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Contents

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The Contemporary PNG Studies: DWU Research Journal is published twice a year in May and November. Given the high cost of printing and the increased access to digital technology, DWU has decided to cease producing hard copies and to make articles freely available online. Contributors receive a complimentary soft copy of the journal. Other readers can access the articles online from the DWU internet website.

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Information for contributors

Articles should be 3000-6000 words in length. The word count includes the abstract and references. A 50-75word biographical note about the author should accompany the article. Reviews of recent books on Papua New Guinea should be 900-1500 words in length. The journal uses APA referencing style and prefers no footnotes. Electronic contributions using PC software can be sent by email attachment to pgrc@dwu.ac.pg. Manuscripts will be acknowledged on receipt. Manuscripts are reviewed anonymously by three referees, including at least two members of the Editorial Advisory Board.

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Acknowledgement

Editorial note

Welcome to Volume 39, August 2025 of *Contemporary PNG Studies DWU Research Journal.* Publication of this Journal began in 2004 in hard copies: ISSN 1815-0351. In 2021, the Research and Higher Degrees Board decided to cease producing hard copies of the Journal and to go fully online. The last Volume 38, November 2022, can be found online preceding this one. This thirty ninth volume of the journal provides an interesting variety of articles ranging from STEM subjects, impact of Covid-19, socioeconomic factors affecting society, to use of social media.

Allen Sumb discusses resilience strategies of tourism and hospitality businesses in Madang Province during the COVID-19 pandemic.

Annette Tsibois Sinnou reports on how students at a primary school in East New Britain province engage in STEM education lessons.

Cooniebhert Samgay discusses his findings on a vaccine hesitancy study during awareness and administering of covid-19 vaccines in Madang province.

Emelda Ariku, **Mathias Miti**, **Allen Sumb,** & **Philip Gibbs** present their findings on social perspectives of different age and gender groups in communities on Manam Island, Madang Province in PNG.

Jerome Oko discusses a Structural Equation Model through teacher-level factors that influence secondary school students' mathematics performance in Port Moresby.

Martin Daniel discusses essential pillars of e-government for Papua New Guinea

Terence Subam shares his findings on social media usage and its influence on learning

Maretta Kula-Semos

Editors:

Dr Maretta Kula-Semos PhD, is the Director of Higher Degrees and Professor of Humanities at the Divine Word University. She has extensive teaching experience at secondary and tertiary levels and previously held positions as Head of Department of Language and Literature, Director of Practicum Programs, Dean of School of Distance & Flexible Learning, Director of Postgraduate Programs, Director of Quality Assurance, and Vice President, Research and Postgraduate Programs. She is currently a Fellow and Council member of the Pacific Academic of Sciences and a member of the Advisory Council of the International Science of Science Asia-Pacific Regional Focal Point (ISC-A-PRFP). She obtained her doctorate on 'Seeking transformative partnerships: Schools, university and the practicum in PNG' from the James Cook University in Australia. Her research interests are in the fields of teacher education, traditional knowledge, indigenous research methodologies, transformative partnerships, and post-colonialism. Email: mkulasemos@dwu.ac.pg

Br Francis Joseph Hough fms, Licentiate in Psychology, is a counsellor and psychologist at Divine Word University. Previously at DWU, he was a teacher in the Social and Religious Studies Department as well as student and staff counsellor. His early background was in secondary education in Australia and more recently he has been working cross-culturally in Papua New Guinea, Fiji, France, the Philippines and Central Australia in the area of psychology. Email: fhough@dwu.ac.pg

Resilience strategies of tourism and hospitality businesses in Madang Province during the COVID-19 pandemic

Allan Sumb

Abstract

This paper analyzes the socio-economic impact of the COVID-19 pandemic (2020–22) on 20 tourism and hospitality businesses in Madang Province, Papua New Guinea (PNG). Qualitative data were collected through semi-structured interviews and analyzed thematically. The study found that all the tourism and hospitality businesses interviewed in Madang were adversely affected by COVID-19. Most experienced a decline in customers due to the travel restrictions imposed by the PNG government, leading to significantly reduced or no income. As a cost-cutting measure, some businesses resorted to laying off staff, which had a ripple effect on dependents, a common scenario in PNG. In response, other businesses aggressively promoted and marketed domestic tourism to sustain their operations. Additionally, the study revealed that the majority of the businesses managed to operate during the COVID-19 period without any support from the PNG government. Although the government announced stimulus packages to support affected businesses, none of the participants in this study reported benefiting from them. The paper also evaluates resilience strategies and provides recommendations to help businesses prepare for future pandemics or natural disasters.

Key words: Tourism, Socio-economic, COVID-19, Business

Introduction

The tourism and hospitality sector was one of the industries' worst affected globally during the COVID-19 pandemic due to travel restrictions, self-isolation measures, and lockdowns (Desbiolles-Higgins, 2020; Nicola et al., 2020; Reuben, 2022). Similarly, the PNG government implemented strict travel restrictions and curfews, which led to a significant decline in the number of tourists entering the country, and Madang was no exception (Barter, 2020). In addition to the impact of travel bans, Madang faces ongoing safety and security challenges, posing risks to both tourists and locals (Sumb, 2017; Ford et al., 2018). The COVID-19 pandemic further exacerbated these issues. This paper aims to examine the specific challenges posed by COVID-19 to tourism and hospitality businesses in Madang.

Madang is a well-known tourist destination in PNG (Ford et al., 2018). It offers iconic tourism products, such as the Madang Visitors and Cultural Bureau, which showcases a wide variety of arts and crafts from Madang and other provinces (Ford et al., 2018). Other notable attractions include the Coast Watchers Lighthouse, Machine Gun Beach, the Alexishafen Catholic Mission Station, Bilbil Village (famous for pottery making and demonstrations), and the Balek Wildlife Sanctuary (Ford et al., 2018).

Additionally, Madang boasts various tourist accommodations, including the Madang Resort Hotel, Jais Aben Resort Hotel, Malalo Plantation Lodge, Madang Star International Hotel, and numerous guesthouses and lodges (Sumb, 2019; Ford et al., 2018). Madang is also renowned for

its rich traditions, culture, and language. Of the 800-plus languages spoken in PNG, 173 are found in Madang. In some remote areas, traditional cultural practices remain largely unaffected by modern influences, providing an authentic cultural experience for tourists (Ford et al., 2018).
This study is organized into three sections: the first provides background information on Madang and its tourism offerings; the second reviews the challenges faced by tourism businesses during COVID-19, based on a literature review; and the third outlines the study's methodology and results, followed by discussion. The paper concludes with recommendations drawn from the study's findings.

Literature Review
The impact of COVID-19 on tourism and hospitality businesses

Since travel is essential for tourism, restrictions severely impacted the industry (Yeh, 2020). Nicola et al. (2020) highlighted that while air transport restrictions temporarily reduced global mobility, they had lasting socio-economic effects (Desbiolles-Higgins, 2020). In the Pacific, niche tourism predominates, and early border closures helped countries like Samoa and Vanuatu avoid initial outbreaks (Edwards, 2020; Noy et al., 2020). However, as borders reopened, some countries reported COVID-19 cases, disrupting their tourism industries. PNG faced significant economic losses (Sumb, 2021; Trawen, 2021). A survey by PNG Tourism Promotion Authority (PNG TPA) (2020) revealed that 90% of respondents experienced booking cancellations, including major attractions like the Kokoda Track and cultural events in Goroka and Mt. Hagen. In Madang, the tourism industry was similarly devastated. Melanesian Tourist Services, which relied on international bookings, faced mass cancellations. To cope, the company downsized and adjusted staff schedules. Other businesses, including airlines, hotels, and guesthouses, took similar measures to survive the downturn (Barter, 2020; PNG TPA, 2020).

Government support on affected tourism and hospitality businesses

The COVID-19-affected tourism and hospitality businesses in many overseas countries were, in many cases, well-funded and supported by their governments (Nicola et al., 2020). This was done through subsidies and financial assistance such as offering low-interest loans, deferment of loan repayments, tax relief and reimbursements to employers to continue paying staff even when they were laid off (Nicola et al., 2020; Sönmeza et al.,2020). For instance, the United States of America   provided recovery packages such as loans and grants, and deferral of existing loans. Most European countries also provided rescue packages to help support businesses (Nicola et al., 2020).

The PNG government obtained K5.6 billion to combat the COVID-19 pandemic (Kabuni, 2021; Sumb, 2021; Yakam, 2020). Of the K5.6 billion stimulus package, K500 million was directed to health and security, K600 million to support loan deferrals for businesses affected by COVID-19, K2.5 billion to domestic bond financing for the government, K1.5 billion for concessional financing from foreign multilateral institutions and K500 million to support superannuation (PricewaterhouseCoopers, 2020).

A closer look at the stimulus package revealed that the type of assistance offered in some instances was not accessible to smaller operators (Kabuni, 2021). For instance, from the K600 million allocated to support businesses, K100 million was given to the Bank South Pacific (BSP) to offer low-interest loans to businesses. The perceived challenge is that banks have their own criteria for businesses to obtain loans. One of the requirements for businesses is to have a turnover of K3 million to be eligible for the loan (Tom, 2020). So far only 40 small to medium enterprises (SMEs) have benefited from the K100 million. These include all other businesses affected by COVID-19 (Tom, 2020).

Laying off staff to minimise operational costs

The majority (90%) of tourism and hospitality businesses in the world had laid off their staff due to COVID-19 because there were no customers. This increased unemployment and little income for their families (Gössling et al., 2020). The same scenario was experienced in Pacific Island countries, as the majority of the staff laid off were from the tourism and hospitality sector (Gerasimova, 2020). This has affected many families in the Pacific since tourism was their only source of income (Gerasimova, 2020). In PNG, a thousand-plus staff were laid off from tourism and hospitality businesses. For instance, according to the PNG TPA survey (2020), a total of 1209 tourism and hospitality staff were laid off. This is a huge social challenge in PNG because it has existing issues such as a lack of job opportunities, safety and security and a high cost of living (Sumb, 2020). Furthermore, in PNG culture, one person's income is for the extended family and not one person. They all depend on one person's income and the loss of jobs for tourism and hospitality staff could have a huge implication in PNG in terms of an increase in criminal activities and social problems (PNG TPA, 2020). For instance, Madang Resort Hotel employs 150 staff but was forced to lay off 120 workers and retained only 30 staff (Barter, 2020).

Methodology

For the purpose of this study, the researcher adopted qualitative research methodology. The qualitative data were collected via a series of semi-structured interviews. These were conducted in Madang with the tourism and hospitality business owners and managers to obtain their experiences, challenges, issues and expectations. A letter was written and delivered to the organizations to obtain their permission to conduct research at their property or business premises. Participants signed the consent form and were given a participant's information sheet. Interviews were conducted from 25 May 2022 to 08 June 2022.This study used purposive and snowball sampling, which are non-probability sampling techniques (Sekaran & Bougie, 2016). A total of 20 participants took part in the research, 13 being female and 7 as male. Ethical approval was granted by the Faculty of Business and Informatics' Ethics Committee at Divine Word University, Madang. COVID-19 protocols including wearing face masks, 1.5 m social distancing and handwashing sanitizers were followed during the interview.

Table 1.Summary of research participants

No	Pseudonym	Business	Sex	Age
Summary of research participants				
1	Paul	Melanesian Tourist Services	Male	45-60
2	John	Madang Country Club	Male	45-60
3	Cecilia	Lutheran Guest House	Female	45-60
4	Michael	Niugini Dive Shop	Male	45-60
5	Aggie	Green Island Guest House	Female	45-60
6	Jenny	Kekem Hire Cars	Female	45-60
7	Rita	Modilon Inn	Female	35-45
8	Paulin	Nambis Inn	Female	35-45
9	Maggie	Madang Visitors & Cultural Bureau	Female	35-45
10	Margaret	Madang Club	Female	35-45
11	Diana	Madang Resort Hotel	Female	25-30
12	Dorothy	Eden Restaurant	Female	34-45
13	Julie	Kranket Arts & Craft Market	Female	45-60
14	Wilfred	Kranket Arts & Craft Market	Male	45-60
15	Tom	Kekeri Lodge	Male	45-60
16	Luke	Gift Shop	Female	45-60
17	Rose	Global Travel Center	Female	45-60
18	Betty	CWA Guest House	Female	45-60
19	Joy	Joma Hire Cars	Female	45-60
20	Lucas	Madang Star International Hotel	Male	45-60

The following steps were taken to analyse the data: First, audio data were downloaded to the researcher's computer and careful transcription of the data was undertaken. Preliminary observations were made. The second step was to carefully look in detail at the data to start identifying the codes and develop the categories that have similar meanings and make summaries. Third, these initial categories were gathered together to begin to develop a coding scheme, to check if there was common feedback from the participants. The fourth step was to start applying these codes to the whole dataset.

Finally, a thematic map was produced, which shows the relationship between the code and theme based on similar categories.

Findings and discussion
The huge impact of travel restrictions on the tourism and hospitality sector businesses

All the tourism and hospitality business owners expressed that their businesses were affected by COVID-19. The participants highlighted some of the challenges that they experienced, which include a limited number of customers visiting their establishments due to the travel restrictions imposed by the PNG government, social distancing, lockdowns and other measures. This was highlighted by one of the participants from the travel agent sector:

> "The PNG government closed the borders and flights were restricted and some or most of the flights were canceled. People were not traveling and we were not able to make money, that is the biggest problem. Hence, we received fewer customers and no income to the business and were unable to meet operational costs" (Rose, Global Travel Center).

Similarly, it was discussed during the interview with Melanesian Tourist Services (MTS) that they did not receive any tourists. This had a negative social-economic impact on the business. They were unable to retain the staff and sustain the operations.

> "What happened since 2019 due to COVID-19, there was zero number of international tourists coming in when PNG government declared travel restrictions" (Paul, MTS).

He further stated that their business survives more on international tourists as they get tourists both air and sea, especially cruise ships but when travel was restricted, they were cut off and there was no revenue in the business.

This also affected local tourism resource owners in Madang. The local tourism resource owners get bookings from MTS to visit rural tourist attraction sites such as the Balek Wild Life Sanctuary, Bilbil villages and other attraction sites. They charge a small entry fee as a means of income for their family. However, there were no tourists during the COVID-19 period. The Madang Visitors and Cultural Bureau (MVCB) receives tourists from MTS and they experienced the same issues. An employee from MVCB expressed the following when asked about the COVID-19 impacts:

> "MVCB since 2019 till 2021 we did not receive any visitors. The main source of income is from the entry fees that we collect but from 2019 to 2021 nothing" (Maggie, MVCB).

Moreover, the Niugini Dive Shop experienced similar challenges as highlighted by one of the participants from Niugini Dive Shop:

> "Normally we get big group of divers coming in from abroad mainly from Japan. They come in groups every week in big numbers. Also, we have a Japanese instructor here but during COVID-19, there were no divers from overseas' (Michael, Niugini Dive Shop).

Furthermore, the arts and crafts sellers were severely affected by COVID-19 as alluded to by Wilfred, an arts and crafts seller:

> "COVID-19 affected our sales. No tourists and we were not selling our arts and crafts. Local people not interested in arts and crafts" (Wilfred, Arts and crafts seller).

In the accommodation sector, two major hotels in Madang, Madang Resort and Madang Star International Hotel, reported how COVID-19 affected their operations. For instance, an employee at Madang Resort Hotel, revealed that operations of the hotel were disrupted.

> "Due to cancellations of flights to Madang as well as the border restrictions, most of our clients are corporate clients and some are international so with the border restrictions, it affected us greatly. I would say 90% of the hotel was empty for the 1st three to four months" (Diana, Madang Resort Hotel).

Madang Star International Hotel also experienced a drop in room occupancy which had a "big impact" on the business due to vaccinations, face masks, social distancing and travel restrictions (Lucas, Madang Star Hotel).

Lodges and guesthouses in Madang experienced the same challenges. For example, Tom from Kekeri Lodge highlighted that "Covid-19 stopped customers from visiting our lodge" and as result, they did not make any income (Tom, Kekeri Lodge). The same sentiments were shared by Rita from Modilon Inn: "Not many clients in our guest house, just one or two clients in a day" (Rita, Modilon Inn). However, Green Island Guest House in Karkar Island was severely affected and they closed down the business because they mainly get tourists from Australia, Canada, the United States of America and China. They lost all the clients due to COVID-19 (Aggie, Green Island Guest House, Karkar).

Apart from accommodation facilities, two member clubs that were operating in Madang, Madang Country Club and the Madang Club, stated that COVID-19 affected the operations of their club. This was shared by John from Madang Country Club:

> "COVID-19 affected the operations of the business. It actually stopped a few social activities due to restrictions of no more than 100 people. It affected the business, with regards to the dart competition that we organise. We cut down on the number of participants at any one night in the competition so in a way, it affected the business" (John, Madang Country Club).

Based on these study results, it found that COVID-19 impacted all tourism and travel businesses in Madang, including hotels, lodges, restaurants, bars, car rental services, and arts and crafts vendors. The primary causes of disruption were government-imposed travel restrictions, lockdowns, and social distancing measures. These findings align with other research, such as Jiang and Ritchie (2017), which highlights the tourism sector's vulnerability to travel restrictions. Similar challenges were observed across the Pacific, where many nations closed their borders to prevent the virus's spread, resulting in significant setbacks for local tourism industries.

Domestic tourism potential in Madang and PNG

Of the 20 establishments that were interviewed, just one guest house in Karkar Island closed down its operations, due to no guests on the Island. However, the majority of the tourism and

hospitality businesses were resilient and implemented various strategies to sustain their business operations. For instance, Rose, from Global Travel Center (GTC) stated that they came up with the idea to sell diesel within the university so they were able to raise some funds for its operations (Rose, Global Travel Center). Similarly, MTS came up with a practical strategy to promote and market domestic tourism in Madang Province. This was highlighted by Paul from MTS:

> "We promoted domestic tourism aggressively during the COVID-19 period. So we were focusing on domestic tourism, we strategized with our advertisements, trying our best to drop the rates, cut it by nearly like half the price and we got some clients and kept our business open" (Paul, MTS).

A similar approach was taken by Niugini Dive Shop as highlighted by one of the participants:

> "We did harbor cruise as all the boat activities come under dive shop so all the payments that we collected helped us in our operations" (Michael, Niugini Dive Shop).

He further stated that locals are the ones that sustained the operations of the business. This changed the perception of Niugini Dive shop's focus, with their focus now on domestic tourism. As highlighted by Michael:

> "We say it's the tourists that bring money but no it's the locals that bring money." (Michael, Niugini Dive Shop).

Moreover, hire car companies like Jome Hire Cars mentioned that they hire out cars to "trusted individuals" that they know to hire their vehicles to sustain their operations such as paying loans, electricity, water bills and wages for their staff (Joy, Jome Hire Cars).

Madang Resort and Madang Star International Hotel, two major hotels in Madang Province, have branches in Australia as highlighted by one of the participants:

> "We have hotels in Australia and real estate business in Port Moresby" (Lucas, Madang Star International Hotel).

This was similar to some lodges and guest houses as their businesses are not only in the accommodation sector but their businesses are diversified to real estate, car rental and other businesses that, during COVID-19, complemented each other. For instance, Modilon Inn has other subsidiary companies such as Kekem Hire Cars and a logistics company. These two companies helped Modilon Inn to fund its operations during the COVID-19 period. This was shared by Rita from Modilon Inn: "We have hire car and trucking company that covered the cost for the lodge" (Rita, Modilon Inn).

Furthermore, she mentioned that Modilon Inn has a hire car business which was not really affected as they have their own clients who hired the cars on a long-term basis and also their

customers are locals. She further stated that they have a trucking company. The trucking company operated during the COVID-19 period to transport goods and services to the Highlands. Another example is Kekeri Lodge, whose owner has a hire car and real estate business, which subsidised the lodge's operational costs.

For the restaurants, one of the strategies was to do "takeaways". For instance, Eden Restaurant did takeaways for customers (Dorothy, Eden Restaurant). Nambis Inn did the same, as highlighted by Paulin from Nambis Inn:

> "Like we started serving from, not inside the restaurant but takeaways. We did just catering and our hotel bus dropped off the food but no room sales" (Paulin, Nambis Inn).

From the study findings, COVID-19 forced business owners in Madang to rethink their operations, particularly in the tourism sector, which traditionally focused on international tourists. According to the PNG Tourism Promotion Authority (TPA), domestic tourism had not been prioritized due to several challenges, including high travel costs, expensive accommodations, and security concerns. As a result, few Papua New Guineans could afford to travel domestically. During the pandemic, however, businesses like Melanesian Tourist Services (MTS) shifted focus to the local market, offering affordable tour packages that attracted domestic tourists. This success highlights the potential for developing domestic tourism in PNG. Key stakeholders, including the PNG TPA, local governments, and businesses, could collaborate to subsidize costs and promote domestic travel, stimulating the industry and providing a buffer against future global disruptions. Despite the opportunities, safety and security remain significant obstacles. Addressing these issues and reducing tourism-related costs could unlock the potential of PNG's exotic destinations, particularly in regions like Madang. The findings align with global research advocating for domestic tourism as a recovery strategy post-pandemic. PNG TPA's Tourism Development Plan (2022–2026) supports this approach, proposing measures such as discounted accommodation, subsidized airfares, and targeted incentives to promote domestic travel.

Lack of government support on affected tourism and hospitality businesses

When asked about any government support from PNG national government, all the participants responded that there was a lack of support from the government. This feedback is from the travel agent sector when asked if they get any support from PNG government: "No, nothing" (Rose, Global Travel Center). Similarly, this feedback is from an arts and craft seller:

> "No support from government or any other organizations, I survived myself and helped my family through betelnut sales" (Julie, Arts crafts vendor).

There was similar feedback from all the tourism and hospitality businesses. Here are some more examples:

> "There is no direct funding support from the national government but we get most
> of our clients from Madang provincial government so it's like an indirect support to
> us" (Tom, Kekeri Lodge).
> "True, true, there was hardly any support from provincial or national government
> but we managed to survive through God's grace" (Joy, Jome Hire Cars).

However, Madang Star International Hotel has hotels in Australia and has seen how Australia's
government supported the affected tourism and hospitality businesses. This is what they have
shared comparing PNG and Australia:

> "There was no support from any government entities in PNG. We have hotels in
> Australia and have seen how the Australian government supported our hotels.
> They like to keep the employment going and did a subsidy called job keepers
> subsidy" (Lucas, Madang Start International Hotel).

The same sentiments were expressed by Paul from MTS:

> "Absolutely nothing from PNG government. I would say nothing directly from the
> government. To be honest absolutely nothing, you know, hotel operators, or tour
> operators like us there is nothing" (Paul, MTS).

The research highlights the lack of support from the PNG national and Madang provincial
governments for tourism and hospitality businesses affected by COVID-19. All 20 businesses
interviewed expressed dissatisfaction with the absence of government assistance, despite the
severe impact of travel restrictions imposed by the National Executive Council (NEC). Although
these restrictions were essential for public health, they led to layoffs and business closures due
to a significant decline in customers and revenue.

This finding is inconsistent with the literature, which indicates that most businesses affected by
COVID-19 in other countries, including some in the Pacific, received substantial support in the
form of subsidies, low-interest loans, and tax relief (Nicola et al., 2020; Sönmez et al., 2020). This
discrepancy may be attributed to the greater financial capacity of these countries to support their
businesses. However, despite the PNG national government securing loans specifically to assist
COVID-19-impacted businesses, the promised funds were not disbursed as intended.

Laying off staff

The study reveals that two major hotels in Madang managed to lay off staff. The layoffs in these
larger establishments were attributed to their higher operational costs and larger workforces
compared to smaller businesses such as guesthouses, lodges, and car rentals. According to
feedback from Madang Star International Hotel:

> "We were hit hard by COVID-19 and had to implement cost-cutting measures by
> reducing staff. So, we laid off employees without pay. If I had the money, there
> would have been no need to lay them off. There were no guests in the rooms or

the restaurant, and we were basically doing takeaways, so we only needed a few
staff." (Lucas, Madang Star International Hotel).

Laid-off staff faced significant challenges, as the cost of living increased during the pandemic.
For instance, the price of a 10kg bag of rice rose from K32.00 pre-pandemic to K45.00 by
November 2022. These economic pressures could potentially exacerbate social issues like crime,
prostitution, and other unlawful activities as individuals struggle to meet their financial needs.
The findings are consistent with global trends, where international businesses in the hotel and
travel industries laid off staff during the pandemic (Gössling et al., 2020).

