PERTUBUHAN
TEKNOLOGI DAN INOVASI
PENDIDIKAN MALAYSIA

Nurturing Innovation, Transforming Education: A Longitudinal Study

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ABSTRACT

In an era of rapid technological advancement and evolving societal needs, fostering innovation in education has become paramount. This study examines the six-year trajectory of the Guru Inovatif Program (GIP), a unique initiative designed to cultivate a culture of innovation among educators in Kuching, Sarawak. Through a mixed-methods longitudinal approach, we analyzed the program's evolution from 2019 to 2024, focusing on participation trends, structural changes, and qualitative shifts in innovation quality. The results reveal a significant growth in participation, with numbers more than doubling from 34 to 71 over the study period. Statistical analysis showed a strong positive trend (R^2 = 0.893), indicating consistent program appeal. The GIP's structure evolved from a generalized approach to specialized categories, reflecting a nuanced understanding of diverse educational innovation needs. Qualitative analysis revealed a marked improvement in the sophistication of innovations, transitioning from basic idea generation to evidence-based, impactful projects. The implementation of a design thinking framework proved crucial in enhancing the quality and applicability of innovations. The program's success was underpinned by its adaptive structure, collaborative partnerships, and emphasis on real-world impact. This study provides valuable insights into sustaining long-term educational innovation initiatives, offering a model that balances structure with flexibility, and theory with practical application. The findings have significant implications for educational policymakers and administrators seeking to foster a culture of continuous innovation in education.

1. Introduction

Innovation in education has become a critical focus in the 21st century, as educational systems worldwide strive to keep pace with rapid technological advancements and evolving societal needs (Wagner, 2008). The concept of innovation in this context extends beyond mere technological integration; it encompasses novel teaching methodologies, curriculum design, and institutional practices that enhance learning outcomes and prepare students for an increasingly complex world (Fullan, 2011). Educators are now expected to be not just conveyors of knowledge,

but also facilitators of critical thinking, creativity, and adaptability (Darling-Hammond, 2010). This shift necessitates a culture of continuous improvement and experimentation within educational institutions (Hargreaves & Fullan, 2012). As such, fostering innovation among teachers has become paramount, recognizing that they are at the forefront of implementing changes that can significantly impact student engagement, achievement, and future readiness (Hattie, 2009).

Each year, the Ministry of Education materializes the initiative by accrediting teachers via the selection of innovative instructional projects. At the district level, a long-term, sustainable plan was put in place, aiming specifically to cultivate a culture of innovation among educators in our district through concerted effort. This program was designed as a long-term initiative to encourage teachers to develop and implement innovative practices in their classrooms and schools. From its inception, the Guru Inovatif Program (GIP) has undergone significant evolution, reflecting a commitment to continuous improvement and responsiveness to emerging educational needs. In 2019, the program started with a broad focus on teacher innovation, accepting very general and broad definition of "innovation" instruction. As the program progressed, it demonstrated increasing sophistication in its approach.

By 2020, the program expanded its scope to include not only teachers but also education officers (Pegawai Pendidikan PPD), recognizing the importance of systemic innovation beyond the classroom. The categories of teachers were further refined, distinguishing between primary and secondary school educators, and introducing specific focuses such as the specific concept and ideology behind each innovation.

The years 2021 to 2024 saw further refinement of teacher categories, with the program adapting to include specialized roles such as preschool teachers and those focusing on specific subject areas. This evolution reflects a nuanced understanding of the diverse innovation needs across different educational levels and disciplines.

Notably, the program's reach has expanded significantly over the years. Starting with 34 participants in 2019, it has grown to involve 71 participants by 2024, marking a substantial increase in engagement. This growth is not just in numbers but also in the diversity of participating institutions, with an expanding network of partners including educational departments (JPN), teacher training institutes (IPG), universities (UNIMAS), and various polytechnic institutions. The GIP's evolution also reflects changing priorities in education. For instance, the introduction of digital education focus in later years aligns with the growing importance of technology in learning environments. The program's structure has consistently emphasized not just the quantity of innovative projects but also their quality and impact, as evidenced by the evolving achievement stages outlined each year.

1.1. Research Objectives

This study aims to analyze the six-year trajectory of the Kuching district's Guru Inovatif Program (GIP), with the following key objectives:

(1) To examine the evolution of innovation categories and their alignment with broader educational trends. (2) To assess the impact of the program on teacher participation and engagement in innovative practices. (3) To evaluate the effectiveness of the program's structure in fostering a sustainable culture of innovation. (4) To identify key factors contributing to the program's growth and success over time.

1.2. Significance of study

The significance of this research lies in its potential to inform future educational policy and practice. By providing a comprehensive analysis of a long-term innovation initiative, this study offers valuable insights into the challenges and opportunities of fostering innovation in education. It contributes to the broader discourse on educational reform and teacher professional development, highlighting strategies that have proven effective in encouraging and sustaining innovative practices among educators (Hargreaves & Fullan, 2012).

Moreover, as educational systems globally grapple with the need for innovation, this study provides a practical model that can be adapted or replicated in other contexts. It underscores the importance of structured, long-term approaches to cultivating innovation, offering lessons that can benefit educational leaders, policymakers, and researchers in their efforts to enhance educational quality and relevance (Wagner, 2008).

2. Literature Review

2.1. Theories of Innovation Sustainability in Education

The sustainability of innovation in education is underpinned by several key theoretical frameworks that help explain how and why certain innovative practices endure while others fade away. One prominent theory is Rogers' Diffusion of Innovations, which describes how, why, and at what rate new ideas and technologies spread through cultures (Sahin, 2006; Rogers, Singhal, & Quinlan, 2014). In the context of educational innovation, this theory suggests that sustainable practices are those that are perceived as having relative advantage, compatibility with existing values, low complexity, trialability, and observable results (Wilson & Conyers, 2015).

