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Integrated Rehabilitation and Holistic Poverty Reduction Model for Education (IRAH-PRIME): A Comprehensive Intervention Framework for Delinquent Students from Low-Income Families in East Coast of Malaysia

Model Rehabilitasi Bersepadu dan Pengurangan Kemiskinan Secara Holistik untuk Pendidikan (IRAH-PRIME): Satu Kerangka Intervensi Komprehensif bagi Pelajar Delinkuen daripada Keluarga Berpendapatan Rendah di Pantai Timur Malaysia

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ABSTRACT

This study developed and validated the IRAH-PRIME (Integrated Rehabilitation and Holistic Poverty Reduction Intervention Model for Education) framework to address behavioral challenges among non-urban university students from low-income families in Malaysia's eastern states. Using the Fuzzy Delphi Method (FDM), expert consensus was obtained from a panel of ten professionals, including psychology officers and academic faculty with between 3 and 30 years of experience. The study utilized a seven-point Likert scale questionnaire derived from a comprehensive literature review, with responses converted into triangular fuzzy numbers, followed by defuzzification and threshold distance analysis. All eight proposed intervention dimensions were accepted based on rigorous criteria (≥75% consensus, M ≥ 0.5, Avg d ≤ 0.2). Six constructs (75%) achieved 100% consensus, and two reached 90%. Defuzzification scores ranged from 0.849 to 0.983, with Family Support and Social Support receiving the highest endorsement (M = 0.983, Avg d = 0.031). Hierarchical prioritization ranked Psychological Support first, followed by Educational Support, Family Support, and Social Support. These results support integrated ecological-developmental theories, emphasizing the need to address multiple ecological levels simultaneously in behavioral interventions. The validated IRAH-PRIME framework provides educational institutions and policymakers with an evidence-based blueprint for culturally sensitive, holistic intervention programs, along with guidelines for phased implementation in resource-limited non-urban settings.

Keywords: Fuzzy Delphi Method; at-risk students; support strategies; non-urban education; IRAH-PRIME model; expert consensus; Malaysia

ABSTRAK

Kajian ini membangunkan dan mengesahkan rangka kerja IRAH-PRIME (Integrated Rehabilitation and Holistic Poverty Reduction Intervention Model for Education) untuk menangani tingkah laku nakal pelajar dalam kalangan populasi universiti luar bandar daripada latar belakang keluarga berpendapatan rendah di negeri-negeri Pantai Timur Malaysia. Menggunakan Kaedah Fuzzy Delphi, konsensus pakar telah diwujudkan melalui sepuluh orang panel yang terdiri daripada pegawai psikologi dan ahli akademik fakulti dengan pengalaman di antara 3 sehingga 30 tahun. Kajian ini menggunakan soal selidik skala Likert tujuh mata berdasarkan sintesis literatur yang komprehensif, dengan respons dianalisis melalui penukaran nombor kabur segi tiga, penyahkaburan dan pengiraan jarak ambang. Kesemua lapan dimensi intervensi yang dicadangkan mencapai penerimaan sejagat berdasarkan kriteria pengesahan yang ketat (konsensus ≥75%, M ≥0.5, Avg d ≤0.2). Enam konstruk (75%) mencapai konsensus sempurna 100%, manakala dua mencapai persetujuan 90%. Nilai penyahkaburan berkisar antara 0.849 hingga 0.983, dengan Sokongan Keluarga dan Sokongan Sosial mencapai pengesahan maksimum (M=0.983, Avg d=0.031). Keutamaan hierarki meletakkan Sokongan Psikologi (Kedudukan 1), Sokongan Pendidikan (Kedudukan 2), Sokongan Keluarga (Kedudukan 3), dan Sokongan Sosial (Kedudukan 4) sebagai dimensi intervensi utama. Dapatan kajian mengesahkan rangka kerja ekologi-perkembangan bersepadu, menunjukkan bahawa intervensi tingkah laku yang berkesan mesti

menangani pelbagai peringkat ekologi secara serentak. Rangka kerja IRAH-PRIME yang telah disahkan menawarkan institusi pendidikan dan pembuat dasar pelan tindakan berasaskan bukti untuk mereka bentuk program intervensi komprehensif yang responsif budaya dengan panduan praktikal untuk pelaksanaan berperingkat dalam tetapan luar bandar yang terhad sumber.

Kata kunci: Kaedah Fuzzy Delphi; pelajar delinkuen; strategi intervensi; pendidikan luar bandar; model IRAH-PRIME; konsensus pakar; Malaysia

INTRODUCTION

Malaysia has made significant progress in reducing poverty and income inequality, with 301,268 poor household heads reported in 2025 (Department of Statistics Malaysia, 2025). Poverty is relatively balanced between urban (51.3%) and rural (48.7%) areas, with the Malay community constituting the largest poor demographic, followed by Bumiputera Sabah and Sarawak, Indians, Chinese, and Orang Asli. Kelantan, Terengganu, and Pahang show declining poverty incidence and improved income equality, although socioeconomic challenges remain (Department of Statistics Malaysia, 2025).

Despite these positive achievements in poverty reduction, educational attrition among economically disadvantaged families remains a critical concern that threatens the sustainability of this progress (Quimco, 2025; Skenderidou et al., 2025). Educational disengagement poses a significant challenge to human capital development and risks perpetuating the intergenerational poverty cycle targeted by government efforts (Paraman & Mohd Hussain, 2025). Student dropout refers to a situation where students discontinued attending school without a reasonable excuse, resulting in their formal education termination (Ministry of Education Malaysia, 2018). Official data from the Ministry of Education Malaysia shows the number of absent Malaysian Certificate of Education (SPM) examination candidates from 2016 to 2024, whereby it increased dramatically from 7,155 in 2016 to 14,858 in 2022, before declining to 10,160 in 2023 and 8,076 in 2024 (Ministry of Education Malaysia, 2025a). Although this decline reflects the intervention measures, the significant spike in 2021 and 2022 raises the critical impact of the COVID-19 pandemic on student engagement. Ibrahim et al. (2025) emphasize that persistent misconduct, truancy, and actions that violate school rules or community norms, affect academic achievement, school climate, and long-term community outcomes. This intersection between poverty concentration and educational attrition creates a complex web to Malaysia's aspiration toward high-income nation status and sustainable human capital development (Abu Hassan & Khairul Anwar, 2025), especially in eastern that continue to struggle with higher socioeconomic challenges compared to the national average (Anuar et al., 2024).