Recommendations

First, this study highlights the potential for domestic tourism in Madang. Most of the businesses
that were interviewed continued operating during the pandemic by re-strategizing to attract local
customers. The PNG government, PNG Tourism Promotion Authority, tourism and hospitality
business owners, and other stakeholders could collaborate to offer tour packages to local families
at subsidized rates. This approach could encourage more Papua New Guineans to explore regions
such as the New Guinea Islands or the Highlands.

Second, the tourism and hospitality industry would benefit significantly from having an
independent body to advocate for its interests. The study found that government support for
businesses affected by the pandemic was lacking. However, there is currently no representative
organization to voice the concerns of these businesses to the government. While one or two tour
operators raised their concerns through the media, they received no government response.
Therefore, establishing an independent body to represent the industry would be ideal.

Finally, it is recommended that the PNG national government engage research institutions such
as the National Research Institute, the University of Papua New Guinea, Divine Word University,
and others to conduct studies on issues affecting businesses and other areas. Research findings
could be submitted to the government to inform policy development, ensuring that decisions are
based on reliable, research-driven data that address the needs of the industry and its businesses.

Conclusion

This study examines the socio-economic impact of COVID-19 on tourism and hospitality
businesses in Madang, Papua New Guinea. The findings reveal that all businesses in the tourism,
travel, and accommodation sectors were significantly affected by the pandemic. The primary
challenges included a sharp decline in tourist numbers due to travel restrictions, lockdowns, and
social distancing measures imposed by the PNG government. This led to reduced income,
operational difficulties, and in some cases, the laying off of staff without pay, exacerbating socio-
economic issues such as potential increases in crime.

Despite these challenges, many businesses managed to stay afloat by pivoting to domestic
tourism and exploring alternative revenue streams. This underscores the potential for developing

a domestic tourism market in Madang. However, high domestic travel costs remain a significant barrier. The study suggests that government subsidies on airfares and partnerships between the government and tourism operators could help foster domestic tourism.

The research also highlights the need for future studies to focus on rural tourism resource owners, as current findings relied heavily on feedback from Melanesian Tourist Services, a key local tour operator. Including broader perspectives from rural stakeholders could provide a more comprehensive understanding of the pandemic's impact on the tourism sector in Madang.

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Author

Allan Sumb hails from the Tambul-Nebilyer District in the Western Highlands Province. He is a lecturer in the Department of Tourism and Hospitality Management within the Faculty of Business and Informatics at Divine Word University. He holds a Master of Tourism from Otago University, New Zealand, and a Master of Research Methodology from Divine Word University. His other qualifications include a Postgraduate Diploma in Education, a Postgraduate Certificate in Higher Education Teaching and Learning (both from Divine Word University), a Certificate III in Tourism Operations from the Australia Pacific Training Coalition, and a Bachelor's degree from Divine Word University. He is currently pursuing a PhD at DWU.
Email: asumb@dwu.ac.pg

Science Technology Engineering and Mathematics (STEM) Education: A report on how students at the primary school engage in STEM education lessons

Annette Tsibois- Sinnou

Abstract

STEM stands for Science Technology Engineering and Mathematics. It is a method of education wherein the subjects are taught in coherence instead of in isolation. This research report investigates the strategies used in teaching STEM education lessons and the impacts it has on students. STEM education is a subject which focuses on actions that lift foundational skills in STEM learning areas, and develops mathematical, scientific and technological literacy for students involved. It also promotes the development of the 21st century skills of problem solving, critical analysis and creative thinking. This case study is inspired by reasons that STEM is being studied as separate subjects in Papua New Guinean (PNG) schools. Also, it is yet to be formally incorporated to PNG's education system and curriculum. This case study used Arts Based Research (ABR) during data collection because ABR is a creative research approach which enables researchers to gather data through observation, interviews and/or questionnaires and analysis of first-hand information from participants. The findings indicate that students' critical thinking and problem solving skills are enhanced through STEM education because of the hands-on approach and the practical pedagogy involved in facilitating STEM lessons using Lego sets from suppliers like the young engineers in Australia.

Key words: Science technology engineering mathematics, critical thinking, technological literacy, creative thinking, Lego, pedagogy, arts based research, inquiry based learning

Background

In Papua New Guinea, subjects like science, engineering and mathematics, are taught as separate subjects in schools. With the introduction of Science Technology Engineering Mathematics (STEM) Education as a subject on its own in countries like Australia, its significance in children's learning has motivated educationists to explore the impacts it has on students involved.

In Australia, according to the learning areas, STEM develops mathematical, scientific and technological literacy, and promotes the development of the 21st century skills of problem solving, critical analysis and creative thinking. These development goals are challenged by Thomas and Watters' (2015, as cited in Kelley & Knowles, 2016) findings which indicate that students' interest and motivation to STEM learning has declined especially in Western countries and more prosperous Asian nations. This has raised concerns on how effective current STEM education pedagogies are in fulfilling such set goals.

Understanding the mentioned goals and the research that questions the effectiveness of STEM education pedagogies has led to this case study through arts based research. The following questions form the core of this research report:

- In what ways does STEM education have impacts on how students acquire knowledge?

- How do students use designed STEM pedagogies to engage in critical analysis and problem solving?
- In what ways does STEM Education help motivate students to learn or get engaged in the learning process?

To investigate the mentioned questions, Stem Primary School was chosen as the research site. The research location is important because my daughters who are also participants, have recently joined schooling in Australia without any introduction to STEM education back in Papua New Guinea (PNG). As a researcher and a mother in this case study, I have seen great learning opportunities while observing how STEM education has had an impact on their learning. Also it has helped those students in the same class who have been exposed to inquiry based learning which is used in STEM education lessons in Australia. The use of Lego in STEM education, has increased their interest in attending lessons.

Rationale

As an educator, this small scale case study is valued as a starting point to major researches that can be done later. The significance of this research is based on reasons that STEM education has not been introduced as yet in PNG's Education system. Upon completion of this arts based research at Stem Primary School, it was anticipated that there would be more understanding on how STEM education can be approached in terms of knowledge acquisition and active engagement.

As assumed, 3/4GW and 5/6Q classes that were chosen to be participants formed a very significant combination as they were a mixture of students who have had some exposure and my daughters who have never heard of STEM education. In maintaining the agreement on privacy and not exposing the identity of students, the staff and the school, all photography, interviews and voice recordings done, have not been labelled or directly named. Apart from that, direct views of students' faces have been avoided in shots.

It is such researches by Tharayil, Borrego, Prince, Nguyen, Shekhar, Finelli, and Waters (2018), claiming active learning as promoting student learning and increasing retention rates of STEM undergraduates that has given purpose to investigate further what actually happens in STEM education at the primary level of schooling years. It has been intriguing to investigate how STEM education has had an impact in the participants, especially when considering their differing exposure to STEM education backgrounds. This is noted as important because a different setting of learning does have an impact on how one might view the success of an implemented program.

As stated by Valsiner (2006, p.601, as cited in Vasilachis de Gialdino, 2009):

> "The social representation system of society at some historical period may selectively guide the researcher to seek general knowledge, or through denying the possibility of general knowledge, let the researcher be satisfied by description of local knowledge".

The benefits anticipated from this research, though small scale, can be highly regarded and appreciated if considered from the following perspective. Firstly, it will help STEM educators at Stem primary school revisit, add or adjust on methods if need be and acknowledge the hard work that they put into each STEM lesson daily. Secondly, that participants will consider the positive outcomes of the research as a praise and the opposite as a reminder to refocus on relevant teaching strategies. Finally, that the researcher gains an insight into a highly regarded program so as to be better equipped for future work or help to my country's possible implementation of STEM education.

The aim in this creative approach is to investigate through an arts based research by being involved in STEM education at Stem primary school. Furthermore, to investigate how effective students acquire knowledge and how STEM education pedagogies motivate their interest to engage in learning. The research aimed at incorporating Renold's (2018) method of giving participants a chance to express themselves. It would have been unrealistic to simply analyse information already researched by others in different countries. As Law (2009) emphasises, 'it is the job of inquiry to discover and describe the realities as best may be'. Thus in the course of this research, the practical inquiry that was done during STEM lessons has made it possible to unpack the concept of STEM Education.

Methodological review

While Arts-Based Education Research (ABER) seems as old as its first introduction in 1975 by Eisner (1998, as cited in Pentassuglia, 2017), the amended terminology of the research approach to Arts-Based Research (ABR) by McNiff (2011, as cited in Pentassuglia, 2017), has given it its new acronym ABR as known today. In this case study, ABR is used because of reasons connected to the definition of ABR as a creative research approach. One of the arguments in favour of ABR that is fitting to the context of this case study is given by Greenwood (2012, as cited in Pentassuglia, 2017), that 'practices based on the ABR approach respond to the need to both bring out and share understandings and phenomena that are difficult to read properly through traditional approach'.

With reference to his argument, this case study specifically relates to the approach of using ABR as a means of better understanding how STEM education has had an impact on students as young as those in grades 3, 4, 5 and 6 who have been the focus of this study. It is significant because researching about it the traditional way as in using others' literature to unpack the concept of STEM education would have been very different from the findings that will be discussed in the latter paragraphs. This view on ABR as a qualitative approach, is reinforced by St. Pierre (2013a, as cited in Wolfe, 2017), who makes us notice that 'what is affectively felt in fluxing relation by the researcher (and participants and virtual audience) makes the data, rather than simply what is deciphered through a hierarchical organisation that is static qualitative coding and thematic analyses based on words as "quasi-numbers"'.

As a creative approach, ABR enables the researcher to actively participate in data collection. It also gives the power to analyse findings and make a personal critical review of the findings which

would have only been reviewed through the lenses of others, through the traditional approach. Such research methods give researchers a voice in contributing to help shape systems where need be. Others in support of this approach have noted that the arts-based method as an indirect form of communication has proven to be effective in changing stands of power holders and experts, enabling a dialogue that creates culturally sustainable aid (Huss, Kaufman, Avgar & Shouker, 2015). This statement supports the fact that ABR can give a person that power to make a difference through finding out or showing something from primary sources collected.

Methodology

Arts Based Research (ABR) has been used in conducting this case study. It is a creative approach because the focus was not on gathering already researched data, but on actually getting involved in the research with participating students in order to source valuable information to enlighten the issue. This argument is further understood when viewed from Law's (2009) perspective of methods as techniques for describing reality and treating knowledge practices as more or less performative. By getting involved with the participants of grade 3/4GW and 5/6Q, better understanding of their stories about STEM education and especially how it affects their learning has surfaced. The idea of being an active participant in the research is valued more when considering Davies' (2018) argument that 'we don't obtain knowledge by standing outside the world; we know because we are of the world and that we are part of the world in its differential becoming'.

This research used photography, interview, and observation plus active participation by the researcher, to source information from the participating students and from the classes that attended in general. The research method preference is influenced by Taylor (2017) who claims that 'the anthropocentric assumptions of qualitative inquiry posits the role of the researcher as the one whose job is to capture and understand perspectives, usually via dialogue and try to give them voice'. Using photography is a method that was aimed to capture active and fun moments of the participants as they were 'caught in the act' especially when unaware of the researcher taking a picture. This was done without exposing the identity of the participants.

With reference to photography, interview, observation and active participation, there were processes followed before attending the two classes. I had to apply for a Working with Children Check (WWCC) as a volunteer in Australia. After successfully obtaining a WWC card, I was able to be part of the class as an active participant during their scheduled STEM lessons. All these happened after a negotiation over emails to and from the school's secretary and the principal.

The other process that was also done before actually taking photos, doing interviews and recording students was the sending of a consent form with an explanatory statement from the researcher. The school principal helped in distributing the consent forms which were signed by the parents. Though there may be other detailed findings on how STEM education has an impact on students learning and engagement, this research is basically done with the understanding that research done at different settings are not always the same and thus are unique in their own rights. This is supported by Law and Mol (2001, as cited in Law, 2009) that truths are not universal.

Participants/materials/procedures

After negotiations and confirmation, participants of 3/4GW and 5/6Q classes were confirmed to undertake research on STEM education. It should be noted that the total number of 3/4GW class was 24 students and 5/6Q class was 26 students, and that despite all being part of the lessons, only 12 3/4GW students and 9 5/6Q students were actively involved in interviews, photography, questionnaire and videos recorded for analysis purposes.

A detailed overview of participants that took part in the voice recorded interviews, the questionnaire, photography, video and the recordings that were done without the students and the teacher's knowledge, has formed part of the supporting documents to this research. A transcript from an interview between the researcher and 3/4GW girls also proved to be raw evidence to results that will be discussed in this research report. Moreover, only one teacher is specialised in teaching STEM education lessons at Stem primary school.

The collection of data through interviews, recording, shots and videos was done using an iPad tablet. Despite the challenge encountered in using appropriate devices, all data collected is of standard.

Before the lessons were attended, a scheduled time was given by the secretary to attend STEM lessons for 3/4GW and 5/6Q. Since Lego lessons were newly implemented at the school, 40 to 80 minutes was devoted to doing STEM through Lego lessons at the STEM lab. I was able to see 5/6Q class on Mondays from 9:40am to 10:20am and the 3/4GW class on Wednesdays from 11:45am to 1:05pm. From observation, the 3/4GW had more time of 1 hour 20 minutes a week, while 5/6Q only had 40 minutes of STEM lessons in a week. Because of this, data collected from 3/4GW seems more detailed than data collected from 5/6Q.

The first visit to each class was for observations to familiarise myself with the students and the teacher's teaching style. Since only three weeks was scheduled for active participation in attending classes, interviews and recordings were commenced earlier than scheduled. Timing to gather detailed data was a challenge. Despite that, interviews were conducted for 5/6Q male and female participants during their first contact of Lego lesson. The 3/4GW class however were interviewed, recorded and taken photos of during their second contact Lego lesson.

Each interview was done in another room within the STEM lab, especially away from the other students and their teacher. The focus of the interview was on investigating whether there was active learning taking place. This methodology leans towards an epistemological assumption concerned with how knowledge can be created, acquired and communicated (Cohen et al., 2007, p.7 as cited in Scotland, 2012). Also, recordings of students conversing with their teacher was taken while they were unaware. This was purposely done to capture the innocence of the teacher to/from student interaction, without the researcher interfering.

Due to the ethics surrounding the explanatory statement in the consent form, the names of the transcripts of the recorded lessons, interview with their teacher and other students, have been purposely faked. It will however be used as an input to clarifying certain aspects in the findings and discussion sections. Furthermore, the shots were taken at an angle that would not directly expose the identity of the student. Nutbrown (2011 as cited in Allen, 2015) correctly argues that as a researcher, photography in an art-based education research is used to help with interpreting what has happened during the research event, focusing on children's learning experiences.

Procedures were followed to collect data during and after Lego lessons, and time was arranged with the teacher, for participating students to complete the questionnaire in a sitting. All anticipated activities and data collection were completed as planned by the third week of observation.

Results and discussion

STEM education through Lego lessons has impacted how students acquire knowledge and how it motivates them to learn. With reference to the questionnaire, the table (*Table 1*) reveals the results in percentage. The results analysed in the table indicate the following logical conclusions: that in 3/4GW class, the majority of the students indicated that they are always excited to go for all STEM lessons, in contrast to the 5/6Q students who preferred to go only sometimes.

Firstly, their reasons for attending STEM in question 6 shows that the majority of 3/4GW students attend because practical activities done, help them better understand how things work. The 5/6Q students had a balanced response of going to class for practical work, for fun with friends and for the love of learning outside of the usual classroom setting.

Table 1. **Results of questionnaire responses in percentage**

Questions/Purpose of Question	Class	Explanation in Percentage	Combination of two classes result
Q1. Identifying students' **motivation level** during a Lego lesson	3/4GW	50% voted yes 30% sometimes 20% most times 0% not at all	34% voted yes 45% put sometimes 20% said most times 0% voted not at all
	5/6Q	10% voted yes 60% sometimes 30% most times 0% not at all	
Q2. Checks on students' **understanding/speed** in completing a set of instructions in a Lego lesson	3/4GW	60% voted all the time 35% said sometimes 5% voted most times 0% said never	35% voted all the time 45% said sometimes 20% said most times 0% said never
	5/6Q	0% said all the time 70% voted sometimes	

		30% said most times 0% voted never	
Q3. Checks on **factors hindering progress** in accomplishing lesson objectives.	3/4GW	6% blamed timing 4% said it's too difficult 10% blamed it on disturbances from friends 40% said it's due to mistakes that they must fix before continuing 40% said they always complete tasks on time	20% blamed timing 8% said it's too difficult 12% blamed it on disturbances from friends 45% said it's due to mistakes that they must fix before continuing 15% said they always complete tasks on time
	5/6Q	45% blamed timing 10% said it's too difficult 10% blamed it on disturbances from friends 45% said it's due to mistakes that they must fix before continuing 0% said they always complete tasks on time	
Q4. Checks on students' **knowledge acquisition**. Especially **concepts learned** in class	3/4GW	30% said they remember the word all the time. 60% voted sometimes 10% said not remembering at all	25% said they remember the word all the time. 70% voted sometimes 5% said not remembering at all
	5/6Q	0% said they remember the word all the time. 70% voted sometimes 30% said not remembering at all	
Q5. Measures the child's **level of understanding** the processes followed/**knowledge acquired**.	3/4GW	65% remembered fixing **a** problem 5% couldn't remember 25% remembered fixing **some** problems 5% said they don't face problems	35% remembered fixing **a** problem 5% couldn't remember 45% remembered fixing **some** problems 5% said they don't face problems
	5/6Q	10% remembered fixing **a** problem 10% couldn't remember 80% remembered fixing **some** problems 0% said they don't face problems	

Q6. Identifies **factors that motivate students** to attend STEM Lessons.	3/4GW	60% said practical activities help them understand how things work 30% said they love learning outside of the usual classroom 10% said they just want to play with friends 0% said they're not always excited	45% said practical activities help them understand how things work 30% said they love learning outside of the usual classroom 20% said they just want to play with friends 5% said they're not always excited
	5/6Q	32% said practical activities help them understand how things work 32% said they love learning outside of the usual classroom 32% said they just want to play with friends 4% said they're not always excited	
Q7. Checks on students approach to **revisiting forgotten concepts learned** in class	3/4GW	5% said to take note when the teacher explains it 70% said to ask the teacher to give them the concepts learned. 25% said it does not matter, as long as they can solve a problem.	10% said to take note when the teacher explains it 70% said to ask the teacher to give them the concepts learned. 20% said it does not matter, as long as they can solve a problem.
	5/6Q	15% said to take note when the teacher explains it 70% said they just want to play with friends 15% said it does not matter, as long as they can solve a problem.	
Q8. Checks on **students view on the significance of Lego lessons/STEM** education in the **real world**	3/4GW	90% voted yes to the importance of STEM lessons 10% said they're not sure 0% said no	80% voted yes to the importance of STEM lessons 15% said they're not sure 5% said no
	5/6Q	80% voted yes to the importance of STEM lessons 5% said they're not sure 15% said no	

Despite the more time allocated for STEM lessons, results indicate that timing is a major factor when trying to complete a set of Lego instructions. Significantly, both classes agreed that making mistakes during class and redoing the same process causes many delays. Also outstanding in the responses is that both classes opted to ask the teacher to give them words not understood or remembered during class time.

Very few said to take note during class time. These results indicate that the interests of students depend mostly on doing practical activities rather than the theory part of the lesson. Through observations, it is obvious that students enjoyed the practical part of problem solving more than the theory part of note taking on new words introduced during STEM lesson. From the findings shown through questionnaire, the majority of the participants indicated that STEM education can help them to understand how to solve problems in the real world.

Secondly the following photographs, portray teamwork by the students in solving problems together. It also shows students testing their completed boats, and being assisted by the teacher or other students, when they need help.

Photo 1: A team of 3/4GW girls working together to build a sailing boat
Photo by Annette

Photo 2: A 5/6Q Student discussing instruction paper with the other student
Photo by Annette

Photo 3: Year 3/4GW students testing their completed sailing boat.
Photo by Annette

Photo 4: Teacher assisting a 5/6Q student with instructions
Photo by Annette

Moreover, the interview conducted with the 3/4GW girls, shows the team work that exists in working together to resolve problems that arise during the course of the Lego lesson. Despite the results showing students not remembering words introduced in class, it is evident through their participation and interest, that they do learn better when placed in a practical setting. Such results would not have been possible without the ABR approach which regards truth as not universal and in which methods only work to make reality in particular places (Law. 2009).

Finally, but not the least, results from the interviews done show a trend that locals (Australians) were more interested in the practical STEM lessons while my two daughters favoured learning the traditional way. Both can be understood from the perspective that they have not been exposed earlier to inquiry based learning, which is mostly used and encouraged in Lego lessons.

Interview with participating students (2nd May 2018)

Anne (researcher): *Okay, Hi girls.*

All: *Hi*

Anne: S*o what did you learn from today's STEM lesson?*

Hidi: *Um....*

Sow: *That I thought because my boat would sink but since we've even up the back part of the boat, it actually was even.*

Jess: *Um...I learned that um...um...if you put more weight on the back it wouldn't nose dive. It would stay upright like, so instead of having heaps of weight at the front, and sink nose diving. It would actually keep it flat, so that's what I learned.*

Tilda: *I learned today was um...when you put um...a couple more tires on, you balance it out. At the end I was gonna put a tire at the front, another tire at the front, another tire at the back and then four then two at the back as well and then two at the front like...but I didn't get to test that out. But I learned that um... the more tires you have, the more float it is.*

Anne: *Thank you.*

Oliv: *Um...I learned that um...that if you put wheels on it, it will float more than if you don't have them.*

Anne: *Okay and....*

Hidi: *Yeh I also learned that the wheels made it float more than if you didn't have them.*

Anne: *Lyn...*

(Background noise from other students)

Lyn: *Um...I learned that.... if you...if you put um...if you put like a lot of like Lego on it won't really float. Yeh...*

Anne: *Okay, did you come across any problems while building the boat?*

All: *Yeh*.

Jess: *Ah...I didn't really...All of us...is...when we put all that SpongeBob, people and family, it would, it would like break but like if we'd made it more like steadier, it would, it would work.*

Anne: *ah...ah...*

Scow: *Um... I didn't have no problems.*

Jess: *But we had a problem with nose diving.*

Tilda: *Yeh we had problem*.

Hidi: *Cos the um...the points of the weight won't spread around evenly which means it would sink at one point.*

Anne*: How did you solve the problem when you......you know faced a problem.*

Hidi: *We um...added...so we had like two tires at the back and one tire at the front, we added to make two tires at the front...spread the wait evenly.*

Anne: *Was it easy for you to follow the instructions?*

All: *Yesss/Nooo*

Hidi: *The placing of the blocks, trying to count which holes they were going in... and...that was tricky cos you can't see properly.*

Jess: *When we tryna make the bench part where the sail sticks out..Maco did that part..but like he like..it was done wrong so we had to redo it..cos um he was copying the picture and the picture wasn't really that clear..*

Hidi: *...it was really hard*..

Jess: *..but um*...

Anne: *But you managed to solve the problem*...

Jess:...*ye ye*..

Anne: *Did you all finish your boat?*

All: *Yeh...haha..that's yes yes yes yes yes yes yes ...haha*

Anne: *Okay, so what often inspires you or makes you feel excited about STEM lessons?*
Jess: *Umm..this is a tough one...*
Hidi: *...I know...I like modifying the things*
Jess: *Yeh yeh.. modifying*
Hidi: *I don't know but cos we did a race car and you could race them*
Oliv: *What excites me to do is that...I get to learn all these new things that I haven't learned before.*
Jess: *I like that because..we have a big bag of Lego at home that like ..there's instructions, but we don't know where the pictures are...and like now at STEM we have Lego and then actually see the actual pieces that we...*
Hidi: *...know where they are..*
Jess: *...yeh..cos at home we just have different Lego pieces in one place*
All: *haha*
Anne: *Um you also have Maths lessons right?*
All: *Yeh*
Anne: *In the classrooms?*
All: *Yeh*
Anne: *Um so would you say you love maths lessons more or STEM lessons?*
All: *Yeh/Ummm/Maths/Both* (*all shouting at the same time*)
Jess: *Depends...times tables and divisions...haha*
Scow: Nope ...nobody likes times tables...if it's times tables and divisions, no
All: *haha*
Anne: *Okay um..what would you tell your other friends about STEM lessons...if you were to* say something about STEM?
Tilda: *Um..that it's quite exciting and enjoying because you get to make stuff and you get to test them out with mottos*
Hidi: *I would probably say that um it's fun and you get to um..not many schools get experience this so um ..I mean it's a great experience.*
Jess: *Um it's a great experience because like...you might not have Lego at home so you might think... "oh Lego might be fun...I might enjoy this" because you don't have a lot of fun at home so you don't know if it's gonna be fun or not so..but yeh..I really like Lego so..*
Anne: *Okay thank you and you go back to your class*
All: *Thank you, bye...*

Personal reflection

To sum up, below are my personal views on creative/qualitative research. Identified are the phases approached in this creative research and the critical reflections on decisions in each phase of the research. ABR is a methodological approach that I saw fit in conducting this research on STEM education. Personally, I think using a creative research approach to conduct this case study was significant because it allowed for direct involvement in sourcing information and it was more creative and qualitative. As Tracy (2013) states, qualitative research is about immersing oneself in a scene and trying to make sense of it.

