings underscore the critical role that family dynamics play in shaping the emotional and psychological development of younger family members. The role of family communication in moderating the effects of various stressors on adolescent well-being has been a focus of recent research. Studies have shown that positive family communication can offset the negative effects of parental stress on adolescent physical activity[49]. However, the mechanisms by which family communication predicts healthy lifestyle behaviors in families with varying levels of stress remain understudied. This represents a critical gap in literature, as understanding these processes could inform more effective interventions for families facing various challenges.

An emerging area of research has explored the discrepancies between parent and adolescent perceptions of family functioning. Studies have found that parents often report higher levels of family functioning than adolescents[50]. These discrepancies in perception have been associated with various outcomes, including adolescent self-esteem, depressive symptoms, and health behaviors[51,52]. The impact of these perceptual differences on family function and adolescent well-being represents an important avenue for future research, as it may provide insights into developing more targeted family interventions. The COVID-19 pandemic has significantly impacted family functioning, necessitating a re-evaluation of how families adapt to crisis situations. Research during this period has highlighted the importance of family resilience and the ability to maintain positive functioning in the face of unprecedented challenges. Studies have examined how families have navigated issues such as remote work, online schooling, and social isolation, revealing both strengths and vulnerabilities in family systems[53]. However, there is a need for more longitudinal research to understand the long-term effects of such global crises on family function and to develop interventions that can enhance family resilience in the face of future challenges.

The role of technology in shaping family function has become increasingly relevant, particularly in light of the pandemic. While technology has facilitated communication and connection among family members, especially during periods of physical separation, it has also introduced new challenges to family dynamics. Research is needed to explore how digital technologies influence family communication patterns, boundary-setting, and overall family functioning in an increasingly connected world. Another area requiring further investigation is the impact of changing family structures on family function. With the increasing prevalence of blended families, single-parent households, and same-sex parent families, there is a need for research that examines how these diverse family compositions influence family functioning and child outcomes. Current literature often fails to adequately represent the full spectrum of family structures, limiting our understanding of how family function operates across different family types[54].

The intersection of family function with broader societal issues, such as economic inequality, racial discrimination, and access to healthcare, represents a significant gap in the current literature. While some studies have touched on these issues, there is a need for more comprehensive research that examines how societal factors influence family functioning across different socioeconomic and cultural contexts. This research could inform policy decisions and interventions aimed at supporting families facing systemic challenges. In the context of long-term care settings, family involvement has been recognized as a crucial factor in enhancing residents' quality of life and family caregiver well-being[86]. Recent research has shown that more frequent family visits are associated with fewer psychological disturbances for residents with dementia and better overall quality of life[53]. However, there remains a significant gap in understanding how to optimize family involvement in assisted living and long-term care settings. Future research should focus on developing and evaluating interventions that promote meaningful family involvement while respecting the needs and preferences of both residents and staff.

In conclusion, while recent research has significantly advanced our understanding of family function, several critical gaps remain. These include the need for more diverse representation in family studies, a deeper understanding of the impact of technology and societal changes on family dynamics, and the development of more effective interventions to support family functioning across various contexts.

4. Methodology

This study employs a qualitative approach using the Fuzzy Delphi Method (FDM) to develop dimensions of family functionality among rural students in Malaysia. The FDM is a sophisticated technique for achieving consensus among experts, allowing for the incorporation of linguistic variables and fuzzy set theory in the decision-making process[55]. This approach enables researchers to capture the nuanced perspectives of experts while mitigating the ambiguity often associated with human judgment. The study's methodology comprises two primary stages in developing the questionnaire elements. In the initial phase, the researchers conducted a comprehensive literature review to identify crucial elements pertinent to the implementation of family functional, as outlined in **Table 1**. This systematic analysis of existing literature formed the foundation for the questionnaire's content. The subsequent phase involved the creation of an expert questionnaire based on the elements identified in the literature review. This questionnaire utilized a 7-point scale and was distributed to a panel of seven experts, each possessing specialized knowledge in the field. The responses from these experts were then subjected to analysis using the Fuzzy Delphi Method (FDM) technique, allowing for a nuanced interpretation of expert opinions and facilitating the convergence towards a consensus. This two-phase approach ensures a robust methodology that combines theoretical insights from existing literature with expert judgment, thereby enhancing the validity and reliability of the study's findings.

