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Green financial literacy, wellbeing, and education as drivers of greenpreneur intention: Evidence from Malaysia's energy transition

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ABSTRACT

This study aims to examine the influence of green financial literacy, green financial well-being, and green financial education on greenpreneur intention among Malaysian youth within the High-Growth High-Value (HGHV) energy transition sector, addressing a critical gap in sustainability and entrepreneurship literature. Grounded in the Theory of Planned Behavior and supported by the Dynamic Capability Theory and the Natural Resource-Based View, the study integrates green financial attitude, behavior, and knowledge into a comprehensive framework to explain youths' intentions to engage in green entrepreneurship. A quantitative, cross-sectional design was employed, with data collected from undergraduate students enrolled in energy transition and business-related programs at Malaysian higher education institutions. The data were analyzed using partial least squares–structural equation modeling (PLS-SEM) to assess the proposed relationships and model robustness. The findings indicate that green financial literacy significantly and positively predicts greenpreneur intention among youth. Additionally, green financial well-being strengthens this relationship by enhancing financial confidence and resilience, while green financial education further reinforces the effect by equipping youth with relevant sustainability-oriented financial competencies. These results highlight the importance of financial capability and educational support in fostering sustainable entrepreneurial intentions. In practical terms, the study underscores the need for universities to embed green finance components into entrepreneurship curricula, promote experiential learning related to sustainable business models, and enhance students' financial well-being. Policymakers are encouraged to strengthen youth-focused green finance initiatives, funding incentives, and capacity-building programs to support Malaysia's National Energy Transition Roadmap and HGHV development agenda. Furthermore, the study offers insights applicable to other emerging economies pursuing sustainable energy transitions.

Contribution/ Originality: The scope of the Theory of Planned Behaviour, combined with Dynamic Capabilities and the Natural Resources-Based View Theory, has been expanded in this context. It aligns with the entrepreneurship literature, particularly within the energy transition sector. This study integrates the TPB into a comprehensive model to examine the relationships among financial literacy, financial wellbeing adoption, financial education adoption, and entrepreneurial intentions.

1. INTRODUCTION

The global shift toward low-carbon energy systems, known as the energy transition, is reshaping industries, economies, and workforce demands. In Malaysia, this transition is supported by national strategies such as the

National Energy Transition Roadmap (NETR), which promotes renewable energy adoption and reduces reliance on fossil fuels. This transformation creates new opportunities in green and sustainable sectors for youth to engage in green entrepreneurship. Youth constitute a large and influential portion of Malaysia's population, with those aged 15 to 64 comprising 69.9 percent in 2023 [1]. Table 1 presents Malaysia's youth population trends, the share of renewable energy, and projected green job opportunities from 2021 to 2025, with long-term projections extending to 2050.

Table 1. Malaysia's youth population and renewable energy trends (2021–2025, Projected 2050)

Year	Total population (Million)	Youth (15–64) %	Renewable energy share (%)	Projected green jobs
2021	32.58	69.7%	22%	–
2022	32.65	69.5%	25%	–
2023	33.06	69.9%	27%	–
2024	34.10	70.0%	29%	–
2025	35.98*	70.1%*	31%*	200,000+*
2050	38.00*	66.2%*	70%*	300,000+*

Note: * = projections based on national targets and international estimates.
Source: Department of Statistics Malaysia [1], Malaysian Investment Development Authority [2], SEDA Malaysia [3], International Renewable Energy Agency (IRENA) [4], and Organisation for Economic Co-operation and Development [5].

Malaysia's youth, who represent nearly 70 percent of the population (2023, 2024), could be a transformative force in advancing the green economy. However, the persistent financial literacy gap (36% in 2022) [6] and lack of exposure to green-finance tools suggest that many young people remain unprepared to participate. This disconnect between policy ambitions and youth readiness highlights a critical research gap: understanding the financial, well-being, and educational drivers of youth green entrepreneurial intention. Figure 1 illustrates Malaysia's progress toward renewable energy adoption from 2021 to 2050.