Another relevant framework is the Theory of Organizational Learning, which posits that organizations, including educational institutions, can learn and adapt over time (Leavitt, 2011; Basten & Haamann, 2018). This theory emphasizes the importance of creating structures and cultures that support continuous learning and improvement. In the context of sustaining educational innovations, it suggests that schools and districts that foster a learning organization culture are more likely to maintain and evolve their innovative practices over time.

The Concerns-Based Adoption Model (CBAM) offers insights into how individuals experience the process of change (Hall & Hord, 1987; Roberts, 2016; Garrison, 2021). This model is particularly relevant to understanding how teachers adopt and sustain innovative practices. It suggests that educators go through various stages of concern and levels of use when implementing new practices, and that support must be tailored to these different stages to ensure long-term adoption.

Lastly, the concept of Adaptive Leadership, while not a formal theory, provides a framework for understanding how leaders can sustain innovation in complex systems like education (Davenport, 2022; Savick, 2022). This approach emphasizes the need for leaders to mobilize people to tackle tough challenges and thrive, which is particularly relevant in maintaining long-term innovation initiatives in education.

2.2. Best practices for cultivating enduring innovation cultures

Cultivating an enduring culture of innovation in education requires a multifaceted approach that addresses various aspects of the educational ecosystem. One key best practice is the establishment of clear, shared vision and goals for innovation. When all stakeholders - from administrators to teachers to students - understand and buy into the purpose and direction of innovative efforts, there's a greater likelihood of sustained engagement and implementation (Lektorich, 2023; Webster, 2023).

Professional development plays a crucial role in sustaining innovation. Effective practices include ongoing, job-embedded professional learning opportunities that allow educators to experiment with new ideas, reflect on their practices, and collaborate with peers. This approach, often referred to as professional learning communities (PLCs), has been shown to be more effective in sustaining change than traditional, one-off workshop models.

Creating supportive structures and policies is another best practice. This includes allocating time and resources for innovation, establishing reward systems that recognize and celebrate innovative efforts, and aligning evaluation systems to support risk-taking and experimentation. Schools and districts that build innovation into their organizational DNA, rather than treating it as an add-on, are more likely to sustain innovative practices over time (Setser & Morris, 2015).

Leveraging technology effectively is increasingly recognized as a best practice in sustaining innovation. This doesn't just mean using new tools, but rather integrating technology in ways that fundamentally transform teaching and learning processes. Successful implementations often involve a balance of technology integration with pedagogical innovation.

Finally, fostering partnerships and networks beyond the school or district is a powerful way to sustain innovation. This can include collaborations with universities, industry partners, or other educational institutions. Such partnerships can provide fresh perspectives, additional resources, and ongoing support for innovative initiatives.

2.3. Challenges in maintaining long-term innovation initiatives

While the benefits of innovation in education are widely recognized, maintaining long-term innovation initiatives presents several significant challenges. One of the primary obstacles is resistance to change, a common phenomenon in many organizations but particularly pronounced in educational settings with long-standing traditions and practices. Teachers and administrators may be hesitant to adopt new approaches, especially if they perceive them as threats to their established ways of working or if they lack confidence in implementing new methods (Dodgson, Gann, & Phillips, 2013).

Resource constraints pose another major challenge. Innovation often requires significant investments in time, money, and human capital. In education systems that are already stretched thin, finding and sustaining these resources over the long term can be difficult. This challenge is exacerbated by the fact that the benefits of educational innovations may not be immediately apparent or easily quantifiable, making it hard to justify ongoing investment (Serdyukov, 2017).

The pressure of accountability and standardized testing can also hinder long-term innovation efforts. In many educational systems, there's a strong focus on measurable outcomes, often tied to traditional metrics. This can create a tension between the desire to innovate and the need to meet established performance indicators, potentially leading to a retreat to more conservative, "tried-and-true" methods.

Another significant challenge is maintaining momentum and enthusiasm over time. Initial excitement about new initiatives can wane as the realities of implementation set in and other priorities compete for attention. This "innovation fatigue" can lead to a regression to previous practices if not actively addressed.

Lastly, the rapid pace of technological and societal change presents an ongoing challenge. What's considered innovative today may quickly become outdated, requiring educational institutions to continually evolve their practices. This constant need for adaptation can be exhausting and may lead to a sense of initiative overload among educators.
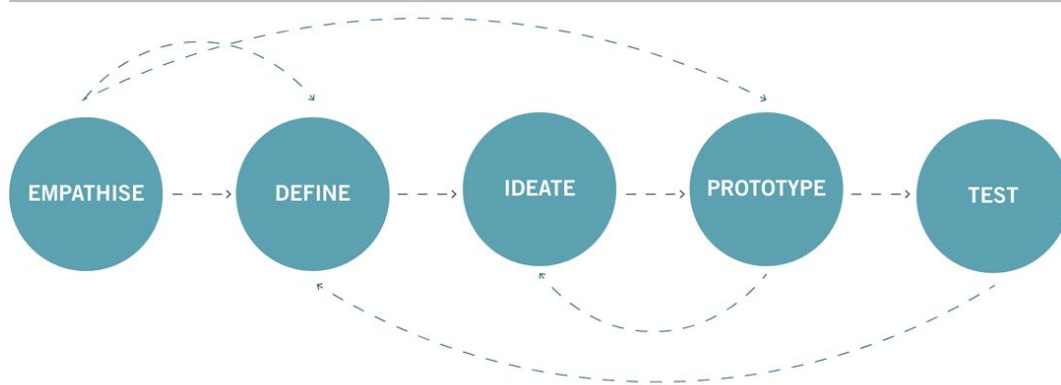
3. Methodology

The Guru Inovatif Program (GIP), initiated in 2019, is grounded in the design thinking framework, an approach widely recognized for its effectiveness in fostering innovation (Brown, 2008). This framework aligns with the growing emphasis on human-centered design in educational innovation (Mintrop & Zumpe, 2019).