Apart from direct involvement, ABR has further enhanced my research and analytical skills as I used my own perspectives to create specific research questions that were aimed at trying to further understand the participants in relation to my topic. Creative researches in its true sense,

has given a researcher like me, an opportunity to create something out from nothing. This is because, when drafting questions to investigate more on inspiring topics, it gave me an opportunity to grow and mature as a researcher and to understand the culture in which STEM education is taught. As Tracy (2013) claims, apart from qualitative research being an excellent approach to studying contexts that interest you, it provides insight into cultural activities that might otherwise be missed in a structured survey or experiment.

In identifying the different phases to this case study, I mostly reflected on education based issues that are challenging to implement in PNG. It is because of this, that I chose STEM education as my research topic.

The second phase of this case study mostly involved formalities. I had to make contacts and wait for responses before I proceeded with the actual research. This however, was not really challenging because parents, the principal, secretary and others involved were prompt in responding.

The third phase involved the actual conducting of the research. I saw this phase as very important as it helped me uncover unknown knowledge, analyse them, and thus turn it into research findings. This can be better understood when referring to Tracy's (2013) concept of 'thick description' that explains such research as a period of investigating circumstances present in that scene, and moving forward towards grander statements and theories. I learned a lot from this phase of the research since it opened my mind to understand the difference between 'traditional' approaches to teaching as compared to creative approaches to teaching.

The final phase of this research, has been both intriguing and challenging. The different data collection techniques that are used, called for more analysis from a specific approach. This was a challenge because of the time frame to complete the research.

It is interesting to note that even though there is an emphasis on problem solving as a core of any STEM lesson in Stem primary school, there is still a need to research further on how students can be made to understand concepts. Especially understanding concepts that seem so difficult for them to understand at such an early age and in the context of a STEM Education methodological approach.

Conclusion/Limitations

In conclusion, everything explained, reasoned, argued and stated about a creative research that was conducted, succeeded with each phase and was completed accordingly as scheduled. Despite the anticipated challenges in the course of the research, every stage of the research was finally accomplished. The principal and the secretary were very helpful and prompt in responding to emails and especially making sure those classes were held on time as scheduled.

The limitations of this research arise within the context of timing and the number of participants involved. Due to a short period of time in conducting the research and the limited number of

participants, results shown may not truly portray the true essence of the impacts of STEM Education on students. Because of this, there are still greater gaps to fill, especially in understanding how STEM education can effectively help students in acquiring knowledge while at the same time being motivated in a STEM learning environment.

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Author

Annette Tsibois Sinnou is from Buka in the Autonomous Region of Bougainville. She holds a Bachelor of Education Degree obtained from the University of Goroka in Eastern Highlands province PNG and a Masters of Educational Studies obtained from Monash University in Melbourne Australia. She is married to Christopher, a secondary school teacher from Nisan Island. She has two daughters Margaret and Lynette, a son Gerard (deceased) and a granddaughter Christal. She is qualified in lecturing topics under professional development, ethical leadership, research and language and literature, as per her study background. She is however not limited to teaching those areas only. She also has 13 years of teaching experience at the secondary school level and is currently lecturing professional ethics to year one student teachers at Divine Word University (DWU) Our Lady of Sacred Heart (OLSH) Kabaleo Rabaul Campus. Her teaching experience is accompanied by vast experiences in administrative duties, grade 12 marking for written expression and language and literature papers. Apart from work experiences under the education department, she has also done voluntary office work with Red Cross in Buka. She also tutored early childhood student teachers at Target Training and Consultancy Services (now known as Dianna Ope Training Institute), which is a private learning institution managed by Dr. Dianna Ope in Bougainville/Arawa. Email: asinnou@dwu.ac.pg

Socio-cultural factors affecting the Madang Provincial Health Authority in the awareness and administering of covid-19 vaccines: A study on vaccine hesitancy

Cooniebhert Samgay

Abstract

The looming fear of the SARS-CoV-2 (Covid-19) pandemic disrupted Papua New Guinea (PNG) in almost all aspects of living. PNG needed to adapt to the international standards to face the pandemic through pragmatic health schemes. An important PNG government service is health, and is one of the most challenged. Despite inabilities to reach all areas to effectively treat patients, the Provincial Health Authorities have shown great willingness to administer the Covid-19 vaccine. Yet, initial response from the public indicated fear and doubt in the vaccines. To run the vaccination program in the province, the Madang Provincial Health Authority (MaPHA) formed a Covid-19 response team that consisted of 5 sub-teams: Surveillance, Point of entry, Risk Communication, Infection control and Vaccination. MaPHA, and the response team received three different vaccines to circulate within Madang province. Collectively, they regulated efforts to fight Covid-19. But the vaccination program in Madang faced much resistance and heightened public scrutiny. Despite the efforts, vaccine hesitancy was dominant in local communities. Covid-19 vaccine hesitancy is an issue that needs to be addressed as it ultimately affects the lives of the people.

Key words: Covid-19, Vaccination, Vaccines, Vaccine Hesitancy, Madang, Madang Provincial Health Authority, Health workers

Introduction

In 2020, the fear of the Coronavirus disease stunned Papua New Guinea in almost all aspects of living. To offset the impending dire changes in the country, the PNG government sought the aid of ally nations and the World Health Organization to donate vaccines through the Covax initiative, with the hope of creating a new normal (Niupela Pasin) in the country. While most people accepted the donated vaccines with optimism, a large portion of the population remained sceptical about being vaccinated. Their scepticism grew when they came into contact with anti-vaccine or anti-Covid-19 social media content that were focused on discrediting the pandemic (Chan, 2021) or the effectiveness of the vaccines. Despite the public hesitations, vaccinations were rolled out in the province.

Housing many cultures and people, Madang province has seen a growth in vaccine hesitancy despite awareness campaigns carried out by the Madang Provincial Health Authority on posters or radio talk back shows in 2020 to 2021. Thus, this research project sought to ascertain the effects Covid-19 vaccine hesitancies had on the vaccine rollout in Madang and how MaPHA addressed this problem. Human socio-cultural behaviour plays a role in vaccine hesitancy hence, affecting vaccination rollout by the MaPHA.

Methodology

Throughout the research, 8 Vaccine Awareness/Administering Participants (VAP) were interviewed over a period of 3 months, employing a purely qualitative method of audio recorded face-to-face interviews to collect from primary sources of information, health workers. Furthermore, non-participant observations were employed to observe interactions between the public and vaccination personnel during advocacy campaigns or vaccinations. The criteria for the participants were that they must be Madang Provincial Health Authority (MaPHA) Covid-19 staff that were directly involved in advocating for or distributing the Covid 19 Vaccines within and around Madang Province, hence the low number of participants. The 8 were a mixture of vaccination team leaders, data analysts, a provincial health coordinator and vaccination team members, all participating in the different sub-teams of the provincial Covid-19 response team.

Findings

Through post-research analysis of data, 5 themes were extrapolated as answers to the research question. Each theme draws from the others and creates a picture of the socio-cultural factors that influenced Covid-19 vaccine hesitancy in Madang province. The 5 themes that will be discussed include knowledge and perceptions, Covid-19 vaccines, the media, awareness and support.

To clarify, during the time of the research, three vaccines were being delivered by MaPHA; AstraZeneca (AZ), Sinopharm (SP) and Johnson & Johnson (J&J). It should be noted that although there has been other research done on Covid-19 vaccine hesitancy, the reasons for Covid-19 vaccine acceptance and hesitancy remain complex (Machingaidze, 2021).

Knowledge and Perceptions

Accepting the vaccines requires knowledge and perceptions to consider options. As stated by Soares et al. (2021):

"vaccine hesitancy results from a complex decision-making process, influenced by a wide range of contextual, individual and group, and vaccine-specific factors, including communication and media, historical influences, religion/culture/gender/socioeconomic, politics, geographic barriers, experience with vaccination, risk perception, and design of the vaccination program." (p.1)

MaPHA acknowledged the fact that the public encompasses people who have various levels of knowledge and susceptibility. With the plethora of information on Covid-19 and its vaccines, knowledge and perception have become essential in accepting the vaccine. Madang is no exception. MaPHA faced hesitation from the public even before the availability of Covid-19 vaccines in the province. The public perception about the vaccines was being built around the perception that Covid-19 vaccines would do worse than good. Also, the lack of knowledge about Covid-19 vaccines presented another issue. As acknowledged in other literature, if health

workers administer vaccines, they then have the responsibility of informing the public (Eguia et al., 2021).

Perceptions

As stated by Troiano & Nardi (2021) and MaPHA interviewed participants, the concerns that surrounded the vaccines in Madang included concerns about vaccine safety; rushed production and delivery; vaccines that may be ineffective due to the perceived 'harmless nature' of Covid-19; general lack of trust, doubts about the efficacy of the vaccine, belief in natural immunity, and doubt about the origin of vaccines. VAP3 mentioned that "their [public] personal opinions [were] based on their own background knowledge", affirming that the vaccine perceptions that most people pooled together were not all factual and tend to be substituted for factual medical information. As such, "…many people [were] uninformed. Therefore, when they hear[d] rumours, they don't see to it for themselves, but based on other's words, they fear[ed]" (VAP4). All these misinterpretations surfaced in the country well before the vaccines were delivered, having enough time for them to settle and sway the minds of the public.

Additionally, "health workers have a prominent role to play in increasing people's willingness to receive a vaccine for Covid-19" (Hoy et al., 2021, p.26; Ali et al., 2021), actively shaping perceptions of vaccines. Yet the Madang public has proven to be particularly hesitant to advocacy attempts by the MaPHA. During a particular vaccine advocacy campaign held at the Mis community in Madang, members of the community emphatically aired their concerns, stating their fears that ranged from general fears to religious driven reservations. Their reservations revolved mainly around the origins of the vaccines and how they would affect their bodies. Opposing the concerns of the Madang local communities, the team of officers tried their best to give answers that could satisfy basic understanding. Despite the campaigns held by MaPHA, people still held on to their perceptions of the vaccines.

Culture induced perceptions

PNG societies still dutifully practice cultural practices in this day and age. It is an integrated component in PNG societies. In Madang, cultural hierarchies are patriarchal in nature. Males take charge in the social setting by making decisions or fronting negations. Females, on the other hand, are culturally compliant to males. VAP8 alluded to this cultural induced perception when referring to mothers fearing being vaccinated against Covid-19 and allowing their children to be immunized. Fathers would command their family not to be vaccinated. Deep veneration to cultural norms places a strain on decisions the female population of Madang make in accepting vaccines. This was reflected in the low count of females at vaccination sites.

Religiosity

The PNG Constitution acknowledges the Christian faith as a guiding principle that the Papua New Guinean society follows alongside their cultures. Additionally, local beliefs are prevalent and greatly affect the judgment of PNG people. "In a society where we have those very firm beliefs,

that misfortune can happen because of the supernatural, this just feeds really well into this whole [religious] narrative" (Chandler, 2021) as affirmed by Dr. Fiona Hukula. This does not imply that the religious faith should be counted as a problem in vaccine hesitancy. Instead, the lapse occurs when people tend to mix and substitute science with religion. Religiously fuelled arguments were acknowledged by MaPHA participants to be a particularly delicate case, where "religiosity was negatively correlated with Covid-19 vaccination" (Troiano & Nardi, 2021: 250). During a vaccine advocacy campaign at Mis, VAP3 expressed to the community that despite personal differences with Christianity, vaccines were the best options for combating Covid-19. Another popular religiosity rumour that has been associated with the vaccines, was that the vaccines were malevolent in nature. VAP1 and VAP5 have stated outright that coupled with the media influence, people are concerned if the vaccines contain microchips that may herald the reign of the biblical '666', a ploy by evil forces to control people through the microchips. Therefore, MaPHA could not, in its capacity, effectively translate medical science to resonate among religious groups. Religiously substituted perceptions guided public opinions against vaccine acceptance due to the strong ideals of devout Christians or local cultures.

Covid-19 Vaccines

Introducing something relatively new to any society would be accompanied by hesitation, much less a vaccine that was produced in the wake of a deadly pandemic. As aforementioned, the lack of knowledge of the Covid-19 vaccines created fear of the vaccines. VAP1, an officer in the MaPHA Covid-19 Risk Communication sector, affirms this by stating that "now many people are not fearing the virus, they are fearing the vaccines that are coming around". Throughout the research, the majority of the participants mentioned that people were hesitant because of the rushed production of the vaccines and the existence of three different vaccine brands, causing uncertainty. Preceding vaccines in PNG did not have this degree of unique hesitation from the public.

Rushed deployment

'How long did it take to make these vaccines?' 'Were the vaccines medically tested before being placed into rotation?' 'How can they make these vaccines swiftly right after the Covid-19 outbreak?'. These were some questions that the Madang public was concerned about over the vaccines. To many in the public, as the safety of their health is of utmost importance, a new medication for a new illness jeopardizes that. VAP1 and VAP7 stated that Madang communities raised many questions concerning the swift deployment of the Covid-19 vaccines, and whether or not the vaccines had undergone adequate checks before deployment. In this case, Covid-19 vaccines were not just medical articles, but they also donned a social characteristic. As stated by Soares (2021:2) "vaccination coverage is highly influenced by its acceptability and the overall perception of its benefit/safety profile".

Vaccine types

Different variations of the vaccines caused confusion about which one should be taken. Madang had three vaccines that were distributed to the public during the time of the research; AZ, SP and J&J. From the three vaccines, only AZ and J&J were used more in the public, as confirmed by VAP4. News of vaccines causing side-effects and deaths (Covid: Woman Died from Rare Vaccine Side-Effect, n.d.; TGA Links Two Deaths to Rare COVID-19 Vaccine Side Effect, as Nearly 10 Million AstraZeneca Jabs Administered, 2021; Erdbrink et al., 2021) grew the hesitation, and it all depended on the preference people had for the vaccines. People were asking, "why are we using different type[s] of vaccines; why not only one type of vaccine?" (VAP5). Incidentally, VAP4 stated that people have shown concern over the differences in the vaccines, backing the response from VAP5. According to MaPHA vaccination data collected in the second half of the 2021 vaccination program in Madang, vaccines that were double dosage (AZ or SP) had a lower vaccination rate when compared with the single dosed vaccine (J&J). It was then evident that people preferred the single-dose vaccine rather than the double-dose, minding the overall safety or risk the vaccines have on health.

Immunization-fear

The general fear of the Covid-19 vaccines evolved and affected normal immunizations for children. This immunization-fear phenomenon spawned as a result of misinformation and the lack of knowledge combined. When mothers with limited vaccine knowledge were misinformed about the vaccines, they began to fear immunizations. As such, this specific nature of Covid-19 vaccine hesitancy was not cited in other researches carried out in other provinces or countries. What sets this apart is the logic that this concern is built on, which was immunizing children with Covid-19 vaccines.

In Madang, it was understood that most women and mothers feared the vaccines. Yet they further feared that Covid-19 vaccines were mixed into the immunization injections that were to be given as baby immunizations. VAP8 stated that "there were occasions where the nurses and the staff that go for it, give immunizations, and mothers they run away". VAP8 went on to state that for three months, no mother brought their child in to be immunized. In other parts of Madang, such as at the Gusap Health Centre in Ramu, "they even cut the tree across the road for them [staff] not to go to their village" (VAP6). Ultimately, VAP6 and VAP7 emphasized that continued aversion from immunizations can lead to outbreaks of other vaccine-preventable diseases (Stahl et al., 2016) in children.

Awareness

An integral part of this research was to investigate the attempts at awareness the MaPHA carried out within Madang Province. When doing awareness for Covid-19 and its vaccines, public awareness campaigns were chosen to be the driving force that could increase vaccination acceptance in Madang province. During the early stages of the vaccination period, campaigns were made nationwide about the vaccines and the pandemic. The media, therefore, became the

vital dissemination apparatus of the National Department of Health. Messages stating "Trust the facts. Get the vax!" or "Be a vaccine champion" were strewn across posters, billboards, newspapers, radio, TV and social media. Awareness of Covid-19, in general, was very high in PNG. However, there were misconceptions toward understanding the number of cases and Covid-19 related deaths in PNG (Hoy et al., 2021). Despite the NDoH and other Provincial Health Authorities insistently campaigning for the vaccines, Madang PHA held awareness events that were revealed to be futile. Awareness styles, methods, or even the messages used by MaPHA may not have been the most effective in aiding vaccine acceptance.

Awareness campaigns

MaPHA carried out awareness campaigns, choosing to face the brunt of the public hesitations head-on. It believed that "concerns can be addressed via awareness campaigns guided by physicians and other healthcare professionals to foster trust in health authorities, assure the public, and illustrate the role of vaccination in acquiring herd immunity and preventing disease transmission" (Al-Jayyousi et al., 2021; Ali et al., 2021). As health workers, public scrutiny was almost constant in everything that they may have said or done. Interviewed participants and observations acknowledged that the atmosphere at awareness campaigns was cautious and abrasive before, during and after the campaigns. The public audience just looked on with worry and fear for the vaccines. The awareness officers had to challenge a great deal of scepticism. Despite their awareness campaigns, VAP6 critiqued the process, stating that MaPHA "started without advocacy…only one big launching at the [main] marketplace, and after that, there was no other awareness advocacy". The vaccine program launching was the main public awareness talk in early 2021, where more effort seemed to have been placed. Social media awareness, which did present opportunities, was not pursued by MaPHA, as a specialized team was needed to do this method of awareness, and the safety of staff would have to be guaranteed (VAP5 & VAP6). The lack of MaPHA social media presence was reflected in the high level of hesitation.

The Media

A catalyst that defines this modern era is media. It has become more favourable in bringing across news and education, reaching a wide range of audiences. Throughout the height of the Covid-19 pandemic, the media was used more as physical isolation was enforced. People relied more on media to bring them news and to contact each other through social media platforms. Traditional media aimed to present facts, while social media presented personal impressions of events. They were influencing people to either continue living in fear or to hope for a permanent end to the pandemic. Whether it was traditional media or social media, the "ease-of-access" characteristic of the media played a major role in the acceptance of vaccines (Eguia et al., 2021). MaPHA found the media to be both helpful and unhelpful. This bittersweet aspect was a result of resources being underutilized and an increase in public reliance on the Internet.

Traditional media

MaPHA did partake in media awareness of the Covid-19 vaccinations. Seemingly, radio was the only form of traditional media that was used to disseminate information. Throughout the second and third trimester of 2021, a member of the Risk Communication team would go on to NBC Radio, Madang, and educate people on Covid-19 and give updates on the vaccination program. The reason NBC Radio Madang was chosen to be used most likely had to do with the fact that it reached more people within Madang province compared to any other media channel. As VAP2 stated, "they (Risk Communication) have people that go on the radio, they speak on the radio" aiming to bring awareness to the public. Newspapers were mainly used to present infection rates, vaccination rates and death rates concerning the Covid-19 pandemic in Madang and PNG – dispensing collected data about the vaccines. Traditional media was used well enough. However, it was meant to be mainly a single channel dissemination system where proper dialogue could not be facilitated between the public and health experts. Information presented through traditional media stoked fear more than educating people.

Social media

During their interviews, the interviewees all agreed that social media greatly affected the awareness and administering of Covid-19 vaccines. Social media utilizes interactive engagement with users, allowing users to easily relate to messages on social media rather than conventional media. Unlike traditional media, social media accommodates personal narratives and communication more than facts and news. "These narratives add a new dimension to health information: a personal and embodied view of vaccine-preventable disease, vaccines and their potential (often negative) consequences" (Dubé et al., 2013, p.4). Social media facilitates the opinions and ideas anyone may have, regardless of whether or not the opinions and ideas are factual. Because of the far-reaching influence of social media, it has "offered the opportunity for vocal anti-vaccination activists to diffuse their message" (Dubé et al., 2013), supercharging fears (Chandler, 2021). Thus, social media is regarded as one of the major influencing factors in vaccination acceptance.

MaPHA does acknowledge that social media influences people in accepting vaccines. As stated by VAP3, "most people are concerned about the safety - safety of the vaccine itself. Due to a lot of misinformation they get through social media platforms". The overwhelming flow of information on social media platforms blurred the lines that separated opinions from facts. Backtracking to the lack of knowledge on the virus and vaccines, people used social media to fill in knowledge gaps. Seemingly, most people have come to rely more on social media and the Internet rather than traditional media and experts. Concerns about vaccine safety have been met with stories and posts of life-threatening side effects and death, as well as health benefits of the vaccines on social media platforms. However, MaPHA has little to no presence on social media platforms. VAP1 and VAP5 have explicitly stated that social media campaigns can prove to be counter-productive when compared to public awareness campaigns. Social media simplifies

communication, yet it creates distance between health experts and the public while providing facts and opinions together.

Lack of support

Support is needed from stakeholders to carry out any vaccination programs at such a huge scale within a province. Whether it will be from the government, non-government organizations (NGOs) or village leaders, support is needed to quell vaccination hesitancy in Madang. Vaccine hesitancies are linked to the level of support that is given to the vaccines (VAP3). Four participants have indicated worryingly that the lack of support from stakeholders had been a concern. VAP5 stated that a reason the public hesitancies were high in Madang when compared to other provinces, was that the local government in Madang and local community leaders showed little to no support for the Covid-19 vaccination program. VAP3 also believed that "churches are very powerful. …their stance as well, can influence the acceptance" of vaccines. Loop PNG, in mid-2021, reported that the then Provincial Governor of Madang had been an outspoken sceptic of the vaccines (Mou, 2021). That stance from the governor increased hesitancies and complicated Covid-19 vaccine administration and awareness. International NGOs such as World Vision and UNICEF have been pushing for herd immunity in Madang province. However, their advocacy has not been fruitful, likewise for MaPHA and other advocacy groups. Churches and the local government are essential pillars of Madang province, guiding and influencing people. As an act of posterity, VAP8 and VAP3 have stated that to counter the lack of support, MaPHA had shifted their focus to educating local leaders to use as the primary advocators of the Covid-19 vaccines in communities with the help of NGOs. Support from stakeholders is important to vaccine acceptance since people look to such stakeholders for guidance.

Finally, the social phenomenon of vaccine hesitancy has been plaguing the MaPHA in their Covid-19 vaccination program since its inception and "vaccine hesitancy has now become a threat to public health" (Stahl et al., 2016). As affirmed by Manineng et al. (2021), in a challenging environment such as that of Papua New Guinea, factual information of the vaccines may not reach the whole population. The lack of knowledge on the three new types of vaccines caused the Madang public to be reluctant in accepting them. Dubé et al. (2013) expressed that imprecise information regarding both vaccine safety and the process eventually leads to significant problems for public health workers. The Madang public seemed to have become more reliant on social media and the Internet rather than advice from health workers, despite public awareness made by the Covid-19 team at the MaPHA. As a result, Covid-19 vaccines have developed a social feature over its own medical appeal. With no support from local leaders, church leaders and even the government, people had little trust in health workers, much less the vaccines. Therefore, "the effectiveness of immunization programmes, including Covid-19 vaccines delivery, relies on population uptake and acceptance of vaccines" (WHO and UNICEF, 2021).