This study focuses on university students from low-income families who exhibit behavioral challenges linked to earlier educational disengagement, addressing the gap in understanding attrition at the tertiary education level. While national statistics primarily concern secondary school students, the challenges of university students from similar socioeconomic backgrounds remain underexplored, particularly regarding behavioral and academic attrition risks (Noor Syafiza Ariffin & Bity Salwana Alias, 2025). This focus is important because students from B40 groups often face complex socioeconomic pressures that affect their engagement and success in higher education. A report by the Perak State Education Department identified 2,047 students with premature primary and secondary schools' leaving, with 38.2% due to expulsion, 35% lack of interest in school, 12.1% working, and 10.1% family problems (Sinar Harian, 2025). School attrition therefore involves beyond physical absence to include lack of active engagement, weak mastery of basic

language skills, and a tendency to drop out academically (Nur Faiqah Nasuha Muhd Zafrullah & Zamri Mahamod, 2025). More concerningly, of the 8,076 candidates who did not sit for SPM 2024, 6,231 were students from Ministry of Education Malaysia schools, indicating attrition cases mostly occur within the mainstream education system despite strict monitoring mechanisms (Ministry of Education Malaysia, 2025a). This paradox raises questions about how effectiveness current monitoring systems are and whether reported improvements reflect actual engagement or merely changes in reporting methodology.

In-depth analysis reveals that educational attrition is multidimensional problem and requires comprehensive approach. Nur Faiqah Nasuha Muhd Zafrullah & Zamri Mahamod (2025) reveals main contributing factors including student attitudes, motivation and readiness, discouraging parental support, unconducive learning environments, family socioeconomic factors, peer influence, and the COVID-19 pandemic. These findings are consistent with Norfarahzatul Asikin Zakari et al. (2022), who also confirm that family socioeconomic factors, student personality, and external factors such as culture and environment, peer influence, and teacher teaching methods as main causes of school attrition. According to the Institute for Democracy and Economic Affairs Malaysia (IDEAS, 2017), nearly 60% of students who leave school prematurely are from low-income families, with absenteeism affecting students' academic performance (Norfarahzatul Asikin Zakari et al., 2022). This proves that school attrition is a multidimensional phenomenon requiring integrated strategies beyond academic support. Socioeconomic factors, family dysfunction, peer influence, substance abuse, and mental health issues all contribute to problematic conduct, with consequences that extend beyond individuals to affect community safety and overall societal well-being (Ibrahim et al., 2025).

The need for this integrated strategy is supported by various developmental and behavioral theories. Bronfenbrenner's Ecological Systems Theory (1979) emphasizes that individual development occurs within nested environmental systems, requiring programs that address multiple ecological levels. This interdisciplinary approach synthesizes insights from psychology, neuroscience, sociology, and education to develop a nuanced understanding of behavioral challenges, examining risk factors at individual, family, peer, school, and community levels while also considering the neurobiological basis of adolescent decision-making and impulse control (Ibrahim et al., 2025). Additionally, Cognitive-Behavioral Theory emphasizes that maladaptive behavior results from distorted cognitive patterns and poor emotional regulation (Beck, 2011), while Social Capital Theory states that supportive social networks and community resources are critical protective mechanisms (Putnam, 2000; Dishion & Tipsord, 2011). Together, these perspectives show that effective programs must address psychological, educational, family, social, and spiritual dimensions simultaneously (Henggeler et al., 2009). Meta-analytic evidence shows integrated multi-component programs produce much larger effect sizes (d=0.45-0.65) compared to single-component approaches (d=0.20-0.35), confirming the need for holistic intervention design (Lipsey, 2009). However, the translation of these theoretical principles into context-specific programs for non-urban Malaysian settings that integrate Islamic values and local cultural realities remains a critical gap to be filled.

Comparison with international contexts shows that educational attrition is not unique to Malaysia, but rather a global challenge. According to the 2024 World Education Statistics by UNESCO, approximately 249 million children and adolescents aged 6 to 18 are out of school, especially in low- and middle-income countries, with main causes including poverty, lack of access to quality education, unsafe learning environments, weak nutritional and health support, and insufficient psychosocial support (Noor Syafiza Ariffin & Bity Salwana Alias, 2025). In the

Philippines, Bayron (2023) documents that 52.78% of rural households earn monthly income between 2,000-2,999 pesos monthly, with students frequently attending school hungry (M=3.75), unable to pay school obligations (M=3.56), and having insufficient transportation budgets (M=3.69). These findings are supported by Hua (2025) who emphasizes that educational inequality remains a major barrier to rural development, with students facing large gaps in academic performance compared to their urban peers. This comparison shows despite Malaysia's upper-middle-income status, structural challenges still exist and similar to other developing countries' context. The increasing trend of SPM candidates' absences in 2021 and 2022 further shows the educational system's vulnerability to external disruptions such as the COVID-19 pandemic, indicating the need to build a more resilient and adaptive education system.

Among contributing factors to educational attrition, family dynamics emerge as a critical determinant that cannot be ignored. Ibrahim et al. (2025) assert that consistent parental involvement, emotional support, and effective disciplinary practices are consistently associated with lower rates of problematic conduct. Conversely, neglectful or harsh parenting styles, marked by inconsistent discipline, low warmth, and weak supervision, can increase the risk of antisocial behavior and academic attrition. A study by Budimlić et al. (2024) found that 7% of rural students in Bosnia and Herzegovina live in families lacking one or both parents, with physical punishment emerging as the most prevalent form of victimization (30.6% lifetime, 22.1% in the past 12 months). Yuniarti (2024) identified that broken family households, inadequate parental attention, and weak supervision contribute to attrition factors. Ibrahim et al. (2025) further emphasize that lack of family control, frequent conflicts at home, uncomfortable residential environments, and media influence are contributors to juvenile misconduct. Typically, juvenile students are often involved in criminal activities to meet basic needs and seek recreation due to inadequate family support. For them, lack of parental response and insufficient financial support fully shape students' personality and character at school. These findings are highly relevant to Malaysia, where low family income influences educational development by reducing students' motivation to continue learning, and limiting their ability to continue education to higher levels (Norfarahzatul Asikin Zakari et al., 2022).

