








Exploring the Innovativeness Among Early Childhood Education Students in Sabah, Malaysia: A Quantitative Study

Fung Lan Yong^{1*}, Florence Chuah², Norizan Tan³
Frederick Chen Tshung Chong⁴, Loreta Ling Ling Uie⁵, Ming Ha Lee⁶
Melinda Kong⁷

¹Postgraduate Studies, Jesselton University College, 88300 Kota Kinabalu, Sabah, Malaysia
Email: fungyong@jesselton.edu.my

²Inclusive GEMS Consultancy, 46200 Petaling Jaya, Selangor, Malaysia
Email: florencecsy@gmail.com

³School of Foundation Studies, Swinburne University of Technology Sarawak Campus, 93350 Kuching, Sarawak, Malaysia
Email: NTan@swinburne.edu.my

⁴Open University Malaysia, 88200 Kota Kinabalu, Sabah, Malaysia
Email: fredct@oum.edu.my

⁵Business Studies, Jesselton University College, 88300 Kota Kinabalu, Sabah, Malaysia
Email: loretaling8383@gmail.com

⁶Faculty of Engineering, Computing and Science, Swinburne University of Technology Sarawak Campus, 93350 Kuching, Sarawak, Malaysia
Email: mhlee@swinburne.edu.my

⁷Faculty of Business, Design and Arts, Swinburne University of Technology Sarawak Campus, 93350 Kuching, Sarawak, Malaysia
Email: mkong@swinburne.edu.my

ABSTRACT

CORRESPONDING AUTHOR (*):

Fung Lan Yong
(fungyong@jesselton.edu.my)

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Student innovativeness is the capacity of learners to generate, promote, and implement new ideas, while adapting to challenges through experimentation and creative problem-solving. It is critical for long-term academic and professional success, besides fostering resilience and turning creative thinking into tangible solutions. The main purpose of this study was to investigate early childhood education students' innovativeness in Sabah, Malaysia. The sample consisted of 84 respondents who completed the Innovation Attitude Survey on Google Forms. Data were analyzed using SPSS 26.0. Kruskal-Wallis H test showed no significant differences in innovativeness by way of ethnicity, while Mann-Whitney U test indicated no significant differences by way of gender and age. Additionally, Wilcoxon signed rank test showed that 11 of the items significantly differed from the hypothesized value of 3.5 at $p < .001$; only two of the items were significantly different from the same hypothesized value at $p < .05$. About 40.4 to 57.2 percent of the students strongly agreed/agreed on four of the items, while 67.9 to 70.3 percent of them strongly agreed/agreed on six of the items. Besides that, 76.2 to 78.6 percent strongly agreed/agreed on three of the items, while 83.3 to 84.5 percent strongly agreed/agreed on only two of the items. Findings imply that early childhood education

students tend to possess an average level of innovativeness. In light of the findings, several recommendations were made on ways to increase the innovativeness among college students in Sabah.

Contribution/Originality: This study addresses the crucial yet underexplored area of student innovativeness in the context of early childhood education in Sabah, Malaysia. It is the first research attempt to highlight the significance of student innovativeness in the process of preparing early childhood education graduates to adequately function in a rapidly evolving educational landscape in Malaysia.

1. Introduction

Innovativeness is critical for developing 21st century skills, enabling students to handle complex, unknown situations, adapt to rapid technological changes, drive educational vitality, and foster socioeconomic growth. Besides enhancing students' ability to think creatively, innovativeness boosts their engagement, critical thinking, and resilience, besides preparing them to create sustainable solutions for future real-world challenges. Students' innovativeness results in improved academic and professional outcomes since it encourages them to seek entrepreneurial ventures and gain high-level technical skills needed to adequately function in the digital age. Additionally, it increases students' technological adaptability as they are more willing to use the latest digital devices, thus enhancing their academic performance and prospects. Students' innovativeness brings societal and economic value, as graduates with effective critical thinking and problem-solving skills can better contribute to sustainable development and address various global challenges. It holds educational relevance as it drives positive change in teaching methods, making education more engaging, personalized, inclusive (Konak et al., 2025; Li & Pu, 2023; The Global Village, n. d.).

Nevertheless, Shamsir (2023) asserted that students are often overlooked in the Malaysian value network of innovation, and their potential unrealized. While many students often stand on the frontier of ingenuity with a unique lens to perceive and navigate barriers to innovation, some Malaysian educational institutions rarely emphasize the commercialization of academic innovation and ideas. Some separate entrepreneurship into different portfolios; some student entrepreneurs are at times supervised by the deputy vice-chancellor academic or student affairs, whereas academic entrepreneurs can be supervised by the deputy vice-chancellor for research and innovation. While student entrepreneurs engage in mostly course-based business projects, academic entrepreneurs often create pre-commercial, government-funded IP-based derivatives. These opposite ends of the spectrum may not meet, with some academics disregarding students as prospective collaborators. Additionally, some educational institutions limit their support to beginner-level entrepreneurial endeavors, offering mainly taster activities (selling food, clothing, or stationery). They usually organize only fiestas and other events to provide an introductory experience in entrepreneurship without a well-coordinated sandbox system to support the innovation commercialization platform.

1.1. Student Innovativeness in Education

Student innovation is the cornerstone of growth, pillar of innovation, principal component of development, bedrock of progress, and essential element of improvement,

while playing a pivotal role in revolutionizing traditional pedagogic methods, fostering creativity, and addressing contemporary challenges (The Global Village, n. d.). From unprecedented technological advancements to inventive teaching methodologies, students are spearheading innovation and change in different fields. In the educational domain, student innovations are crucial as they offer novel perspectives and cutting-edge solutions to complex problems associated with teaching and learning. In the dynamic landscape of education, where traditional methods often fail to engage and adapt to diverse learners, student-led innovations bring relevance and vitality into the teaching and learning process. Moreover, students' innovations often resonate deeply with their own needs and experiences, making education more accessible, equitable, and inclusive in the long run. Whether it is designing sustainable academic initiatives, creating apps to facilitate teaching and learning, or modifying classroom management, student innovativeness drives positive change and inspire educators to approach problems with imagination, originality, and unconventional perspectives.

Students who engage in innovative initiatives often develop valuable skills essential for success in the digital age. First, innovation improves their critical thinking and problem-solving abilities as they navigate challenges and brainstorm ground-breaking solutions. Moreover, it nurtures creativity, encouraging students to think outside the box and explore unconventional approaches, besides honing their collaboration and communication skills as they often engage in teamwork, exchanging ideas and perspectives to achieve common goals. Additionally, innovation enhances students' resilience and adaptability as they learn to embrace failure as an integral part of the inventive process, persevering in the face of challenges and making incremental changes to improve their undertakings (The Global Village, n. d.).