Summary and Conclusion

Summary

In late 2019, a pandemic shook the world, testing health facilities, health professionals and ordinary people alike – the Corona Virus. With the number of deaths and infection cases climbing every day, vaccines were seen as the best solution to subdue the spread of Covid-19. The vaccines produced had a mixed reception worldwide. Depending on the social structure of any country, people either accepted the vaccines with hope or regarded them with uncertainty. The PNG population was more sceptical rather than accepting of the vaccines. In 2021, Covid-19 vaccine hesitancy in PNG was one of the highest in the East Asia Pacific region. The National Department of Health charged the Provincial Health Authorities to advocate for and administer Covid-19 vaccines – the vaccination programs. Yet, the people of PNG had high levels of vaccine hesitancy, high infection rates and low vaccination rates. PNG health professionals feared countless deaths despite their efforts. Overall, the Covid-19 vaccines were no longer just medications, but they became subject to socially fuelled vaccine hesitancy, forming a strong social presence.

To run the vaccination program, MaPHA formed a Covid-19 team that consisted of 5 sub-groups: Surveillance, Point of entry, Risk communication, Infection control and Vaccination. Collectively, they regulated efforts to fight Covid-19. MaPHA received three different vaccines to circulate within Madang province: AstraZeneca, Johnson & Johnson and Sinopharm. But the vaccination program in Madang faced much resistance and heightened public scrutiny. Despite their efforts, vaccine hesitancy became dominant in local communities. Covid-19 vaccine hesitancy is an issue that needs to be addressed, as it ultimately affects the lives of the people.

Data was analyzed and structured themes set in subsequent order. For the knowledge and perceptions theme, participants generally alluded to the disparity of comprehension levels Madang people had toward Covid-19 vaccines, which became stimulated by cultural perceptions and religiosity. The participants also admitted that how health professionals phrase their messages can affect the perceptions of Covid-19 vaccines. In the theme of Covid-19 vaccines, the vaccines were not understood by people in Madang province. Participants referred to this theme as the main issue that kept people from accepting the vaccines. This theme spawned as a consequent theme from the knowledge and perceptions theme. Under the awareness theme, answers from participants and researcher observation showed the efforts that the MaPHA Covid-19 awareness team has made in advocating for the vaccines. As part of the observations, the researcher noted the presence of MaPHA on the local radio educating the public along with community awareness talks. The participants also gave their evaluation of the factors that affected community awareness campaigns or media awareness and also, how their shortfalls can be addressed to improve in the future. The media became a major driving catalyst in vaccine hesitancy in Madang Province, thus becoming an important theme. Both traditional media and social media platforms have proved to be some of the fastest and most efficient tools to spread information about Covid-19 and its vaccines. Yet, it proved counter-productive where social media became an avenue for misinformation to grow, and traditional media did not provide

much space for educational dialogue between health experts and the public. This showed how two-way and one-way communication can work for or against messages that are being disseminated to the public. Finally, and interestingly, the fifth theme of support showed the lack of backing from community leaders, church leaders and the provincial political leadership. Support from these leaders is essential in gaining the trust of people in the province. Lack of support from leaders was reflected in the low vaccine acceptance rate in the province.

Out of those main issues, knowledge and perceptions along with the media appeared to be the driving factors in vaccine hesitancy. When there is a gap in knowledge on the Covid-19 vaccines, misinformation can slip into the minds of people, amplified by the efficiency of social media. A lack of effective public awareness to address the shortage of factual information leads to fear of the vaccines themselves and less support from leaders.

Additional outcomes of this research on vaccine hesitancy include fear amongst volunteer staff moving around to vaccinate people because of verbal threats levelled against them, immunizations being discarded because of misgivings, decrease in public trust in the capability of health professionals, and Covid-19 vaccines going to waste as other infection rates increased, some leading to death, in Madang. As shared by VAP6, when mothers keep their children from being immunized out of fear, the possibility of other epidemic outbreak increases, e.g. measles or tuberculous.

Conclusion

Covid-19 is a disease that greatly affected the lives of many people globally, causing mass panic since its onset in 2019. Countries around the world rallied to find effective treatments to combat the rapid spread of Covid-19. As a result, various vaccines were hurriedly developed to be used in late 2020. The new vaccines caused adverse effects during the early days of their deployment. People experienced blood clots and severe side effects and even some died after receiving the vaccination. The hope that was once associated with the Covid-19 vaccines became shrouded in doubt and hesitancy. People started to lose confidence in the effectiveness of the Covid-19 vaccines and the health professionals that administered them. Vaccine hesitancy became a prominent concern to healthcare system facilities and health professionals. PNG introduced the Covid-19 vaccines to its population in 2021 through the Covax vaccination program with Prime Minister James Marape being the first Papua New Guinean to be vaccinated in the country.

Vaccine hesitancy is and should be seen and viewed as a hindrance to healthcare. Especially in a country such as PNG that has a healthcare system that is strained, vaccine hesitance will only further weaken the waning health system. Vaccines are regarded to be one of the best medical deterrents against pandemics or epidemics, but social factors play into their acceptance. This research sought to identify the socio-cultural factors that fuelled Covid-19 vaccine hesitancy in Madang province. Madang Provincial Health Authority, just like any other province health administrator in PNG, strives to achieve herd immunization against Covid-19. After the analysis of the data was completed, the major research question: "What are the socio-cultural factors

affecting the Madang Provincial Health Authority in the awareness and administering of Covid-19 vaccines?" was answered through this research. The socio-cultural factors that affect the Madang Provincial Health Authority in the awareness and administering of Covid-19 vaccines are: knowledge and perceptions, Covid-19 vaccines, awareness, the media and support. This research study was formulated to assist the public and academic community in understanding the effects of public vaccine hesitation on health bodies that facilitate the distribution of Covid-19 vaccines by examining the Madang Provincial Health Authority.

Although there were five themes drawn from the research, the more dominant factors were the media and knowledge and perceptions. The latter theme is regarded as the foundation of the Covid-19 vaccine hesitancies. It feeds into how people behave and think according to their surroundings and how people adapt to changes. Participants interviewed constantly referred to how the Madang public viewed the Covid-19 vaccines through the scope of various ideas and conspiracies, just to compensate for their lack of knowledge on the vaccines. The former theme of media primarily affected the awareness of the Covid-19 vaccines by being the catalyst in spreading facts along with and subsequently the acceptance rate. The media played a part in disseminating information to the public. Traditional media gave updated data on infection rates and deaths in the country and province. However, it did not provide much of an avenue for dialogue between the Madang public and the Covid-19 team of MaPHA. Social media, on the other hand, did provide the avenue for dialogue to be held. The MaPHA team did not regard the use of social media to counter the conspiracies dominating social media platforms. MaPHA have not delved into the social media campaign due to fear of being threatened or lack of resources. Yet, early attempts by WHO through the NDoH at informing people through social media misfired because the information presented was either too technical or vague. This showed how delicate social media awareness for Covid-19 has been.

The types of Covid-19 vaccines played into the confusion and hesitation. Madang citizens tended to ask why there were different variations of the vaccines and how they would affect their bodies. Public confusion about the vaccines became clear during awareness talks that the MaPHA team carried out. Vaccine acceptance rates varied depending on the type of vaccine. According to MaPHA vaccination data, J&J had a higher acceptance rate when compared to AstraZeneca and Sinopharm. However, the high J&J acceptance rate may have been an outcome of public preference for single-dose vaccines or because of the 'no jab, no job' policy that pressed people to quickly vaccinate themselves to keep their employment. Specificity aside, vaccine variations have caused misgivings on vaccinating against Covid-19. Misgivings turned into the fears that were shown during awareness. Fear of the vaccines had consequently reduced support from the provincial government, church leaders and community leaders. Note that vaccine hesitancies can apply to different vaccines depending on the contextual situation that surrounds it. Ultimately, VAP3 expressed a point that should be remembered, stating "people can fear us or the vaccines all they want. But when they get sick and infected, we carry the burden of caring for them".

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Author

Cooniebhert Samgay is an alumni of the Faculty of Arts and Social Sciences, graduating in 2023 with an Undergraduate Degree in PNG Studies & International Relations. Hailing from a mixed parentage of Madang and East New Britain, his academic interests lie in humanities research and Papua New Guinea social behaviours. In the future, he aims to bring more insight to the unique discourse of Papua New Guinea's social patterns and social phenomenon.
Email: conniebherts@gmail.com

Social perspectives of different age and gender groups in communities on Manam Island Madang Province in PNG.

Emelda Ariku, Mathias Miti, Allen Sumb & Philip Gibbs.

Abstract

Divine Word University (DWU) and DKA Austria are working together to identify the social perspectives of different age and gender groups in four communities from three provinces of Papua New Guinea (PNG). Four broad themes structure the analysis: 1) Marginalization and exclusion; 2) Influence of modernization on culture and traditions; 3) Violence in the community and families; and 4) Intergenerational conflict. In JUNE 2022, a study was conducted on Manam Island, Madang Province as part of this project. The study draws on individual interviews, focus group discussions, survey questionnaires, and activities to identify perspectives from different age and gender groups on social issues affecting their community. In total, 219 participants were involved in the study. Participants comprised children ages 5 years and above, students at the St. Mary's Bieng Primary School, community leaders, church and women leaders, village court officials, health workers, teachers and other members of the community. The study documents stories of safety and concerns and/or the future for each gender and age group. The data generated from this project can be of use and interest to a range of audiences, from the community to government and non-government agencies. The paper concludes with the authors' fieldwork reflections.

Key words: intergenerational conflict, generational gap, marginalization, violence, modernization, Christianity, culture, decision-making

Introduction

Divine Word University (DWU) and Dreikönigsaktion Hilfswerk der Katholischen (DKA) are working together to identify the social perspectives of different age and gender groups in four communities from three provinces of Papua New Guinea (PNG). Four broad themes structure the analysis:

- Marginalization and exclusion
- Influence of modernization on culture and traditions
- Violence in the community and families
- Intergenerational conflict

The first study was with an isolated rural community in the Highlands named Ambulua (McKenna et al 2020). The second was with a rural coastal community named Dimir, (Gibbs et al, 2021). In March 2022, a third study was undertaken in Sinsibai, a semi-rural community in the Western Highlands Province.In July 2022, a fourth study was undertaken in Manam Island, a volcanic Island in Madang Province. These four studies can act as a guide for other groups or individuals who would like to conduct similar studies in other provinces or communities in the country.

Fieldwork activities were conducted in Manam Island by DWU Staff, with the assistance of a post-graduate Master of Research Methodology (MRM) student, Matthias Miti. Semi-structured interviews, focus group discussions, children's activities, and questionnaires were used to achieve the following project objectives:

- Define the dynamics of marginalization and exclusion of groups or people, young and old, who suffer from marginalization and forms of violence in the communities.
- Review the potential and actual resources available to address the risks to family and community life.
- Determine the participants' perception of modernization and its influence on culture and traditional governance and order.
- Document peace-building capacities and initiatives in the families and communities.
- Explore the hopes and expectations of the participants in the communities.
- Understand how the participants are addressing their own issues locally.
- Identify the stakeholders and decision-makers in the community and review to what extent they work together successfully.

This summary report documents the fieldwork activities and findings.[1] A short film is available at https://www.youtube.com/watch?v=9tZkwj8L8Ig

Figure 1. Manam Island off the coast near Bogia

About Manam Island

Manam Island is located in the Bogia District of Madang Province. It is located in the Bismarck Sea on the northeast coast of mainland Papua New Guinea (Connel, 2017). The island is 10 kilometers wide and has a total population of approximately 10,000 people (International

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[1] Consent was received from the participants. When involving children, the team ensured parental consent prior to commencing the activities

Organization for Migration, 2016). It has an active volcano that erupted in 2004 and its residents were resettled to the mainland (Basse, 2015; Radio New Zealand, 2018). It erupted again in May 2022 but did not cause any major destruction as it did in 2004 (Global Volcanism Program, 2022). The Manam Island people are subsistence farmers. They cut the bush and burn it to make a garden. The food produced is limited due to poor-quality soil. This is supplemented by fruit trees (Connel & Lutkehaus, 2017). Manam traditional leaders called *kukurai* have power and influence (Lutkehaus, 2021). They make decisions for the community and impose penalties for those who disobey them. However, this has somewhat changed after the volcanic eruption in 2004 when many people moved to the care centers.

The main services on the island are Biang Health Center and Primary School at the Biang Catholic Parish. The Catholic Church established the first mission station on Manam Island in 1924 through the Divine Word Missionaries (Connel & Lutkehaus, 2017). However, there is no priest on the island at the moment.

Literature Review
Introduction

Understanding social perspectives across age and gender groups in PNG communities particularly in Manam Island, requires examining how modernization, cultural shifts, and socio-economic challenges shape intergenerational and gendered experiences. Studies from Madang Province and similar coastal communities offer a lens into these dynamics.

Marginalization and Exclusion

Research conducted in Dimer, a coastal community in Madang Province, highlights marginalization and exclusion as key themes affecting different social groups. Older adults often feel sidelined in decision-making processes, while youth express frustration over limited opportunities and recognition (Gibbs et al., 2021). Women, particularly in patriarchal village structures, face systemic exclusion from leadership roles and land ownership (UNDP, 2023).

Influence of Modernization

Modernization has introduced both opportunities and tensions. Youth in coastal Madang communities increasingly adopt globalized lifestyles reflected in music, fashion, and attitudes which sometimes clash with traditional norms upheld by elders (Yakam et al., 2022). This cultural divergence contributes to intergenerational misunderstandings, especially around gender roles and expectations.

Gender-Based Violence and Inequality

PNG has some of the highest rates of gender-based violence globally, with over 80% of women experiencing intimate partner violence (Aboagye et al., 2023). In communities like Manam, where displacement due to volcanic activity has disrupted traditional support systems, women

and girls are particularly vulnerable. Gender inequality is further entrenched by limited access to education and healthcare for women (UNDP, 2023).

Intergenerational Conflict

The divide between older and younger generations is not only cultural but also structural. Elders often lament the erosion of customary practices, while youth criticize the lack of infrastructure and employment pathways (Gibbs et al., 2021). These tensions are exacerbated in resettled communities, where resource scarcity and land disputes intensify social fragmentation.

Implications for Manam Island

Although specific data on Manam Island is limited, the patterns observed in Dimer and other Madang communities suggest similar dynamics. The island's history of displacement, coupled with traditional gender hierarchies and youth marginalization, likely mirrors the broader provincial trends. Future research should prioritize community-led participatory studies on Manam to inform culturally grounded development strategies.

Methodology
Research Design

This study used a mixed methods design, integrating both qualitative and quantitative data to explore the social perspectives of different age and gender groups within Manam Island communities. The mixed approach provided a deeper, triangulated understanding of individual and group experiences shaped by culture, displacement, modernization, and community change (Creswell & Plano Clark, 2023).

Study Area

The research was carried out in selected communities on Manam Island in Madang Province. This allows for capturing rich information from the locals at Manam.

Participants and Sampling

A purposive sampling method was used to include participants across five age brackets (children, adolescents, young adults, adults, elders) and gender categories. Approximately 219 participants were included across both qualitative and quantitative components, ensuring diverse representation (Palinkas et al., 2015).

Data Collection Methods

For the qualitative component, the follow methods were used to collect the data.
- **Focus Group Discussions (FGDs):** Facilitated in age and gender-specific groups to explore perceptions about community, roles, and values (Fazeeha, 2023).

- **Semi-Structured Interviews:** Conducted individually to uncover personal narratives and sensitive themes (Brinkmann, 2018).
- **Community Mapping Activity:** Enabled participants to visually represent spatial aspects of their social environment, highlighting inclusion and exclusion zones (Chambers, 2006).
- **Transect Walks:** Guided walks allowed observational data collection on farming, housing, and infrastructure from different generational and gendered viewpoints (Rojas, & West, 2021).
- **Safety Continuum Exercise:** Used to assess perceived safety and vulnerability in public and domestic spaces, especially for women and children (Petal, & Tofa, 2020).
- **Food and Farming Inventory:** Gathered community-generated data on local agriculture, seasonality, and food security concerns (Food and Agriculture Organization of the United Nations, 2020).
- **Participant Observation:** Researchers joined daily life to observe community routines and cultural dynamics (Ribeiro, & Foemmel, 2012).

For the quantitative component survey questionnaires were used to collect the data.
- **Survey Questionnaire:** A structured survey instrument was distributed to 50 participants, capturing demographic data, access to services, education levels, livelihood patterns, and perceptions of government and community support.

Data Integration and Analysis
Qualitative data were transcribed, coded thematically and interpreted through a grounded theory lens (Braun & Clarke, 2006). Quantitative data were analysed using descriptive statistics. Findings from both strands were integrated at the interpretation phase to deepen insights and enable comparison.

Ethical Considerations
Approval was obtained from the Divine Word University Research Ethics Committee, Papua New Guinea. Participants provided informed consent, with special procedures for obtaining parental consent and child assent. Privacy, cultural respect, and the right to withdraw were emphasized throughout the study (Israel, 2017).

Limitations
Language barriers, transportation challenges, and potential social desirability bias during group activities posed limitations. However, triangulation, community validation meetings, and reflexive journaling helped strengthen the credibility of findings (Lincoln & Guba, 2010).

Results
Fieldwork Activities

219 participants were involved in the study. Focus groups, interviews and the children and young adults' activities involved 199 participants. Additional data was generated from 10 structured

questionnaires and 20 Menzies surveys.[2] Participants comprised children, students at the St. Mary's Bieng Primary School, community leaders, church and women leaders, village court officials, health workers, teachers, and, other members of the community.

For children, there were exercises in drawing and mapping, questions about food and farming resources, and a transect walk through the community. For young adults there was a structured agree/disagree activity and a safety continuum activity. For adults, the following questions were used as a guide for the focus group discussions:

- How are decisions about community matters made on Manam?
- What changes have you observed in the culture and traditions of Manam? Are the changes positive or negative? Why?
- How would you describe the relationship between the older generation and the young ones on Manam today?
- What do you expect from your community, government, family, friends and leaders? What do they expect from you?
- What kind of services are available in your community and who provides them?
- If a child or person is beaten or abused, what does the community do?
- How is peace maintained in the community?
- Are there any widows, orphans or people living with disabilities here? If so, how does the community care for them or treat them?

Voices of Children and Adolescents
Community mapping activity: Grade 5 & 6 students

Approximately 30 grade 5 and 6 students, 17 females and 13 males, participated in the Community Mapping Activity that was conducted by two project team members. The activity was conducted under the watch of their teacher. The students were divided into four (4) groups, and were given butcher paper to draw a picture of their community, then put a smiley face (☺) on places they felt safe, and a sad face (☹) on places they felt unsafe in. This was done in groups, and then plenary presentations were made by the groups to the whole class. Explanations were provided for their choices of 'safe' and 'unsafe' places.

According to the maps drawn, the only difference is that some places that are said to be safe by some students were considered unsafe by others, such as the sea and garden. Otherwise, all the responses were more or less the same.

Listed below are the most commonly mentioned 'safe' and 'unsafe' places in the activity with the students. Places the students identified as *safe* were:
- **Church** — People pray and worship God.
- **School** —They get education.

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[2] Adapted from the Parenting for Child Development program developed by the Menzies School of Health Research, Darwin, Australia.

- **House** — Where they live and they sleep there.
- **Sea** — Get water to use as salt.
- **Market** — People sell food and get money.
- **Garden** —That is where they get their food to eat.
- **Well Water** — They get water and drink.

Certain places were discussed and explained why they were indicated as *unsafe*:

- **Toilet** — it smells
- **Forest**
  —There are snakes that might bite them.
  —There are *masalais* (bush spirits) in there.
  — There are sorcerers.
  —There are poisonous animals.
- **Coconut plantation**
  —The palms or nuts will fall down and kill or injure them.
- **Drain** — Lava from the volcano comes through this to destroy everything on the island.

Grade 6 student

"The drain is an unsafe place because the lava from the volcano comes through this drain to destroy the people and everything"

Figure 2. Grade 4 students in safety continuum activity

These four places were mostly referred to as unsafe by the students. However, it would be very interesting to note that some other places that are considered safe by certain groups, were considered unsafe by others. For instance, while group 3 said that the sea was safe because that is where they get water to use as salt, group 1 argued that it was unsafe because when the volcano erupts the sea gets hot. Other areas briefly described as unsafe were the beach and the volcano. The beach is said to be unsafe because there are broken bottles around in the sand from which they might get hurt. The children said that the only time that the volcano is unsafe is when it erupts.

Safety continuum: Grade 7 & 8 students

Two classes of 50 students participated in the safety continuum activity. Statements concerning the safety of individuals and community members were read. Students were then asked to move to either side of the room depending on whether they felt safe or unsafe, on a scale of 1 to 10, with 1 being very unsafe, and 10 being very safe.

Students were also asked to formulate statements or scenarios for their classmates who then responded by moving where they felt safe or unsafe.
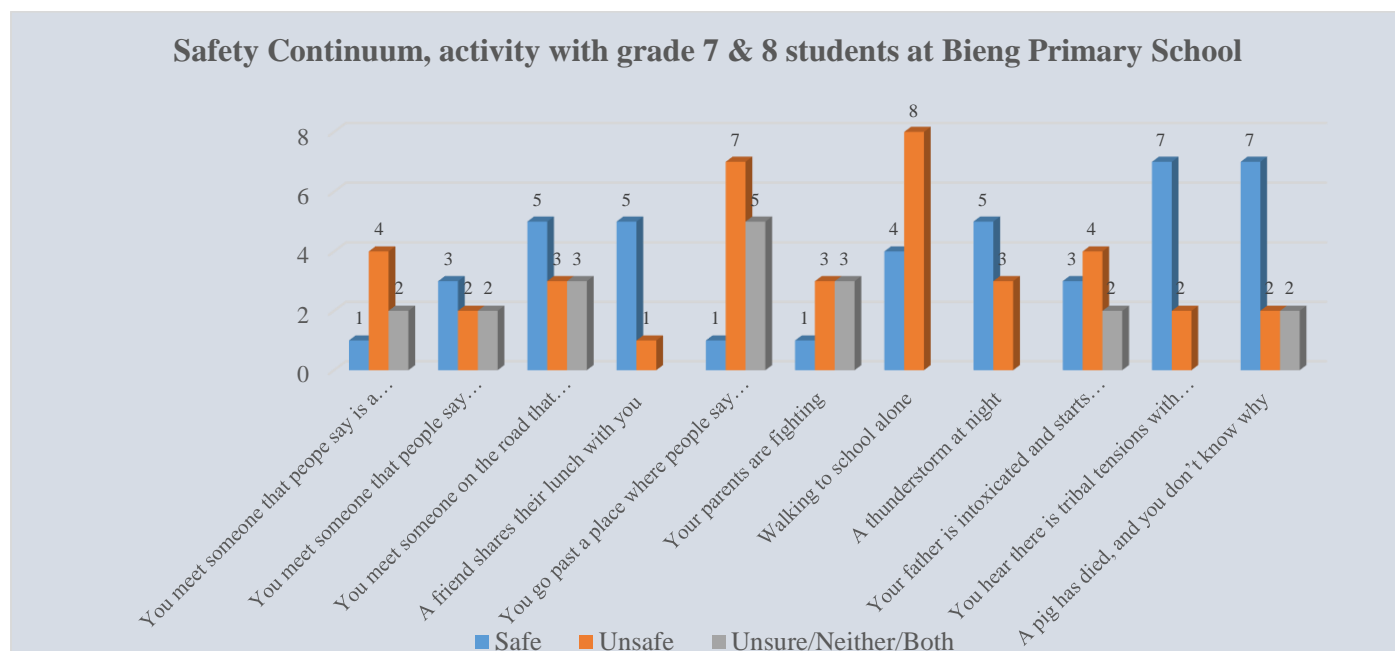
Figure 3: Graph of students' responses to each statement for the safety continuum activity

The graph above portrays the number of students in each position, according to how they felt about each statement. There were various responses from the students justifying why they thought the statements were safe, unsafe, or neither or both. The students gave examples and experiences they went through that influenced their answers. For example, while some students spoke from experience that meeting a sorcerer is unsafe for them, others say that because they will cure them using their sorcery, they felt safe.

Transect walk activity: Children from Manam Island

The transect walk activity was conducted with approximately 20 children. The group consisted of elementary and primary school children. The children took the project team for a walk around the community, pointed to places where they felt safe or unsafe and provided their reasons.

These places included the river, the bush, coconut trees or plantations, and the volcano. The children expressed their fear of the river because when it rains, the river floods making it unsafe for them to walk to school. There was an incident where a young female was crossing the flooded river and drowned. Also, there is no bridge and children fear this situation. When asked how the

community responded to their concern, they stated that the community is fully aware of it but nothing has been done over the years.