Beyond family dynamics, teacher quality and institutional capacity are also important factors influencing educational success globally. Ibrahim et al. (2025) emphasize that teachers play a major role in managing behavioral challenges through education, guidance, and disciplinary action. When teachers fail to interact effectively with problematic students, those students become less engaged in school activities and may develop negative attitudes toward education (Ibrahim et al., 2025). Hua (2025) identifies that ensuring teacher quality and retaining teachers in rural schools is a challenge faced by many countries, where rural schools constantly struggle to attract and retain qualified educators. China's Rural Teacher Support Program (2015-2020) successfully improved teacher recruitment and quality through financial incentives, housing, and promotion opportunities, showing positive impacts on students' mathematics and literacy achievement, although teacher retention problems in remote areas persist (Hua, 2025; Li, 2025). Teacher accountability reforms in India show conditional improvements, where teacher attendance monitored through GPS and linked to financial bonuses successfully reduced absenteeism by 21 percentage points and produced moderate improvements in test scores, but chronic absenteeism persists in states with weak governance (Hua, 2025). These international experiences raise questions about whether Malaysia's rural education system faces similar challenges in attracting and retaining quality educators, and whether current teacher support mechanisms can address the needs of at-risk students in resource-limited environments.

Analysis of problematic behavioral patterns shows complex dynamics closely linked to educational disengagement problems. Budimlić et al. (2024) document that alcohol use is the most frequent prohibited behavior by students, with 28.1% having tried it in their lifetime and 20% using it in the past 12 months, followed by unauthorized internet downloads (16.9% lifetime, 16.2% in the past 12 months). Comparative analysis between 2005/06 and 2015/16 reveals significant increases in rural student involvement with property crimes, where theft victims increased by 13%, physical injuries increased by 13%, and robbery increased by 23% (Budimlić et al., 2024). Cyber misconduct shows a dramatic spike from 35% to 50% among perpetrators (Budimlić et al., 2024). Ibrahim et al. (2025) document that problematic behavior tends to peak during early secondary school years, with male students more vulnerable to such behavior compared to female students. School well-being plays an important role as negative school environments are associated with increased misconduct such as truancy and vandalism. In the Malaysian context, qualitative analysis reveals that 78.6% of students identify lack of interest in learning as the main attrition factor, followed by family economic factors (71.4%) and boring learning systems (57.1%) (Mohamad Taha Ijab et al., 2025). These findings align with Norfarahzatul Asikin Zakari et al. (2022), who state that student attitudes, interests, and motivational aspects are closely related to learning performance, and when students lack self-motivation to receive lessons, they tend to be involved in social problems that ultimately lead to school attrition.

However, an interesting contradiction emerges in empirical studies. A moderate negative relationship ($r=-0.382$, $p<0.001$) shows that higher principals' management practices for student needs are associated with lower B40 student attrition rates (Noor Syafiza Ariffin & Bity Salwana Alias, 2025). Nevertheless, the same study reveals that basic needs recorded the lowest score (mean=4.009, SD=0.728) compared to love needs (mean=4.381) and safety needs (mean=4.354) (Noor Syafiza Ariffin & Bity Salwana Alias, 2025). This raises a critical question: Is Malaysia's education system more successful in meeting students' psychosocial needs compared to their basic needs, or is there a systematic implementation gap in delivering material assistance to at-risk students? This question is also supported by Norfarahzatul Asikin Zakari et al. (2022) that reveals low family income influences educational development, resulting in low motivation for children to continue learning, and limited financial resources do not allow students to continue education to higher levels. This contradiction suggests the possibility of a gap between policy intentions and grassroots implementation, raising speculation that current approaches may only address symptoms rather than the actual root causes of student disengagement in education.

In response to this crisis, the Ministry of Education Malaysia has implemented various strategic measures. These include daily monitoring of student attendance through the Student Attendance System (eKehadiran), activation of the At-Risk SPM Student Intervention Task Force at all levels, National Performance Dialogue, and focused activities such as the Ziarah Cakna Program and Parent-Teacher Association sharing sessions (Ministry of Education Malaysia, 2025a). The Ministry of Education Malaysia has also provided various assistance such as free textbooks, Supplementary Food Program (RMT), student milk program, as well as counseling services and remedial teachers to increase students' interest in continuing their studies (Norfarahzatul Asikin Zakari et al., 2022). However, the effectiveness of these measures is still questioned given the significant spike in candidate absences in 2021 and 2022, raising speculation that material assistance alone is insufficient to address the actual causes of educational attrition which are complex and involve multiple factors. Contemporary best practices emphasize multisystemic approaches that integrate psychological, educational, family, social, and spiritual

dimensions (Henggeler et al., 2009). Ibrahim et al. (2025) suggest organizing strategies into three main categories: Individual and Relational Strategies (including mentoring and counseling programs, family-based approaches, teacher-student relationships), Whole School and Systemic Approaches (including restorative justice practices, School-Wide Positive Behavioral Interventions and Supports/SWPBIS (Bradshaw et al., 2009), comprehensive positive school climate initiatives), and Alternative Engagement Models (including alternative education models, co-curricular activities, and technology-based approaches). Meta-analytic evidence shows comprehensive multi-component programs produce much larger effect sizes (d=0.45-0.65) compared to single-component approaches (d=0.20–0.35), confirming the need for holistic program design (Lipsey, 2009).

International experience in implementing evidence-based intervention programs has shown encouraging effectiveness in various contexts. Mentoring programs such as Big Brothers Big Sisters of America show students are less likely to initiate drug and alcohol use, engage in violent behavior, and skip school compared to control groups (Ibrahim et al., 2025). Multisystemic Therapy (MST) shows effectiveness in reducing problematic behavior and improving family functioning, with meta-analyses reporting significant reductions in recidivism or repeat behavior rates (Ibrahim et al., 2025). Restorative justice practices in Minnesota schools found significant reductions in suspension rates and improvements in teacher-student relationships, while schools in Oakland, California experienced a 56% reduction in suspensions for African American students (Ibrahim et al., 2025). SWPBIS consistently shows effectiveness in reducing disciplinary referrals, suspensions, and expulsions while improving academic outcomes and school climate (Ibrahim et al., 2025). However, these Western-developed approaches in non-urban Malaysian contexts, particularly in eastern provinces, with unique socioeconomic and cultural characteristics, have not been extensively explored. This raises concern of whether these models will be effective to provide meaningful impact in local contexts.