In a literature review, Li (2023) summarized that innovativeness is crucial among contemporary college students because it enables them to not only excel in their personal career development, but it also promotes societal progress and development. However, one of the major barriers to nurturing innovativeness among college students is that the conventional educational system overly emphasizes the dissemination and retention of knowledge. Consequently, it overlooks the development of students' creative thinking and innovative abilities. In their quest for academic excellence, students are often compelled to follow a linear progression, which in turn, restricts their opportunities to engage in creative thinking, thereby impeding their full potential for innovation. Further, many university classroom teaching is still grounded on theoretical knowledge, without linking it to practical problem-solving. Due to the lack of practical experience and a weak innovation-oriented network, many college students find it difficult to put their learning into practice, thereby inhibiting their innovativeness.

Nurturing innovativeness among college students involves creating a supportive ecosystem through an interdisciplinary curriculum, experimentation, and a culture that encourages risk-taking and failure. Effective approaches include implementing design thinking, providing maker spaces, mentoring, and fostering an entrepreneurial mindset to transform creative ideas into actionable, real-world solutions. Higher educational institutions (HEIs) can nurture student innovation by (1) offering an interdisciplinary curriculum that allows students to combine knowledge from different fields, fostering unique perspectives, (2) promoting active learning methods that encourage students to shift from passive lectures toward project-based learning, experiential learning, and design thinking, (3) cultivating a supportive arena that provides such resources as makerspaces, specialized libraries, and research facilities, (4) fostering a failure-positive

culture by encouraging students to take calculated risks and learn from failures without fear of harsh judgment, and (5) recruiting mentors and collaborators (professors, industry experts) to help students turn ideas into prototypes (Li, 2023).

Student innovativeness in Malaysia is growing, driven by a national push for a high-income digital economy, with Malaysian students demonstrating high levels of personal innovativeness, particularly in mobile learning and digital adoption. Moreover, innovation practices are increasingly tied to business ventures, with students being encouraged to become job creators rather than job seekers. To increase their innovativeness, it is important to research college students' confidence and autonomy to act as independent, creative researchers and potential entrepreneurs, besides making them see innovation as a process of continuous, creative problem-solving needed to build a competitive, innovative, and digital-ready nation (Mahat et al., 2012).

1.2. Research questions

To narrow the research gap and provide a contextual framework for the study, three research questions were formulated to guide the research. They define the scope and focus of the study by narrowing the broad area of innovativeness into a specific, manageable topic, besides guiding methodology by dictating the most suitable approach to measure student innovativeness. Further, they provide structure by offering a roadmap for the entire study, from research design to final analysis and interpretation. Overall, they help in planning, identifying potential challenges, and saving time and resources in relation to assessing student innovativeness. The three research questions are as follows:

- i. What were the descriptive statistics of student innovativeness toward education and their relevant implications?
- ii. Were there any significant differences in student innovativeness by way of gender, age, and ethnicity?
- iii. Were any of the student innovativeness items significantly different from the hypothesized value of 3.5?

1.3. Significance of the Study

A review of literature showed that quantitative research on college students' innovativeness is lacking in Malaysia, especially in the island state of Sabah. Therefore, the main purpose of this study was to investigate early childhood education students' innovativeness, which would help fill the research gap and establish a theoretical framework for the study. Key reasons for researching student innovativeness in Sabah, Malaysia, include the following: First, findings would provide deeper insight into students' levels of innovativeness, enabling HEIs to better prepare students for creative problem-solving in light of rapid technological changes. Second, research on student innovativeness would provide a framework for improving learning quality; higher educational institutions (HEIs) need empirical data to help cultivate innovative behaviors among students (e.g., willingness to learn and adopt new methods, adaptability, teamwork), which can increase their engagement, motivation, and overall learning efficacy. Third, the authors of this study decided to use a sample of Sabahan college students to test the robustness and reliability of the instrument used to measure innovativeness. Overall, findings of this study could generate novel knowledge on college students' capacity and tendency to engage in creative processes, experimentation, and the generation of novel ideas or products to achieve career

success and promote sustainable development, especially in the field of early childhood education.

2. Review of Literature

A literature was conducted to identify what is unknown, controversial, or missing in current studies on student innovativeness, highlighting areas for new research. It places the current research within the context of what has already been published, showing how it contributes to the field of education, besides ensuring that the authors are not repeating research that has already been conducted, thus saving time and resources. Besides, examining how others have studied student innovativeness helps the authors refine their own methodology and approach. Lastly, a comprehensive review shows that they have a firm grasp of the literature, thus enhancing the credibility of their findings.

2.1. Technological Innovativeness and Entrepreneurship

In their study, Deniz and Godekmerdan (2012) determined the level of students' technological innovativeness in terms of mobile phone change. Findings revealed that students tend to demonstrate a high level of technological innovativeness, replacing their mobile phones within 18 to 24 months due to their desire for novelty and the latest technical specifications. Besides, students often replace their mobile phones prematurely because of psychological and social factors; for example, they face social pressure to own the latest model, while perceiving that older devices are outdated. Overall, high engagement with technology tends to accelerate the replacement cycles among students.

The mediating effect of entrepreneurial alertness in shaping the association between entrepreneurial intentions and innovativeness among university students was examined by Gozukara and Colakoglu (2016). Findings indicated that that innovativeness tends to have a positive effect on entrepreneurial intention, while entrepreneurial alertness tends to fully mediate the relationship between the two variables. Findings imply that innovativeness increases students' vigilance for opportunities, which fosters the intention to start a new business. On the other hand, entrepreneurial alertness enables students to identify opportunities that others have overlooked, acting as the bridge that links innovative tendencies to entrepreneurship.

Factors influencing undergraduate students' innovativeness, attitudes toward entrepreneurship, and entrepreneurial intentions were analyzed by Wathanakom, Khlaisang, and Songkram (2020). Findings showed that innovativeness tends to significantly predict entrepreneurial intentions. Defined as the predisposition to creativity, experimentation, and the introduction of new products or processes, innovativeness acts as a key driver that intensifies students' desire to start a business. Students with higher levels of innovativeness often develop creative ideas, utilize new technology, and constantly learn, which directly increase their commitment to launching new ventures. Overall, innovativeness equips students with the cognitive power to recognize opportunities, allowing them to identify, create, and capitalize on new business ventures.

In their research, Zhang et al. (2020) examined the connection between the sense of responsibility for entrepreneurship and innovation and positive psychological quality among college students. Findings showed that positive psychological qualities (self-

esteem, courage, optimism) tend to be the significant drivers of innovation and entrepreneurship, fostering a strong sense of responsibility. These traits enhance the ability to manage risk, cultivate resilience against failure, and drive the social responsibility needed for sustainable, impactful business ventures. Findings imply that cognitive and emotional traits (i.e., honesty, optimism, courage, self-esteem) encourage students to engage in innovation, while their entrepreneurial psychological quality enables them to manage stress, handle high-risk situations, and navigate uncertainty. Lastly, students' strong sense of responsibility inspires them to turn their innovative ideas into practical action, moving beyond profit to sustainable development and social impact.