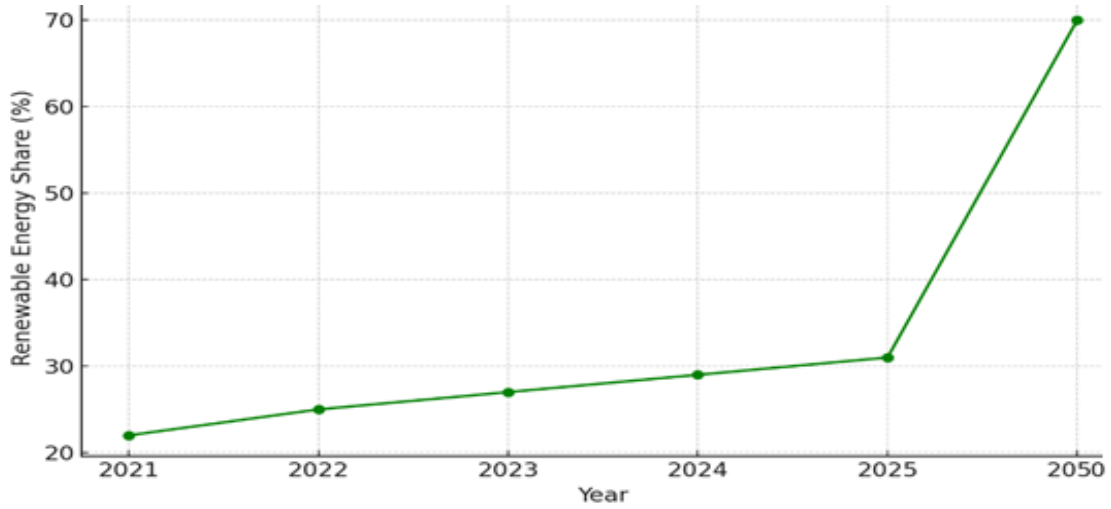

Figure 1. Malaysia progress toward renewable energy adoption (2021-2050).

Source: SEDA Malaysia [3]; Malaysian Investment Development Authority [2], and International Renewable Energy Agency (IRENA) [4].

Despite the strong demographic foundation for green entrepreneurship, this potential is hindered by limited financial literacy and a lack of exposure to green finance [7]. This is mainly because green financial systems are complex, and there is insufficient exposure to sustainable financial tools. Additionally, young people often lack confidence when it comes to making eco-friendly economic choices. As a result, the gap between young Malaysians and the energy industry continues to grow, driven by limited knowledge. There is a tendency to avoid risks, as well as the belief that clean energy projects are out of reach. Moreover, in terms of financial literacy, countries such as Sweden and Germany report their financial literacy rates exceeding 70 percent [6]. However, Malaysia's rate stands

at only around 36 percent in 2022 [6]. Such restrictions deter young people from engaging in entrepreneurial projects, particularly in the green sector, where planning and risk-taking are involved. A significant challenge is the limited ability of Malaysian youth to connect financial decisions with environmental objectives. In developed countries such as Germany and the Netherlands, where green financial systems are more advanced, the participation of young people in clean energy and sustainability initiatives is increasing. Conversely, most Malaysian youth tend to be confused about how to apply financial instruments to promote sustainable practices [8].

Youth who face financial strain are impacted, impacting confidence and willingness to start businesses. Lack of access to green loans, subsidies or mentorship makes many consider green entrepreneurship to be an impossible task [9, 10]. The proliferation of startups and concerns about financial stability further discourage engagement, especially in industries focused on sustainability. These issues need to be addressed when working with young green entrepreneurs. Additionally, education plays a crucial role in equipping young people with relevant skills; however, most institutions fail to incorporate emerging topics such as green finance and clean energy business models [11]. This gap limits engagement, necessitating an education system in Malaysia that provides practical learning opportunities for success in the green economy.