The long-term effects of educational attrition on national development are profound and cannot be taken lightly. Systematic analysis identifies six main effects of premature school leaving: inability to master basic Malay language literacy skills, falling behind in learning, disrupted student motivation and emotions, declining academic performance, uncertain career paths, and lack of soft skills (Nur Faiqah Nasuha Muhd Zafrullah & Zamri Mahamod, 2025). These implications not only affect individuals but also threaten the nation's economic competitiveness in the Industrial Revolution 4.0 era, which requires a highly educated and skilled workforce. Economic growth is now driven by education-based industries, where high-quality labor requirements and sustainable job growth are important foundations for transforming the economy from a middle-income to a high-income country (Norfarahzatul Asikin Zakari et al., 2022). The Ministry of Education Malaysia emphasizes that the issue of SPM examination candidate absence is an issue that cannot be tolerated by the ministry, reflecting the government's seriousness in addressing this challenge (Ministry of Education Malaysia, 2025a). However, the persistent gap between policy rhetoric and implementation outcomes raises fundamental questions about systemic capacity to translate aspirations into effective action.

Despite extensive research on behavioral challenges, significant knowledge gaps remain in understanding program effectiveness in non-urban higher education contexts, especially in developing countries. Hua (2025) identifies critical research gaps in understanding how policy design and local implementation interact to influence rural education quality, stating that existing research tends to study national reforms separately. Ibrahim et al. (2025) call for longitudinal studies examining the long-term impact of various strategies, investigations of culturally

responsive approaches that consider diverse student populations and community contexts, and further exploration of innovative technology-based approaches leveraging artificial intelligence and virtual reality. Most existing studies focus on Western or urban contexts, with limited research on unique dynamics influencing behavioral challenges in non-urban Malaysian contexts (Kuah & Mohamad, 2023). The eastern Malaysia context shows complex dynamics with high poverty rates and unique infrastructure challenges, yet empirically validated context-specific intervention frameworks remain limited. The operationalization of behavioral outcomes lacks standardization, complicating cross-study comparisons. Although various theories have been used to understand behavioral challenges, the integration of these theories into coherent and implementable intervention frameworks remains limited (Majeed et al., 2024). The translation of these principles into context-specific intervention programs for non-urban Malaysian settings that integrate Islamic values and local cultural realities remains a critical gap. Spiritual Well-being Theory states that religious practices and moral internalization contribute to psychological well-being and behavioral regulation (Ellison, 1991), which is highly relevant in the Malaysian context where Islamic values are a central cultural element (Smith & Denton, 2005), yet the integration of spiritual dimensions into comprehensive frameworks remains understudied.

As a proactive response to this challenge, the Ministry of Education Malaysia has collaborated with the Ministry of Finance Malaysia through the Madani Monitoring Unit, Yayasan Hasanah, and public universities in implementing the Anak Kita Program: SPM Program focusing on compulsory SPM subjects, namely Malay Language and History, as well as emphasis on Mathematics (Ministry of Education Malaysia, 2025a). In 2025, 22,000 SPM candidates from 928 schools, including students with special educational needs (MBPK), will receive device kits or tablets, supported by Sultan Idris Education University and Universiti Sains Malaysia as strategic partners (Ministry of Education Malaysia, 2025a). This program also involves collaboration through the Medium Industry Internship Program (PIMA) which is a skills-stream program in secondary schools implemented collaboratively between the Ministry of Education and industrial or training institutions to reduce attrition risk among secondary school students not interested in academic fields (Norfarahzatul Asikin Zakari et al., 2022). However, the effectiveness of this program in addressing the actual causes of attrition still requires more in-depth empirical assessment, especially in the context of B40 students facing various complex socioeconomic pressures. Norfarahzatul Asikin Zakari et al. (2022) emphasize that education gap created by attrition can be narrowed down when basic needs are continuously met, and that a closer examination of the current education system is needed to elevate the education sector to a higher level.

Based on the needs in this study, it aims to develop and validate the IRAH-PRIME Model (Integrated Rehabilitation and Holistic Poverty Reduction Model for Education) as an integrated framework for rehabilitating at-risk students from low-income families in eastern Malaysia, specifically Pahang, Kelantan, and Terengganu. This model integrates academic, psychosocial, and economic rehabilitation approaches into a coordinated ecosystem, in line with Norfarahzatul Asikin Zakari et al.'s (2022) suggestion that measures to overcome educational attrition must involve increasing parental awareness, student motivation and interest, and diversifying teaching styles to attract student engagement. This study fills a critical gap in understanding the complex dynamics between poverty, behavioral challenges, and educational attrition in specific geographic and socioeconomic contexts, and provides a practical framework that can support schools, State Education Departments, and welfare agencies in designing more responsive, inclusive, and high-impact programs.

By integrating perspectives from various empirical studies and official data, this research will explore whether existing measures effectively address attrition causes or merely covering deeper problems in the nation's education system. Comprehensive understanding of this issue is critical for formulating more responsive, inclusive, and sustainable education policies to ensure no student is left behind in Malaysia's efforts to achieve high-quality human capital development, especially among students at high risk of leaving school prematurely due to interrelated poverty and behavioral challenge factors. Through this holistic and evidence-based approach, it is hoped that the IRAH-PRIME Model can become an effective practical guide for addressing educational attrition challenges in Malaysia, particularly in rural areas facing more complex socioeconomic challenges.

METHODOLOGY

This investigation employed a qualitative research framework utilizing the Fuzzy Delphi Method (FDM) to establish an integrated dimensional model for understanding at-risk student behaviors among non-urban university populations in Malaysia. FDM facilitates the integration of linguistic variables with fuzzy set theory principles, enabling systematic management of uncertainty inherent in expert judgments (Chang et al., 2011), while capturing nuanced expert perspectives and reducing ambiguity in subjective assessments.

The research design incorporated a two-stage developmental process. Initially, extensive synthesis of existing scholarly literature identified fundamental constructs associated with behavioral challenges, systematically organized in Table 1. Subsequently, an expert evaluation tool was constructed based on the identified constructs, employing a seven-point Likert-type response format administered to ten domain experts with specialized knowledge. Expert responses underwent systematic FDM analysis, facilitating interpretation of opinion variations and enabling methodological consensus. This approach ensures a robust research design by synthesizing theoretical insights with specialized expert judgment, strengthening both construct validity and measurement reliability.