5. Sampling

The study employs purposive sampling, a method particularly well-suited for achieving consensus on specific topics. Hasson, Keeney & McKenna[56] affirm that purposive sampling is the most appropriate approach for the Fuzzy Delphi Method (FDM). For this research, a panel of seven experts was assembled, with their respective backgrounds and qualifications detailed in **Table 2**. The selection criteria for these specialists were based on their extensive experience and domain-specific expertise. The literature suggests varying optimal sample sizes for expert panels in Delphi studies, particularly when the group is homogeneous. Adler & Ziglio[57] propose that 10 to 15 experts are suitable for a uniform group. Sforza & Ortolano[58] recommend 8 to 12 participants for a homogeneous sample, while Philip[59] suggests a range of 7 to 12 experts.

In this study, the researchers opted for a panel of seven experts. This decision was influenced by practical constraints, including the challenges in securing expert participation and time limitations in the data collection process. Despite these constraints, the researchers assert that a panel of seven experts is sufficient to gather comprehensive information and achieve meaningful consensus. The choice of seven experts, while at the lower end of the recommended range, aligns with Philip's[59] guidelines and is deemed adequate for the purposes of this study. This sample size strikes a balance between methodological rigor and practical feasibility, allowing for the collection of valuable insights while navigating real-world research challenges.

Table 1. Expert list.

Expert List	Total Expert	Field of expertise	Institutions	Years of Experience
Teachers	3	Education	Public School	10-15 years
Counselor	2		Government Agency	8-12 years
Psychological officer	2		Malaysian Ministry of Education	7-10 years

6. Instrumentation

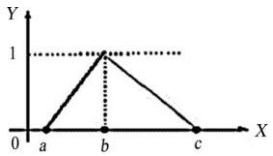
The research instrument for the Fuzzy Delphi method was developed through a comprehensive literature review. This approach aligns with various methodological recommendations in the field. Skulmowski, Hartman & Krahn[60] suggest that questionnaire elements can be derived from literature, pilot studies, and researcher experience. Mustapha & Darussalam[61] propose that questions for the Fuzzy Delphi technique can be formulated based on research highlights, expert interviews, and focus group discussions. Furthermore, Okoli and Pawlowski[62] emphasize the importance of conducting a literature review within the study's scope to inform the development of items and content elements.

Following these guidelines, the researchers in this study utilized existing literature to identify key elements of family functional. Subsequently, they constructed an expert questionnaire employing a 7-point scale (**Table 2**). The choice of a 7-point scale was deliberate, as Chang, Hsu & Chang[55] assert that a higher number of scale points tends to yield more precise and accurate data. To enhance the questionnaire's user-friendliness, the researchers provided a conversion table (**Table 3**) that maps the 7-point linguistic scale to corresponding Fuzzy values. This approach simplifies the response process for experts while maintaining the nuanced data collection capabilities of the Fuzzy Delphi method. By combining a literature-based approach to questionnaire development with a carefully chosen scale, the researchers aim to balance methodological rigor with practical usability, thereby enhancing the quality of data collected from the expert panel.

Table 2. Fuzzy table.

Items	Fuzzy Number
Strongly Disagree	(0.0, 0.0, 0.1)
Disagree	(0.0, 0.1 ,0.3)
Somewhat Disagree	(0.0, 0.3, 0.5)
Neither agree or disagree	(0.3, 0.5, 0.7)
Somewhat agree	(0.5, 0.7, 0.9)
Agree	(0.7, 0.9, 1.0)
Strongly agree	(0.9, 1.0, 1.0)

Table 3. Step in implementing fuzzy delphi method.