In an investigation, Sart and Sezgin (2022) studied university students' perceptions of innovativeness in relation to entrepreneurship levels. Findings revealed a significant and positive relationship between students' perceptions of innovativeness and their entrepreneurial intention/activity. However, only 30.2 percent of students tend to demonstrate high entrepreneurship levels, with only 34.2 percent identifying themselves as innovators, 19.9 percent as pioneers, 19.4 percent as questioners, 17.8 percent as sceptics, and 8.7 percent as traditionalists. Students who perceive themselves as innovators, pioneers, and questioners are more likely to possess high-level entrepreneurship ambitions. Additionally, women tend to display significantly more characteristics of innovators, questioners, and skeptics, while men are more likely to be pioneers and traditionalists. Findings imply that rapid, high-impact innovators are associated with high-level entrepreneurship, characterized by calculated risk-taking and active pursuit of new opportunities. Lastly, highly innovative students tend to be more curious, confident, and proactive, with an ability to identify and capitalize on opportunities, while driving better entrepreneurship performance.

The relationship between innovation and entrepreneurship among college students was analyzed by Chen and Salleh (2024). Findings indicated a significant and positive relationship between students' innovation intentions and entrepreneurship engagement. Findings imply that students' engagement in entrepreneurship education (courses, clubs, projects) tends to significantly increase their propensity to pursue entrepreneurial ventures. Additionally, students' innovation intentions often mediate the link between entrepreneurship education engagement and ultimate start-up behavior, suggesting that engagement fosters creative thinking, which then drives innovative action. Lastly, innovation engagement builds psychological capital (optimism, resilience, self-efficacy) among students, which helps them overcome fear of failure, a major obstacle to entrepreneurial action.

Finally, Tahan (2025) investigated university students' intentions toward innovation and entrepreneurship education, focusing on the roles of opportunity identification, apprehension related to failure, and psychological capital. Findings showed that (1) an entrepreneurial education environment tends to significantly foster innovation intentions among students, (2) psychological capital tends to significantly convert the effectiveness of educational settings to actual intentions and behaviors of students in terms of innovation and creativity, and (3) opportunity recognition tends to be significantly related to the practices and efforts of entrepreneurial education that promote innovative intentions among university students. Findings imply that entrepreneurial education can increase innovation intentions by (1) encouraging students to create value, besides becoming more independent, self-confident, and proactive in problem-solving, (2) training students to identify potential in market

trends, besides enhancing their ability to turn ideas into viable business opportunities, (3) building greater perceived behavioral control or confidence in managing risks and successfully launch new projects, and (4) helping students mitigate the negative emotional response to failure, while boosting their confidence in pursuing innovative endeavors.

2.2. Innovative Characteristics, Perfection, Factors, and Psychological Quality

In their investigation, Roffeei, Kamarulzaman, and Yusop (2017) explored undergraduate students' innovative behavior at research universities. Findings indicated that self-efficacy, effective communication, and innovation climate tend to significantly influence the successful propagation of an innovation culture, which in turn, significantly and positively influences student innovative behavior. Findings imply that shared vision and goals and favorable internal communication increase students' willingness to engage with an innovation culture, which can be fostered through positive interpersonal relationships. Lastly, students' innovative behavior, characterized by creativity, curiosity, proactivity, flexibility, and autonomy, is influenced by their perceptions of stories, rituals, and supporting language at their university.

On the other hand, Artemeva et al. (2017) explored the values and personality traits among university students with high innovativeness. Finding revealed that highly innovative students tend to be characterized by internal control locus and a certain set of fundamental values. They rely on internal criteria to make decisions and evaluate their work outcomes, achievements, and failures rather than on others' opinions. Besides being expressive in social communication, they also demonstrate willingness to join new groups and are inclined to become leaders. They are autonomous in terms of making intellectual decisions and behavior, while being open and direct in terms of interacting with others. Lastly, they are characterized by such intellectual characteristics as interest in novel knowledge, dreaminess, liberal thinking, reformism, and a broad outlook.

Further, Prasad et al. (2018) examined the impact of personal traits, creativity, and organizational trust on university students' innovativeness. Findings revealed that personal traits (risk-taking, self-confidence) tend to significantly influence student innovativeness, implying that personal traits act as key drivers of student innovativeness, enhancing their ability to generate creative ideas and pursue entrepreneurial opportunities. Risk-taking students are more likely to engage in innovative behaviors and entrepreneurship; risk-taking acts as a mechanism that encourages them to discover new opportunities and explore new concepts, especially when combined with high creativity. On the other hand, self-confidence promotes autonomy, allowing students to trust their creative ideas, participate actively, and persist in the face of challenges or setbacks, while viewing potential failures as learning opportunities rather than threats.

In their investigation, Sarkam et al. (2018) analyzed the relationship between *ihsan* (perfection in action) and innovativeness among university students. Findings showed that *ihsan* tends to significantly influence students' product innovation from initial idea development until prototype presentation. Findings imply that *ihsan* encourages students to strive for excellence in their research and product development, which is mainly grounded on ethical considerations, rather than just marketability. Further, *ihsan* in student innovation can be seen through three key aspects, which include

(1) altruism or creating things for the benefit of others, (2) charity or creating things of social value, and (3) empathy or understanding user needs while creating things. Overall, students who practice *ihsan* in conjunction with innovation often create products or services that are more sustainable and valuable to society.

2.3. Individual Innovativeness and Online Learning

In an investigation, Öztürk (2020) probed the individual innovativeness levels of university students participating in a badminton competition. Findings revealed that sports-inclined students tend to demonstrate a high level of innovativeness, with significant differences in relation to gender and department. Findings imply that sports-active students demonstrate curiosity and openness characterized by a thirst for knowledge, often seeking new information, and posing "what if" questions. Their cognitive flexibility enables them to easily switch thinking patterns and adapt to unprecedented changes, often examining problems from multiple perspectives. Change-oriented, they are rarely constrained by their environment; instead, they take action to modify their surroundings. Lastly, their autonomous thinking inspires them to create original solutions and develop more inventive ways in performing tasks.

Tertiary students' acceptance of online learning systems in relation to innovativeness was studied by Kim, Kim, and Han (2021). Findings indicated that user innovativeness tends to significantly moderate the relationship between subjective norms (social pressure) and behavioral intention; students with lower innovativeness (late adopters) tend to have higher subjective norms, modifying their behavioral intention more frequently to accommodate online learning systems. In contrast, students with higher innovativeness (early adopters) are more likely to adopt new technologies due to positive attitudes and perceived usefulness, with their behavioral intention less affected by subjective norms.

2.4. Personal/Individual Innovativeness, Attitudes, and Perceptions

The relationships among undergraduate students' personal innovativeness, compatibility, and academic performance in relation to online learning systems (OLSs) were determined by Wang and Lin (2021). Findings indicated that key compatibility (environmental determinant), together with individual innovativeness (personal influence), exerted a significant influence on students' academic achievement as well as their sustained willingness to engage with OLS. Findings imply that students with greater willingness to try new technologies are more likely to effectively use and benefit from OLSs. Besides, the degree to which online learning fits with students' lifestyles and learning habits also positively impacts their continued usage intentions. Lastly, personal and environmental factors, alongside instructor-learner interaction, are crucial for sustaining long-term usage of online networks.