TABLE 1. Theoretical Framework for Delinquent Student Model

Construct Dimension	Core Components
Psychological Support Strategies	Counselling accessibility, emotional support
Academic Support Strategies	Peer learning, academic mentoring, remedial programs
Family-Centered Support Strategies	Parental engagement, family warmth, supervision
Social Support Strategies	Community involvement, prosocial peer relations
Social Integration & Mentorship	Mentor-mentee relationships, institutional belonging
Comprehensive Program Framework	Multi-system collaboration, intervention continuity
Religious/Spiritual Support	Religious practice engagement, moral internalization
Self-Resilience Development	Adaptive capacity, coping mechanisms, persistence skills

PARTICIPANTS

The investigation utilized purposive sampling, the most appropriate participant selection strategy for FDM applications (Hasson, Keeney & McKenna, 2000). A purposive sampling strategy was used to recruit a ten-member expert panel, selected based on the following criteria: 1) Professional background in psychology, counseling, educational sciences, or student development, with experience working with university students exhibiting behavioral challenges in rural/non-urban Malaysian contexts; 2) Minimum of 3 years and up to 30 years of relevant experience; 3) Affiliation with Malaysian public universities or educational institutions with demonstrated expertise in student behavioral support. A ten-member expert panel was assembled with comprehensive background information documented in Table 2. Selection criteria emphasized extensive professional experience and specialized domain expertise.

Methodological literature presents varying perspectives on optimal expert panel size for Delphi investigations. Recommendations suggest 10–15 experts for homogeneous groups (Adler & Ziglio, 1996), 8–12 participants for homogeneous samples (Sforza & Ortolano, 1984), or 7–12 experts (Philip, 2000). The ten-member panel was determined by pragmatic considerations, including expert participation challenges and temporal limitations. This size, positioned at the lower boundary of recommended ranges, remains consistent with established guidelines (Philip, 2000) and was considered adequate for achieving research objectives while balancing methodological rigor with practical feasibility.

TABLE 2. Expert Panel Composition

Expert Category	Panel Size	Domain Expertise	Institutional Affiliation	Professional Experience Range
Psychology Officers (Counseling Practitioners)	5	Psychological Services and Counseling	Malaysian Public Universities	3–20 years
Academic Faculty Members	5	Educational Sciences and Student Development	Malaysian Public Universities	10–30 years

INSTRUMENT DEVELOPMENT PROCESS

The research instrument was developed through systematic synthesis of existing scholarly literature, aligning with established methodological protocols. Literature indicates that questionnaire components may derive from published research, pilot investigations, and researcher expertise (Skulmowski, Hartman & Krahn, 2007). Items for FDM questionnaires can be formulated through research synthesis and expert consultation (Mustapha & Darussalam, 2017), with focused literature reviews informing item development and content domain specification (Okoli and Pawlowski, 2004).

Following these principles, extensive literature analysis identified critical constructs within the at-risk student framework. An expert evaluation instrument was constructed utilizing a seven-point response scale (Table 3). The seven-point scale selection was methodologically intentional, as increased scale granularity yields more accurate measurement data (Chang, Hsu & Chang, 2011).

A conversion matrix (Table 3) translates the seven-point linguistic scale into corresponding fuzzy numerical representations, streamlining expert response procedures while preserving sophisticated data collection capabilities. This integration of literature-based development with calibrated measurement scales optimizes both methodological rigor and practical implementation effectiveness.

TABLE 3. Linguistic Variable to Fuzzy Number Conversion Matrix

Linguistic Response Variable	Triangular Fuzzy Number Representation (m1, m2, m3)
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 nor 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 4. Systematic Implementation Protocol for Fuzzy Delphi Method

Phase	Procedural Description	Mathematical Formula
1. Objective Definition	Articulate research objectives and scope parameters	N/A
2. Expert Panel Selection	Identify and recruit qualified domain specialists based on predetermined criteria	N/A
3. Questionnaire Development	Construct evaluation instrument incorporating linguistic response variables	N/A
4. Fuzzy Number Conversion	Transform linguistic responses into triangular fuzzy number representations where m1 = minimum value, m2 = plausible value, m3 = maximum value	Refer to Table 3
5. Response Aggregation & Defuzzification	Calculate average fuzzy evaluation and convert to crisp score value	$A_{max} = \frac{1}{4}(m_1 + 2m_2 + m_3)$
6. Alpha-Cut Value Assessment	Determine whether defuzzified values meet minimum threshold criterion	α-cut value ≥ 0.5
7. Threshold Distance Calculation	Assess consensus level using distance measurement between fuzzy numbers m = (m1, m2, m3) and n = (n1, n2, n3)	$d(\tilde{m},\tilde{n}) = \sqrt{\frac{1}{3}[(m_1 - n_1)^2 + (m_2 - n_2)^2 + (m_3 - n_3)^2]}$
8. Consensus Criterion Verification	Determine whether consensus threshold achieved	$d \leq 0.2$ indicates consensus
9. Percentage Agreement Analysis	Calculate proportion of experts achieving consensus threshold	Percentage agreement ≥ 75%
10. Final Results Interpretation	Synthesize findings through ranking of accepted items based on defuzzified values	N/A

Note: *This table presents structured procedural overview for implementing the Fuzzy Delphi method, including critical phases and mathematical formulations. Researchers should adapt procedures according to specific study requirements while maintaining methodological integrity.*