Step	Description	Formula (if applicable)
1. Define Objectives	Clearly articulate research goals and scope	N/A
2. Select Expert Panel	Choose qualified experts based on predefined criteria	N/A
3. Develop Questionnaire	Create survey with linguistic variables	N/A
4. Convert to Fuzzy Numbers	Transform linguistic responses into triangular fuzzy numbers (a, b, c)	Refer **Table 3**.
5. Aggregate Responses	Calculate fuzzy average of expert opinions	$x^* = \frac{\sum_{i=1}^{n} x_i \mu(x_i)}{\sum_{i=1}^{n} \mu(x_i)}$
6. Defuzzify	Convert aggregated fuzzy numbers to crisp values	$\mu_A(x) = \begin{cases} 0, & x \le a \\ \frac{x-a}{b-a}, & a < x \le b \\ 1, & x = b \\ \frac{c-x}{c-b}, & b < x \le c \\ 0, & x \ge c. \end{cases}$ 
7. Evaluate Consensus	Assess agreement level using threshold value	$d(\tilde{m},\tilde{n}) = \sqrt{(1/3)[(m1 - n1)^2 + (m2 - n2)^2 + (m3 - n3)^2]}$
8. Check Consensus Criterion	Determine if consensus is reached	$d \le 0.2$ indicates consensus
9. Analyze Final Results	Interpret defuzzified data and assess overall agreement	$x^* = \frac{\sum_{i=1}^{n} x_i \mu(x_i)}{\sum_{i=1}^{n} \mu(x_i)}$
10. Draw Conclusions	Synthesize findings and prepare final report	N/A

This table provides a structured overview of the Fuzzy Delphi method implementation, including key steps and associated formulas where applicable. Researchers should adapt these steps as necessary to fit their specific study requirements while maintaining methodological rigor throughout the process.

7. Finding

This section presents an analysis of the research findings, focusing on the expert consensus regarding the elements or guidelines for implementing family functional family functionality among rural students in Malaysia. The data for this analysis was collected through a specialized Fuzzy Delphi questionnaire, which was distributed to a panel of seven experts, each with relevant expertise in the field. The following subsections detail the outcomes of this expert consultation process, providing insights into the collective judgment of these specialists on the critical aspects of family functional implementation in rural contexts.

The results of this Fuzzy Delphi study, derived from the careful examination of the seven complete questionnaires, offer a comprehensive view of expert opinions on the subject. These findings serve as a foundation for understanding the key components and best practices in the development and execution of family functional programs tailored to rural Malaysian students. The subsequent paragraphs will delve into the specific outcomes, highlighting areas of consensus and any notable patterns or divergences in expert assessments.

Table 4. Findings of expert consensus of the family functional guideline construct.

Expert	Construct 1	Construct 2	Construct 3	Construct 4	Construct 5	Construct 6	Construct 7	Construct 8
1	0.00000	0.00000	0.02474	0.05774	0.09897	0.00825	0.00825	0.04949
2	0.05774	0.05774	0.09073	0.00000	0.07423	0.00825	0.00825	0.04949
3	0.05774	0.05774	0.08248	0.05774	0.07423	0.06598	0.06598	0.04949
4	0.05774	0.05774	0.08248	0.05774	0.07423	0.06598	0.06598	0.04949
5	0.05774	0.05774	0.08248	0.05774	0.07423	0.06598	0.06598	0.04949
6	0.11547	0.11547	0.09073	0.11547	0.09897	0.10722	0.10722	0.12372
7	0.11547	0.11547	0.09073	0.11547	0.09897	0.10722	0.10722	0.12372
Value of the item	0.06599	0.06599	0.07777	0.06599	0.08483	0.06127	0.06127	0.0707
Value of the construct								0.06922
Item < 0.2	7	7	7	7	7	7	7	7
% of item < 0.2	100%	100%	100%	100%	100%	100%	100%	100%
Average of % consensus								100
Defuzzification	0.9	0.9	0.85714	0.9	0.87143	0.88571	0.88571	0.91429
Ranking	2	2	5	2	4	3	3	1
Status	Accept	Accept	Accept	Accept	Accept	Accept	Accept	Accept