Similarly, the personal innovativeness among university students and teachers in relation to information technology was investigated by Šorgo, Virtič, and Dolenc (2021). Findings showed that personal innovativeness tends to positively impact student learning behavior and encourage the adoption of new learning technologies, with digital competence and personal innovativeness greatly influencing learning behavior. However, both students and teachers tend to demonstrate moderate levels of personal innovativeness although it often drives technology adoption. Although students are often considered digital natives, teachers tend to hold higher levels of personal

innovativeness. This situation potentially leads to expectancy conflicts; when innovative teachers encounter non-innovative students, or vice-versa, discord occurs.

Findings imply that information technology not only influences students' innovative behaviors, but it also boosts their self-efficacy, making them more inclined to explore novel technologies in their learning. Personal innovativeness often dictates teachers' willingness to integrate new technological tools, which is positively related to e-learning readiness, with male students demonstrating higher e-learning readiness than their female counterparts. Findings imply that individual innovativeness acts as a key precursor to e-learning readiness, influencing students' willingness to use digital resources, while actively participating in virtual learning environments. Conversely, the behavioral intention of students with lower innovativeness is more heavily influenced by subjective norms. Since social pressure from family, friends, or classmates plays a stronger role in shaping their adoption intent, more focused social messaging or community support can significantly increase their positive behavioral intention. Lastly, besides predicting students' capacity to succeed in e-learning, individual innovativeness also mediates the relationship between lifelong learning tendencies and online learning readiness. In sum, innovative students tend to be more proactive in adopting digital technologies and self-directed learning necessary for effective e-learning (Šorgo, Vrtič, & Dolenc, 2021).

2.5. Passion, School Climate, and Awareness

The role of HEIs in promoting students' innovativeness and passion toward entrepreneurship was probed by Porkodi et al. (2023). Findings showed that passion and innovativeness tend to be significantly and positively related to individual transformations and entrepreneurship educational outcomes, with educational settings influencing passion. Findings imply that HEIs can promote student innovativeness and entrepreneurial passion by creating supportive frameworks that blend specialized curricula, experiential learning, and digital resources. They can provide incubators, mentorship, funding, and industry partnerships that foster skills in creative problem-solving, resilience, and calculated risk-taking, besides incorporating specialized seminars, colloquiums, and business plan competitions into the academic system. Further, they can emphasize experiential learning, shifting from theoretical knowledge to pragmatic experience (e.g., simulations, collaborative learning, entrepreneurial internships). Lastly, they can increase industry collaboration by linking students with corporate practitioners to strengthen the connection between innovation and authentic business applications.

Additionally, Cai (2024) examined the impact of school innovative climate in the relationship between proactive personality and creative behavior among college students. Findings showed that proactive personality tends to significantly and positively predict creative behavior, with cognitive flexibility playing an intermediary role in the relationship between the two variables. Findings imply that proactive students are characterized by higher intrinsic motivation, increased feedback-seeking, and creative self-efficacy. They rarely wait for direction, but promptly identify opportunities to improve performance and act on them, which is inherently innovative. Lastly, proactivity augments their creative output by increasing their engagement in identifying problems, gathering information, and brainstorming solutions.

In their investigation, Zhang and Chen (2025) examined college students' innovation awareness, knowledge, skills, and practices. Findings revealed that college students tend to have high innovation awareness and rich innovative ideas, but they display low innovation action, low attention to scientific and technological trends and the market, and scarce innovation knowledge and interdisciplinary knowledge. They also tend to demonstrate low mastery of innovation skills and a lack of motivation for innovation practice. To bridge the gap between awareness and action, universities can strengthen practical training, optimize innovation platforms, and promote an innovation-oriented culture.

2.6. Innovative Behavior, Competitions, and Indicators

Innovative behavior among undergraduate students in relation to demographic characteristics was examined by Saengpanya, Upasen, and Kaewkohsaba (2025). Findings showed that students' level of innovativeness tends to be moderate. Moreover, they tend to obtain relatively higher scores in generativity, but much lower scores in championing ideas. Findings imply that students find the earlier stages of innovation (idea generation) generally more accessible compared to the later stages (idea promotion and implementation). For example, championing, which requires students to advocate their ideas, persuade others, and mobilize support for innovation, demands not only cognitive capability, but also high levels of creative self-efficacy. Since innovativeness is regarded as a core competence for innovation development, universities can encourage students to actively engage in opportunity seeking, create novel products and services, engage in thought leadership, and translate their innovative ideas into prototypes.

In their study, Konak et al. (2025) investigated the impact of innovation competitions and programs (ICPs) on university students' innovativeness. Findings showed that students who participated in ICPs tend to rate technical and problem-solving skills higher than other innovation mindset skills. Findings imply that universities can incorporate more entrepreneurial elements into their ICPs to improve students' innovativeness, while helping them mitigate challenges associated with innovation and change. Moreover, they can organize hackathons, design challenges, and accelerator programs that comprise structured, experiential learning initiatives formulated to foster entrepreneurship and real-world problem-solving. They can also help bridge academic knowledge with industry needs by offering a safe environment for experimentation, enabling students to develop critical thinking, leadership, and technical skills, while cultivating a proactive innovation mindset.

The current practice of innovation-promoting indicators among high school students was analyzed by El Sleemi et al. (2025). Findings revealed a moderate level of implementation of the indicators, with the curriculum indicator ranking the highest, and the educational environment indicator the lowest. Significant differences tend to exist between regular students and the gifted in terms of the overall innovation indicators (curriculum, student role, educational environment), favoring the gifted. Findings underscore the importance of revising and enhancing the existing curricula to better stimulate innovative thinking among students, strengthening their capacity for innovation. Schools can implement innovation-promoting indicators to foster creativity and problem-solving by (1) adopting flexible curricula that incorporate creative thinking, problem-solving, and interdisciplinary learning, (2) propagating a culture that promotes innovation through available technology, resources, and a safe, non-

threatening atmosphere that fosters creativity, (3) encouraging teachers to adopt innovative, interactive, and active teaching methods, including mentoring and encouraging constructive criticism, (4) planning project-based learning, innovation tournaments, and STEM/arts-based creative assignments, (5) providing leadership and academic structures that prioritize professional development, encourage risk-taking, and offer mentorship, and (6) fostering a collaborative school culture that supports team-based projects and knowledge-sharing among students.

3. Methodology

3.1. Research Design and Approach

This study employed a quantitative methodological framework to enable a rigorous examination of student innovativeness through the analysis of numerical responses and statistics. This approach facilitated the measurement of students' perceptions of the construct with the overarching aim of generating robust findings that could be generalized to the wider population of college students in Sabah. In addition, Statistical Package for the Social Sciences (SPSS) version 26.0 was utilized to calculate percentages of agreement, as well as to identify statistically significant variations across demographic variables such as age, gender, and ethnic background. The fundamental components of the quantitative design comprised (1) three clearly articulated research questions, (2) the use of a convenience sampling involving early childhood education students as representatives, (3) a set of innovativeness indicators, (4) a suitable procedure for data gathering, (5) clearly specified statistical techniques for data analysis, and (6) adherence to ethical principles, including informed consent and the safeguarding of participant confidentiality.