Malaysia prioritizes the national development agenda by focusing on green and technology-intensive industries through the High-Growth High-Value (HGHV) program. The strategy emphasizes areas such as energy transition and sustainable innovation, supported by pilot projects and incentives to promote growth and development in these sectors [12]. The transition to a high-value green economy is being influenced by new blueprints, such as the New Industrial Master Plan 2030, the National Energy Transition Roadmap, and the needs for industry, government, and international cooperation [12]. These strategies will reshape the industrial environment in Malaysia and enable youth to become active contributors to the green economy. It is important that, regarding national green economy development, youth play a vital role in driving sustainable business models in renewable energy and climate-sensitive agriculture in Malaysia. The financial preparedness of Malaysian youth is also a factor that should be improved to enhance their productivity as members of a green economy. In conclusion, it can be stated that youth in Malaysia are capable of becoming a source of sustainability. However, a lack of financial and educational well-being capabilities presents obstacles to their participation. Therefore, measures are necessary to support the youthful population in building a robust sustainable economy.

Such country engagements provide young people with a valuable opportunity to assist Malaysia in achieving a low-carbon economy. However, realizing this potential depends on addressing longstanding issues such as low levels of financial literacy, limited access to green financing instruments, and the gap between theoretical understanding and practical ability to implement sustainable practices. Understanding and improving the financial preparedness and attitudes of Malaysian youth is essential for empowering them. Particularly, young people will play a crucial role in the green economy, especially during the energy transition. Malaysian youth are vital in ensuring their meaningful contributions to the green economy and energy transition. Nonetheless, their involvement is often hindered by financial constraints, inadequate education, and widespread societal issues. Overcoming these challenges is necessary to enable young people to become active participants in building a resilient, environmentally-focused economy.

2. LITERATURE REVIEW

Financial stability plays a crucial role in personal and family life, influencing long-term planning and decision-making. It is also essential for meeting expenses, reducing stress levels, and expanding opportunities. Financial literacy is inherently linked to financial stability because it equips individuals with the knowledge and skills necessary to make informed financial decisions. As a result, financial literacy is increasingly important in business, particularly in industries focused on sustainability. Youths who understand how to manage resources, assess risks, and make prudent investment decisions are more likely to initiate green businesses. This trend is especially evident in high-impact sectors such as renewable energy, where extensive planning and financial strength are required for operational

success. Research by Burchi et al. [13] indicates a positive and statistically significant correlation between financial literacy and sustainable entrepreneurial activity across various countries. Furthermore, enhancing financial literacy benefits not only individual financial well-being but also promotes young people's engagement in green innovation, contributing to broader environmental and economic objectives.

Financial attitude comprises individuals' thoughts, opinions, and judgments regarding finance. It plays a vital role in shaping financial decisions and behaviors. Normawati et al. [14] report that there is a strong correlation between financial attitude and entrepreneurial intention. Furthermore, positive green financial approaches promote responsible planning, savings, and environmentally friendly interests, such as investing in green technologies. Yasir et al. [15] have reported similar findings using the deep Theory of Planned Behavior (TPB) model. It was found that environmental factors significantly contribute to sustainable entrepreneurial intentions [15]. Additionally, Bethlendi et al. [16] discussed the role of personal environmental values in fostering interest in green financial products. The research indicates that individuals concerned about sustainability in their daily lives tend to develop a favorable attitude toward green finance.

The concept of green financial behavior involves how individuals, particularly students, adapt to evolving financial patterns within the context of environmental concerns. Kálmán [17] found that good financial literacy influences students' financial behaviors, such as budgeting, saving, and spending. Being financially literate encourages environmentally conscious individuals to invest in green businesses. These findings highlight the importance of financial literacy courses that incorporate green values to promote sustainable entrepreneurship.

Besides that, green financial knowledge refers to the ability to understand and apply financial strategies that support sustainability, such as eco-friendly investments and cost-saving green innovations. Rusu et al. [18] emphasized that financial knowledge positively influences students' entrepreneurial intentions, especially among rural and business students. Collectively, these findings suggest that GFK is not just a technical skill but a strategic asset that enhances young people's capabilities and intentions to pursue green entrepreneurship.

Green financial well-being is utilized as a mediator in this study and refers to a psychological state characterized by satisfaction with financial matters and the ability to maintain stability while preparing for the future. Numerous studies have examined this concept using various measures without providing a clear, standardized definition. Porter and Garman [19] describe it as a combination of personal, perceived, objective, and assessed traits. In addition, Joo and Grable [20] suggest that it is shaped by financial behavior, personal traits, and financial stress. Based on the Dynamic Capabilities Theory, Teece et al. [21], individuals with strong financial well-being are capable of adapting and managing resources effectively under changing conditions. Financially secure individuals face fewer barriers to starting green businesses because they possess the resilience and financial literacy necessary to manage risks. Studies by Yao et al. [22] emphasize that financial well-being not only enhances personal financial confidence but also acts as a key driver of green entrepreneurship intentions, often referred to as green financial well-being, especially in today's economy focused on sustainability.