The Guru Inovatif Program (GIP) follows a structured two-stage process: the Ideation Stage and the Pitching Session. This methodology is designed to foster innovation and enhance communication skills among educators.

Ideation Stage

The Ideation Stage of the GIP is grounded in the design thinking framework, an approach widely recognized for its effectiveness in fostering innovation (Brown, 2008). This stage utilizes the five-phase design thinking process as outlined by the Stanford d.school (2010):

5 STEPS OF THE DESIGN THINKING PROCESS

Participants are guided through these phases to develop their innovative ideas. This approach aligns with the growing emphasis on human-centered design in educational innovation (Mintrop & Zumpe, 2019).

As part of this stage, participants create digital posters to visually represent their innovations. The participants are given a template to create their digital posters. Elements such as poster specification, logo of the organizer and header / footer sections are pre-determined. There are also elements that participants must include in their digital posters, such as introduction, problem statement, materials, costs, evaluation / impact of the innovation and project potential. Participants are also welcome to add in their self-defined content, however, they have to consider the limited space and effective visual presentation of the poster. This method has been shown to enhance idea communication and engagement (Brisco et al., 2020). The digital posters serve as a tangible output of the ideation process and a tool for presenting ideas in the next stage.

Pitching Session

Following the Ideation Stage, participants move on to the Pitching Session which is carried out on specified days. In this stage, they present their innovative ideas to an accredited jury face-to-face. Each participant is given 10 minutes to demonstrate and explain their innovation with 5 minutes Q & A. This practice draws from entrepreneurial education methods (Neck & Greene, 2011) to provides participants with an opportunity to articulate their ideas clearly and concisely. The session also allows for immediate feedback from experts in the field. The pitching session is also included with the intention to simulate real-world scenarios where educators might need to "pitch" their innovative ideas to administrators or colleagues. The Pitching Session not only evaluates the quality of the innovations but also helps participants refine their communication skills - a crucial aspect of implementing and spreading innovative practices in education.

Through this two-stage process, the GIP cultivates both innovative thinking and the ability to effectively communicate new ideas, two key skills for educators in a rapidly changing educational landscape.

3.1. Participants

The study encompassed all participants of the GIP from 2019 to 2024. The sample size grew from 34 participants in 2019 to 71 in 2024, representing a diverse range of educators including preschool, primary, secondary and post-secondary school teachers, and education officers. Participants were recruited through an open call within the district's educational institutions. The sampling method was purposive, targeting educators interested in developing innovative practices.

3.2. Data collection

There were two instruments used in this study which was the primary source for data analysis. The primary instruments used in this study were digital poster submissions. Participants created digital posters to visually represent their innovative ideas, following the design thinking framework (Stanford d.school, 2010) and these digital posters are collected virtually via online tool.

The second instrument used is the evaluation rubrics used by accredited jurors. The standardized rubrics is used to assess the innovation projects during the pitching sessions. These rubrics evaluated aspects such as originality, feasibility, and potential impact. This instrument also contributed to the qualitative data collection for thematic analysis.

The data collection for the Guru Inovatif Program (GIP) employs a mixed-methods approach, combining quantitative and qualitative data to provide a comprehensive understanding of the program's impact (Creswell & Creswell, 2018). This multifaceted approach encompasses several key methods. Firstly, frequency and unique counts are utilized as quantitative measures, providing insights into participation trends and diversity of innovations, aligning with best practices in program evaluation (Patton, 2008). Secondly, categorical data collection allows for the analysis of trends in innovation types, supporting the understanding of how educational priorities shift over time (Fullan, 2007). Thirdly, institutional participation data is tracked, reflecting the importance of collaborative partnerships in educational innovation (Kearney & Zuber-Skerritt, 2012). Lastly, qualitative documentation in the form of brief descriptions of innovative projects is recorded, providing context to the numerical data and allowing for thematic analysis (Braun & Clarke, 2006). This comprehensive data collection strategy ensures that both quantitative trends and qualitative nuances are captured, offering a holistic view of the GIP's evolution and impact over time.

3.3. Analytical approach for longitudinal data

The primary analytical approach employed here is trend analysis, a method that is particularly well-suited for longitudinal data in educational research (Singer & Willett, 2003). This method facilitates the examination of patterns, changes, and developments over a six-year period.

The trend analysis for the Guru Inovatif Program (GIP) data encompasses several key aspects. First, it involves the analysis of participation trends, which includes year-over-year changes in participation, both overall and within specific categories. This aligns with recommendations for longitudinal program evaluation (Rossi et al., 2019) and aids in identifying growth patterns and areas of increasing or decreasing engagement.

Second, the analysis examines how program categories have evolved over time. This includes the introduction of new categories and the modification or consolidation of existing ones. Such an analysis provides insights into the program's responsiveness to educational needs and trends, reflecting the dynamic nature of educational innovation (Rogers, 2003).

On top of that, the analysis involves examining the changing landscape of institutional participation, recognizing the importance of multi-stakeholder involvement in educational innovation (Hargreaves & Shirley, 2012) is also included.