3.2. Research Location

The investigation was carried out in Kota Kinabalu, Sabah's administrative centre on the island of Borneo, a setting where empirical studies employing quantitative approaches to examine student innovativeness remain limited. This urban area was selected because it hosts multiple tertiary institutions, enabling access to a broad and diverse pool of undergraduates from across the state. Consequently, this context supports a representative and reasonably balanced evaluation of innovativeness among students in Sabah.

3.3. Sample and Justification

The participants of this study comprised 84 college students ($n = 84$) recruited from a private university college in Kota Kinabalu, Sabah. They come from culturally, linguistically, and ethnically diverse communities in Sabah. Enrolled in the Early Childhood Education program at the university college, they possess average English proficiency and are studying full-time at the institution. Initially, the registrar was contacted via email and phone; agreeing to help administer the online questionnaire, he subsequently shared the survey link with students.

The participant pool was considered an adequate reflection of the undergraduate population in the Kota Kinabalu context. According to the central limit theorem, a threshold of at least 30 respondents is generally regarded as sufficient to achieve acceptable statistical robustness and generalizability in foundational survey-based

investigations (Roscoe, 1975; RUBIKTOP, 2023). In this study, the participants met established adequacy criteria, providing acceptable precision and analytical power in the nonparametric analyses (i.e., Kruskal-Wallis, Mann-Whitney U, and Wilcoxon signed rank tests) used.

Ethnicity-wise, the sample involved 40.4 percent Malays, 17.9 percent Kadazandusuns, and 41.7 Muruts. Gender-wise, 7.1 percent were males and 92.9 percent were females. Age-wise, 81 percent were 18 to 20 years old and 19 percent were 21 to 23 years old (see Table 1).

Table 1: Demographic Characteristics of Respondents ($n = 84$)

Characteristic	Category	Frequency	Percentage (%)
Ethnicity	Malay	34	40.5
	Kadazandusun	15	17.9
	Murut	35	41.7
Gender	Male	6	7.1
	Female	78	92.9
Age	18-20	68	81.0
	21-23	16	19.0

3.4. Instrument

The Innovation Attitude Survey (IAS) designed by Christensen and Knezek (2022) was adapted to collect data. It comprises 16 Likert-type items selected to measure early childhood education students' attitudes toward innovation and leadership in the advancement of innovative ideas in teaching and learning. The goal of administering the IAS was to identify innovative dispositions that might be related to future educational careers among college students in Sabah, Malaysia. To determine its suitability for the current research, the IAS was tested on 25 college students in a pilot study and SPSS 26.0 was used to analyze the data. Results indicated that its Cronbach's alpha is 0.910, reflecting its high internal consistency. Lastly, its total score is 80 (64-80 = high, 56-63 = average, low= less than 56).

3.5. Data Collection and Analysis

College students were requested to complete the IAS questionnaire and indicate their consent to voluntarily participate in the study. All the students were informed of the purpose of the study and that they could withdraw at any time. All the responses were anonymized, and securely kept.

The dataset was compiled in a spreadsheet and subjected to statistical analysis using SPSS 26.0. Initially, descriptive analyses were performed to obtain the proportions of respondents expressing agreement with respect to perceived innovativeness. Subsequently, differences associated with age and ethnicity were examined using the Kruskal-Wallis H test, whereas gender-related differences were analyzed through the Mann-Whitney U test. Lastly, the Wilcoxon signed-rank test was conducted to assess whether individual innovativeness indicators were significant at 3.5, the hypothesized value.

4. Findings

4.1. Mean and Percentages of Agreement

The mean score of student innovativeness was 60.33 (total score = 80). Percentages of agreement (strongly agree/agree) were combined to gain an overall view of innovativeness among early childhood education students at the private university college in Sabah. About 40.4 to 57.2 percent of the students strongly agreed/agreed that they (1) were often chosen as the team leader, (2) would rather start their own educational business than work for others, (3) solved mathematical and science problems to increase their interest in the subjects, and (4) had the chance to lead a group via project work (see Table 2).

Further, 67.9 to 70.3 percent of the students strongly agreed/agreed that (1) they enjoyed searching for new ideas for educational products and services, (2) they felt really motivated when they produced something that was novel, (3) inventing new solutions to educational problems could turn into an important part of who they were, (4) once they started something, they would like to finish it, (5) they were motivated to figure out how to improve existing educational products or services, and (6) they would like to invent something new to education (see Table 2).

Besides that, 76.2 to 78.6 percent of the students strongly agreed/agreed that (1) when they were doing something, they liked to feel that it had a purpose or goal, (2) they wanted their future work to be based around a set of challenges that they would find interesting, and (3) they would like to do something new that would bring about positive changes to education (see Table 2).

Lastly, 83.3 to 84.5 percent of the students strongly agreed/agreed that they (1) were proud when they had designed something themselves successfully and (2) liked to pursue their hobbies or interests where they felt more in control (see Table 2).

Table 2: Percentages of Agreement on Student Innovativeness

Item	1	2	3	4	5	4+5 (Collapsed)
Searching for new ideas for educational products and services is enjoyable to me	0.0	3.6	31.0	56.0	9.5	65.5
I am motivated to figure out how to make existing educational products or services better	0.0	2.4	27.4	61.9	8.3	70.2
I would like to invent something that is new to education	0.0	2.4	27.4	64.3	6.0	70.3
I would like to do something new that would bring about positive changes to education	0.0	1.2	20.2	53.6	25.0	78.6
Inventing new solutions to educational problems could turn into an important part of who I am	0.0	2.4	28.6	56.0	13.1	69.1
When I am doing something, I like to feel it has a purpose or goal	0.0	0.0	27.4	57.1	15.5	76.2
I am proud when I have designed something myself successfully	0.0	0.0	16.7	57.1	26.2	83.3
I feel really motivated when I produce something that is novel (new)	0.0	0.0	32.1	54.8	13.1	67.9
I want my future work to be based around a set of challenges that I would find interesting	0.0	0.0	20.2	63.1	16.7	79.8

I like to pursue my hobbies or interests where I feel more in control	0.0	0.0	15.5	63.1	21.4	84.5
Once I start something, I like to finish it	0.0	1.2	28.6	50.0	20.2	70.2
Project work gives me the chance to take a leading role in the group	1.2	4.8	36.9	52.4	4.8	57.2
I am often chosen to be the team leader	4.8	6.0	48.8	36.9	3.6	40.5
I would rather start my own educational business than working for others as my career	2.4	3.6	52.4	38.1	3.6	41.7
Solving problems in math and science topics increases my interest in learning more about the topics	1.2	2.4	41.7	45.2	9.5	55
Studying topics that impact my local environment encourages me to pursue a career to help solve problems	0.0	1.2	29.8	57.1	11.9	69

Strongly disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly agree = 5

4.2. Non-significant Differences

Kruskal-Wallis H test showed no significant differences in innovativeness by way of ethnicity. Mann-Whitney U test indicated no significant differences by way of gender and age (see Table 3).