Moreover, green financial education is used as a moderator in this study, serving as a structured process that equips individuals with the knowledge, skills, and confidence to make informed financial decisions. Based on the Dynamic Capabilities Theory by Teece et al. [21], financial education acts as a dynamic capability that enables individuals to adapt, reconfigure resources, and respond to change. It involves more than just money management because it includes understanding financial risks and opportunities, as well as knowing where to seek objective guidance. Baroni [23] emphasizes that financial education should also encourage individuals to critically reflect on their financial realities within wider socio-economic structures. As a moderator, financial education enhances individuals' capacity to handle uncertainty and supports youth in making confident, sustainability-driven financial decisions.

Dynamic Capability Theory, developed by Teece et al. [21] in 1997, explains how firms build, integrate, and reconfigure resources to sustain a competitive advantage in rapidly changing environments. It extends the Resource-

Based View (RBV) by emphasizing learning, innovation, and adaptability in response to uncertainty [24]. This theory is similar to youth-led green entrepreneurship, where young entrepreneurs must be flexible, learn continuously, and innovate to achieve sustainable results. Complementing this, Hart [25]'s Natural Resource-Based View (NRBV) extends RBV by highlighting the strategic value of addressing environmental issues. Instead of viewing ecological challenges as obstacles, NRBV considers them opportunities for pollution prevention, product stewardship, and sustainable development [26]. In this study, the concept of "green," through green financial literacy, green financial well-being, and green financial education, is supported by NRBV, demonstrating how environmental efforts can create long-term value, foster innovation, and strengthen green entrepreneurship initiatives among youth.

In summary, prior literature highlights the significant influence of green financial attitude, behavior, knowledge, well-being, and education on greenpreneur intention. However, there is a need to better understand how these factors interact and influence youth green entrepreneurship. This study adopts an extended Theory of Planned Behavior (TPB) framework, supported by the Dynamic Capability Theory and the Natural Resource-Based View (NRBV). These theories provide a comprehensive foundation for examining both behavioral drivers and resource-related capacities essential for sustainable entrepreneurship. Figure 2 illustrates the theoretical framework of the study, showing the relationships between green financial literacy components, green financial well-being as a mediating variable, and green financial education as a moderating variable, all contributing to greenpreneur intention among youth.