Food and Farming Resources: Grade 3 & 4 students

This activity was added to the data collection instruments for the children to identify the type of food they grow, prefer and consume in their community. Moreover, to identify who was responsible for the farming, harvesting and preparations of food, and whether it was sold for income and who was responsible for that.

Students were asked to work in groups to draw the type of food their family grows, who is responsible for the farming/ gardening, and what food they consume daily. Below are the results of this activity.
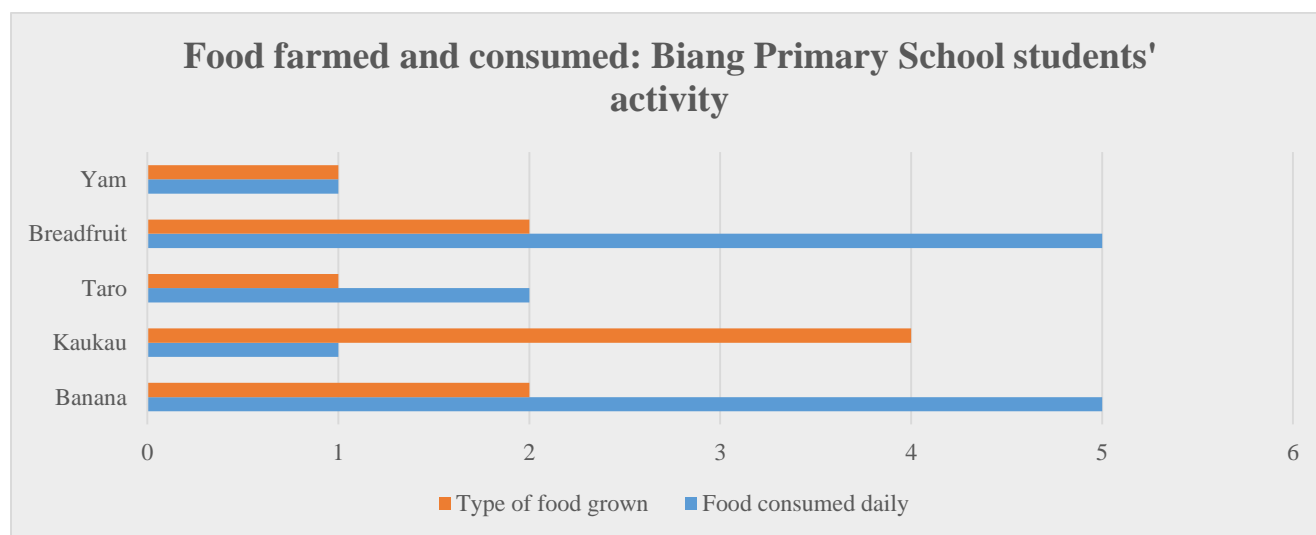
Figure 4: Food farmed and consumed: Biang Primary School students' activities

Shown on the graph are the foods consumed daily and the type of food grown. The numbers on the x-axis represent the number of groups that participated in the activity. It would seem that breadfruit and banana are the most commonly consumed food within the household of the students in that class. This is obvious also when one enters the community, the bread fruit trees and banana gardens are hard to miss.
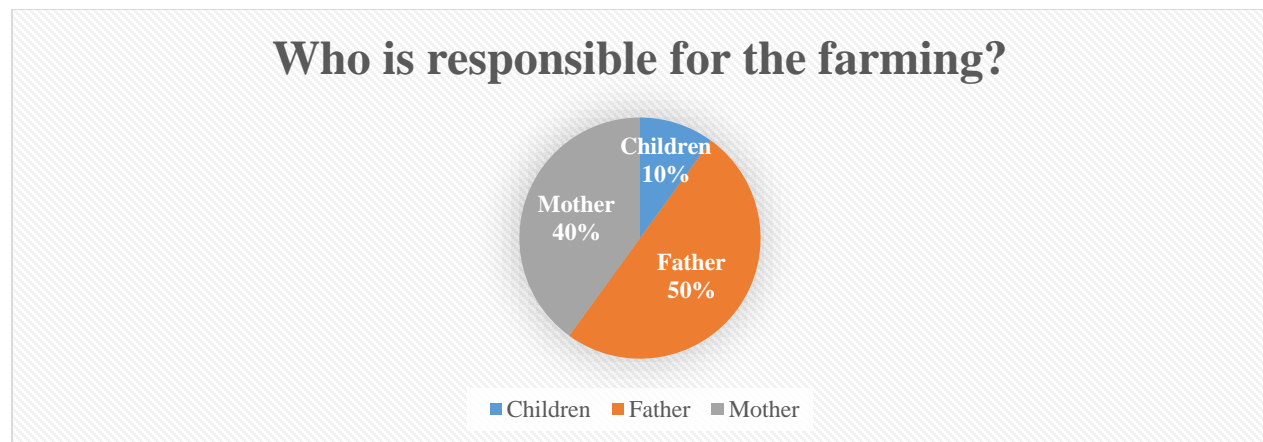
Figure 5: Farming responsibility

Most of the islanders are subsistence farmers, farming the land to provide for their families. This is not like any other communities in PNG where they produce surplus and sell some at the market. Hence, both parents are responsible for gardening. Men cut down the bush and prepare land for planting while women and children plant food.

Voices of Adults & Young Adults
Violence

In terms of violence, adults and young adults are experienced with some form of violence. The most common types of violence experienced or witnessed in their community, as indicated by the participants are:
- Family violence - arguing with spouse.
- Youths taking marijuana and alcohol (Yawa).
- Verbal.
- Physical.
- Emotional.
- Psychological.
- Marginalization and exclusion.
- Spiritual (Religious).
- Intergenerational conflict.
- Generational gap.

It is interesting that 'youths taking marijuana and illicit drugs' is a common form of violence. It could either be seen as a factor that contributes to violence in the community, or violence in self (harming one's own body).

Men and women are perceived to be the main victims of violence in the community, followed by children and the elderly and those living with disabilities. The respondents identified various factors that contributed to violence in their community, and the most mentioned factors are alcohol consumption and marijuana. This is followed by individuals' attitudes and behavioral

problems, disagreements, land disputes, political differences, unemployment, poverty, and lack of basic services.

A majority of the respondents indicated that women are the main victims. They do not believe violence is a private matter. Many said they did not know of any available support services. The ones who knew listed the following:

- Meri safe house
- Child protection
- Family & sexual violence unit (FSVU)
- Police
- Village elders
- Village authority

Most of the participants did not know of any support services available indicating that people in the community may not be aware of such services. It demonstrates a need for awareness of these services in the community for those who may need this kind of support or assistance.

Peace-building capacities and initiatives in Manam Island

Peace building initiatives and strategies are mostly headed by the village chiefs (*kukurais*), which involves both traditional and modern arrangements like the police, church leaders, village court system, magistrates and ward members. While that is the case, a majority of the participants stated that youths have no or little respect for their elders, parents and leaders. In the past, there was respect for elders but now that has changed. They highlighted several contributing factors. First, youths have been affected by marijuana and homebrew, and do not respect and listen to leaders. The second factor is the breakdown in cultural values. During the eruption in 2004, most of their people went to care centers and children were influenced by the mainland people. The third is that the *kukurai* has less power and authority. In the past, the youths feared the *kukurai* because he could poison them to death but now it's not happening so. Youths do whatever they like. The final factor is that there is less opportunity for education. There are no vocational schools to cater for grade 8, 10 and 12 drop outs.

Some participants expressed concern that law and order can be a major issue because in the past youths feared the *kukurai,* but now there is no fear of the*m.* Consequently, in the communities, people experience fights, stealing and teenage pregnancy. Responses from adult females show that there are several methods used to maintain peace in the community. These include mediation, negotiations and compensation with pigs, betel-nuts, clothes, Galip nuts, chickens and some foods from their gardens. The participants also stated that they have established a committee that deals with law-and-order problems. Conflicts are solved through both traditional practices of mediation and compensation payments while the village courts, church, and police also play important complementary roles in mediation and crime prevention.

Community response to a child that is badly beaten by parents

Physical punishment such as beating and/or slapping are commonly used by parents to instill discipline and encourage obedience from their children. It is often viewed as morally right and part of counselling for deviant children. Many participants expressed when a child misbehaves or disobeys, it is good to beat them so that they can learn the difference between right and wrong. They emphasized that this is not child abuse but a form of discipline. However, community members sometimes intervened when the beating is unjustified and is seen as abuse. In the event of a suspected child abuse, the community members usually intervened to protect the child from abuse. Nearby community members observe to determine whether the parent is abusing or disciplining the child. On the other hand, if the abused child belongs to another person, community members would respond through arbitration when the matter has been escalated to community leaders. The first level of mediation is with the church and when the two conflicting parties disagree, the issue is then referred to the village court.

Influence of Modernization

When discussing about the influence of modernization, participants mostly referred to the services that have been made available to them, such as schools, water supply and the health center. They also emphasized the introduction of Christianity and the important roles it plays in the community. Further, they mentioned the introduction of the internet and technology and their influence on the culture, dressing and lifestyle of the people, especially the youths and mothers in the community.

There are rituals for mothers to follow when they give birth to a newborn child and young girls having their menstruation periods. However, these rituals are being influenced by modern cultures and are now not fully practiced by women.

The chiefs traditionally have the power to make changes in the communities. They decide how the community will live and do things. The chiefs try to implement changes and advise their community members to come up with initiatives such as making businesses to cater for their school fees and meet family needs. However, some *kukurais* do not agree with the introduction of changes to their communities.

Another influence is the volcanic eruption in 2004. This changed many things as expressed by many participants. Before the eruption their chiefs had power and influence, and local community members respected them. But, after the eruption things have changed. Some people moved to the care centers with their chiefs and a minority remained on the Island. In the care centers, the youths were introduced to marijuana, home brew and alcohol, leading to fights with the host communities.

Modernization has brought many changes in culture and traditions within the Manam community. The main drivers of these societal changes include education, religion, political leadership (politics), new technologies and modernization. Therefore, rural communities where

culture and tradition were well preserved during the pre-colonial period are gradually being transformed into modern societies.

Factors contributing to the changes and their effects on Manam Island

The most influential factors in the community are the institutions of 'education' and the 'church'. The most visible changes in the community are the changes in houses, attire, infrastructure, and people's attitude. Although some positive changes have been noted, some disadvantages came with these changes, such as alcohol, drugs, loss or erosion of traditional knowledge and cultural practices, and the introduction of the Internet where (sexually) explicit materials are available for the public to view. This has posed a great concern for the people in the community. When asked about the impacts of changes, they maintained that the changes are positive.

Technological changes have also brought about improved means of communication from the previous calling or shouting out and sending messages to neighboring communities or using slit-drum (*garamuts*) to the current use of mobile phone networks.

Marginalization & Exclusion

There exists a form of marginalization and exclusion within the community concerning orphans, widows, widowers, people living with disabilities, and decision-making. Participants express sympathy for those who are disadvantaged; however, helping them has proven to be a challenge. Additionally, decision-making in the community seems to involve only a certain group, even though others wish to express their views and provide input.

People living with disabilities, widows and orphans

Participants unanimously agreed that there are orphans, widows, widowers, and a few people living with disabilities. While they recognize this and sympathize with them, the community does little to show support them. One adult participant stated that it was hard to provide for and help another individual or family who is disadvantaged because they need to provide for their own family too. Some of these individuals are supported by immediate family but there is no community support.

Female participants agreed that although the community does not collectively help these groups of people, the church does. Individuals in the church and church groups visit them, pray with them and offer them help and other items that they need. They are offered food, mostly when there is a surplus and perhaps when family members are not busy. Once in a while, women also assist widows by working in their gardens. It is only when the issues are referred to the leaders by individual families that the community gets involved. In this case, they discuss and assess the likely impact and then suggest appropriate actions to address the situation.

In addition, excessive marijuana consumption has led to mental illness or mental disturbances among some community members, which is seen as a form of disability. Generally, the

community is not as sympathetic to such individuals also known as "drug bodies", because they believe that it was their choice to consume drugs in the first place.

When asked to list the three most marginalized individuals in the community, respondents in the community listed the following:
- Drug addicts
- Young people, women and ordinary people
- People with disabilities

When asked about the possible contributing factors to marginalization and exclusion, the participants stated that sometimes when disobeying or disrespecting leaders, educated people go against the chiefs' decisions and are excluded, and lack of gender equality practices leads to marginalization.

Decision-making on Manam Island

Most of the decisions are made by the chief or *kukurai*. The *kukurai* is the traditional chief leader in the community with authority, power and influence. His decisions for the community are to be accepted and respected. The negative aspect of this type of decision-making is that it restricts the rights of the people, who have little or no freedom to engage in productive activities. For instance, people were restricted from engaging in Small to Medium Enterprises (SMEs). The ultimate goal to engage in SMEs is to support one's family to sustain themselves by paying school fees for their children and to meet other basic needs However, *kukurais* have their reason for restricting people from engaging in SMEs. *Kukurais* also restrict people from building permanent houses. Only the chiefs are allowed to build permanent houses.

The land is affected by the volcano and overpopulation and people need money and food to survive. These decisions made by the *kukurais* restricting people are not helping them to sustain themselves but force them to remain poor and vulnerable. People hope for change in their culture and tradition which would give them the freedom to participate in economic activities and improve the standard of living.

A glimmer of hope came during the 2004 volcanic eruption. The volcanic eruption displaced the people and most went to the care centers while a few remained on the island. Those who went to care centers were exposed to both positive and negative influences. One positive influence is that several kukurais experienced the outside world and the challenges of living in a developing and changing environment. They finally decided to allow their clan members to participate in economic activities and support their families. School fees increase every year and one way to earn money is to engage in some economic activities. It is a relief for people who were given the freedom to do business and engage in production to help themselves. The negative view is that youths have the freedom to engage in illegal activities such as the production and consumption of alcohol, and drugs, and involvement in sexual activities which is degrading the cultural values.

Food and Farming
Time and location for farming

The major types of food grown in Manam are taro, yam, banana and sweet potato. There is no season for growing a certain type of food. Unfortunately, many people do not grow vegetables such as aibika, cabbage, onion, tomato and beans. Consequently, there is a shortage of balanced diets on the island. Before the eruption in 2004, people were able to do gardening and grow enough food for family consumption but after the eruption due to the destruction of gardens covered with waste from the volcano, locals were not able to plant any crops.

Person(s) responsible for farming

Farming is done by both parents. The father clears the land and has the land ready for the mother to plant, and is assisted by the children.

The food is produced by family members while decision making about food production and farming is jointly done by both the husband (father) and wife (mother). The decision-making includes the time for garden activities like planting, harvesting and marketing, and the type of crops to be planted. While each family unit shares the responsibility of farming and harvesting, it is different for widows with children, as the task is done by the mother and the children. In some cases, it is solely the mother's responsibility. Overall, since the father is regarded as the head of the family, he is expected to mobilize his family to carry out gardening activities.

Threats to food and farming in Manam community

There are several threats to farming. First, the land for gardening has been covered with volcanic scoria and dust. The fertile soil is sometimes metres down and could take years for the land to be useable for gardening. However, bananas still grow well but taro and yam do not yield as normal due to the poor quality of the soil. Due to the eruption in 2004, people left the island without their domestic animals such as pigs, cats and dogs. These animals survived the volcano and now some became wild, destroying food gardens if they are unprotected. The third major issue is inadequate land for cultivation. The island itself is small and the population is approximately 10,000 people resulting in land shortage experienced by the islanders.

Services and support in Manam

Basic services such as health center, schools and churches are provided. These services are provided by the Catholic church. Apart from these services, there are water supplies provided by the European Union (EU) but only three of them are working.

Expectations from Government, Community & Family

Participants' responses consisted of requests for more and improved services and support from the government. They also had expectations from their community and local leaders.

Expectations from Government

First, they are requesting the government to resettle them because living in care centers is "like living in hell". They said they have nowhere to make gardens, collect firewood, go fishing and hunting and have no clean drinking water. There are hardly any clean creeks or rivers for drinking, or doing laundry and cooking. The fertile soil is covered with volcanic scoria and dust, which makes it hard for people to cultivate the land for gardening. Fortunately, they have some fruit trees. The population on the island is increasing and they consider the best solution would be to resettle them on the mainland.

The second is for the government to improve the water supply in their community, due to damage from the volcanic eruption. Mothers and children find it hard to fetch water for drinking and cooking. They dig wells but the water tastes salty and is undrinkable. Sometimes they have no choice, so people drink the contaminated water. There has been a diarrhea outbreak in Manam.

The third major need is roofing iron for building houses that are permanent. Their traditional houses have coconut leaf rooves, destroyed by the volcanic dust.

Expectations from community leaders

Community leaders are like the voices of the people, who want the leaders to fix the resettlement of the islanders because it makes the community unsettled, living in temporary settlements as they are now.
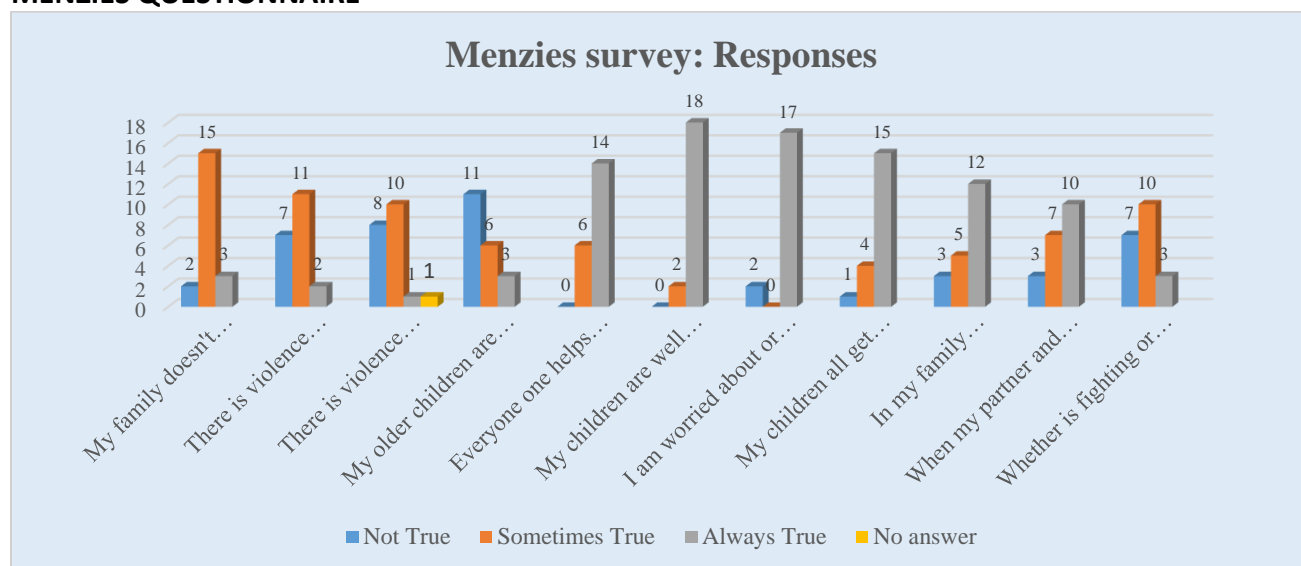
MENZIES QUESTIONNAIRE

Figure 6: Menzies survey: Responses

The above graph shows the responses from Menzies survey administered in the study in Manam. It shows that generally, there is cooperation and peace within the family unit. Although, there is minimal violence between spouses, there is some violence among family members and some concern for drinking and drugs within the family. It is true that families sometimes do not have enough food mostly due to infertile land due to the volcanic eruption. This is confirmed from the participants in the interviews and discussions, that the main problem they face is shortage of food due to the eruption and the volcanic ashes that destroys the land and their gardens. Nearly all the participants mentioned that they are worried about drugs in their families. It is a major concern from the community in Manam.

Additionally, families on Manam faced challenges in terms of food. Most times, they are faced with shortage of food because the beetles eat the plants grown and the ashes from the volcano make the soil strong, making it difficult for the villagers to plant their crops on time. Despite these challenges, people live in peace and whatever food they have, they use them appropriately to feed their families.

Discussion

The voices of community members on Manam Island in Madang Province, Papua New Guinea, reveal an intricate mosaic of perspectives shaped by age, gender, and experience. Through community engagement and dialogue, seven recurring themes emerged that reflect both the continuity of traditional life and the pressures of a rapidly changing world. These include the experiences of children and adolescents, adults and young adults, the influence of modernization, generational gaps and intergenerational conflict, marginalization and exclusion, food and farming practices, and expectations from government, community, and family.

Voices of Children and Adolescents

Children and adolescents on Manam Island often articulate hopes for education, safety, and belonging—especially in the face of displacement and limited services (Alves et al, 2022). Although resilient, many feel excluded from decisions that shape their futures. Including their voices in community planning strengthens child-focused outcomes and builds long-term resilience (UNICEF, 2021).

Voices of Adults & Young Adults

Adult and young adult members face increasing pressure to provide for families amidst changing environments and economies (Cunningham & Rious, 2015). Young adults often feel caught between traditional expectations and modern aspirations, especially in contexts of migration and displacement (Poutama & Hart (2019). Adults highlight the need for community rebuilding and restoring dignity in daily life (Hellström & Beckman, 2021).

Influence of Modernization

Modernization has brought both hope and disruption. Access to technology, education, and urban life has expanded possibilities, but also challenges cultural identity and traditional roles (Mazi & Ojukwu (2019). Exposure to new values sometimes conflicts with customary law, particularly around gender and authority (Sali et al, 2025). The community response to modernization remains divided; some welcome change, others resist it.

Marginalization & Exclusion

Marginalized groups including women, people with disabilities, and those relocated from volcanic areas often lack access to land, leadership opportunities, or essential services (Nadarajah, 2022).). Customary structures often prioritize senior male authority, limiting broader participation (UNDP, 2021). Strengthening inclusive representation is vital for equity and resilience.

Food and Farming

Food security is threatened by declining soil fertility, land shortages, and disrupted farming systems due to resettlement. This is supported by Georgeou et al., (2022) that through reviving traditional techniques and integrating climate-adaptive practices can restore productivity and dignity to farming

Expectations from Government, Community & Family

Displaced communities look to the government for long-term housing, schools, and infrastructure, particularly in the resettlement context (da Costa, 2024).). People also expect transparency from community leaders and compassion from family networks (Baird et al.,2017). Collective responsibility is seen as key to healing and moving forward.

Fieldwork Reflections

1. The four pilot projects have provided an opportunity for staff and students from Divine Word University to develop and test various methods for researching social perspectives of different age and gender groups in four different communities in Papua New Guinea: the first, an isolated highlands community, the second a coastal hills community, the third a community accessible to a major town in the Highlands, and finally, with this fourth study - an island community.
2. On this occasion on Manam Island an educated young woman there challenged the research team commenting that perhaps they were being treated as "guinea pigs" and that DWU should return to offer business or health courses sustaining life on Manam Island. This sentiment needs to be taken seriously.
3. In the previous three project sites we were hosted by relatively healthy sustainable local communities. On Manam our fieldwork was in the context of a village community experiencing

radical social change in association with the insecurity of a natural hazard (volcanic eruption) along with government inaction. The whole context is unstable.

4. We came together with a DWU student from the Island and another with close relatives on the island and this opened means of communication and an atmosphere of trust for us, which would have been much more difficult to establish. Contacts through church links also helped and we were able to be based at the Catholic mission station and travel on a boat arranged through church contacts.

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Acknowledgements

Authors

Emelda Calista Ariku is currently the Postgraduate Senior Liaison officer at the Solomon Islands National University. Previously she was the lecturer in the department of Health Management and System Development at Divine Word University (DWU). Ms. Ariku holds a Bachelor's degree in Health Management and Masters in Research Methodology from Divine Word University. She also holds a Postgraduate Certificate in Higher Education Teaching & Learning from Divine Word University. Email: Emelda.Ariku@sinu.edu.sb

Mathias Miti is a Principal Research Officer (Consultancy) at the Uganda National Examinations Board (UNEB). He is a community development economist, food security fellow, researcher, and educationist. Previously, he worked in Papua New Guinea with the International Organization for Migration (IOM) and VSO International. Mr. Miti holds a Bachelor's degree in Social and Philosophical Studies from Makerere University, a Postgraduate Diploma in Teacher Education from Kyambogo University, and a Master of Science in Development Economics from Uganda Martyrs University. He also completed a Master of Research Methodology program at Divine Word University.