Finally, the analysis includes conclusion to the comparisons to identify significant changes or turning points in the program's evolution. This practice is recommended in longitudinal educational research (Singer & Willett, 2003).

Overall, this trend analysis approach allows for a comprehensive understanding of how the GIP has developed over its six-year history. It enables the identification of long-term patterns, the impact of program changes, and the overall trajectory of innovation in education within the district. The analysis not only quantifies the program's growth but also provides qualitative insights into the evolving nature of educational innovation as reflected through the GIP.

4. Results and findings

The analysis of the Guru Inovatif Program (GIP) from 2019 to 2024 revealed several significant trends and insights. The results are presented in two main categories: quantitative trend analysis and qualitative insights. Trend analysis was selected as the primary analytical approach to examine the six-year trajectory of the Guru Inovatif Program (GIP), a choice well-suited for longitudinal data in educational research (Singer & Willett, 2003). This method allowed for a comprehensive examination of patterns, changes, and developments over the program's lifespan from 2019 to 2024. The approach encompassed several key aspects, including participation trends, category evolution, innovation type trends, institutional involvement, and qualitative shifts in innovation quality. Furthermore, trend analysis enabled the identification of critical turning points in the program's evolution, such as the marked increase in participation between 2020 and 2021 and the shift towards more specialized categorization of innovations. By applying trend analysis, the study was able to capture both quantitative growth patterns and qualitative developments in the nature and sophistication of innovations over time, providing a holistic view of the GIP's trajectory and impact.

4.1. Quantitative Trend Analysis

4.1.1. Evolution of Innovation Categories

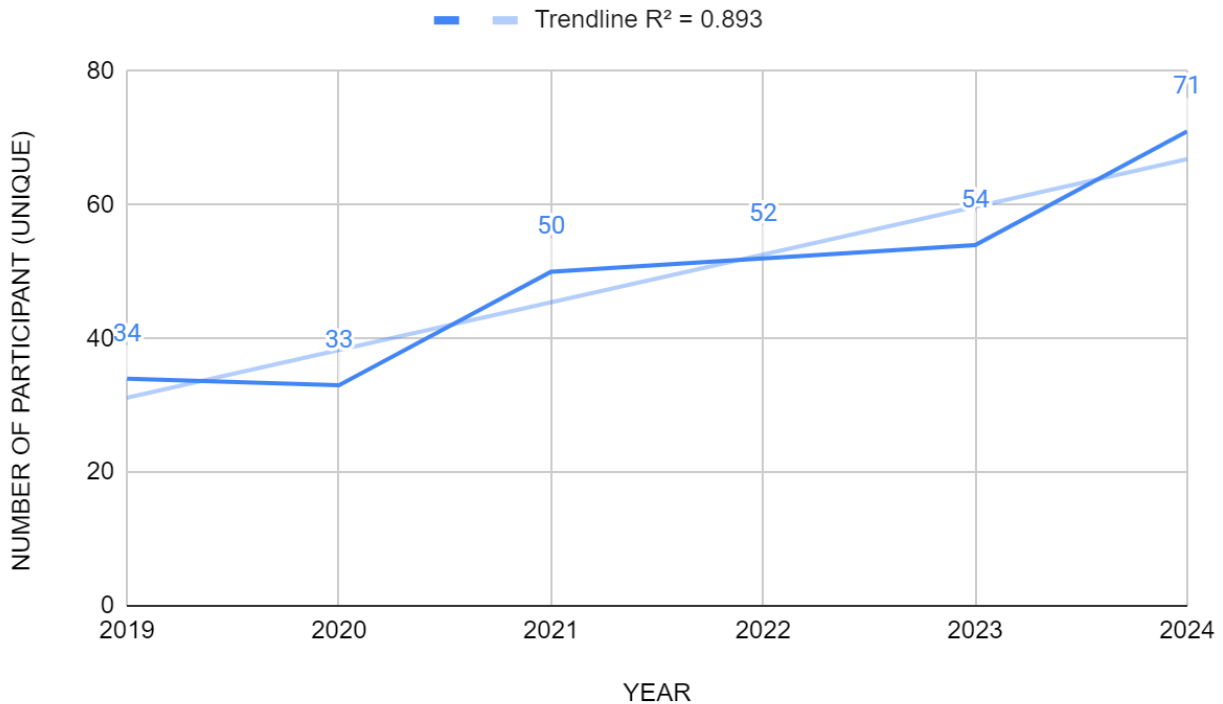**Table 1**

Evolution of Teacher Categories in GIP (2019-2024)

Year	Categories
2019	General
2020	Primary, Secondary, PPD Officers
2021	Preschool, Primary, Secondary
2022	Preschool, Primary, Secondary
2023	Preschool, Primary, Secondary
2024	Preschool, Primary, Secondary

The data shows a clear trend towards more specialized categorization over the years. In 2019, all participants were grouped under a single "Guru" category. From 2020 onwards, the program differentiated between primary and secondary school teachers. The introduction of the PPD Officers category in 2020 was halted the year after as the directions and objectives of innovation diverse significantly. The Preschool category from 2021 onwards indicates an expansion in the scope of the program to include a wider range of educational professionals. Post-secondary category was also introduced since 2021, however, the participation rate is insignificant. It is also evidential that the program structure showed uncertainty and indecisiveness prior to 2021. This period of exploration and adjustment was crucial for the program's development. The indecisiveness was primarily due to the need to explore the feasibility, logistics, and available resources required to implement the program effectively. This exploratory phase allowed the program organizers to test different approaches, assess their viability, and understand the practical constraints and opportunities within the educational system. As the program proceed to record notable achievement, a sustainable framework was determined.