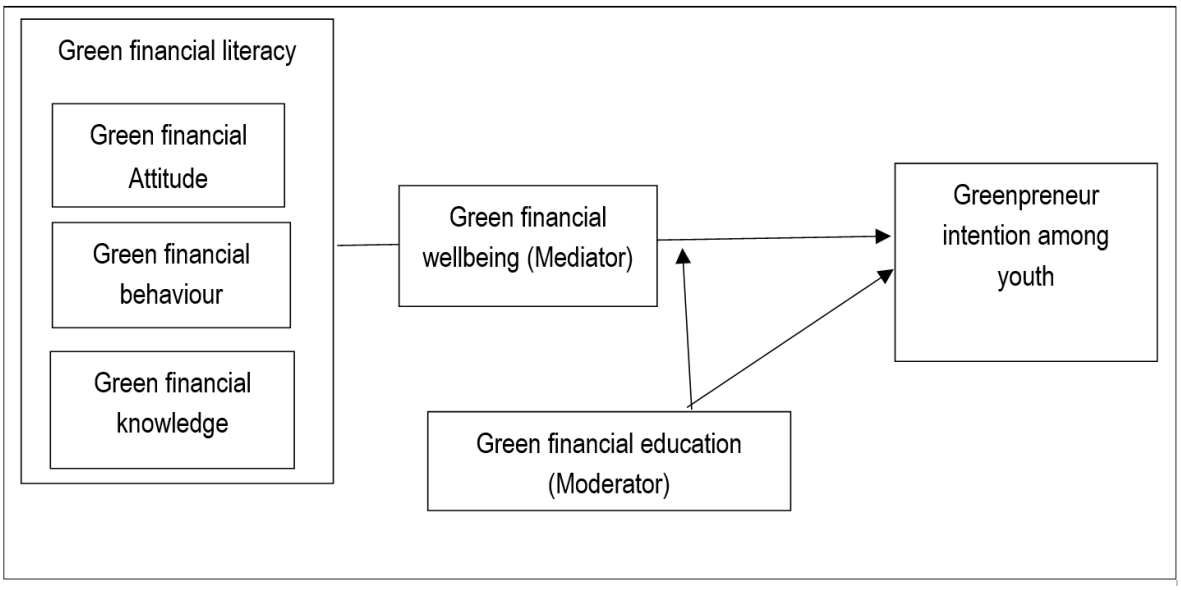

Figure 2. Theoretical framework of the study.

2.1. Relationship Between Green Financial Attitude and Greenpreneurial Intention Among Youth

According to the Theory of Planned Behavior (TPB), attitude is a key component in shaping behavioral intention, as it influences how individuals manage their finances and make strategic decisions. Normawati et al. [14] found a strong relationship between financial attitude and entrepreneurial intention, where individuals with a positive financial attitude were more likely to engage in responsible financial planning and green entrepreneurship. Similarly, Yasir et al. [15] demonstrated that attitudes toward sustainable entrepreneurship, along with perceived behavioral control and environmental values, significantly influence sustainable entrepreneurial intention. Despite these findings, research exploring the role of green financial attitude in promoting green entrepreneurial intention remains limited, particularly among youth. Therefore, this study proposes the following hypothesis.

Hypothesis 1: A positive attitude towards green finance has a beneficial effect on greenpreneurial intentions among youth.

2.2. Relationship Between Green Financial Behaviour towards Greenpreneur Intention among Youth

Financial behavior is increasingly recognized as a fundamental factor influencing green entrepreneurship intentions. Kálmán [17] examined the financial responses of 1,600 university students during environmental disasters, focusing on their saving, spending, and budgeting practices. The study reported that external stressors, such as the COVID-19 pandemic, affected their financial habits; however, none of these habits deteriorated over time, indicating that students demonstrated adaptability. The findings support the notion that planned financial behaviors, including conscious budgeting and saving, are essential for fostering green entrepreneurial activities. Similarly, a study conducted by Ogiemwonyi [27] found that young individuals who practiced disciplined financial management shaped by factors such as confidence in green products and sensitivity to environmentally friendly pricing were more likely to pursue careers in green business ventures. Based on these insights, a hypothesis was developed emphasizing the importance of disciplined financial behavior and environmental awareness in promoting green entrepreneurship.

Hypothesis 2: Green financial behavior has a positive effect on greenpreneur intention among youth.

2.3. Relationship Between Green Financial Knowledge towards Greenpreneur Intention among Youth

Green financial knowledge (GFK) equips young people with the competence to make sustainability-oriented financial decisions, including funding eco-projects and managing green ventures. Research literature with a broader scope, such as Burchi et al. [13], notes that financial knowledge enhances intelligent decision-making, which becomes sustainable in the long run. All of this data indicates that GFK is not only a technical knowledge but also a strategic resource that contributes to the ability and desire of young people to become green entrepreneurs. Therefore, this paper is based on the following hypothesis.

Hypothesis 3: Green financial knowledge has a positive effect on greenpreneur intention among youth.

2.4. Relationship Between Green Financial Well-being towards Greenpreneur Intention among Youth

Green financial well-being (GFWB) reflects an individual's capacity to maintain financial stability, and environmentally friendly decision-making also significantly contributes to how youth develop green entrepreneurship intentions. Studies have demonstrated that improvements in life satisfaction and emotional resilience are factors that influence a person's financial well-being, which is essential for entrepreneurial confidence [28]. Specifically, the view of fiscal well-being and sustainable living encourages longer-term inspiration for entrepreneurs. Additionally, there is substantial evidence on the positive effects of green finance on overall human well-being, which underscores the importance of environmentally oriented financial systems [22]. All these findings overall indicate that green financial well-being not only generates personal financial confidence but also serves as one of the drivers of greenpreneur intention in the current sustainability-oriented economy. This has led to the development of the following hypothesis.