Allan Sumb hails from the Tambul-Nebilyer District in the Western Highlands Province. He is a lecturer in the Department of Tourism and Hospitality Management within the Faculty of Business and Informatics at Divine Word University. He holds a Master of Tourism from Otago University, New Zealand, and a Master of Research Methodology from Divine Word University. His other qualifications include a Postgraduate Diploma in Education, a Postgraduate Certificate in Higher Education Teaching and Learning (both from Divine Word University), a Certificate III in Tourism Operations from the Australia Pacific Training Coalition, and a Bachelor's degree from Divine Word University. He is currently pursuing a PhD at DWU.
Email: asumb@dwu.ac.pg

Philip Gibbs is the President of Divine Word University and a Professor of Social Research. He is a Divine Word Missionary priest and has served in various capacities in Papua New Guinea since 1973. He holds a Postgraduate Diploma in Anthropology from the University of Sydney, an MBA from Divine Word University, and a Doctorate in Fundamental Theology from the Gregorian University in Rome. Email: pgibbs@dwu.ac.pg

Teacher-level factors that influence secondary school students' mathematics performance in Port Moresby: A Structural Equation Model

Jerome Oko

Abstract

A student's mathematics performance is affected by teacher-level factors such as teacher affective support and classroom instruction. The students' performance is indicated by achievement in a mathematics test. Factors that influence the students' achievement are teacher-level factors. The purpose of the study is to identify the factors at teacher-level that influence students' performance at secondary schools. This study employed structural equation modeling techniques to examine students' performance in mathematics through selected teacher level variables. Structural equation modelling was conducted to analyse factors that are predicting mathematics results. The findings of the study revealed that quality teaching, instructional resources and the learning environment have a significant influence on students' mathematics performance. These four factors that directly influenced the mathematics performance also influenced other demographic variables at the teacher level. Among all the factors, instructional resources had the highest total effect as well as indirect effect to performance in mathematics. Hence, this model can serve as a guide in making decisions in the classroom or curriculum in mathematics.

Key words: instructional resources, learning environment, mathematics, quality teaching, performance, teacher-level, structural equation model.

Introduction

The importance of mathematics beyond the four corners of the classroom is undeniable. The various functions of mathematics particularly for mental and logical growth of students are basic for fundamental sciences and engineering courses (Do'stov & Xolmirzayev,2023). It was also mentioned that mathematics was given special attention in terms of educational systems all over the world. Studies were conducted to improve mathematics education (Sarimsakova,2022; Do'stov & Xolmirzayev (2023) and to prepare individuals in the challenges and complexities in their lives, particularly in making well-grounded decisions by applying logical and mathematical reasoning (Tsui, & Khan,2022; Nardi, 2022). Planas, Adler, & Mwadzaangati, (2022) highlight that mathematics is applied in people's daily lives because of its functions in real life such as counting, computing sales, measuring dimensions and much more. Its importance was emphasized as early as primary school and it was described as a key component of the primary school curriculum (Do'stov, Xushboqova, Xolmatov, & Malikova, 2022). Efforts were made to understand the factors that might influence students' achievement in mathematics. Regression analysis was used to determine predictors of mathematics achievement, performance or competence (Devlin, Jordan, & Klein, 2022; Jiang, Cayton-Hodges, Oláh, & Minchuk, 2023; Nuraydin, Stricker, Ugen, Martin, & Schneider, 2023).

A study by Syamsuri & Bahtiar, (2023) employed factor analysis to examine factors that influence students to do mathematics whilst a correlation analysis involving direct and indirect factors was done by Short & McLean, (2023) to examine mathematics achievement. Further, Putwain, & Wood, (2023) employed a structural equation model in determining factors that might influence mathematics performance or achievements. In the studies conducted using the structural equation model, mathematics achievement was influenced significantly by teachers-level factors such as quality teaching and their qualification (Wang, Qin, Luo, Yang, & Xin, 2022; Putwain, & Wood, 2022; Quintero, Hasty, Li, Song, & Wang, 2022). Socio economic status and teacher centered activities have also a positive impact on mathematics achievement (López, Salgado, & Berkowitz, 2023; Mauer, Uchikoshi, Bunge, & Zhou, 2023).

Relationally, the more positive perception of success and interest towards mathematics and science, the higher the scores in mathematics. The achievement of students in mathematics was measured through international studies such as Programme for International Student Assessment (PISA). Some studies used the results obtained from the assessment to explore factors that might influence mathematics. The study revealed that factors that influenced mathematical literacy were factors at the student and teacher level.

Hence, with limited studies on the use of the structural equation model to determine factors that affect mathematics, factors explored in this study do not consider personal, other school-related experiences, family background and views and confidence on mathematics. Researchers such as Liu, Gao, & Chen (2023) and Glover, Reddy, & Crouse (2023) have confirmed that teacher characteristics can have a greater effect on student mathematics outcomes. While the research in support of this contention does find significant effects for teacher characteristics, the magnitude of these effects tend to be moderate (Fosu, Arthur, Boateng, & Adu-Obeng, 2023; Zhu, & Kaiser, 2022). Related to students' performance, there are some teacher level factors which influence their performance. These factors are instructional resources, classroom environment, quality teaching and their demographic variables.

Aim of the study

The study aims to identify teacher-level factors that influence secondary students' mathematics performance in Port Moresby, PNG.

Research questions

1. What are the teacher-level factors that are affecting secondary students' mathematics results in Port Moresby, PNG?
2. What are the relationships among classroom environment, teaching quality, instructional resources, teachers' teaching experience and education level that influence students' mathematics results?

Literature review

This section of the study highlights the different views researchers have towards the teacher-level factors that influence students' mathematics results. There are many factors but this study focuses on relevant factors that are within the PNG classroom context. The first factor is the teacher's education level.

Teacher education level (highest educational degree obtained by a teacher) is one of the main attributes of teacher quality that has gained attention in the literature, and has been the focus of many investigations. However, the results of existing studies examining the relationship between student achievement and teacher education level have found contradicting outcomes, with some studies suggesting a positive relationship and others suggesting that there is no relationship at all (Kosgei, Mise, Odera, & Ayugi, 2013). For instance, a recent study by Tella (2017) finds that the relationship between teacher education level and student achievement is still unclear, while other studies suggest no relationship, and still others suggest a small, positive relationship (Tella, 2017; Zhang, 2008). However, recent studies have focused on whether teachers with a master's degrees or greater have a significantly greater impact on student achievement (Horn & Jang, 2017; Lee, 2018; Sauceda, 2017). These studies found that a teacher having a master's degree in science or education is a statistically insignificant predictor of student achievement in science. By contrast, a study by Baliyan et al. (2012) discovered that advanced degrees such as master's degrees in science or education have a direct influence on student achievement in science.

Other studies emphasize that a teacher cannot be determined to be qualified simply by checking his or her education level and years of experience. This is because teachers influence students through their interactions in the classroom, and teacher education level and experience only represent a portion of the ability to manage the classroom efficiently and to promote student achievement (Kosgei et al., 2013; Sauceda, 2017). Despite that, teacher experience and teacher education level are related to teacher quality. Several studies investigating the relationship between teacher education level and student achievement showed statistically significant positive results (Horn & Jang, 2017; Lee, 2018). In these studies, students were found to have learned more mathematics when their math teachers had an additional degree in mathematics (Kosgei et al., 2013; Lee, 2018; Zhang, 2008). However, only mathematics teachers who have master's degrees in mathematics will significantly improve students' mathematics achievements; and mathematics teachers with a master's degree in a subject other than mathematics will not have great impact on their students' mathematics achievements. In contrast, Zhang (2008) highlighted that an advanced degree in science or education significantly and positively influenced student science achievement. Based on the author's experience, teachers with advanced degrees in mathematics or education are more likely to exhibit positive teaching behaviours, which in turn is a characteristic associated with better student performance in mathematics. The next factor that has a significant effect on students' mathematics results is classroom learning environment

The classroom-learning environment refers "to the social, psychological, and pedagogical contexts in which learning occurs and affect students' achievement" (Yang, 2015, p. 251). In the past decade, there has been a remarkable growth of research in investigating classroom-learning environments in both Western and Eastern countries, such as Australia, the USA, Singapore and South Korea (Yang, 2015). This is due to the impact that learning environments have had on students' mathematics and science results in Trends in International Mathematics and Science Studies (TIMSS) and Programme for International Student Assessment (PISA). For example, the TIMSS 2015 study found a positive relationship between classroom environment and student achievements. This is because an effective learning classroom environment has also been found to increase student motivation and participation (Hogan, Thompson, Sellar, & Lingard, 2018; Malik & Rizvi, 2018; Wang, Yin, Lu, & Zhang, 2017). Therefore, in the context of this study, the classroom learning environment is discussed in respect to a) its role as an innovative learning environment, b) teachers' role in the classroom, and c) the teacher-student interaction/relationship. Together, these aspects can promote a conducive learning environment for both teachers and students in the classroom. Each of these aspects is now discussed in turn. Innovative and positive *learning environment*s are significant because they determine the quality of education received by students (Deieso & Fraser, 2019; Hogan et al., 2018). An innovative and positive learning environment is a system comprising of the physical involvement, the organizational objectives, and the characteristics of teachers and students (Schmidt & Cagran, 2006). According to Shmis, Ustinova, and Chugunov (2019), there is a significant relationship between innovative and positive learning environments and improved achievements through student engagement and behavior. Therefore, the need for teachers to maintain positive environments in the classroom has been continuously emphasised in schools. The positive environment will enable teachers to effectively use instructional resources in their delivery of lessons.

Instructional resources refer to objects or devices that assist teachers to make learning meaningful to learners. Instructional resources can be classified into two types (Aina & Adekanye, 2013; Ode, 2014). The first type are visual resources made up of reading and non-reading resources such as textbooks, teachers' guides, pictures, maps, charts and graphs. The second type consists of audio-visual resources that are made up of both electronically operated and non-electronically operated resources. These resources include laptop computers, audio tape recorders, video tape recorders and slide projectors. These resources offer a variety of learning experiences to meet different teaching and learning challenges both individually or in combination (Fan et al., 2017; Sabah & Hammouri, 2010). A study by Olayinka (2016) in Nigeria found that instructional resources that increase learning are of vital importance to the teaching of any subject in the school curriculum. He further stresses that the use of instructional resources can assist students to be more engaged and motivated in learning. For instance, a teacher who enthusiastically makes use of appropriate instructional resources to supplement teaching enhances and promotes students' innovative and creative thinking. Thus, mathematics results in many countries are reflections of the quality of the instructional resources utilised by teachers, and their use by students at schools (Fan et al., 2017; Olayinka, 2016). This is because such resources are major sources of teachers' planning and practice, and function to bring different

discourses together. Fan et al. (2017) stress that the use of instructional resources is beneficial for teachers' learning as well. Instructional resources can contribute to the professional development of teachers and guide them to teach effectively and with confidence. A study by Sabah and Hammouri (2010) highlights that well-designed, instructional resources can increase participation in learning for both students and teachers. Teachers use textbooks and teachers' guides to assist them to differentiate teaching styles and in understanding the curriculum. A similar sentiment is shared by Clement et al. (2012) who affirm that teaching guides and syllabi assist teachers with new ways to teach and simultaneously ensure that students learn what is intended for them at school.

Research Methods

This study employed a quantitative research design. Primary data in the study was collected in Port Moresby secondary schools in exploring the predictors of students' mathematics performance. The instruments used in this study were adopted from international studies such as Trends in Mathematics and Science Studies (TIMSS) and Programme for International Student Assessment (PISA). The survey questionnaires for teachers were designed to measure quality of teaching, classroom environment and instructional resources, as well as teachers' background/demographic variables. The PISA and TIMSS instruments are combined to obtain comprehensive and relevant responses in the PNG context for mathematics teachers. Mathematics achievement was measured through mathematics test items. The instrument underwent pilot testing before it was given to the teacher respondents. Prior to the administration of this study, it was necessary to obtain ethical research approval from the University of Adelaide's Human Research and Ethics Committee (UAHREC). The UAHREC granted approval for this study to proceed on 14 July 2017 (Ethics Approval No H-2017-133). Since the study was to be employed in Port Moresby, approval was likewise sought from the PNG National Department of Education (NDOE) research division, and secondary schools' secretary for education in Port Moresby, respectively. After that permission letters were given to the authority of the schools. Upon approval, data gathering was scheduled. Teachers were given 45 minutes to 1 hour to answer the questionnaire. A sample size of 344 enrolled in Grade10 took the mathematics test. Analysis of SPSS and MPlus software was used to construct the equation model at the teacher level to determine the factors predicting mathematics performance.

Structural equation modelling (SEM) is "a comprehensive statistical approach for testing hypotheses about relations among observed variables and constructs" (Holye, 1995, p.1 cited in Hailaya, 2014). In this study, the empirical data are used in SEM to quantify and validate the theoretical aspects. This permits the researcher to examine and determine whether a hypothesised relationship exists (or does not exist) among the constructs and demographic variables at the teacher levels (Hooper et al., 2008; Ramlall, 2016). This study used the Mplus version 7.0, a statistical modelling program that provides researchers with a flexible tool to analyse data (Muthén & Muthén, 1998). Mplus estimates regression, path analysis, confirmatory factor analysis, structural equation modelling (SEM) and discrete and continuous analysis models (Byrne, 2013; Muthén & Muthén, 1998; Wang & Wang, 2012). In quantitative research, a model is used to represent the phenomena under investigation. The model may be illustrated in

pictorial/graphical form, or in a series of structural equations to represent the relationship under study. The theory under study is made clearer through these representations. According to Ramlall (2016) and Kline (2015), models in graphical form use the following shapes to represent the symbols most often used in SEM diagrams. They are:

a) Ellipse symbols representing latent variables
b) Rectangle symbols representing observed variables
c) Straight single-headed arrows representing the impact of one variable on another variable (relationship) and,
d) Doubled-headed arrows representing covariance or correlation between pairs and variables

The hypothesised teacher-level model

The hypothesised teacher-level model shown in Figure 1.1 is derived from the literature. The theory identified that Quality teaching (QT), Classroom Environment (CE) and Instructional Resources (IR) are significantly affecting students' mathematics results. As highlighted in the literature review section combined with other demographic variables such as teaching experience, level of education, and specialization of subjects, influence teaching methods at the teacher-level, and consequently have an impact on students' mathematics results. These demographic variables are hypothesised as exogenous (independent) variables as they are not influenced by other variables and scales in the teacher-level model. The factors QT, CE and IR at the teacher level are viewed as endogenous (dependent) variables, as they may interact with one another at the teacher-level model. As mentioned earlier in relation to the student-level model, scales or variables in the process are product variables and are viewed as endogenous, due to the mediating effect or influence they have on the teacher-level model. The proposed theoretical framework in Figure 1.1 shows that the observed variables and two scales (CE and IR) influence the scale QT, therefore having an indirect impact on students' mathematics results.
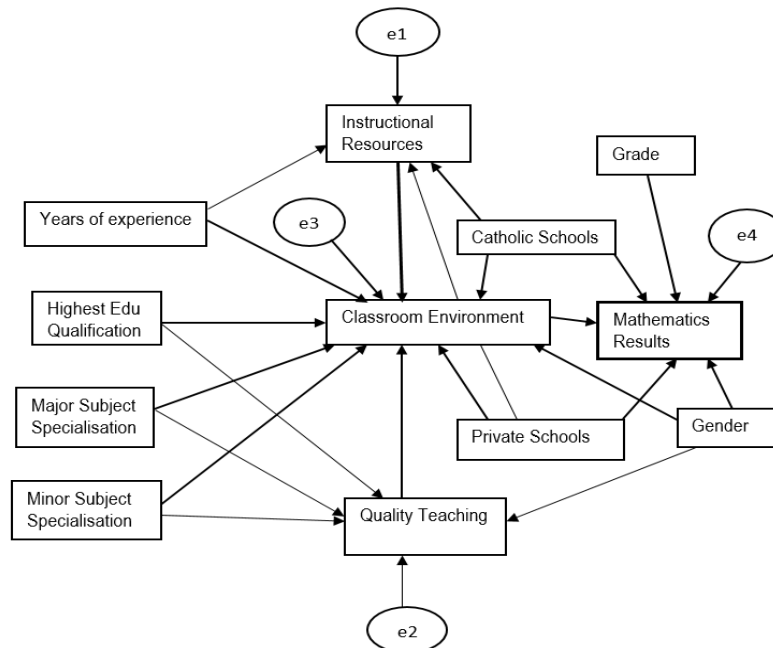
Figure 1.1 The proposed teacher level model (n=41)

Analysis and Results

After deleting the variables not conforming to the statistical criteria, the final teacher-level path is shown in Figure 1.2. The deleted demographic variables from the hypothesised teacher-level model are: grade, gender, highest education level and minor areas of specialisation, as they were not within the set statistical criteria.
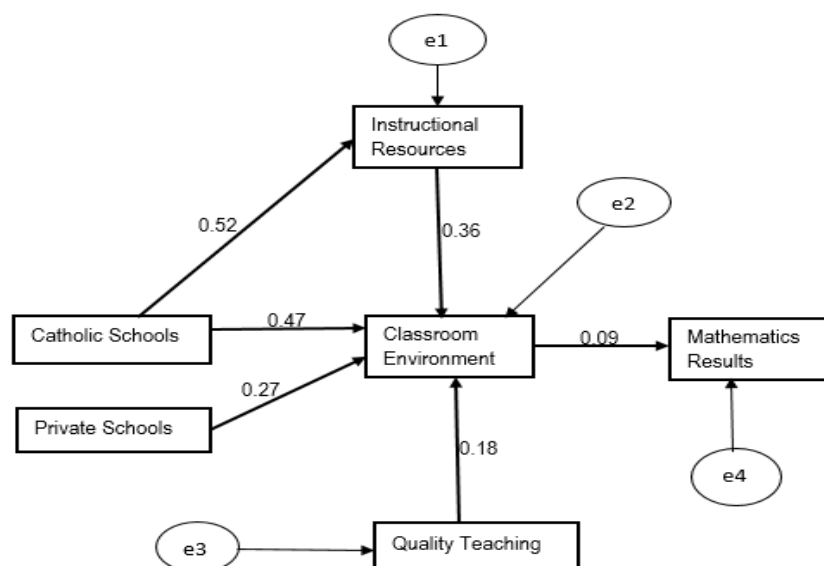

Figure 1.2 The final teacher level model (n=41)

Measurement model results for teacher-level scales

The scales at the teacher-level *quality teaching* (QT), *classroom environment* (CE) and *instructional resources* (IR) had single-factor structures and were represented by a single score. Therefore, the three constructs were treated as observed variables for the path model in terms of analysis. This means that all the variables at the teacher level reflected in Figure 1.2 involve only observed variables with no latent components. As a result, there was no discussion about the measurement model reflected in this section.

Teacher-level model fit indices

Table 1.1 shows the results of the fit indices of the final teacher-level model. Similar fit indices employed in the student-level model are used in this section. As shown in Table 1.2, the RMSEA value of 0.06 and SRMR values of 0.03 reflected a good model fit, as they are close to 0. Moreover, the CFI (0.97) and TLI (0.94), also provide acceptable values above 0.90 (i.e., closer to 1), indicating that the final teacher level-model is a parsimonious model.

Table 1. 1 The results of the fit indices of the final teacher level model

Fit Index	Obtained values	Remarks
X^2/df	7.09/6=1.18	Acceptable fit
RMSEA	0.06	Acceptable fit
SRMR	0.03	Acceptable fit
CFI	0.97	Acceptable fit
TLI	0.94	Acceptable fit

Results of teacher-level structural model

The Mplus 7.0 structural model results at the teacher level are presented in Table 1.2. The next section discusses in detail the standardised estimates for the direct and indirect effect of the variables on mathematics results.

Table 1. 2 Teacher level variables with structural model results

Dependent Variable		Teachers Direct (β)	Indirect (β)	Total (β)	*p*
	Independent				
IR					
	Catholic	0.52	-	0.52	0.00
CE					
	IR	0.36	-	0.36	0.00
	QT	0.18	-	0.18	0.04
	Catholic	0.47	0.06	0.06	0.00
	Private	0.25	-	0.25	0.04
Maths Results					

QT	-	0.02	0.02	0.03
IR	-	0.03	0.03	0.04
CE	0.09	-	0.09	0.03

Findings and Discussion

Figure 1.2 and Table 1.2 show that *Catholic schools* (β=0.52) have a significant (p<0.05) direct effect on instructional resources (IR). The path coefficient of Catholic schools on instructional resources indicates that Catholic schools provide adequate instructional resources for teaching compared to public and private schools. This finding indicates that Catholic schools provide instructional resources for both teachers and students for teaching and learning to be effective in the classroom. Consequently, this can have a positive effect on students' mathematics performance. Similarly, *IR* (β=0.36), *QT* (β=0.18), *Catholic* (β=0.47) and *private* (β=0.25) have direct effect on classroom environment experience (CE). These results are supported by the researcher's experience in teaching, that quality teaching and instructional resources provide a better learning environment in the classroom. As a result, there is improvement in students' academic performance. In addition, *instructional resources* have a significant (p<0.05) effect on the classroom learning environment. This indicates that teachers use different resources to be more creative in imparting knowledge and producing more successful learning spaces. Moreover, *Catholic and private schools* have a significant impact on the teaching environment, suggesting that teachers at these schools encourage a conducive environment for both teaching and learning in classrooms, compared to the public schools (baseline schools). Furthermore, the *quality of teaching* (β=0.18) of teachers has a significant (p<0.05) effect on the classroom environment, with a positive path coefficient. This suggests that higher-quality teaching produces a better learning atmosphere for teachers and students to work collaboratively in the classroom. Moreover, *Catholic schools* (β=0.06) exerted a positive indirect effect that is mediated by instructional resources and classroom environment on mathematics results. This suggests that Catholic schools also offer better instructional resources to support teachers' instructional practices, compared to both private and public schools, thereby promoting better classroom learning environments.

As indicated in Table 1.2, *classroom environment* (β=0.09) has a direct significant impact on the students' mathematics results. This result supports studies that a conducive learning environment supports students to learn effectively. The teachers' role is to create an atmosphere for learning in the classroom where students are motivated but challenged to discover information. Moreover, quality teaching (β=0.02) has an indirect significant (p<0.05) influence on the students' mathematics results. Similar findings are evident in other studies on quality teaching (Helda, & Syahrani, 2022; Jamoliddinovich, 2022; Wang, & Yang, 2023). Instructional resources (β=0.03) is another factor shown in Table 1.2 that has a significant effect on mathematics results. This indicates that instructional resources have the potential to motivate the students and increase engagement in the lessons. Studies also reveal that instructional resources enable students to be proactive and become independent learners (Munene, Mutsotso, & Masibo, 2023; Dantic, 2023).

Conclusion

In this study, the teacher-level model was analysed to examine the factors identified in the literature that are affecting secondary students' mathematics results using Mplus 7.0. The structural equation model was employed to identify predictor variables of mathematics performance. Findings from the structural equation model at the teacher-level analysis with variables such as instructional resources, quality teaching and Catholic schools had a significant ($p<0.05$) relationship with the classroom environment. This result reflects the hypothesised relationship that *instructional resources*, *quality teaching* and *Catholic schools* are correlated with classroom environment. The classroom environment, quality teaching and instructional resources had a significant ($p<0.05$) effect on the students' mathematics results. This study's findings confirm the results of the literature that instructional resources, quality teaching and learning environment have an influence on students' performance in mathematics.

Recommendation(s)

This section highlights the recommendations, based on the findings of this study.
- The government of Papua New Guinea (PNG) should invest more money in training secondary school mathematics teachers at training institutions and universities. This is because confident teachers with adequate content knowledge and effective teaching pedagogies have more influence on their students' mathematics outcomes.
- Quality teaching should be encouraged at schools to promote quality learning as it has an influence on students' mathematics results.
- Teachers should create and develop a conducive learning environment to promote effective learning. This is due to the fact that in this study learning environment has a significant effect on the students' results.
- Adequate instructional resources should be available for teachers to use in their lessons to assist students in their learning.