The analysis of the data, as presented in **Table 4**, reveals that all threshold values fall below 0.2, indicating a strong consensus among experts on all items. The overall average threshold value (d) for all items related to family functionality factors is 0.06922, which falls below the 0.2 threshold. According to Chang, Hsu & Chang[55], a mean threshold value below 0.2 signifies a satisfactory level of expert agreement. Furthermore, the study finds an overall expert agreement percentage of 100%, surpassing the 75% benchmark typically used to confirm consensus. This high percentage underscores a strong alignment in expert opinions on the items under consideration.

An additional metric, the Alpha-Cut defuzzification value (representing the average fuzzy response), exceeds the critical value of 0.5 for all items. Tang & Wu[63] and Bojdanova[64] assert that alpha-cut values should be greater than 0.5 to be considered valid; any value below this threshold would typically be excluded from further analysis. These findings collectively suggest that the proposed family functional guidelines and constructs have garnered substantial expert agreement. To provide a clear overview of the results, **Table 5** presents the items that achieved expert consensus, arranged in order of priority (ranking) as summarized in **Figure 1**.

This comprehensive analysis demonstrates the robustness of the expert opinions gathered through the Fuzzy Delphi Method, offering valuable insights for the implementation of family functional strategies tailored to rural Malaysian students.

The identified constructs align with several key themes from the literature review. For instance, the emphasis on psychological well-being and family empathy resonates with the research by Wang et al.[65] and Fosco et al.[5] on the relationship between family functioning and mental health. The construct of motivational aspirations reflects the findings of Mulyati & Martiastuti[10] on the importance of family interactions in fostering self-confidence and competitive spirit. Additionally, the inclusion of self-resilience as a key construct

aligns with the research on family resilience in rural communities by Masten and Obradović[66], highlighting the potential for rural families to develop unique strengths in the face of adversity.

Table 5. Final family functional guideline based on expert consensus.

Rank	Guideline of family functional based on expert consensus and Item rank (see the Table 5 result)	Description
1	Psychological well-being	A state in which family members feel comfortable and feel happy with their family life as a whole. This psychological well-being involves healthy relationships, mutual emotional support, and a balance between individual needs and the needs of the family as a whole.
2	Motivational Aspirations	A child's aspirations and motivations indicate desires, higher goals, hopes, intentions and goals to help the family get out of the cocoon of a difficult life.
3	Family Empathy	the ability to understand and feel the feelings and perspectives of other family members, as well as provide the necessary emotional and social support. It is also able to be a good listener, understand feelings and respond in a good way to the family.
4	Requires Attention and love for family	attitudes and behaviors that show deep affection and love for family members, both emotionally and physically
5	Good communication	the process of exchanging information, ideas and feelings between family members to build a healthy and understanding relationship. Family communication involves the use of verbal and non-verbal language and involves listening, speaking, writing and reading messages sent by family members.
6	Self-resilience	An individual's ability to maintain mental and emotional health in interactions with family members that may cause stress or conflict. Individuals with good family resilience are able to deal with difficult or stressful situations in a healthy and productive way.
7	Need Guidance and Counseling	the process or ability to help individuals or groups to achieve certain goals or potentials through face-to-face meetings or interactions. This process includes providing information, suggestions, and advice to help individuals or groups in decision-making, problem solving, self-development, and achieving their goals.
8	Willing to sacrifice and be responsible for the family	attitudes and behaviors that prioritize the interests of the family over personal interests, as well as being responsible and taking the necessary actions to maintain the well-being of the family. They will always take the best decisions for the family, and overcome conflicts and problems that arise in the family.