Table 3: Results of Kruskal-Wallis H and Mann-Whitney U Tests

Fixed variables	Non-parametric test	p-value
Ethnicity	Kruskal-Wallis H test	0.807
Gender	Mann-Whitney U test	0.060
Age	Mann-Whitney U test	0.183

4.3. Wilcoxon Signed Rank Test Results

Wilcoxon signed rank test showed that 11 of the items significantly differed from the hypothesized value of 3.5 at $p < .001$. Only two of the items significantly differed from the hypothesized value of 3.5 at $p < .05$ (see Table 4).

Table 4: Wilcoxon Signed Rank Test (hypothesized value = 3.5)

Item	p-value
Searching for new ideas for educational products and services is enjoyable to me.	0.004*
I am motivated to figure out how to make existing educational products or services better.	< 0.001***
I would like to invent something that is new to education.	< 0.001***
I would like to do something new that would bring about positive changes to education.	< 0.001***
Inventing new solutions to educational problems could turn into an important part of who I am.	< 0.001***
When I am doing something, I like to feel it has a purpose or goal.	< 0.001***
I am proud when I have designed something myself successfully.	< 0.001***
I feel really motivated when I produce something that is novel (new).	< 0.001***
I want my future work to be based around a set of challenges that I would find interesting.	< 0.001***
I like to pursue my hobbies or interests where I feel more in control.	< 0.001***
Once I start something, I like to finish it.	< 0.001***
Project work gives me the chance to take a leading role in the group.	0.314

I am often chosen to be the team leader.	0.040*
I would rather start my own educational business than working for 3s as my career.	0.121
Solving problems in math and science topics increases my interest in learning more about the topic.	0.225
Studying topics that impact my local environment encourages me to pursue a career to help solve problems.	< 0.001***

* $p < 0.05$, *** $p < 0.001$

5. Discussion

This section consists of a summary of key findings on innovativeness among early childhood education students in Sabah, Malaysia, with a clear, direct, and succinct statement of the main findings. Findings are interpreted according to the underlying reasons or causes for the results, besides being compared with existing literature, highlighting similarities, differences, or contradictions, with implications being made. Recommendations are also provided, proposing future studies to address unanswered questions or improve on the current research.

5.1. Key Findings and Implications

Findings imply that the college students tend to possess an average level of innovativeness, which were supported by previous research. In a study, Jurišević (2011) appraised that postgraduate students' creativity tends to be adversely affected by cultural and systemic constraints and entrenched academic habits. The lack of a nurtured creative culture often poses as a significant barrier to creativity. Some academic environments often prioritize traditional, rigid research methods over creative, interdisciplinary approaches, regarding creativity as unrequested or secondary to traditional output in higher education. Further, systemic barriers (e.g., supervision and curriculum) often pressure students to produce quick results under directive guidance, which discourages independent creative thought. The lack of practical, creative assignments in the curriculum also limits opportunities to practice innovation. Lastly, years of traditional schooling often teach students that there is only one correct answer to every question, making it difficult for them to embrace the open-ended, uncertain, and failure-prone nature of truly innovative research.

On the other hand, Ting-Chee et al. (2020), who investigated the nature of innovation at Malaysian polytechnics, disclosed that a common misconception tends to exist among students and lecturers, who associate innovation with invention projects only, focusing mostly on product innovation. By limiting innovation to basic inventions, students and lecturers overlook the broader skills needed for technical creativity, exacerbated by the lack of exposure and guidelines on authentic innovation. Selvaraja et al. (2021), who explored the impact of school innovativeness on academic performance, found that Malaysian schools tend to practice a moderate level of innovativeness. Similarly, Derasid et al. (2022), who examined the innovation level among engineering and non-engineering undergraduate students at a Malaysian university, discovered that only 44.39 percent of engineering students and 47.09 percent of non-engineering students tend to possess high innovation capabilities.

Lastly, Malaysia ranks 34th out of 139 economies in the 2025 Global Innovation Index (GII); however, the nation is still in a developing stage with regards to the specific nurturing of an innovative mindset among students. Despite ranking high in tertiary

education output, the innovation ecosystem urgently needs to increase the intellectual property (IP) registration for students to cultivate an early innovative mindset. While evidencing high-tech exports and a high percentage of science/engineering graduates, Malaysia still faces significant challenges in terms of translating research into market value (commercialization) and low indigenous technology adoption. Lastly, in terms of innovativeness, Malaysia ranks 86th among the top 100 science and technology clusters, indicating a need for greater regional innovation activity (Global Innovation Index, 2025).

5.2. Recommendations

5.2.1. Innovative Endeavors and Holistic Education

Student innovativeness can be enhanced through specific innovative endeavors (The Global College, n. d.). First, HEIs can encourage students to undertake innovative initiatives to equip them with valuable skills that are essential for success in the 21st century. They can reinforce students' innovativeness by fostering critical thinking and problem-solving abilities, while encouraging them to critically navigate challenges and devise innovative solutions. Additionally, HEIs can nurture students' creativity by allowing them to think outside the box, exploring unconventional approaches to problem-solving, besides helping students to improve their collaboration and communication skills through teamwork and idea sharing. Since resilience and adaptability are vital for innovation, HEIs can encourage students to embrace failure as an integral part of the innovation process, persist in the face of disappointment, and engage in a continuous cycle of testing, gathering feedback, and refining concepts to improve quality.

Additionally, to promote student innovation, educational institutions can emphasize holistic education, fostering intellectual, personal, emotional, and social development among students (The Global College, n. d.). HEIs can underscore inquiry-based learning among students, while encouraging them to explore their interests, ask questions, and seek solutions independently. Moreover, HEIs can help students develop innovative attributes such as ethical standards, open-mindedness, and reflectiveness, which empower them to approach challenges with curiosity and integrity, while driving innovation in their academic pursuits. Further, HEIs can integrate interdisciplinary learning into their curricula, allowing students to make connections across various subject areas, besides applying their knowledge in real-world contexts. This cross-disciplinary approach can nurture innovation by encouraging students to draw upon diverse perspectives and methodologies to address complex issues in a comprehensive manner. Lastly, HEIs can emphasize service learning and community engagement to instill a sense of social responsibility among students, besides motivating them to leverage their skills and knowledge to implement innovative initiatives for the betterment of society.