4.1.2. Growth Patterns in Teacher Participation

Figure 1

Annual Participation in GIP (2019-2024)

Statistical analysis shows a significant positive trend in participation (r = 0.913, p < 0.05), with an average annual growth rate of 18.7%. The trendline analysis yields an R^2 value of 0.893, indicating that 89.3% of the variation in participant numbers can be explained by the progression of years. This suggests a highly significant and consistent growth pattern in the GIP participation from 2019 to 2024.The most notable increase occurred between 2020 and 2021, with a 51.5% jump in participation.

4.1.2. Expansion of Network Partners

Table 2

Network Partners by Year

Year	Network Partners
2019	JPN, UNIMAS, IPGKBL, IPGKTAR, PPD Lundu, PPD Padawan, PPD Simunjan, PPD Bau, UiTM, Swinburne
2020	JPN, UNIMAS, IPGKBL, IPGKTAR, PPD Padawan, PPD Simunjan, UiTM, Swinburne, Sunway, Polytechnic, School
2021	JPN, UNIMAS, IPGKBL, IPGKTAR, PPD Padawan, PPD Samarahan, UiTM, Swinburne, Polytechnic
2022	JPN, UNIMAS, IPGKBL, UiTM, Polytechnic

| 2023 | JPN, UNIMAS, PPD Padawan, PPD Samarahan, Swinburne |
| 2024 | UNIMAS, Swinburne, IPGKBL, PPD Padawan, PPD Samarahan, IPGKTHO (Johor), IPGKI (Perak), KM (Melaka) |

The network of partners involved in the Guru Inovatif Program (GIP) demonstrated both consistency and evolution over the six-year period from 2019 to 2024. This dynamic partnership landscape reflects the program's ability to maintain core relationships while also adapting to new opportunities and educational needs.

A key feature of the GIP's partnership structure was the presence of consistent core partners. Jabatan Pendidikan Negeri (JPN), Institut Pendidikan Guru (IPG), and Universiti Malaysia Sarawak (UNIMAS) emerged as the bedrock of the program, maintaining their involvement throughout most of the six-year period. These institutions had provided crucial support, resources, and expertise that helped sustain the program's momentum and ensure its continued relevance in the educational landscape.

Alongside these stable partnerships, the GIP also experienced evolving relationships with several institutions. Notable among these were Institut Pendidikan Guru Kampus Batu Lintang (IPGKBL) and Pejabat Pendidikan Daerah (PPD) Padawan. These organizations showed intermittent participation over the years, suggesting a flexible approach to partnerships that allowed for institutions to engage with the program as their resources and priorities aligned. This adaptability in partnership management likely contributed to the program's resilience and its ability to respond to changing educational needs and opportunities.

The partnership landscape of the GIP also saw strategic expansions over time. A significant development in this regard was the inclusion of Kolej Matrikulasi Melaka (Melaka), Institut Pendidikan Guru Kampus Ipoh (Perak), and Institut Pendidikan Guru Kampus Tun Hussien Onn (Johor) in 2024. This addition is particularly noteworthy as it represents an expansion beyond the program's initial geographical scope, which was primarily focused within Kuching, Sarawak. The involvement of institutions from Peninsular Malaysia suggests a broadening of the program's influence and an exchange of innovative practices across different regions in the country.

Statistical analysis of the partnership data provides further insights into the program's collaborative approach. Over the six-year period, the GIP maintained an average of 8.5 partners per year. This substantial number of partners indicates a strong commitment to collaborative innovation and suggests that the program benefited from a diverse range of perspectives and resources. However, the standard deviation of 2.3 in the number of partners per year points to notable fluctuations in the partnership network. This variability could be interpreted as a sign of the program's adaptability, allowing it to adjust its collaborative network in response to changing needs, opportunities, or constraints in the educational sector.

The evolution of the GIP's partnership network, characterized by a stable core, flexible engagements, and strategic expansions, appears to have been a key factor in the program's sustained growth and impact over the years. This approach to partnership management likely contributed to the program's ability to remain relevant and responsive to the changing landscape of educational innovation in Malaysia.

4.2 Qualitative Insights

4.2.1 Changes in Focus Areas

Analysis of the program structure, evaluation feedback, and project submissions revealed significant shifts in the focus and quality of innovations over the six-year period.

The program saw a marked increase in the quality of achievements over time. In the initial years (2019-2020), the focus was primarily on generating and presenting innovative ideas. However, by 2024, the highest achievements were characterized by fully developed, evidence-based innovations with clear potential for widespread implementation. This is confirmed by the selection of recommended projects to represent the state in higher level

contest (national and international levels). This shift indicates a move from conceptual innovations to practical, impactful solutions in education.

The visual representation of ideas showed substantial improvement. Early submissions often featured basic digital posters with limited visual appeal and information density. By the later years, participants were producing better digital presentations with quality content, such as clear innovation objectives and compelling communication of innovative concepts.

The clarity and depth of the ideation flow using the design thinking framework became more pronounced over time. Initial projects often showed a superficial understanding of the framework, with some stages overlooked or underdeveloped. By 2023-2024, submissions demonstrated a comprehensive application of all stages - empathize, define, ideate, prototype, and test - with clear evidence of iteration and user-centered design principles.

The quality of project pitches saw significant enhancement. Early pitches were often descriptive and lacked strategic depth. In contrast, recent years saw participants delivering more convincing, persuasive presentations that not only explained their innovations but also articulated clear implementation strategies, potential impacts, and scalability plans. This improvement suggests a growing emphasis on the practical aspects of innovation.