RESULTS AND DISCUSSION

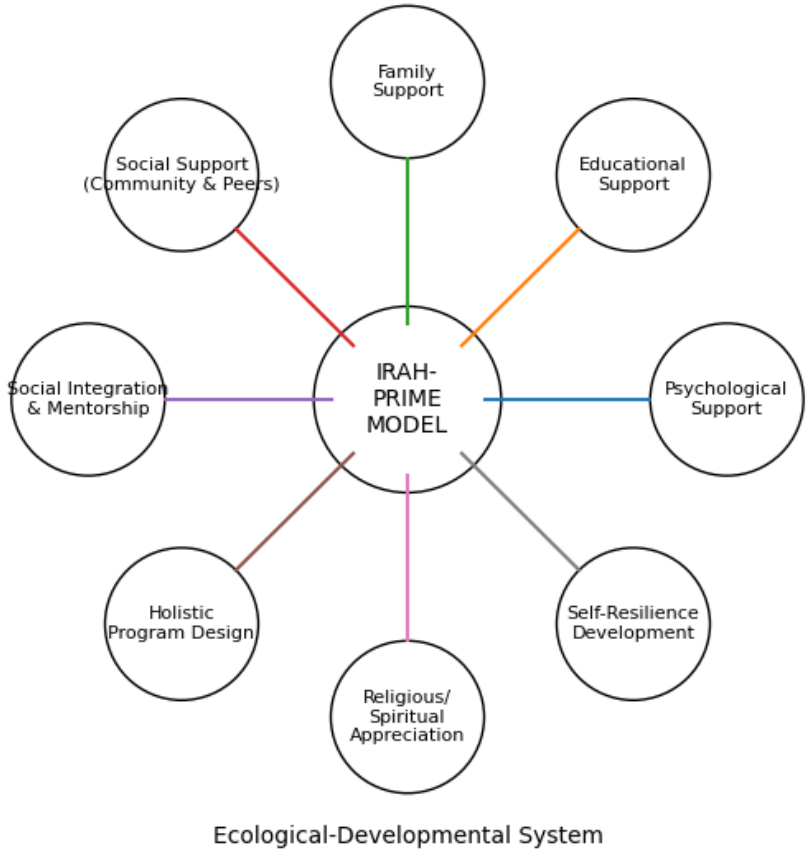
DEVELOPMENT OF THE IRAH-PRIME MODEL

Based on the systematic literature review and expert consensus obtained through the Fuzzy Delphi Method (FDM), this study developed the IRAH-PRIME (Integrated Resilience and Holistic Psychological-Rural Intervention Model) as a comprehensive ecological-developmental framework to address behavioral challenges among non-urban university students in Malaysia. The IRAH-PRIME model comprises eight interconnected dimensions: 1) Psychological Support;

2) Educational Support; 3) Family Support; 4) Social Support (Community & Peers); 5) Social Integration Support and Guidance Programs; 6) Holistic Intervention Design; 7) Religious/Spiritual Appreciation; 8) Self-Resilience Development.

These dimensions operate simultaneously within an ecological-developmental system, emphasizing that behavioral intervention requires multi-level and integrated support mechanisms.

FIGURE 1. Conceptual Framework of the IRAH-PRIME Model



The framework proposes a hierarchical support structure whereby psychological and educational interventions serve as foundational mechanisms, followed by family and social support systems, while holistic intervention, spiritual appreciation, and resilience development function as complementary and reinforcing components. The model acknowledges that behavioral challenges among non-urban university students emerge through complex interactions among psychological, educational, familial, social, cultural, and spiritual factors.

THRESHOLD DISTANCE ANALYSIS OF EXPERT CONSENSUS

This section presents empirical findings from the FDM analysis, focusing on expert consensus regarding dimensional constructs of the IRAH-PRIME model for behavioral challenges among non-urban university populations in Malaysia. Data were obtained from ten expert questionnaires completed by domain specialists with extensive expertise in student behavioral support, educational psychology, and rural educational contexts. The analysis examines consensus patterns, construct validation outcomes, and hierarchical prioritization of support strategies.

TABLE 5. Threshold Distance (d) Values of Expert Consensus Across IRAH-PRIME Model Constructs

Construct	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
Support Strategies - Psychological Support	0.118	0.118	0.118	0.118	0.052	0.118	0.052	0.552	0.118	0.052
Support Strategies - Educational Support	0.050	0.050	0.050	0.050	0.120	0.050	0.050	0.280	0.050	0.050
Support Strategies - Family Support	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.153	0.017	0.017
Support Strategies - Social Support (Community & Peers)	0.084	0.084	0.084	0.084	0.086	0.084	0.084	0.586	0.084	0.084
Support Strategies - Social Integration Support and Guidance Programs	0.100	0.100	0.100	0.100	0.400	0.100	0.100	0.230	0.100	0.070
Support Strategies - Holistic Intervention Design	0.136	0.034	0.034	0.034	0.034	0.034	0.034	0.136	0.034	0.034
Support Strategies - Religious/Spiritual Appreciation	0.017	0.017	0.017	0.017	0.153	0.017	0.017	0.017	0.017	0.017
Support Strategies - Self-Resilience	0.017	0.017	0.017	0.017	0.153	0.017	0.017	0.017	0.017	0.017

Table 5 presents threshold distance values (d) across all expert respondents for each support construct. The threshold metric indicates opinion convergence, with lower values signifying stronger consensus. Analysis reveals three distinct patterns: (1) Exceptional consensus in Family Support, Religious/Spiritual Appreciation, and Self-Resilience constructs, where 90% of experts recorded threshold values ≤ 0.017; (2) Strong consensus in Educational Support and Psychological Support, with majority threshold values below 0.120; and (3) Moderate consensus in Social Integration Support, showing greater variability (range: 0.070–0.400). Expert 8 consistently exhibited elevated threshold distances across multiple constructs, suggesting alternative prioritization perspectives, while Experts 1–4, 6–7, and 9–10 demonstrated remarkable alignment across all dimensions. Overall, the threshold analysis confirms substantial agreement among experts regarding the appropriateness and relevance of all proposed dimensions within the IRAH-PRIME framework.

VALIDATION OF THE IRAH-PRIME MODEL CONSTRUCTS

This section presents the validation results of the IRAH-PRIME model using the Fuzzy Delphi Method, incorporating consensus percentage, defuzzification values, and average threshold distance.

TABLE 6. Validation of IRAH-PRIME Model Constructs through Fuzzy Delphi Technique

Rank	Construct	Consensus %	Defuzzification (M)	Avg d	Status
1	Support Strategies - Psychological Support	100.0	0.900	0.140	ACCEPTED
2	Support Strategies - Educational Support	100.0	0.966	0.054	ACCEPTED
3	Support Strategies - Family Support	100.0	0.983	0.031	ACCEPTED
4	Support Strategies - Social Support (Community & Peers)	100.0	0.983	0.031	ACCEPTED
5	Support Strategies - Social Integration Support and Guidance Programs	100.0	0.867	0.186	ACCEPTED
6	Support Strategies - Holistic Intervention Design	100.0	0.917	0.133	ACCEPTED
7	Support Strategies - Religious/Spiritual Appreciation	90.0	0.916	0.134	ACCEPTED
8	Support Strategies - Self-Resilience	90.0	0.849	0.151	ACCEPTED

Table 6 presents comprehensive validation outcomes incorporating three critical metrics: consensus percentage, defuzzification values (M), and average threshold distance (Avg d). All eight constructs achieved acceptance based on predetermined criteria (consensus ≥ 75%, M ≥ 0.5, Avg d ≤ 0.2), providing robust empirical validation for the IRAH-PRIME framework's theoretical comprehensiveness.