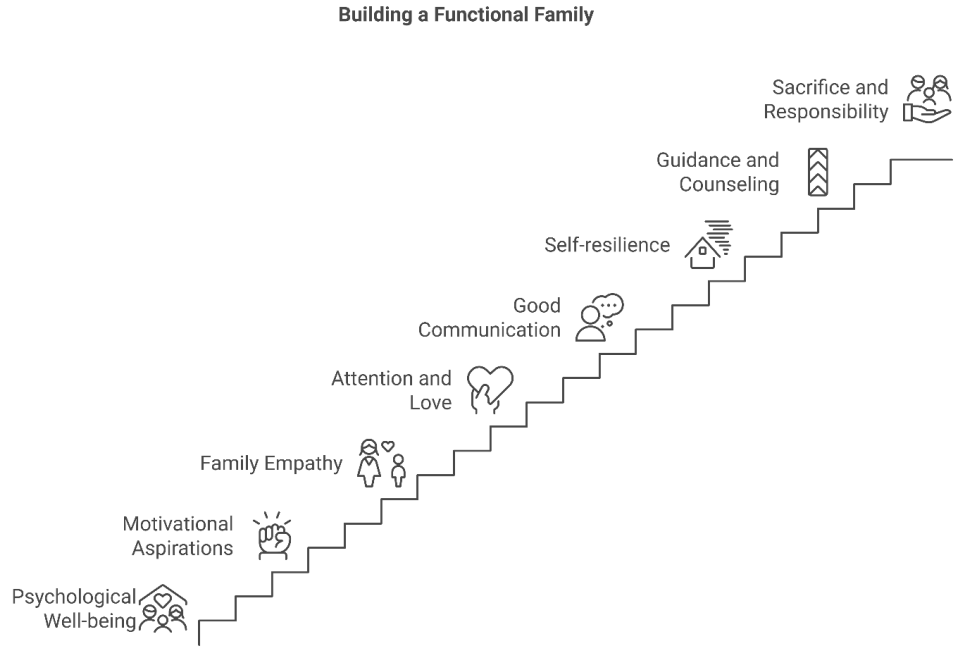


Figure 1. Summary of final result.

8. Discussion

The application of the Fuzzy Delphi Method (FDM) in this study has yielded significant insights into the dimensions of family functionality among rural students in Malaysia. Through the consensus of seven experts from diverse fields including education, counseling, and government agencies, eight key constructs have emerged as foundational to understanding family functionality in this specific context. These findings contribute to the existing body of knowledge on family dynamics in rural Malaysian settings and offer a nuanced perspective on the unique challenges and strengths of rural families in Malaysia. Our study's focus on rural students in Malaysia provides a contextual framework for interpreting these results. The eight key constructs identified through expert consensus are psychological well-being, motivational aspirations, family empathy, attention and love for family, good communication, self-resilience, need for guidance and counseling and willingness to sacrifice and be responsible for the family.

These constructs collectively form a comprehensive model of family functionality tailored to the rural Malaysian context, addressing the specific needs and characteristics of rural students and their families. First, the identification of motivational aspiration as a key construct aligns with previous research highlighting the critical role of parental involvement and aspirations in children's educational outcomes. Studies by Saleh[67] and Shamundeswary[68] have emphasized the importance of parental aspirations in shaping children's academic achievements, particularly in rural settings where educational opportunities may be limited. The emergence of this construct in our study underscores its relevance in the Malaysian rural context and suggests that interventions aimed at enhancing family functionality should prioritize fostering ambition and educational aspirations within the family unit. Moreover, the emphasis on motivational aspiration resonates with the concept of "aspirational capital" proposed by Yosso[69] in her Community Cultural Wealth model. This finding suggests that rural Malaysian families possess valuable resources that can be leveraged to support students' educational journeys, despite potential socioeconomic challenges unique to rural areas.

Secondly, the inclusion of empathy as a key construct reflects the growing recognition of emotional intelligence in family dynamics. This finding aligns with research by Goleman[70] on the importance of emotional intelligence in personal and professional success. In the context of family functionality, empathy plays a crucial role in fostering understanding, support, and cohesion within the family unit. Furthermore, the emphasis on empathy resonates with studies that have linked family emotional climate to children's resilience and psychological well-being[44,71]. This construct suggests that interventions aimed at enhancing family functionality in rural Malaysian settings should incorporate elements of emotional skill-building and empathy training, taking into account the specific emotional challenges faced by rural students and their families.