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Author

Jerome Oko (PhD) is currently the Campus Administrator for Divine Word University (DWU), Port Moresby Campus in Papua New Guinea. He obtained his Bachelors in Education-Technical degree from Don Bosco Technological Institute in Papua New Guinea. He received his Master and Doctoral degrees in Mathematics Education from the University of Adelaide, South Australia. Currently, his enrolled for Master in Business Administration at Divine Word University. His Research interest areas include Mathematics and Science Education. His research covers measurement and evaluation in Education. He mainly employs in his data analysis newer psychometric techniques such as Rasch model and multi-level modelling. Email: joko@dwu.ac.pg

Essential pillars of e-government for Papua New Guinea

Martin Daniel

Abstract

The advances in information and communications technologies, including the widespread use of the Internet, have enabled the adoption of innovations. Businesses, institutions and various organisations are able to improve their processes and achieve effective service delivery by improving the way they conduct their daily activities. Governments are also able to provide their services such as visa applications online. The Papua New Guinea Government is striving to provide such services online but the progress has been slow. To gain some understanding, qualitative methods were used to collect and analyse the data from selected participants in the public and private sectors and educational institutions to identify the main pillars of e-government. This paper reports on this study by providing an understanding of the essential pillars of e-government in Papua New Guinea, which need to be considered for further e-government development.

Key words: back-office reorganisation, citizen-centricity, electronic government (e-government), resources, governance, interoperability, new organisational models, people, pillars of e-government, processes, social inclusion, standardisation, technology, virtual organisation.

Introduction

The advances in information and communications technologies (ICT) including the widespread use of the Internet have enabled the adoption of innovations such as e-commerce and e-learning. Businesses, institutions and various organisations are able to improve their processes and achieve effective service delivery by improving the way they conduct their daily activities. Businesses are enhancing the way they are marketing and selling their goods and services while educational providers are facilitating teaching and learning activities in fully online or blended mode. Governments are also able to provide their services such as visa applications online.

The Papua New Guinea (PNG) Government is striving to provide such services online but the progress has been slow due to various issues. This paper will provide an understanding of the essential pillars, which affect e-government development. It will discuss the research context, literature review, methods used to collect and analyse the data, findings and discussion, and conclusion of the study.

Research context

Many PNG citizens have become more internet-aware and have had good experiences in accessing electronic services from the private sector. They expect similar services from the public sector (Al-Shafi, 2009). For example, customers expect to be able to apply for their passports online. Electronic government (e-government) attempts to imitate the private sector by providing services efficiently and effectively.

The PNG Government has broadly stated in its various development plans (e.g. Medium Term Development Plan 2011 – 2015) the need to provide advanced and affordable ICT infrastructure reaching all parts of the country and access to e-government services such as e-passports and other online applications. These plans aim to provide access to these services to be fully implemented by 2030 (PNG Government, 2010a). Although the Government has invested in ICT initiatives, e-government is not yet fully implemented (Manohar, Rao, & Mellam, 2010). Progress has been slow, as in other developing countries (Nelson, 2002, November 22; Sodhi, 2016). Thus, it is desirable to explore more aspects such as essential pillars of e-government development in PNG, which has the potential to improve service delivery (Meiyanti, Utomo, Sensuse, & Wahyuni, 2018; Singh et al., 2011; Sodhi, 2016). These issues motivated the researcher to undertake this study, to explore the pillars of e-government in PNG.

Literature review

E-government has been defined as a way of enabling agencies to provide easily accessible services online to citizens, businesses and various stakeholders (AL-Sowayegh, 2012). It is about "providing public access via the Internet to information about all the services offered by central government departments and their agencies; and enabling the public to conduct and conclude transactions for all those services, for example, paying tax, claiming and receiving benefits, getting a passport. It is also about departments harnessing new technology to transform the internal efficiency of government departments" (Margetts & Dunleavy, 2002, p. 1).

E-government in developing countries

Many countries are using e-government to improve processes in the public sector, making them more efficient and increasing effectiveness in service delivery (Alsaif, 2013; Alshehry, 2008). Many see e-government as a powerful tool to achieve better government and have developed policies and regulations to promote such developments (Rokhman, 2011). These services can be provided with the necessary infrastructure, appropriate regulations, capacity-building (Abdalla, 2012; Al-Shafi, 2009; Alshehri, 2012; Bwalya, 2018d), and conducive cultural, political and economic conditions.

E-government initiatives in developing countries have mixed records. If they fail, it is usually due to such challenges as presented above (Bwalya, 2018c; Pathak et al., 2008). However, there have been a variety of successful initiatives. In Brazil, Citizen Service Assistance centres were established in shopping malls and other public places so that citizens can access public services such as identification cards, job applications, passports and checking their retirement eligibility (Ndou, 2004; UNDP, 2018). In Nigeria, citizens can now apply for passports while non-citizens can apply for visas (Nigeria, 2018). In the Bahamas, citizens can pay traffic fines and businesses can pay their annual fees (Bahamas, 2018). In Fiji, e-government is being employed but adoption and diffusion are slow due to issues related to technology, laws, regulations and human resources (M. H. Rahman, Naz, & Singh, 2016). Birth, death and marriage certificates can all be applied for online (Fiji Government, 2008).

A few PNG agencies provide limited online services. The Investment Promotion Authority enables its clients to register their businesses online without having to wait for months to obtain their registration documents (Investment Promotion Authority, 2018a). Immigration and Citizenship Service Authority provides online applications for visas, allowing online payments and reducing processing times (Immigration & Citizenship Service Authority, 2019). The Department of Higher Education, Research, Science & Technology (DHERST) enables grade 12 school students to apply online for tertiary studies through the National Online Application System (DHERST, 2018a). The students are then selected using the National Online Selection System according to their choices and institutional entry requirements (DHERST, 2018b).

Pillars of e-government in developing countries

"The rise of the digital society, internet and affordable computing have brought about a shift from traditional government offices with paper-based processes towards electronic resources such as the web and intranets" (Kaczorowski, 2014, para. 1). This change has affected governments and their citizens, businesses and other stakeholders. This led to the emergence of the e-government.

E-government is not all about technology but how to develop a civil society (Kaczorowski, 2014). It is not all about systems and specifications but government; not about computers and websites but citizens, businesses and other stakeholders; not about translating processes but transforming processes (Boughzala, Janssen, & Assar, 2015; Satyanarayana, 2006). These create a challenge for governments to use technology to increase the quality of public services, which includes reducing costs and improving connectedness with citizens, businesses and stakeholders.

E-government is based on various pillars, including "citizen-centricity, standardised common infrastructures, back-office reorganisation, governance, new organisational models and social inclusion" (Kaczorowski, 2014, para. 3), people, processes, technology and resources (Kalam, 2006). These pillars are essential themes around which e-government is developed and need to be carefully considered holistically in the planning, implementation and monitoring processes to obtain the desired e-government outcomes (Satyanarayana, 2006).

Methodology

Methodology refers to the research process (Creswell & Clark, 2011) and is "a broad approach to scientific inquiry specifying how research questions should be asked" which includes "preferences for designs, sampling logic, data collection and analytical strategies, guidelines for making inferences, and the criteria for assessing and improving quality" (Teddlie & Tashakkori, 2009, p. 21). Qualitative methods were used to explore participants' experiences and perceptions concerning the e-government pillars and how they could be considered for further development. Purposive sampling was used to identify participants for exploring people's experiences and perceptions. This sampling enables researchers to use their judgement to choose participants who are most knowledgeable on the issue under investigation (Saunders et al., 2016). The

participants included knowledgeable people from the public sector (e.g. government agencies), private sector (e.g. businesses) and educational institutions, who had relevant experiences and perceptions to provide the required data.

Semi-structured interviews were conducted to collect rich qualitative data about experiences and perceptions concerning the pillars and how they could be addressed. Semi-structured interviews do not use a standard set of questions. However, "the researcher will have a list of themes and questions to be covered, although these may vary from interview to interview" (Saunders et al., 2009, p. 320). Some questions may be excluded, the order of questions may change and additional probing questions may be asked during the interviews to explore the research questions. The interviews involved probing questions when more insight and a deeper understanding of the phenomena were required.

Thematic analysis was used to analyse the data to identify the main themes, which were found as the main pillars of e-government. It provides an orderly and logical way to analyse qualitative data to identify themes or patterns related to a research problem, question or objective (Saunders et al., 2016).

Ethical processes were followed, which included obtaining ethical clearance and using informed consent forms.

Findings and discussion

There were general consensuses among the interviewees about the pillars of e-government in PNG. From the thematic analysis, ten important pillars were identified (Figure 1).
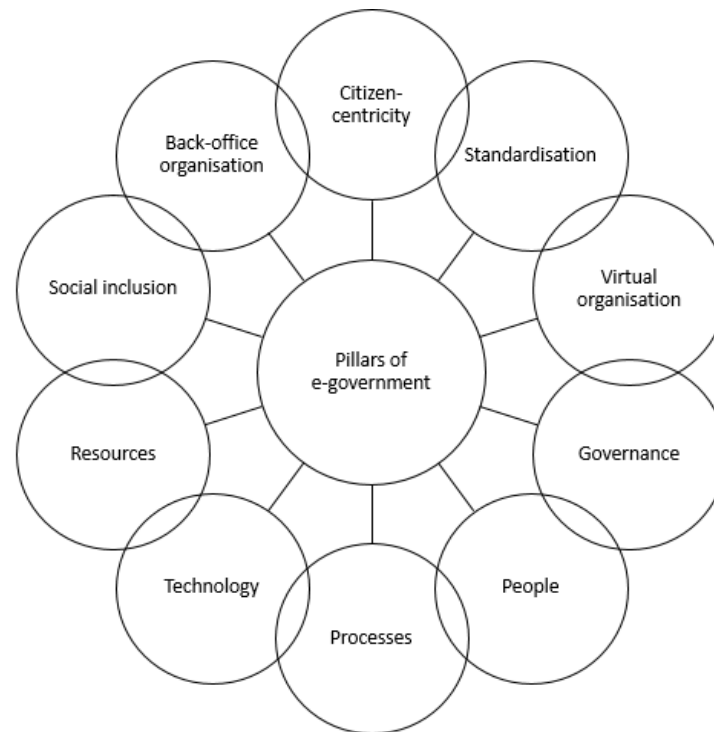
Figure 1: Pillars of e-government development in PNG

The above pillars are interrelated and cannot be considered in isolation, and all need to be considered carefully for effective development. These findings are similar to those of various studies in other developing countries as discussed below.

Citizen centricity

Many interviewees agreed that citizen-centricity is required to meet citizens' needs and expectations. Citizen-centricity "is about shifting the focus from government operational requirements to delivering services based on citizens' needs" (Daniel, 2021, p. 31). It places the citizens at the centre of public service delivery (Kaczorowski, 2014). Citizens desire efficient and easy-to-use services that meet their needs (Berntzen, 2013). The citizen-centric approach not only meets citizens' expectations but also enables them to participate and make decisions in the government processes (United Nations, 2010b). This approach can enable governments to "achieve essential efficiency gains and improve service delivery levels, increase usage of online services, thereby improve sustainability and encourage investment in e-governance [and] improve citizen satisfaction with government services" (Malik, Gupta, & Dhillon, 2014, p. 92).
PNG government needs to "develop the capacity to act as a single enterprise so that citizens," businesses and stakeholders "feel that they are being served by one organisation". It needs to organise itself around citizen demands and expectations and "develop flexible organisational structures" (Kaczorowski, 2014, para. 4). The Government needs "to change focus from prioritising their operations to prioritising the service needs of the citizens. In this way, it would be able to redesign its processes around meeting the needs of the citizens in a cost-effective and timely manner rather than simply automating its processes" (Daniel, 2021, p. 34).

Standardisation

"Standardisation is the process by which specifications are set ... [to] ensure that devices, systems and services retain the ability to connect and interoperate with each other, boosting innovation, [openness] and [competitiveness]" (European Commission, 2019, para. 1). Many participants consented that standardisation is a key pillar as it allows interoperability between systems, processes, software and networks. "Given the complexity of government structures and processes, which have evolved with different, poorly coordinated legacy systems, few governments can afford to take the steps taken by the private sector towards a consistent standardisation of ICT" (Kaczorowski, 2014, para. 6). PNG Government needs to establish standards and national e-government strategies to achieve interoperability between their systems, processes, software and networks, and enable resource sharing to serve citizens better (Daniel, 2021).

Back-office reorganization

Back-office is part of an organisation that is not client-facing and supports the front office (Indeed, 2020). Back-office reorganisation involves automating routine administrative processes so staff can focus more on service delivery. Many participants expressed the need for PNG agencies to re-organise their back offices because governments significantly reduce cost and improve service delivery "when they reorganise their back-office processes before bringing services online" (Kaczorowski, 2014, para. 7). The PNG agencies' back offices require adapting and reorganising to meet challenges and opportunities. This will lead to increased productivity and flexibility, simple organisational structures, greater interoperability and improved working conditions. It also leads to a reduction in the number of citizen visits to public offices, quicker and improved service accessibility, greater transparency and ease of service usage (Millard & Iversen, 2004). Reorganising the back office will help the PNG agencies to realign their government's processes to support the front office in serving the citizens based on their needs.

Governance

Governance refers to structures, systems, practices and processes that are designed to "define how decisions are to be made and establish the organization's strategic direction; oversee the delivery of its services; the implementation of its policies, plans, programs, and projects; and the monitoring and mitigation of its key risks; and report on its performance in achieving intended results and use performance information to drive ongoing improvements and corrective actions" (Canadian Audit & Accountability Foundation, 2010, para. 2 - 4).

Many expressed that PNG lacks appropriate governance structures to enable e-government development. Usually, ministries and agencies were responsible for driving their strategies, leading to "a lack of coordination and interoperable systems, and duplication of solutions" (Kaczorowski, 2014, para. 8). This resulted in a waste of unnecessary resources and efforts. Appropriate governance structures are required at the national level to drive e-government

strategies and ensure proper planning and coordination of e-government initiatives. This suggests that appropriate policy frameworks are also required to support e-government development (Shivakumar, 2002; Talip & Narayan, 2011).

Virtual organization

"An organizational model describes the objectives and the structure of an organization in terms of roles, norms, relations between roles and interactions between roles" (IGI Global, 2020, para. 1). "The current traditional organisational model where organisations operate in isolation will not be able to meet the current citizen demands on time. This necessitates the need to have new organisational models, which require the creation of a network of virtual organisations" (Daniel, 2021, p. 32).

A virtual organization is a network of agencies, joining together "to provide innovative, high-quality products or services instantaneously in response to customer demands" (Advameg, 2020, para. 1). It has more resources and capabilities than each organisation as they mobilise their resources and capabilities to meet citizen needs. Since it requires "joining up multiple organisations to achieve results that a single organisation could not achieve alone, this approach involves breaking down traditional structures based on separate functions and working flexibly and innovatively across boundaries to deliver better value to the citizens" (Kaczorowski, 2014, para. 9). PNG "agencies should now work in partnership with other agencies and the private sector to embark on e-government initiatives" (Daniel, 2021, p. 35).

Social inclusion

Social inclusion is about "the process of improving the terms of participation in society, particularly for disadvantaged people, through enhancing opportunities, access to resources, voice and respect for rights" (United Nations, 2016, p. 17). Many participants agreed that e-government services must be accessible to all citizens including the disadvantaged and those with special needs. The expansion in ICT can have the potential to reduce the gap between digital haves and have-nots (Kaczorowski, 2014). Effective e-government strategies need to address this issue and achieve social inclusion by "improving the ability, opportunity, and dignity of those disadvantaged on the basis of their identity" (World Bank, 2020, para. 1). These disadvantaged people include those with a disability or are located in remote areas. The PNG Government must establish strategies and mechanisms to ensure that e-government services reach everyone including those with special needs.

People

PNG agencies require qualified staff to implement while citizens need the know-how to access e-government services. People, both in and outside, government agencies play a vital role in ensuring the success of e-government initiatives (Abdalla, 2012; Kalam, 2006; Moatshe, 2014). E-government can bring transformation to agencies and therefore requires substantial resources including financial and human resources with the required knowledge, skills, experiences and

commitment (Abdalla, 2012; Moatshe, 2014; Yadav & Singh, 2012). Staff may require appropriate training for a new set of skills. Senior officers and their staff need accurate information about e-government to secure their support and contribution. Active citizen participation is also necessary to contribute to the success of e-government (Moatshe, 2014).

Processes

As previously mentioned, e-government is not about process automation with its inefficiencies, but process transformation and the creation of relationships between the government and its citizens, business and stakeholders (Abdalla, 2012; Kalam, 2006). Government processes are usually slow, inflexible, operate in isolation, and usually lack service-centricity and citizen focus. These issues lead to long queues and unnecessary intermediaries at service delivery points. "Typically, citizens make multiple visits to government offices unsure of the outcome or quality of service, mystified by government procedures and at the mercy of government officials" (Kalam, 2006, p. 31).

The PNG Government needs to reengineer its processes, which involves radical thinking and redesigning processes to achieve significant improvements in performance including cost, quality, service and speed (Bhaskar & Singh, 2014). It "requires that an agency implement substantive reform in organizational structure, initiate a change in culture and mindset, train and improve skills of its people, and put in place appropriate supporting ICT infrastructure to enable online processes that are timely and efficient to both the user and the government agency" (Kalam, 2006, pp. 31-32).

Technology

PNG needs a standardised overall strategy, roadmap and infrastructure. Although e-government is not all about technology, the latter is an enabler and can have the potential to transform government processes, leading to achieving e-government outcomes (Abdalla, 2012; Moatshe, 2014; Reddick, 2018). E-government success depends on having an overall architecture, ICT strategy and roadmap, standardised infrastructure including well-established communication networks, and adopting a service-oriented approach to development (Abdalla, 2012; Kalam, 2006). PNG Government can carefully address these issues by having a proper ICT governance structure for e-government development. This structure should specify e-government principles, policies, architecture, infrastructure, applications, investment and prioritisation (Kalam, 2006).

Resources

The participants expressed the need to have all the required resources available when needed to achieve e-government and realise its benefits. E-government requires financial and human resources, and huge investment in ICT (Abdalla, 2012; Moatshe, 2014). A lack of resource commitment and sustainability can lead to e-government failure or delays. Adequate funding is necessary for the lifetime of e-government initiatives and needs consideration at the beginning of projects. This requires political and top management commitment and support, and proper

planning and coordination so that resources are utilised in a coordinated way for maximum e-government benefits and outcomes. Further, governments can consider public-private partnership arrangements to mobilise resources from the public and private sectors (Kalam, 2006; Yadav & Singh, 2012). In this way, the PNG Government provides funding while the private sector provides technical expertise and management efficiency to embark on e-government projects.

Although e-government presents many challenges and requirements, many countries with differing levels of e-government development show that governments that are ambitious, visionary and committed can overcome these challenges and meet these requirements. Governments can reengineer their infrastructures, thus, creating new ways to enable two-way connections with citizens, businesses and stakeholders.

Conclusion

The rapid advances in technologies including the widespread use of the internet have enabled the adoption of innovations. Many PNG citizens have become more internet-aware, have had good experiences in accessing electronic services from the private sector and expect similar services from the public sector. E-government attempts to imitate the private sector by providing services efficiently and effectively.

The PNG Government has broadly stated in its various development plans the need to provide infrastructure and provide access to e-government services. Although the Government has invested in ICT initiatives such as e-government, it is not yet fully implemented, and progress has been slow, due to various issues.

This paper examined the essential pillars around which e-government is developed. It discussed the research context, literature review and methods used to collect and analyse the data. The findings demonstrated that there are ten main pillars, which reflect similarities with other developing countries. As a result, the paper provided an understanding of these pillars so that they could be carefully considered to facilitate further e-government development. These pillars are interrelated and should not be considered in isolation. Otherwise, those being unconsidered will affect e-government progress. E-government development would be slow or delayed if, for example, limited resources are mismanaged or qualified personnel are not involved in the process.

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Author

Martin Daniel (PhD) is an Associate Professor and the Academic Dean of the Faculty of Business & Informatics at the Divine Word University in PNG. He holds a Bachelor's degree in Information Technology from the University of Queensland in Australia, a Master's degree in Information Technology from the Queensland University of Technology in Australia and a Doctor of Philosophy from the Divine Word University in PNG. His interests include researching and modelling technological developments (e.g. e-government) in PNG. Email: mdaniel@dwu.ac.pg and mdmartindaniel@gmail.com

Social media usage and its influence on learning

Terence Subam

Abstract

This research study explored social media and its influence on students' learning. Social media have become frequently used by many people throughout the world, whether it be for enjoyment, as in creating relationships and networking with others, or for academic purposes, as in seeking new information. Mixed methods was used in this case study, utilising qualitative and quantitative approaches throughout the research process using the convergent parallel design. Purposive sampling was used to select sixty undergraduate students. Techniques used to collect data are questionnaires, semi-structured interviews and observation. The research study looked at the benefits and impacts of social media usage on university students' learning and explored ways to adopt social media to facilitate learning at the university.

Key words: Social media, social networking, student teachers, connectivism, constructivism, teaching and learning

Introduction

Social media has been widely used by students witnessing a rise in regular social media usage with institutions at higher levels (King, Nelson, & Taylor, 2012; Jordon, 2015) where "interactive platforms has become an inevitable part of university students' everyday lives" (Casero-Ripolles, 2012 cited in Kong, 2021, p.34). Exploring the use of social media by university students helped the researcher to identify the impact and benefits on their learning, to explore practical avenues to adopt social media in nurturing a productive higher academic or educational environment.

Background

Nowadays, people are looking for better ways to communicate with each other in this age of digitization using the rapidly increasing number of social media networks. Social media have become frequently used by many people worldwide for enjoyment, as in creating relationships and networking with others, or for academic purposes in seeking new information.

There are many social media platforms available that university students can access anytime, anywhere using a computer or phone connected to the internet for personal use or academic reasons. Examples of social media platforms, social networks, or applications widely used are Facebook, WhatsApp Messenger, Instagram, Twitter, YouTube and Tiktok. Educators can use social media to create conducive shared learning experiences to complement existing classroom practices (Albert, 2015) to boost learning. As stated by Wang and Meiselwitz (2015, p.96), "learning paradigms have shifted over the last decades from a traditional setting to include online learning, e-learning, collaborative learning, and many hybrid forms." However, Alsaif (2016) cited Zarzycka, Krasodomska, Maka, and Radwan (2021) affirmed that social media can become useful if used appropriately for academic purposes and for sharing information. Most social media

functional programs are for sending messages instantly through text or voice. They also include video chats, sharing images or photos, files or documents, music, user location, and other content that can be utilized educationally.

The purpose of the research study is to find answers to achieve the following objectives:
    a. To explore the benefits and impacts of social media usage on university students' learning
    b. To discover ways in adopting social media to facilitate learning at the university level.

This research focused on four research questions that guided the research process.

    1. How has social media influenced the learning of university students?
    2. What are the impacts of social media on the learning of university students?
    3. What are the benefits of social media on the learning of university students?
    4. How can social media be adopted to facilitate learning at the university?

Methodology

Mixed methods approach was used to collect and analyze both qualitative and quantitative data. The study explored a range of perspectives, identifying connections or inconsistencies among variables tied to the research questions, helping to interpret both qualitative and quantitative data. Techniques that were used to collect data are questionnaires, semi-structured interviews, and observation.

Purposive sampling was used to select participants from the total population. A survey using a checklist and Likert scale was conducted among social media users from the Year Four class, and the most active and frequent users were deliberatively chosen from the overall population. Purposive sampling was used in this research for the reason that participants that were engaged have specific "knowledge and experience" (Creswell & Plano, 2011) about or are familiar with the research topic already.

Data collection methods that were used are surveys, questionnaires, semi-structured interviews (focus groups), and observation (anecdotal) using the "convergent parallel design" (Creswell, 2015; Creswell & Creswell, 2018). Firstly, a student-feedback survey was done digitally prior to data collection to determine two things: participants who are frequent users and the high usage of social media platforms. The ICT personnel at the research site offered technical assistance. Secondly, a hard copy questionnaire was given out to participants who were frequent users shown by the student-feedback survey. The questionnaire was divided into two sections. The first one related to the personal data of the respondents such as gender and their educational level. The second section consisted of different questions that related to the use of the social media. Semi-structured (focus group) interviews were conducted with Year Four students and recorded. Finally, a series of observations during lecture times took place through the use of a checklist as a way of making anecdotal notes to determine the use of social media. Data collection was synchronized and the approach of triangulation was used to bring together data by collating, sorting and analysing them making comparison by working out similarities and differences.