CONSENSUS ANALYSIS

Six constructs (75%) achieved perfect consensus (100%), namely:

- Psychological Support
- Educational Support
- Family Support
- Social Support
- Social Integration Support and Guidance Programs
- Holistic Intervention Design

Meanwhile, Religious/Spiritual Appreciation and Self-Resilience Development achieved 90% consensus, substantially exceeding the minimum acceptance threshold.

DEFUZZIFICATION VALUE INTERPRETATION

The defuzzification values ranged from 0.849 to 0.983, indicating strong expert endorsement of all proposed constructs. Family Support and Social Support (Community & Peers) achieved the highest defuzzification values (M = 0.983), establishing these dimensions as foundational components within the IRAH-PRIME model. This finding aligns with ecological systems theory and social capital theory, which emphasize the fundamental importance of proximal social systems in shaping behavioral outcomes. Educational Support also demonstrated strong endorsement (M = 0.966), validating the critical role of academic scaffolding in preventing and managing behavioral challenges. Self-Resilience Development recorded the lowest defuzzification value (M = 0.849). However, this value remained substantially above the acceptance threshold, potentially indicating expert perspectives that resilience develops consequentially through successful implementation of other intervention dimensions.

THRESHOLD DISTANCE ANALYSIS

Average threshold distances ranged from 0.031 to 0.186, confirming robust consensus across all constructs. Family Support and Social Support demonstrated exceptional consensus (Avg d = 0.031), combined with maximum defuzzification values. Educational Support achieved strong consensus (Avg d = 0.054), while Social Integration Support showed an acceptable but relatively higher threshold distance (Avg d = 0.186), suggesting greater diversity in implementation priority perspectives.

HIERARCHICAL PRIORITIZATION OF THE IRAH-PRIME MODEL

The ranking structure provides practical guidance for resource allocation and implementation sequencing within higher education institutions.

Tier 1 Priority (Ranks 1–4)
Psychological Support emerges as the primary priority despite lower defuzzification value (M = 0.900), reflecting expert recognition that addressing underlying emotional and mental health issues constitutes foundational support. Educational Support (Rank 2) validates the interconnection between academic performance and behavioral outcomes. Family Support and Social Support (Community & Peers) (Ranks 3–4) represent fundamental pillars with exceptional consensus metrics, emphasizing family engagement and positive peer networks as essential protective factors.

Tier 2 Priority (Ranks 5–6)
Social Integration Support and Guidance Programs (Rank 5) and Holistic Program Design (Rank 6) represent important secondary dimensions. The positioning suggests that structured mentorship and coordinated multi-system approaches are most effective when implemented alongside foundational support.

Tier 3 Priority (Ranks 7–8)
Religious/Spiritual Appreciation (Rank 7) and Self-Resilience (Rank 8) constitute valuable supplementary components. The slightly lower consensus on religious support reflects recognition of contextual adaptation requirements respecting diverse belief systems. The positioning of Self-Resilience may indicate that resilience develops naturally through the successful implementation of higher-priority strategies.

DISCUSSION OF THE IRAH-PRIME MODEL

The FDM analysis provides robust empirical validation for the IRAH-PRIME model's eight-dimensional framework. Universal construct acceptance, combined with exceptionally high consensus percentages (85% achieving ≥90% consensus) and strong defuzzification values (M > 0.849), establishes compelling evidence for theoretical validity and practical relevance. The exceptional consensus on family and community-peer support (M = 0.983, Avg d = 0.031) underscores the fundamental importance of ecological systems approaches, recognizing students as embedded within interconnected social contexts. The hierarchical framework offers actionable guidance for educational institutions and policymakers in designing evidence-based programs tailored to non-urban university contexts, emphasizing integrated, multi-dimensional approaches over isolated measures.

This study employed the Fuzzy Delphi Method to establish expert consensus on a comprehensive support framework for addressing behavioral challenges among non-urban university populations in Malaysia. All eight proposed IRAH-PRIME model constructs achieved acceptance based on rigorous validation criteria. Six constructs (75%) achieved perfect 100% consensus, while two attained 90% agreement. Defuzzification values ranged from 0.849 to 0.983, with Family Support and Social Support (Community & Peers) achieving maximum endorsement (M = 0.983, Avg d = 0.031). The hierarchical prioritization positioned Psychological Support as the primary support dimension, followed by Educational Support, Family Support, and Social Support, establishing a validated, evidence-based framework specifically tailored to non-urban Malaysian educational contexts.

The exceptional consensus on Family Support and Social Support (M = 0.983) provides compelling empirical validation for Bronfenbrenner's Ecological Systems Theory (1979), which emphasizes that individual development occurs within nested environmental systems. The

universal expert endorsement validates that effective behavioral programs must address multiple ecological levels simultaneously—family microsystems, peer networks, and community exosystems. This finding aligns with Bowlby's Attachment Theory (1988) and Family Systems Theory, which posit that secure attachment relationships and functional family dynamics serve as primary protective factors against problematic behavior, particularly salient in non-urban Malaysian contexts where collectivist cultural values emphasize family interdependence.

The maximum endorsement of Social Support validates Social Capital Theory and Social Support Theory, emphasizing that access to supportive social networks and community resources constitutes critical protective mechanisms. In non-urban contexts characterized by tight-knit community structures, leveraging existing social networks offers particularly effective support pathways. The hierarchical prioritization of Psychological Support (Rank 1) validates Cognitive-Behavioral Theory (Beck, 2011) and Rogers' Person-Centered Theory (Rogers, 1961; 1986), suggesting expert recognition that sustainable behavioral change requires addressing root psychological factors.