Hypothesis 4: Green financial well-being has a positive effect on greenpreneur intention among youth.

2.5. Relationship Between Green Financial Education towards Greenpreneur Intention among Youth

Green financial education is instrumental in fostering green entrepreneurship among youth. It enhances financial skills such as budget planning and investment, while also promoting sustainability awareness. According to Hou et al. [29], education investment primarily targets energy poverty alleviation and facilitates access to green finance. Broader findings by Lee et al. [30] link education to innovation, increased income, and more effective green finance. Additionally, recent research by Yu et al. [31] demonstrates that integrating financial aspects into green entrepreneurship education positively influences awareness, confidence, and the intention of students to establish sustainable businesses. Consequently, this leads to the formulation of the following hypothesis.

Hypothesis 5: Green financial education has a positive effect on greenpreneur intention among youth.

3. METHODOLOGY AND RESEARCH METHODS

This study employs a quantitative approach grounded in the principles of positivism, which assumes a single measurable reality. A cross-sectional design was adopted to collect data at a single point in time, offering a cost-effective method to explore the greenpreneur intentions among students in energy transition-related and business programs at selected Malaysian universities. This design also facilitated the evaluation of the validity and reliability of the variables, as well as the proposed hypotheses [32]. The target sample size for full-scale data collection was 400 students, determined based on the Krejcie and Morgan [33] table. Prior to full-scale data collection, a pilot test involving 20 students was conducted to assess the clarity and reliability of the instrument. All constructs recorded Cronbach's Alpha values above 0.75, confirming strong internal consistency and the suitability of the instrument.

The unit of analysis is individual undergraduate students, consistent with Stewart [34], who emphasized that individuals can meaningfully guide the depth of research. These students were selected because they represent future green entrepreneurs, particularly within the sustainability and energy sectors. The study focuses on aspects such as green financial literacy (attitude, behavior, and knowledge), green financial well-being, green financial education, and greenpreneur intention. The study employed non-probability purposive sampling, which does not require a specific sampling frame [35]. Public universities offering undergraduate programs in engineering (energy transition) and business were selected due to their large student populations. This approach allows for efficient data collection and helps ensure that the sample reflects the diversity of Malaysian university students relevant to this field.

To collect data, this study employs a self-administered survey questionnaire, which is effective in reaching participants across a wide geographic area. The sampling method used is a combination of convenience and purposive sampling. Convenience sampling involves selecting participants who are easily accessible and willing to cooperate. This approach is considered advantageous in situations where time and resources are limited [36]. Conversely, purposive sampling is a procedure in which the researcher intentionally selects respondents based on specific traits relevant to the research question. The goal is to ensure that the sample provides sufficient and meaningful information [36]. Combining these two non-probability sampling methods aims to gather comprehensive data efficiently while maintaining relevance to the research focus.

Additionally, SmartPLS assisted with data screening and interpretation, and all measurements were assigned code names according to SmartPLS's conventions. The measurement items were coded and entered into the statistical software, which was then used to screen the data. This process consisted of three parts. First, it was checked for accuracy. Next, a review was conducted to identify any missing data. This involved flagging potential outliers, and finally, a normality test was performed to provide additional insights.

Since the current study was based on a self-administered survey to measure all the constructs, an evaluation was conducted to assess the potential for common method bias (CMB). Following the methodology outlined by Sulaiman et al. [37], a full collinearity test was performed using SmartPLS. The variance inflation factors (VIFs) for each latent construct, namely Green Financial Attitude (1.473), Green Financial Behaviour (2.091), Green Financial Knowledge (2.368), Green Financial Well-being (2.681), and Green Financial Education (2.963), were all below the accepted threshold of 3.3. This systematic variation indicates that common method variance does not pose a significant problem in this research. Additionally, Table 2 presents the VIF values used to assess collinearity and common method bias, confirming that all constructs are within acceptable limits.

Table 2. Collinearity and common method bias (CMB) assessment.