Perhaps the most notable shift was in the nature of the projects themselves. The program witnessed a transition from projects that largely adopted or slightly modified existing educational practices to truly innovative instructional designs. Early submissions often claimed innovation without substantial originality. However, by 2024, projects were characterized by (1) Original instructional methodologies backed by pedagogical research, (2) Novel applications of technology in education, moving beyond mere digitization of traditional methods, (3) Innovative approaches to curriculum design that addressed specific local or national educational challenges, and (4) Cross-disciplinary innovations that integrated multiple subject areas or educational domains.

A key development was the increased focus on documented evidence supporting the innovations. While early projects often lacked empirical support, recent submissions included (1) Pilot study results demonstrating the effectiveness of the proposed innovations, (2) Diagnostic or early needs assessments justifying the relevance of innovation, and (3) Sustainable sharing and widespread application within school and outside school.

This evolution in focus areas and quality reflects a maturing program that has successfully cultivated a culture of rigorous, impactful innovation among educators. The shift from adopting existing practices to creating evidence-based, original innovations indicates a significant advancement in the innovative capabilities of the participating educators and the overall impact of the Guru Inovatif Program (GIP).

4.2.2 Evolution of Achievement Stages

The Guru Inovatif Program (GIP) demonstrated a clear progression in its achievement stages over the six-year period from 2019 to 2024. This evolution reflected a growing sophistication in the program's approach to fostering and evaluating innovation in education.

In 2019, the inaugural year of the program, the primary focus was on generating and presenting innovative ideas. This initial stage was crucial in establishing a foundation for creative thinking among educators. Participants were encouraged to brainstorm and conceptualize novel approaches to teaching and learning, with the main achievement being the ability to articulate these ideas coherently. This stage was instrumental in breaking traditional mindsets and encouraging educators to think beyond conventional pedagogical methods.

The program took a significant step forward in 2020 by emphasizing the improvement of presentation skills and project documentation. This shift recognized that innovative ideas, no matter how groundbreaking, need to be effectively communicated to gain traction. Participants were guided to refine their presentation techniques, making their innovations more accessible and appealing to a broader audience. This was done by sharing the judges feedback with the participants. Additionally, the focus on project documentation introduced a more systematic approach to innovation, encouraging participants to thoroughly record their processes, challenges, and outcomes. This not only

aided in the clear presentation of ideas but also laid the groundwork for more rigorous evaluation and potential replication of successful innovations.

2021 marked a pivotal year in the program's evolution with the introduction of specific innovation categories and a refinement of evaluation criteria. This development reflected a more nuanced understanding of the diverse areas within education where innovation could make a significant impact. By categorizing innovations, the program allowed for more targeted and relevant contributions across various educational domains. The refinement of evaluation criteria brought a new level of rigor to the assessment process, ensuring that innovations were not just novel but also practical, scalable, and aligned with educational objectives. This stage helped in channeling creative energies into areas of greatest need and potential impact within the education system.

The period from 2022 to 2024 saw a heightened focus on project quality and potential for real-world impact. This phase was characterized by a more holistic approach to innovation, where ideas were not just evaluated on their creativity but also on their feasibility, sustainability, and potential to create meaningful change in educational practices. The main focus of sustainable development in 2024 is the enhancement of project quality. By 2024, the district office emphasized the importance of refining and iterating ideas to ensure they met high standards of quality and practicality. Participants were encouraged to pilot their innovations, gather data on their effectiveness, and make necessary adjustments to enhance their projects' viability and impact.

Throughout this evolution, the GIP demonstrated a commitment to not just generating innovative ideas but to nurturing a comprehensive ecosystem of educational innovation. The program's progression from idea generation to quality-focused, impact-driven innovations reflects a maturing understanding of what it takes to create lasting, meaningful change in education. This evolution also mirrored broader trends in educational reform, where emphasis has shifted from isolated innovative practices to systemic, evidence-based improvements that can be scaled and sustained over time.

By structuring its achievement stages in this way, the GIP effectively guided participants through a developmental journey in innovation. It started with unleashing creativity, moved through enhancing communication and documentation skills, progressed to targeted and well-evaluated innovations, and culminated in high-quality, impactful projects with real-world applications. This structured evolution not only enhanced the quality of innovations produced but also contributed to the professional growth of the educators involved, equipping them with a comprehensive skill set for driving continuous improvement in their educational practices.

In sum, some of the key findings of this longitudinal project are listed as follow:

(1) The GIP demonstrated significant growth, with participation more than doubling from 34 in 2019 to 71 in 2024.

(2) The program evolved from a general approach to a more specialized categorization of educators, indicating a refined understanding of innovation needs across different educational contexts.

(3) There was a consistent core of network partners (JPN, IPD, UNIMAS) throughout the program, supplemented by an evolving set of additional institutions.

(4) The focus areas of the program shifted to include more emphasis on digital education and role-specific innovation over time.

(5) The achievement stages of the program evolved to place greater emphasis on project quality and real-world impact in later years.

These results provide a comprehensive overview of the GIP's evolution and impact from 2019 to 2024, demonstrating its growth in scale, sophistication, and focus on sustainable educational innovation.