5.2.2. Personality traits

Stock, von Hippel, and Gillert (2016), who examined the impact of personality traits on consumer innovation success, disclosed that innovation success tends to be significantly driven by high openness to experience (creativity), conscientiousness (drive), and extraversion (networking). Successful innovators are often resilient, curious, and emotionally stable, with lower levels of neuroticism, enabling them to better adapt to

failure. Their proactive personality, combined with a supportive environment, propels them to transform ideas into market-ready products. Therefore, HEIs can allow students to demonstrate or develop (1) openness to experience through idea generation, allowing them to see new possibilities and product improvements, (2) conscientiousness by encouraging them to bring ideas to the prototyping and commercialization stages, (3) extraversion, which is often associated with networking, team collaboration, and the diffusion of innovations, (4) emotional stability (with lower neuroticism) that allows them to manage risk better and persevere through failures, and (5) proactivity and resilience by actively seeking innovation opportunities and persisting through setbacks.

5.2.3. Growth Mindset, Self-reflection, and Flexible Learning Environment

To enhance student innovativeness, HEI instructors can embrace a growth mindset, encourage self-reflection, and provide a flexible learning environment (Education Advanced, 2022). First, a growth mindset is essential for instructors to propagate an innovative classroom learning atmosphere that is inclusive and safe to make students feel supported in taking calculated risks. Instructors should exude passion for what they are teaching so that students will feel engaged regarding the content and be more likely to engage with the materials. Further, instructors should act as role models, showing students that they themselves also want to innovate and continuously improve their own pedagogic practices. Additionally, instructors with a growth mindset often modify traditional pedagogic strategies to empower students to help them develop an internal locus of control and take ownership of their own learning. Second, instructors can practice self-reflection as they continue to learn and adapt to cultivate an innovative classroom climate, discovering novel ways to find the ideal spot for instruction and fine-tuning various activities and student interactions to achieve the most favorable teaching and learning outcomes. They can also involve students in the self-reflection process, as this allows student to reinforce their strengths and discover areas of growth, besides taking advantage of students' ideas and suggestions for future lesson development. Third, instructors can design a fluid learning environment where students are respected as individuals, each of whom requires a different instructional approach. Besides, they can modify the traditional classroom arrangements to encourage collaborative activities or innovative instructional strategies, even venturing outside the classroom to increase student interest and performance. In brief, they can arrange the classroom for different functions, for example, to allow students to perform alone, communicate with peers, or access work groups/workstations.

5.2.4. Problem-solving, Risk-taking, and Flipped Classroom

Additionally, to enhance student innovativeness, HEI instructors can adopt problem-finding approaches, allow risk-taking and failure among students, and implement a flipped classroom model (Education Advanced, 2022). Besides problem-solving approaches, instructors can encourage students to overcome challenges using problem-finding strategies, which are imaginative and intellectual to determine what might be missing or can be added to something significant, while approaching content from different viewpoints. Further, problem-finding strategies enable students to engage in deep thinking, ask essential questions, and apply innovative ways to resolve issues. Second, instructors can encourage students to take calculated risks and embrace failure as a part of the learning process, while emphasizing that innovative individuals often try different activities to succeed, although they may fail along the process. Moreover, they can provide real-world assignments for students to learn from, persevering until they

succeed. To promote personal development among students, they can underscore that innovative learning is a journey characterized by authentic issues and predicaments to tackle, wrangle, and overcome. Third, instructors can implement a flipped classroom model to capture classroom time for student collaborations by reversing classroom order and direct teaching. Students can prepare before class by studying materials, reading texts, and analyzing their assignments, while instructors can reserve class time for collaborative exercises, including group discussions, peer-to-peer learning, independent learning, and discussions.

5.2.5. Innovation Spirit and Innovation Mindset

According to Xu (2023), innovation has become increasingly crucial for economic, scientific, and technological advancement, reflecting the national power of a country. As the future and hope of a country, college students must cultivate innovative thinking to contribute to national development and progress, while HEIs must serve as a cradle for them to cultivate innovative talents, shape their innovative spirit, and augment their entrepreneurial ability. To enhance college students' innovativeness, HEIs need to implement strategies that can improve their creativity, critical thinking, and problem-solving ability. To instil an innovation spirit among college students, HEIs can (1) implement practical, hierarchical, and progressive teaching systems that encourage research and autonomous learning rather than solely focusing on theoretical knowledge, (2) encourage calculated risk-taking and resilience by offering a safe space for students to take risks without the fear of failure, (3) establish a supportive campus culture that promotes innovation through special events, innovation/entrepreneurship competitions, and dedicated spaces (e.g., maker spaces), (4) strengthen mentorship and teamwork by hiring instructors with practical experience, providing expert mentorship, and promoting interdisciplinary team-based projects, (5) connect education with real-world problems by aligning projects with social impact or industry challenges, and (6) offer individualized skill development by encouraging students to pursue personal interests, engage in self-reflection, and improve emotional intelligence to identify areas for creative growth.

To develop an innovative mindset among students, HEI instructors can encourage students to perceive the world as inherently unpredictable by abandoning judgment, being open to all possibilities, displaying the confidence and courage to adopt a trial-and-error approach, and embracing failure on the path to success. The innovative mindset sits in direct conflict with conventional education, whereby students are taught to think and act according to a set of guidelines, produce standard research, and be assessed against quantifiable evaluation metrics. In contrast, instructors with innovation at heart often encourage students to learn through experimentation and exploration rather than using step-by-step manuals. They depend less on pre-prepared materials and encourage divergent thinking, besides rewarding curiosity and risk-taking. Lastly, they strive to help students overcome the fear of failure and gain confidence to innovate without formal structures and materials (Cheung & Yiu, 2023).

5.2.6. Case Studies

According to Cheung and Yiu (2023), student innovativeness can be fostered through case studies, which enable students to learn from analyzing bona fide cases and applying knowledge from a set of disciplines. Case studies allow students to discover novel knowledge and practices by confronting authentic, real-world problems, ultimately

helping them develop their own proposals for the final course project. For example, early childhood education is one of many domains facing rapid transformation in innovation-driven economies, especially with the emergence of digital technologies. Therefore, early childhood education students need to become digitally innovative to modify traditional pedagogic practices and theories. Moreover, case studies enable students to co-create knowledge through collaborative effort, whereby students need to work together and share analyses and insights with peers. Case studies offer a flexible structure that allows for group and individual efforts; for example, students can share individual work for feedback during class discussions (in-person or online), fostering mutual learning and knowledge-sharing.

Further, instructors can guide conversations by posting open-ended questions to stimulate thoughtful discourse and exploration of topics (Cheung & Yiu, 2023). A typical question might be: Is digital technology the future of early childhood education? Students then need to evaluate and provide responses to the statement using real-world classroom scenarios to support their arguments. To increase participation, students can be asked to contribute to an online discussion board at least once per week, which serves as a platform for them to review peers' posts, share their own insights, and deepen their understanding of the subject matter.

Since the principle of "learning by doing" is central to student innovativeness, instructors can provide assessment exemplars that serve as practical guides, helping students understand what evaluators are looking for in specific tasks and demonstrating what constitutes quality (Cheung & Yiu, 2023). Exemplars can be in the form of analyses of previous case studies and subsequent discussions, exploring how innovations can address problems in early childhood education. Lastly, students can prepare their own proposals for the final project, allowing them to apply the knowledge and insights gained from the exemplars in a practical hands-on setting. Student's work, specifically their analyses and discussions of case studies, can be shared on social media platforms, allowing them to showcase their innovative ideas regarding the rapidly evolving educational sector, besides providing exemplars for future students.