Relationship	VIF	Interpretation
GFA > GI	1.473	No collinearity or CMB
GFB > GI	2.091	No collinearity or CMB
GFK > GI	2.368	No collinearity or CMB
GFW > GI	2.681	No collinearity or CMB
GFE > GI	2.963	No collinearity or CMB

4. RESULTS

At the conclusion of the pilot study, data were successfully collected from 20 undergraduate students enrolled in energy transition and business programs. This pilot test aimed to evaluate the questions and the reliability of the questionnaire before the actual data collection. All responses were complete, and there were no cases of missing data.

In terms of instrument reliability, the SmartPLS results indicated that all the constructs had Cronbach's Alpha values exceeding 0.75, demonstrating strong internal consistency. Additionally, all scores for the Composite Reliability (CR) of individual constructs were greater than 0.80, indicating high overall reliability. The variance extracted from all variables in the model was greater than 0.50, satisfying the criterion for convergent validity. These findings confirm that the measurement items are reliable and valid, and that the instrument used is appropriate for primary data collection. Table 3 presents the reliability and convergent validity results of the measurement model from the pilot study, including Cronbach's Alpha, Composite Reliability, and Average Variance Extracted values.

Table 3. Reliability and convergent validity of constructs (Pilot study).

Construct	Items	Cronbach's alpha	CR	AVE
Greenpreneur: Intention among youth (GI)	GI1	0.898	0.924	0.672
	GI2			
	GI3			
	GI4			
	GI5			
	GI6			
Green financial attitude (GFA)	GF1	0.828	0.854	0.502
	GF2			
	GF3			
	GF4			
	GF5			
	GF6			
	GF7			
	GF8			
	GF9			
Green financial behavior (GFB)	GFB1	0.922	0.938	0.658
	GFB2			
	GFB3			
	GFB4			
	GFB5			
	GFB6			
	GFB7			
	GFB8			
Green financial knowledge (GFK)	GFK1	0.758	0.835	0.625
	GFK2			
	GFK3			
	GFK4			
	GFK5			
Green financial well-being (GFW)	GFW1	0.843	0.887	0.506
	GFW2			
	GFW3			
	GFW4			
	GFW5			
Green financial education (GFE)	GFE1	0.844	0.891	0.613
	GFE2			
	GFE3			
	GFE4			
	GFE5			

Note: All constructs exceed the recommended thresholds of 0.70 for Cronbach's Alpha and Composite Reliability and 0.50 for AVE, indicating strong internal consistency and convergent validity [38].

In general, the pilot study indicates that the measurement model functions effectively, demonstrating reliability and validity across all constructs, including green financial literacy, green financial well-being, and green financial education. These findings confirm the applicability of the questionnaire for primary research. The high psychometric qualities, as evidenced in the pilot study, affirm that the research instrument is suitable for large-scale data collection. This supports the continuation of the research to conduct comprehensive hypothesis testing, aiming to examine the structural relationships among variables and to validate the theoretical conceptual framework.

5. CONCLUSIONS

To conclude, this study explored how green financial literacy through attitude, behavior, and knowledge affects green entrepreneurial intention among Malaysian youth. Green financial well-being can be viewed as a mediating factor, while green financial education serves as a moderating factor. Pilot findings confirmed the model's reliability and suitability for full-scale research. Theoretically, the research builds upon the Theory of Planned Behavior by incorporating both the Dynamic Capability Theory and the Natural Resource-Based View Theory. This approach extends the comprehensive explanation of the formation of sustainable entrepreneurship by integrating the three concepts of financial capability and environmental awareness.

In practical terms, the implications of the findings will enhance green financial literacy among young people, ensure their green financial well-being, and integrate green financial education into the formal educational curriculum. This approach will empower young individuals to contribute to green entrepreneurship and support the realization of Malaysia's National Energy Transition Roadmap (NETR). Future research should consider using a larger and more diverse sample or adopting a longitudinal approach to confirm and expand upon these findings.

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Institutional Review Board Statement: The Ethical Committee of the Universiti Teknologi MARA, Malaysia has granted approval for this study on 10 April 2025 (Ref. No. REC/04/2025 (PG/MR/210).
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.

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