5. Discussion

The Guru Inovatif Program (GIP) demonstrated significant evolution in both structure and participation over its six-year implementation. The program's shift from a generalized approach to more specialized categories reflects a growing understanding of the diverse innovation needs across different educational levels and roles. This aligns with Desimone and Garet's (2015) findings on the importance of context-specific professional development in education. The consistent growth in participation, evidenced by the strong positive correlation (r = 0.9136, p < 0.05) between year and number of participants, indicates the program's increasing appeal and relevance to educators. This growth trajectory suggests that the GIP successfully addressed a gap in professional development opportunities focused on innovation in education. The substantial jump in participation between 2020 and 2021 (51.5% increase) may be attributed to the program's refinement and possibly the increased need for innovative teaching approaches during the global pandemic, although this would require further investigation to confirm. The evolution of achievement stages, from idea generation to quality-focused, impact-driven innovations, mirrors the maturation of the program and its participants. This progression aligns with the Concerns-Based Adoption Model (CBAM) proposed by Hall and Hord (1987), which suggests that individuals go through various stages of concern and levels of use when implementing new practices.

Several factors appear to have contributed to the GIP's sustainability and growth:

1. Adaptive Program Structure: The GIP's evolving categories and focus areas demonstrate responsiveness to changing educational needs, aligning with Wagner's (2008) emphasis on adapting educational practices to meet contemporary challenges.

2. Collaborative Partnerships: The program's network of partners, including educational institutions and government bodies, provided diverse resources and perspectives. This multi-stakeholder approach resonates with Hargreaves and Shirley's (2012) concept of the "Fourth Way" in educational change, which emphasizes collaborative professionalism.

3. Emphasis on Quality and Impact: The shift towards evidence-based innovations and real-world impact in later years likely enhanced the program's credibility and perceived value among educators and institutions.

4. Design Thinking Framework: The consistent use of design thinking principles provided a structured yet flexible approach to innovation, supporting Mintrop and Zumpe's (2019) findings on the effectiveness of design-based interventions in education.

5. Professional Learning Community: The program's structure fostered a community of practice among educators, aligning with research by Kearney and Zuber-Skerritt (2012) on the importance of learning communities in sustaining educational innovation.

The GIP faced several challenges in maintaining momentum, particularly in adapting to new categories and evolving educational needs. The program's success in overcoming these challenges can be attributed to:

1. Flexibility in Program Design: The ability to introduce, modify, or consolidate categories (e.g., the introduction and subsequent removal of the PPD Officers category) demonstrated adaptability to changing needs and feedback.

2. Continuous Improvement of Evaluation Criteria: The refinement of assessment rubrics and the introduction of the "Peningkatan Kualiti Projek" stage in 2024 helped maintain high standards and relevance.

3. Balancing Consistency and Innovation: While introducing new elements, the program maintained core components (like the design thinking framework), providing a stable foundation for participants.

These strategies align with Fullan's (2007) principles of educational change, emphasizing the importance of flexibility, capacity building, and learning in context.

While direct comparisons with other long-term educational innovation programs are limited due to the unique context of the GIP, some parallels can be drawn. The GIP's evolution shares similarities with successful professional development initiatives described by Darling-Hammond et al. (2017), particularly in its focus on sustained, job-embedded learning opportunities.

The program's emphasis on design thinking and real-world impact echoes elements of the High Tech High Graduate School of Education's approach to educator preparation, which emphasizes project-based learning and continuous improvement (Wagner, 2008). However, the GIP's broad reach across various educational levels and its six-year sustained growth present a unique case study in the Malaysian context.

In terms of theoretical implication, the GIP's success supports theories of professional development that emphasize context-specificity, sustained engagement, and collaborative learning (Desimone & Garet, 2015). It also provides empirical support for the application of design thinking in educational innovation (Brown, 2008). While on the practical perspective, the program offers a model for structuring long-term innovation initiatives in education, particularly in balancing consistency with adaptability. The evolution of achievement stages provides a framework for guiding educators from idea generation to impactful implementation. The GIP's success also brings about policy implication where policymakers should consider long-term, adaptive approaches to fostering innovation in education. The program's model of partnerships between various educational institutions could inform policies on collaborative professional development initiatives.

Despite its significant findings, this study has several limitations. For example, detailed study that focuses on a single district limits the generalizability of findings to other contexts. On top of that, this study relies heavily on program data and may not capture all factors influencing participants' innovative practices. Also, the long-term impact of innovations on student learning outcomes was not directly measured.

Future research could address these limitations and expand on the current findings by conducting comparative studies with similar programs in other districts or countries to identify context-specific and universal factors in sustaining educational innovation. Furthermore, longitudinal studies could successfully track the implementation and impact of specific innovations developed through the program. There could be also further investigation into the diffusion of innovative practices beyond program participants to the broader educational community. Finally, future study could explore the relationship between participation in the GIP and measurable improvements in student learning outcomes.

In conclusion, the Guru Inovatif Program demonstrates a successful model for fostering sustained innovation in education. Its evolution offers valuable insights into the dynamics of long-term professional development initiatives and provides a foundation for future research and practice in educational innovation.

6. Conclusion

The Guru Inovatif Program (GIP) demonstrates a successful and evolving model for fostering sustained innovation in education. This six-year longitudinal study reveals several key insights into the dynamics of long-term professional development initiatives aimed at cultivating innovation among educators.

The program exhibited significant growth, with participation more than doubling from 34 in 2019 to 71 in 2024. This growth was accompanied by a shift from a general approach to a more specialized categorization of educators, reflecting a refined understanding of innovation needs across different educational contexts. The consistent positive trend in participation, with an R^2 value of 0.893, underscores the program's increasing relevance and appeal to educators over time.

A notable finding was the evolution of the program's structure and focus. The GIP transitioned from merely generating innovative ideas to emphasizing quality, impact, and real-world application. This progression was evident in the improvement of visual representations, the enhanced quality of project pitches, and the shift towards evidence-based, original innovations addressing specific educational challenges.

The study also highlighted the importance of adaptive program design and collaborative partnerships. The GIP maintained a core group of partners while strategically expanding its network, demonstrating flexibility in response to changing educational needs and opportunities. This approach contributed to the program's resilience and its ability to remain relevant in a rapidly evolving educational landscape.