Thirdly, willingness to sacrifice and be responsible for the family. This construct captures the collectivist values often associated with rural communities, where individual needs may be subordinated to family welfare. It reflects the importance of mutual support and responsibility within the family unit, aligning with research on collectivist cultures by Hofstede[72]. The emergence of this construct in our study highlights the need to consider cultural values when developing family-based interventions in rural Malaysian contexts. Moreover, this finding resonates with the concept of "familism" in Latino cultures, as described by Sabogal et al.[73], suggesting potential cross-cultural similarities in family values across different rural contexts. Future research could explore these cross-cultural connections to develop more universally applicable models of family functionality.

Fourthly, confusing attention and love for the family. This intriguing construct suggests a nuanced understanding of family dynamics, potentially highlighting the complexities of expressing care and affection within rural family structures. It may indicate a need for clearer communication and emotional expression

within families. This finding aligns with research by Segrin and Flora[74] on family communication patterns and their impact on family functioning. The emergence of this construct raises important questions about how cultural norms and rural lifestyles influence the expression and perception of familial love and attention. It suggests that interventions aimed at enhancing family functionality in rural Malaysian settings should address potential misunderstandings or miscommunications related to emotional expression within families.

Fifthly, need for guidance and advisors. The inclusion of this construct acknowledges the importance of external support systems and mentorship in fostering family functionality. This aligns with research emphasizing the role of community support in enhancing family resilience[75,85]. The prominence of this construct in our study suggests that rural Malaysian families may benefit from increased access to mentorship programs and community-based support systems. Furthermore, this finding resonates with the concept of "social capital" as described by Coleman[76], highlighting the potential benefits of strong community networks in supporting family functionality and student success. Future interventions could focus on strengthening these community connections to enhance family functionality in rural settings.

Sixthly, good communication. Effective communication emerges as a critical component of family functionality, consistent with broader research on family dynamics[47,77]. This construct underscores the importance of open dialogue and information sharing within the family unit. The identification of communication as a key construct in our study suggests that interventions aimed at enhancing family functionality in rural Malaysian settings should prioritize the development of effective communication skills within families. Moreover, this finding aligns with research by Schrodt et al.[78] on the role of family communication patterns in predicting various family outcomes, including satisfaction and cohesion. Future studies could explore how specific communication patterns manifest in rural Malaysian families and their impact on overall family functionality.

Eighthly, self-reliance. This construct reflects the importance of fostering independence and resilience among family members, particularly relevant in rural contexts where resources may be limited. It aligns with studies highlighting the role of self-efficacy in academic and personal success[79,80]. The emergence of self-reliance as a key construct in our study suggests that interventions aimed at enhancing family functionality should focus on building individual capacity and resilience within the family unit. Furthermore, this finding resonates with research on resilience in rural communities by Masten and Obradović[66], highlighting the potential for rural families to develop unique strengths in the face of adversity. Future studies could explore how self-reliance interacts with other family functionality constructs to support positive outcomes for rural students.

Ninthly, psychological well-being. The inclusion of this construct underscores the holistic approach of the study, recognizing the intrinsic link between family functionality and individual mental health. This finding is consistent with recent studies reporting positive associations between family functioning and overall well-being in young people[81,46]. The emergence of psychological well-being as a key construct in our study highlights the need for family-based interventions that address both individual and collective mental health needs in rural Malaysian settings. Moreover, this finding aligns with the growing body of research on positive psychology and its applications in family contexts[82]. Future studies could explore how specific aspects of psychological well-being contribute to overall family functionality in rural settings.