5.2.7. Commercialization Process and Pipeline

According to Shamsir (2023) Malaysian HEIs can involve students in the innovation and commercialization process, while instilling entrepreneurial spirit and abilities among them. They need to coordinate and consolidate the commercialization process by implementing policies that can enhance student-teacher collaboration. While student entrepreneurship and academic entrepreneurship cannot be merged, HEIs can connect and match talented academics with entrepreneurial students. Additionally, HEIs can create a vast sandbox for adult learners, offering them a secure setting in which to experiment, learn, and develop their innovative endeavors. Students can be encouraged to experiment with different concepts, make adjustments, and determine which ones work best without the huge risks associated with the corporate sector. Overall, HEIs can propagate a vibrant environment that fosters innovation, collaboration, and creativity, enabling students to become professionals or leaders in their own fields.

Besides, HEIs can construct a single pipeline of continuous value propositions that runs from undergraduate research to employment. In terms of early childhood education, HEIs should require students to discuss issues and challenges that are related to their undergraduate research projects. By providing a continuous chain of value in the form of

innovative ideas and solutions to early childhood education, students can extend their internship at schools, while improving their employability after graduation. Additionally, HEIs can combine theoretical classroom instruction with on-the-job training at a school. For early childhood education students, teaching practicum is a good place to begin and support current government initiatives to boost the availability of employment opportunities and the marketability of graduating students. Overall, early childhood education postgraduates can become innovative academic/educational entrepreneurs by gaining entrepreneurial experience in some capacity as undergraduates (Shamsir, 2023).

5.2.8. Structures, Systems, and Processes

Bloetner (2023) delved into the various structures, systems, and processes that can be implemented to create a culture of innovation. First, HEIs can provide structures or organized frameworks that define the way they operate, ranging from the physical learning environment to the systematic arrangement of curriculum and the underlying administrative system. Classrooms that are flexible, adaptable, and technologically equipped can encourage collaboration and innovativeness among students. Innovation labs, makerspaces, and huddle areas can inspire experiential learning and problem-solving, besides exploring, creating, and prototyping (Bloetner, 2023) different content.

Second, HEIs can implement systems to drive innovation, including organized methods, frameworks, or strategies that educational entities use to deliver content, assess progress, and manage operations. Common systems include (1) project-based learning that provides students with real-world challenges that require innovative solutions, (2) flipped classrooms that allow students to explore content and apply their knowledge through discussions, problem-solving, and projects, and (3) digital systems and online platforms that support the teaching and learning process, which include learning management systems, formative assessments, digital and online platforms, and hybrid delivery (Bloetner, 2023).

Third, HEIs can adopt processes that can foster a culture of innovation, including (1) professional development sessions that introduce instructors to the latest pedagogical strategies, technologies, and research findings related to innovative education, (2) design thinking that allows instructors to teach problem-solving through empathy, iteration, and prototyping, (3) regular reflection that enables instructors to determine the effective strategies or challenges associated with student innovation, (4) interactions that encourage students to approach problems from diverse perspectives, (5) peer learning that encourages students to teach and learn from each other, leveraging the diverse strengths and perspectives within a classroom, (6) and partnerships with local businesses, NGOs, and other organizations that offer students real-world experiences, including internships, community projects, and guest lectures (Bloetner, 2023).

5.2.9. Innovative Thinking, Entrepreneurial Abilities, and Innovation Capabilities

Malaysian HEIs play a crucial role in fostering students' innovative thinking and entrepreneurial abilities (Chen & Salleh, 2024). However, they often encounter several obstacles or barriers when offering innovation and entrepreneurship education, which are primarily related to predominantly uniform curriculum and teaching methods, as well as the lack of entrepreneurial skills among students. Therefore, HEIs need to revise their innovation and entrepreneurship education programs to match the requirements

of the job market, which entails the recruitment of instructors who possess extensive practical corporate experience, enhancement of course offerings, and the refinement of pedagogic methodologies. HEIs should not only provide theoretical instruction, but also offer ample functional experiences, allowing students to apply their knowledge to real entrepreneurial initiatives. Further, they should establish collaborative partnerships with various business entities so that students can have a wide range of serviceable platforms for innovation and entrepreneurship, including opportunities for exploring, cultivating, and assembling teams for innovation and entrepreneurship projects. Lastly, given the advancement of technology, HEIs should make full use of Internet resources to seamlessly incorporate innovation and entrepreneurship education with digital technology through online courses and virtual simulations.

According to Zastempowski (2025), personality plays a significant role in building innovation capabilities among micro-entrepreneurs. HEIs should conceptualize innovativeness as a cognitive and emotional disposition, underscoring the notion that innovation capabilities are significantly related to aesthetics, openness to experience, and assertiveness. In terms of developing aesthetics, HEIs can (1) offer artistic and cultural experiences to students by implementing structured training modules on visual storytelling, product design, or branding aesthetics designed for entrepreneurs, (2) encourage students to actively seek inspiration by studying other people's projects, leadership styles, and trends in various fields, and (3) allow students to deepen their visual practice by developing drawing, painting, photography, or other forms of visual art. In terms of openness, HEIs can (1) develop creative thinking among students through freewriting, mind-mapping, or problem-solving based on unusual perspectives, (2) continuously expand students' horizons through travelling, reading, exploring different fields of art and culture, innovation boot-camps, interdisciplinary hackathons, and ideation workshops. Lastly, in terms of assertiveness, HEIs can encourage students to (1) develop communication skills, (2) undergo assertiveness training, and (3) build self-confidence, including celebrating successes, practicing positive thinking, and constructively dealing with criticism, (4) join mentorship programs to reinforce assertive behaviors in real business contexts, and (5) engage in role-playing sessions to enhance their verbal and non-verbal assertiveness in pitching and negotiation.

5.3. Final Thought

The present study involved a sample of early childhood education students attending a private university college. Future studies can include college students with other majors, (e.g., business administration, psychology, engineering) to determine the impact of various fields on innovativeness, and vice versa. Moreover, this study investigated only a single psychosocial trait (innovativeness). Future research can include other psychological qualities such as self-efficacy, locus of control, and the need for achievement to determine the relationship between innovativeness intention and other variables that can influence students' academic performance. Lastly, future studies can also investigate the extent to which environmental conditions have an impact on innovativeness to determine the cognitive and behavioral factors contributing to college success.

Ethics Approval and Consent to Participate

This study has strictly adhered to all ethical procedures involving the use of human subjects. Informed consent was obtained from all respondents who were ascertained of their anonymity, with their responses kept strictly confidential. They were also informed that the study was of low risk and that they could stop participating any time without any repercussions.

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Conflict of Interest

The authors report no potential conflict of interest regarding this study in terms of the research or publication of this article.

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