The implementation of the design thinking framework proved to be a crucial element in the program's success. Over time, participants showed a more comprehensive and nuanced application of this framework, leading to innovations that were not only creative but also practical and user-centered.

Furthermore, the study revealed the program's role in fostering a professional learning community among educators. The GIP's structure encouraged collaboration, peer learning, and the sharing of best practices, contributing to a sustainable culture of innovation within the educational community.

These findings offer valuable insights for educational policymakers, administrators, and researchers. The GIP's journey provides a template for designing and implementing long-term innovation initiatives in education, emphasizing the importance of adaptability, quality focus, and collaborative approaches.

In conclusion, the Guru Inovatif Program stands as a testament to the potential of structured, long-term approaches in cultivating innovation among educators. Its evolution and impact offer a roadmap for future efforts aimed at enhancing educational quality and relevance through sustained innovation. As education systems worldwide grapple with rapid technological and societal changes, the lessons learned from the GIP can inform strategies for nurturing a culture of continuous improvement and innovation in education.

References

Basten, D., & Haamann, T. (2018). Approaches for organizational learning: A literature review. *SAGE Open*, *8*(3), 2158244018794224

Braun, V., & Clarke, V. (2006). *Using thematic analysis in psychology*. Qualitative Research in Psychology, 3(2), 77-101.

Brisco, R., Whitfield, R. I., & Grierson, H. (2020). Modelling the use of digital sketching tools by experienced designers for idea generation. *International Journal of Technology and Design Education*, 30, 835-862.

Brown, T. (2008). *Design thinking*. Harvard Business Review, 86(6), 84-92.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage Publications.

Darling-Hammond, L. (2010). *The flat world and education: How America's commitment to equity will determine our future*. New York, NY: Teachers College Press.

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.

Davenport, G. (2022). Adaptive leadership for school equity. *Educational Leadership*, *79*(6) .

Desimone, L. M., & Garet, M. S. (2015). *Best practices in teachers' professional development in the United States*. Psychology, Society, & Education, 7(3), 252-263.

Dodgson, M., Gann, D. M., & Phillips, N. (2013). *The Oxford handbook of innovation management*. Oxford University Press.

Fullan, M. (2007). *The new meaning of educational change* (4th ed.). Teachers College Press.

Fullan, M. (2011). *Change leader: Learning to do what matters most*. San Francisco, CA: Jossey-Bass.

Garrison, B. (2021). Concerns-based adoption model (CBAM). *Accelerating Systemic Change in STEM Higher Education.*

Hall, G. E., & Hord, S. M. (1987). *Change in schools: Facilitating the process*. State University of New York Press.

Hargreaves, A., & Fullan, M. (2012). *Professional capital: Transforming teaching in every school*. New York, NY: Teachers College Press.

Hargreaves, A., & Shirley, D. (2012). *The global fourth way: The quest for educational excellence*. Corwin Press.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge.

Kearney, J., & Zuber-Skerritt, O. (2012). *From learning organization to learning community: Sustainability through lifelong learning*. The Learning Organization, 19(5), 400-413.

Leavitt, C. C. (2011). A comparative analysis of three unique theories of organizational learning. *ProQuest Dissertations Publishing.*

Lektorich, B. (2023). *10 Strategies to Create a Culture of Innovation in Your Classroom*. Education World. Retrieved from: https://www.educationworld.com/teachers/10-strategies-create-culture-innovation-your-classroom

Mintrop, R., & Zumpe, E. (2019). *Solving real-life problems of practice and education leaders' school improvement mind-set.* American Journal of Education, 125(3), 295-344.

Neck, H. M., & Greene, P. G. (2011). *Entrepreneurship education: Known worlds and new frontiers*. Journal of Small Business Management, 49(1), 55-70.

Patton, M. Q. (2008). *Utilization-focused evaluation* (4th ed.). Sage Publications.

Roberts, M. (2016). Theories of change: Concerns-based adoption model. *USAID.*

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Rogers, E. M., Singhal, A., & Quinlan, M. M. (2014). Diffusion of innovations. In *An integrated approach to communication theory and research* (pp. 432-448). Routledge.

Rossi, P. H., Lipsey, M. W., & Henry, G. T. (2019). *Evaluation: A systematic approach* (8th ed.). Sage Publications.

Sahin, I. (2006). Detailed review of Rogers' diffusion of innovations theory and educational technology-related studies based on Rogers' theory. *The Turkish Online Journal of Educational Technology*, *5*(2), 14-23.

Savick, S. (2022). Six steps for adaptive leadership. *Educational Leadership*, *79*(6).

Serdyukov, P. (2017). Innovation in education: what works, what doesn't, and what to do about it? *Journal of Research in Innovative Teaching & Learning*, *10*(1), 4-33.

Setser, B., & Morris, H. (2015). Building a culture of innovation in higher education: Design & practice for leaders. *Next Generation Learning Challenges.*

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. Oxford University Press.

Stanford d.school. (2010). *An introduction to design thinking process guide*. Hasso Plattner Institute of Design at Stanford.

Wagner, T. (2008). *The global achievement gap: Why even our best schools don't teach the new survival skills our children need–and what we can do about it*. New York, NY: Basic Books.

Webster, R. (2023). *How to Create an Effective Learning Culture for Continuous Improvement.* Thinkific. Retrieved from: https://www.thinkific.com/blog/effective-learning-culture/

Wilson, D., & Conyers, M. (2015). Transform teaching with the diffusion of innovation. *Edutopia.*