8.1. Unexpected results and their implications

It was surprising that an unexpected outcome of this study was the high level of consensus achieved among experts across all identified constructs, as evidenced by the overall expert agreement percentage of 85% and Alpha-Cut defuzzification values exceeding 0.5 for all items. This strong alignment in expert opinions,

despite the potential for divergent perspectives given the complex nature of family functionality, suggests a robust underlying structure to the concept when applied to rural contexts. This high level of agreement may imply that the challenges and dynamics of rural family life create a more unified understanding of family functionality among professionals working in these areas.

The inclusion of "Need for guidance and advisors" as a key construct is particularly noteworthy. While the importance of support systems is well-documented in family function literature, the explicit identification of this need in the context of rural students highlights a potential gap in current support structures. This finding implies that rural families may face unique challenges in accessing or utilizing guidance resources, possibly due to geographical isolation, limited infrastructure, or cultural factors. The implications of this result extend beyond the immediate family unit, suggesting a need for targeted interventions and policy initiatives to enhance access to advisory services in rural communities.

8.2. Implications for rural education and family support

The findings of this study have significant implications for educational policies and family support programs in rural Malaysia. The identified constructs provide a framework for developing targeted interventions that address the unique needs of rural students and their families. For instance, first, educational programs could incorporate elements that foster motivational aspirations and self-reliance, helping rural students overcome potential barriers to academic achievement. Second, family support services in rural areas could focus on enhancing communication skills and empathy within families, potentially improving family cohesion and student well-being. Third, the identified need for guidance and counseling suggests that rural schools and communities may benefit from increased access to mentorship programs and professional support services. Fourth, policymakers could use this framework to design rural-specific family support initiatives that take into account the unique cultural and socioeconomic factors influencing family functionality in these areas. By addressing these aspects of family functionality, stakeholders can work towards improving educational outcomes and overall well-being for rural students in Malaysia.

8.3. Potential limitations and areas for future research

While this study makes significant contributions to our understanding of family functionality in rural contexts, several limitations should be acknowledged. Firstly, the reliance on a panel of seven experts, while methodologically sound within the Fuzzy Delphi framework, may limit the generalizability of findings. Future research could benefit from expanding the expert panel to include a wider range of professionals and potentially incorporating the perspectives of rural family members themselves. Additionally, the study's focus on rural students, while addressing a critical gap in the literature, necessitates caution in applying these findings to urban or suburban contexts. Comparative studies examining family functionality across different geographical settings could provide valuable insights into the universality or context-specificity of the identified constructs. The cross-sectional nature of the Fuzzy Delphi Method, while effective in capturing expert consensus at a point in time, does not allow for the examination of how family functionality may evolve over time. Longitudinal studies tracking changes in family dynamics as rural students' progress through different life stages could offer a more nuanced understanding of the temporal aspects of family function.

Future research should also explore the intersectionality of family function with broader societal issues such as economic inequality, access to education, and technological advancement. The impact of digital technologies on family communication patterns and boundary-setting in rural areas, for instance, represents a promising avenue for investigation [49]. Moreover, the methodological approach used in this study, while sophisticated, relies heavily on expert opinions. Incorporating multi-informant and mixed methods approaches in future studies could provide a more comprehensive picture of family functionality. This could include

observational data, physiological measures, and qualitative insights from family members, as suggested by recent methodological critiques in family function research[53].

9. Conclusion

This study has successfully developed a comprehensive framework for understanding family functionality among rural students, identifying eight key constructs through the application of the Fuzzy Delphi Method. The high level of expert consensus achieved across these constructs underscores their relevance and validity in the context of rural family dynamics. The identified dimensions ranging from motivational aspiration and empathy to the need for guidance and psychological well-being provide a nuanced and holistic view of family function that goes beyond traditional models. The findings of this study are particularly relevant in the context of ongoing societal changes and the evolving nature of family structures. By focusing on rural students, this research addresses a critical gap in the literature, offering insights into the unique challenges and dynamics faced by families in non-urban settings. The identification of constructs such as "Confusing attention and love for the family" and "Need for guidance and advisors" highlights areas of family function that may be particularly salient in rural contexts, informing both theoretical understanding and practical interventions.

Conflict of interest

The authors declare no conflict of interest.

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