The strong validation of Educational Support (M = 0.966) aligns with Vygotsky's Sociocultural Development Theory (Vygotsky, 1978), emphasizing scaffolded learning and the interconnection between academic engagement and behavioral outcomes, validating extensive research demonstrating that academic failure serves as a significant risk factor for problematic behaviors. The acceptance of Self-Resilience (M = 0.849) supports Resilience Theory (Luthar et al., 2000; Masten, 2014), athough its lower ranking suggests that resilience emerges consequentially from other support mechanisms. The validation of Religious/Spiritual Appreciation (M = 0.916) provides support for Spiritual Well-Being Theory (Ellison, 1991), particularly relevant in Malaysian contexts where Islamic values constitute central cultural elements.

The universal validation of all eight dimensions supports integrated ecological-developmental frameworks that synthesize multiple theoretical perspectives. The findings demonstrate that various theoretical frameworks—ecological systems, attachment, social capital, cognitive-behavioral, and sociocultural development—are complementary rather than competing, each addressing distinct but interconnected aspects of behavioral challenges. The hierarchical prioritization suggests a tiered support model wherein psychological and educational supports constitute foundational layers, family and social supports represent core structural pillars, and holistic design, spiritual appreciation, and resilience development serve as integrative components. This advances theoretical understanding by proposing that program effectiveness depends not only on addressing multiple dimensions but also on appropriate sequencing and emphasis distribution, contributing to contextual adaptation theory by emphasizing that frameworks must be tailored to specific cultural, geographical, and socioeconomic contexts.

This study demonstrates the Fuzzy Delphi Method's effectiveness as a rigorous consensus-building technique for developing complex frameworks. The integration of multiple validation metrics (consensus percentage, defuzzification values, threshold distances) provided comprehensive assessment while accommodating inherent uncertainty in expert judgments. The multi-metric validation approach represents a methodological advancement over single-criterion approaches, providing triangulated evidence for construct validity. The purposive selection of a ten-member expert panel with diverse backgrounds (3–30 years' experience) demonstrates that panel quality—expertise depth and domain relevance—may be more critical than panel size in achieving meaningful consensus. The successful validation of literature-derived constructs demonstrates the effectiveness of systematic literature review as a foundation for Delphi

questionnaire development, offering a replicable framework for developing evidence-based models in diverse educational contexts.

PRACTICAL IMPLICATIONS OF THE IRAH-PRIME MODEL

The validated IRAH-PRIME framework provides educational institutions with an evidence-based blueprint for designing holistic behavioural support programs. Rather than implementing isolated measures, practitioners should develop integrated programs addressing all eight validated dimensions. The hierarchical prioritization offers practical guidance for staged implementation:

Phase 1 – Establish psychological counseling and academic tutoring (Ranks 1–2)
Phase 2 – Develop family engagement and community-peer support networks (Ranks 3–4)
Phase 3 – Implement mentorship programs and coordinate multi-system interventions (Ranks 5–6)
Phase 4 – Integrate spiritual support and resilience-building activities (Ranks 7–8)

This phased approach enables systematic capacity building while ensuring that foundational support is established first. The exceptional consensus on family and community support underscores the critical importance of developing robust family engagement strategies: regular parent-student-counselor conferences, parent education workshops, family therapy services, community mentorship programs, peer support groups, and community service projects. The validation of religious/spiritual appreciation highlights the importance of culturally responsive practice: integrating Islamic values where appropriate, collaborating with religious leaders, providing opportunities for spiritual development, and respecting diverse belief systems. The strong endorsement of Holistic Program Design emphasizes the necessity of coordination mechanisms: multidisciplinary support teams, case management systems, regular team meetings, referral protocols, and outcome monitoring systems. Effective implementation requires substantial professional development: training on evidence-based approaches, family engagement strategies, cultural competency, supervision systems, and continuous professional development opportunities.

This study employed a ten-member expert panel, which represents the lower boundary of recommended panel sizes. Future research could enhance generalizability by involving larger and more geographically diverse panels, incorporating perspectives from student affairs administrators, community leaders, and students themselves. While this study validated broad support dimensions, future research should operationalize specific strategies within each dimension and develop validated measurement instruments assessing implementation fidelity.

Longitudinal effectiveness studies employing quasi-experimental or randomized controlled trials should assess the IRAH-PRIME framework's effectiveness in reducing problematic behaviors and improving outcomes. Cross-cultural validation studies should examine framework applicability across diverse contexts, including urban settings, secondary schools, and different cultural contexts. Implementation science investigations should examine barriers, facilitators, resource requirements, and sustainability factors for translating research into practice. Mechanism studies should investigate causal pathways through which specific support produces behavioral change outcomes.

CONCLUSION

This study successfully employed the Fuzzy Delphi Method to validate an integrated eight-dimensional IRAH-PRIME intervention framework for addressing behavioral challenges among non-urban university populations in Malaysia, with all constructs achieving universal acceptance through exceptionally high consensus levels (75% achieving 100% consensus, 25% achieving 90% consensus) and strong defuzzification values (M = 0.849–0.983). The findings provide compelling support for integrated ecological-developmental frameworks, with exceptional consensus on Family Support and Social Support (M = 0.983, Avg d = 0.031) validating the fundamental importance of addressing multiple ecological levels simultaneously, while the hierarchical prioritization positioning Psychological Support, Educational Support, Family Support, and Social Support as primary dimensions offers practical guidance for staged implementation in resource-constrained non-urban settings. Methodologically, this study demonstrates the Fuzzy Delphi Method's effectiveness in developing complex intervention frameworks through multi-metric validation, offering a replicable framework for evidence-based model development across diverse educational contexts. Practically, the validated IRAH-PRIME framework provides educational institutions, policymakers, and practitioners with an evidence-based blueprint for designing comprehensive programs, with hierarchical prioritization enabling strategic resource allocation through phased implementation and emphasis on family engagement, community partnerships, and culturally responsive practices providing actionable guidance for contextually appropriate support. Despite limitations including a modest expert panel size (n=10) and exclusive focus on Malaysian contexts, this study makes significant contributions to theoretical understanding, methodological advancement, and practical application in behavioral challenge support, with the validated IRAH-PRIME framework representing a substantial advancement in evidence-based practice for non-urban Malaysian university contexts that bridges the gap between theoretical knowledge and practical application, ultimately supporting students in achieving their full academic and personal potential.

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