Discussions and findings

Findings are categorised into four main themes: usage of social media on learning, impacts of social media on learning, benefits of social media on learning, and adoption of social media at the university.

Usage of social media and learning

Social media is used by many people, particularly primary school-age children through to the university level. "For today's younger generation, social media is common place; and children grew up with it in their homes, schools, and on their cell phones" (Thompson, 2011, p.169). Social media is commonly used by everyone at this age and time. Its usage has negative and positive impacts on the user and how others perceive it. From the data collected, the three most common platforms used on a daily basis are Facebook (36%), WhatsApp (34%), and YouTube (15%), whilst the least used are Tiktok (8%) and others (5%) as in Google, and Instagram (2%). All respondents access social media through a smart phone or an android phone.
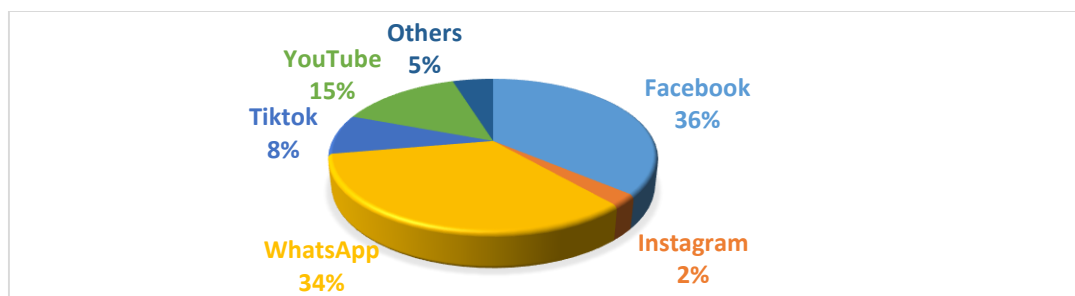
Figure 1: Daily social media usage

There are many social media applications or platforms available to choose from. The most favorable is Facebook, which allows university students to communicate with each other. Academically, Facebook can enhance activities like "course communication, school functions, track intramural and extra-curricular events" (Safko & Brake, 2009 cited in Eunson, 2012, p.712).

Accessing social media has a lot of purposes. Results show that the majority (47%) of students like to keep in touch with friends, thirty percent (30%) utilize social media as a tool for exploration, and twenty-three percent (23%) like to discover new ideas.
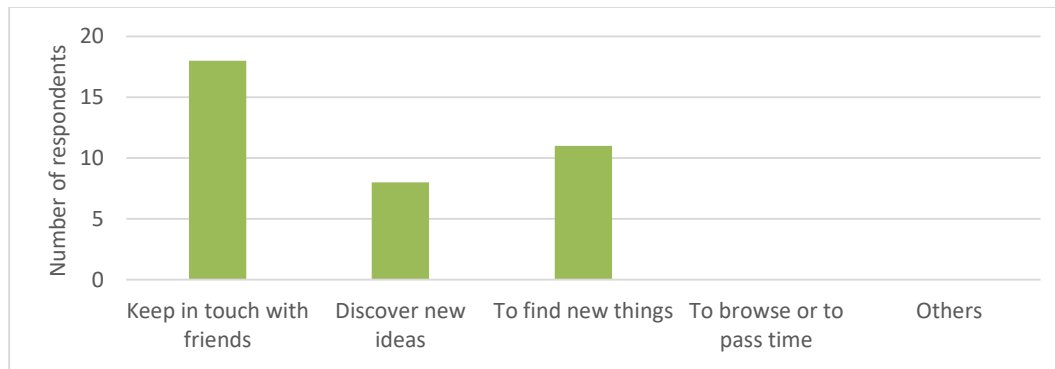
Figure 2: Purpose of social media usage

Twenty-seven percent (27%) of respondents indicated that they use social media regularly, forty-nine percent (49%) once or twice daily, and twenty-four percent (24%) once or twice a week. According to Bialy (2017: p. 73) university students engage in frequent communication and are motivated in part by their use of social media.

According to Henning cited in Lewis and Parry (2021, p. 233) and Wang (2016, p. 57), social media platforms recognize "photographs and other images such as graphics and video clips" as effective ways to aggravate inner deep feelings to provoke users. University students spend hours on social media to communicate with others, keep in touch with friends or discover what is in their feed to see what is going on around them, which are influenced by photographs and images. Data showed that those who use social media daily vary in the time spent on social media. Seventy-six percent (76%) of respondents spend 1-2 hours, twenty-one percent (21%) spend 2-3 hours, and three percent (3%) spend 6 hours or more.
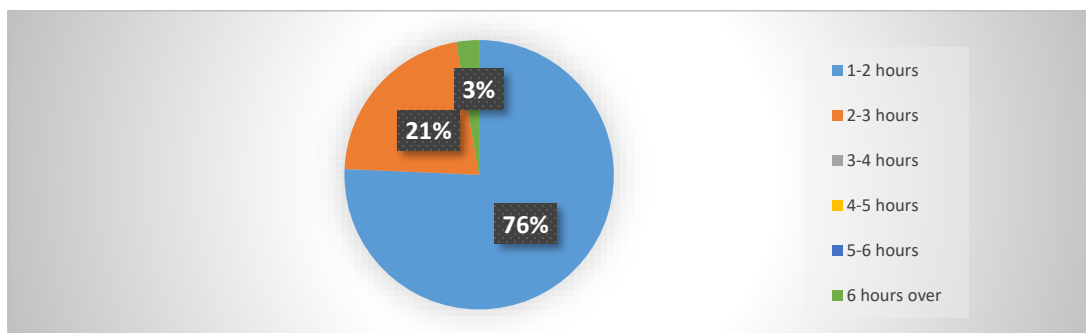

Figure 3: Time spent on social media

Data suggests that most respondents are mindful of how much time they devote to social media, particularly when it is used for recreational or leisure activities. However, data also showed that forty-two percent (42%) of respondents like to use social media from 5-9 pm, thirty-nine percent (39%) after 9 pm, eleven percent (11%) from 8-12 am, five percent (5%) from 12-1 pm, and three percent (3%) from 5-8 am.
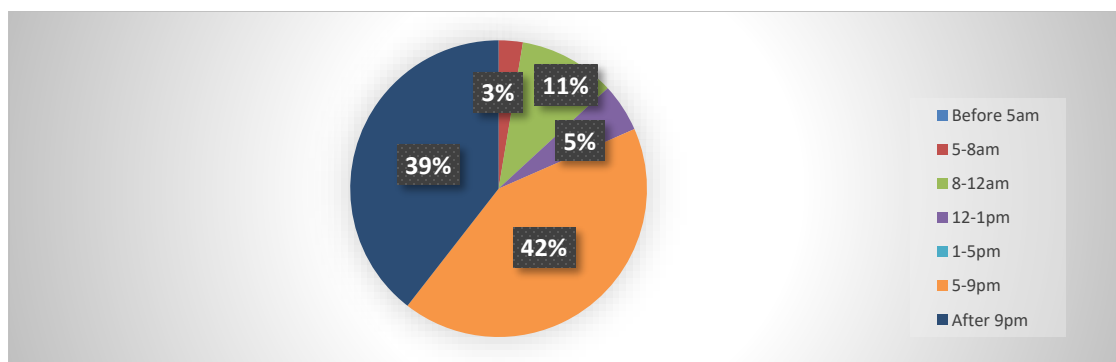
Figure 4: Time most active on social media

Most respondents are usually active on social media in the early hours of the day and/or at night before they sleep. But few students are active on social media during lecture time. Literature has indicated that usage of social media brings with it a lot of challenges and difficulties that users experience, particularly learners at higher learning institutions. Data showed that social media is a problem to users or learners, three percent (3%) of respondents indicated 'always', eighty-two percent (82%) indicated 'sometimes', five percent (5%) indicated 'rarely', and ten percent (10%) indicated 'never'.
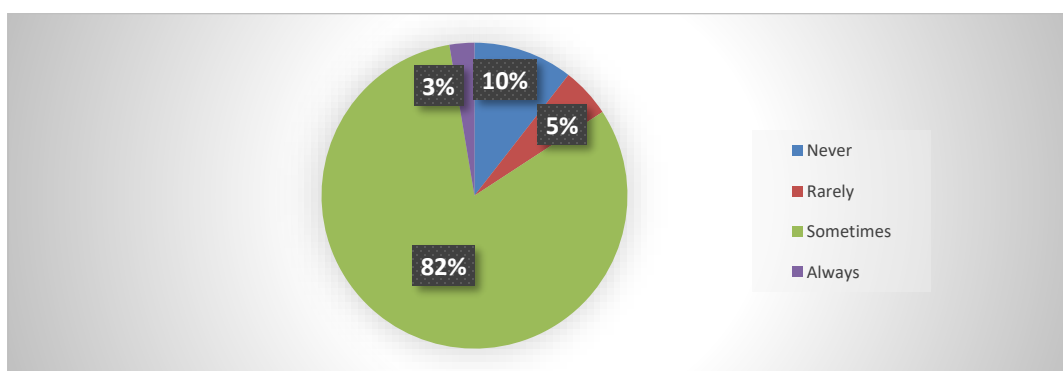

Figure 5: Social media a problem for users

One way or the other, university students using social media would have experienced psychological stress, cyber-bullying, and/or some sort of distraction from one's education. It would have affected their learning as attention or energy would have been divided between worthwhile time in learning and wastage of time on social media. Alsaif (2016, p. 42) stated that: "With frequent use of unattended social media, the students may indulge in the utilization of terrible slang, disregard to folks, educators, and the law in the general public." Social media can impact students' learning one way or another, by accessing educational content or resources through platforms like YouTube, or can be a distraction that reduces focus study time.

Impact of social media on learning

Social media has impacted users particularly, university students at the research site and affects their learning as shown by the literature. Data collected indicated that respondents unanimously

agreed that social media takes away most of their precious academic time. Thompson (2011) affirmed that social media users find it hard to discontinue using a social media application when they start using a phone with internet accessibility.
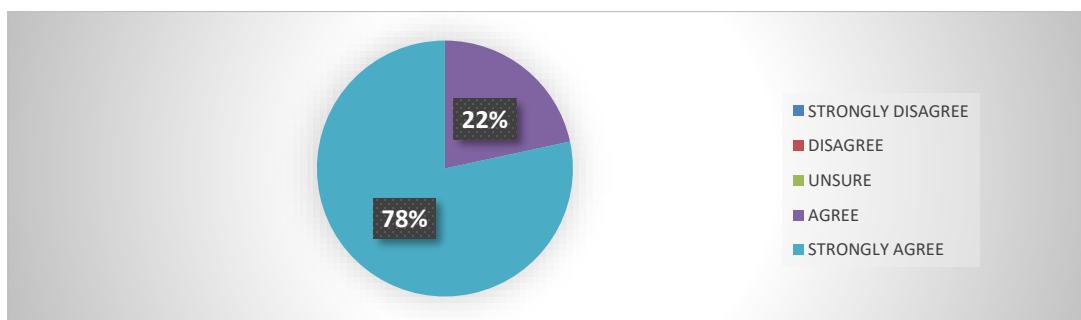

Figure 6: Social media takes away precious academic time

Eighty-nine percent (89%) of respondents 'agreed' that social media significantly reduces the time available for reading books, eight percent (8%) 'disagreed', and three percent (3%) were 'unsure'. This suggests that excessive time spent on social media detracts from valuable opportunities for educational activities that support learning and growth.
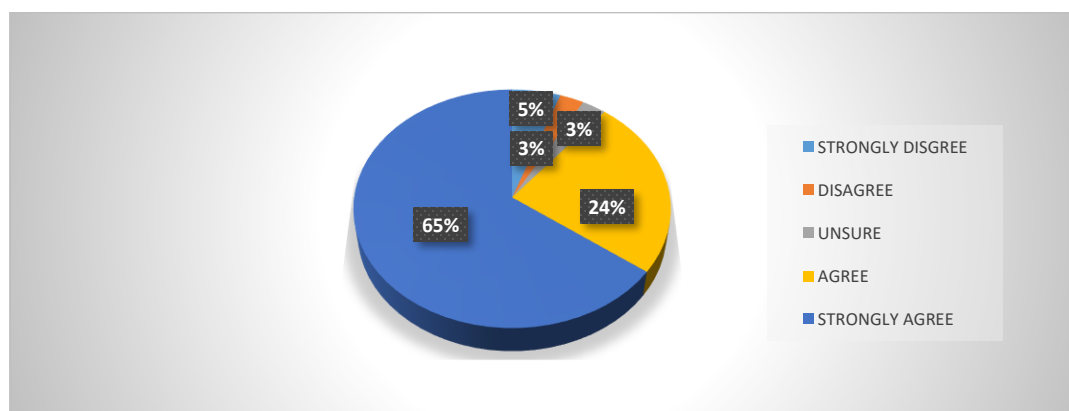

Figure 7: Social media takes away time for reading books

Furthermore, respondents expressed themselves as emotionally feeling satisfied after using social media for some hours. This reveals that social media drives students to access it during class time to monitor posts or status, taking away their concentration or participation time. The majority of respondents (78%) indicated that social media sometimes emotionally stresses them out, whilst nineteen percent (19%) 'disagree' and three percent (3%) were 'unsure'. Over usage of social media or unconsciously spending a lot of time on social media significantly causes lack of sleep and tiredness for wasting precious time. Eighty-one percent (81%) 'agreed', sixteen percent (16%) 'disagreed', and three percent (3%) were 'unsure'.

Heffernan (2009) cited in Eunson (2012, p. 707) in the excerpt stated:

> 'I primarily left Facebook because I was wasting so much time on it', my friend Caroline Harting told me by email. 'I felt fairly detached from my Facebook buddies because I rarely directly contacted them.' Instead, she felt as if she stalked them, spending hours a day looking at their pages without actually saying hello.

While excessive use of social media may result in addictive behaviour and a tendency to prioritize it over academic pursuits, it offers various advantages that can support university students in multiple aspects of their learning and development.

Benefits of social media on learning

Social media can assist university students' learning and advance them in their studies and interaction with colleagues or lecturers. It enables people to communicate effectively with others. It is an asset when utilized well for academic and other work purposes.

Respondents unanimously indicated that one way they benefit from social media is interaction with friends or colleagues. They are able to share academic work collaboratively with colleagues. Ninety-seven percent (97%) indicated that social media can help them to enrich learning at the university if put to good use, whilst three (3%) were 'unsure'. On the contrary, when respondents were asked if they used social media to discuss academic matters with their tutors or lecturers, forty-one percent (41%) 'agreed', forty-three (43%) 'disagreed', and sixteen percent (16%) were 'unsure'.
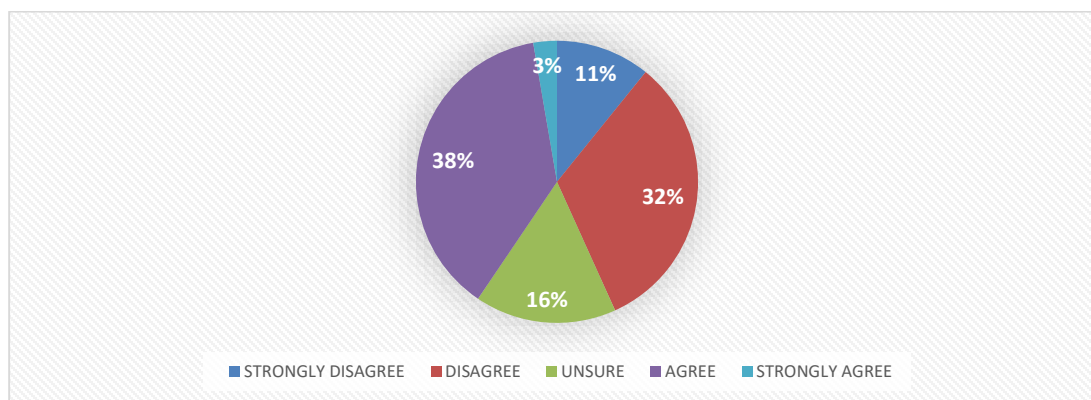

Pie chart legend: STRONGLY DISAGREE (11%), DISAGREE (32%), UNSURE (16%), AGREE (38%), STRONGLY AGREE (3%)

Figure 8: Academic discussion with lecturers through social media

Most respondents do not have shared discussions through social media with their tutor or lecturer synchronously or asynchronously, apart from MOODLE (Modular Object-Oriented Dynamic Learning Environment). Similarly, when posting academic matters to create discussion with colleagues forty-nine percent (49%) frequently posted on social media, nineteen percent (19%) were 'unsure', and thirty-two percent (32%) 'disagreed'.
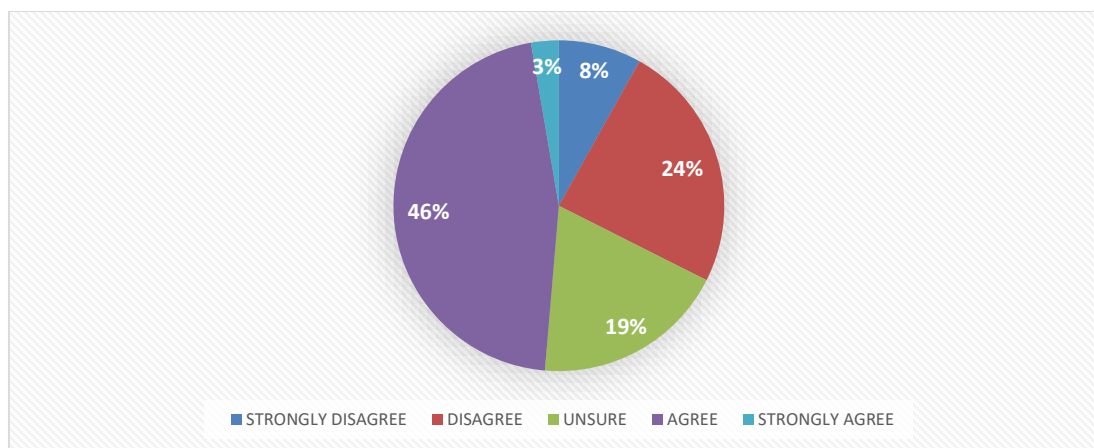
Figure 9: Posting academic matters to create discussion with classmates

Social media enables university students to receive academic support from their peers, fostering collaborative learning that complements the instruction provided by tutors and lecturers. Therefore, its constructive use should be encouraged consistently. However, data also showed that at certain times, university students associate with each other educationally or on a personal basis. Fifty-one percent (51%) shared educational files openly with friends as a supportive group, whilst thirty-three percent (33%) 'disagree', and sixteen percent (16%) were 'unsure'. Those who disagreed or were unsure indicated unawareness or lack of interest.

Data indicated that university students use social media as a mode of learning that creates positivity in a collaborative effort in assisting each other at some point in time. This happens outside of the formal timetabled programs. Furthermore, concepts or behavior shown through the research can be adopted by the university or higher education institutions to strengthen educational learning mechanisms.

Adoption of social media at the university

Higher educational institutions can embrace social media platforms or applications to assist in enhancing learning, disseminating knowledge and for resourceful communication. With social media, individuals can change one's role from audience to being an author, and vice versa, with accessible software to construct content to share with others (Lincoln, 2009 cited in Eunson, 2012, p.706). Thus, the question to ask is, 'how can social media be adopted' to complement university's educational program, as in MOODLE or other related educational computer systems. Qualitative data collected revealed these findings: embracement of social media, acquisition and accessibility to information, and importance of social media to learning, which are presented below.

a. *Embracement of social media*

Embracing social media has the potential to unlock a range of opportunities that can enhance teaching and learning, provided its capabilities are thoroughly explored and thoughtfully applied.

Educators can make good use of social media, for example, creating a Facebook page or WhatsApp page restricted to certain year groups of students or a unit or program for facilitating peer learning, sharing learning materials, providing academic support, or for announcements and updates. Social media platforms are popularly used amongst young people and educators. Higher educational institutions can embrace those opportunities.

Many respondents suggested that adopting social media in education could involve the creation of a Facebook page, enabling open dialogue between students and lecturers. Simultaneously, they emphasized the importance of taking collective ownership of the platform, for collaborative learning and learning exchange. This perspective aligns with the practical experience of a young university faculty member cited in Eunson (2012, p. 719), who explained:

> When there is an announcement that people need to see quickly, I'll write a Facebook note and tag all of the members of the class concern. That way, everyone who needs to know gets notified as soon as they check Facebook – usually much faster than email.

These are other things respondents had to say:

> *'By creating a Facebook page everyone, students and staff can share common interesting or contrasting ideas and new things that others post'*, the other mentioned, *'students and lecturers can make references or suggestions to those platforms to share and expose ideas to others'*.

Similarly, another remarked, *'social media can assist students to access educational stuff and exchange vital information and should be taken seriously as it is beneficial to all'*. And the other stated, *'social media can get students-classmates-lecturers to be friends on Facebook, in order to share ideas by giving or getting updates but users should take ownership of it too'*.

Social media has emerged as a valuable tool for academic research and learning among students. It provides a convenient medium for gathering information to support assignments and projects. One participant noted that while social media can sometimes be seen in a negative light, *'students have to manage their time in using social media; it will be helpful to them for learning rather than seen as a negative aspect.'* This suggests that with proper time management, social media becomes an educational asset rather than a distraction.

Supporting this perspective, another respondent emphasized the potential for academic integration: *'Social media can be adopted at the campus to assist student-teachers to do research and to get more information for critical writing.* This highlights the platform's utility in broadening academic resources and enhancing students' critical thinking.

Similarly, it was also noted that social media encourages curiosity and peer driven learning: *Social media can boost the interest of students to learn more by acquiring information from friends and creates interest in broadening their knowledge on certain issues that are not discusses in the*

classroom. By facilitating information sharing and discussion, social media expands the boundaries of traditional classroom learning and encourages a more engaged and informed student body.

b. Acquisition and accessibility to information

Social media enhances educational practices through the acquisition of information and rapidly sharing it with others. Previously, information was publicized by those who had "printing presses or broadcast mechanisms"; nowadays, the web has allowed people immensely to connect instantly through websites or platforms (Carlile, 2011). The most commonly shared information seen by many users is "visual materials" and it has enabled accessibility to new forms of communication (Wang, 2016:95). Visual materials can help university students to build knowledge and acquire information faster and more easily compared to merely expressing oneself using phone calls. These are some expressions different respondents have to say about social media and how it helps.

One respondent reflected on the personal benefits of shared content, stating, *'Personally, I find blogs on educational leadership and global organizations on social media as beneficial, so I join those pages.'* This highlights how social media allows users to connect with educational interests, fostering professional growth and exposure to global ideas.

Expanding on its practical use, another emphasized how digital tools like Google and YouTube *'enhance classroom practices by researching educational documents, topics, to support learning, and make life easier when it comes to educational research in doing assignments and work given by lecturers.'* These platforms ease access and have the ability to support independent and classroom-based learning.

Another respondent pointed to the inspirational and informative value of social media, explaining that *'Student-teachers and lecturers can get inspirational quotes or important educational information to share with students'*, further noting that staying informed about local and global happenings support effective teaching.

However, not all views were favorable. A contrasting perspective noted concerns about platform quality: *'I think Facebook doesn't have good outlook for educational classroom practices because some people post things that are not helpful.'* Despite this skepticism, the same respondent acknowledged the potential of other social media platforms to better facilitate learning and exploration of ideas.

Still, Facebook found defenders for its collaborative use. One participant remarked, *'A Facebook group can be created to share academic point of view with classmates and lecturers,'* describing how the ability to post and receive feedback enriches understanding through shared insight. Another echoed this, stating, *'Students should be connected with their friends and lecturers… I can post it as my status and everyone will have their views, there I can pick up something.'* These

testimonies illustrate the value of peer interaction and real-time discussion, especially when navigating educational challenges.

Data indicates that information or knowledge can be shared through social media users instantly through synchronous or asynchronous communication and can be a bonus for students seeking assistance. If that goes on, university students build a good relationship with classmates and their lecturer, constructing positive interactive skills as an important aspect.

c. *Importance of social media to learning*

Social media is vital and can help if adopted by users for the purpose of learning as indicated by the qualitative data. Social media can offer university students in the following manner: be for leisure and recreation, getting updated educational information, and becomes a mode of communication.

Social media when used appropriately adds to leisure and recreation. It helps in de-stressing when there is a lot of things going through a person's mind, for example, after sitting on an assignment for too long. Social media as in Facebook, Twitter or YouTube "give us a real opportunity to engage with our members and to enable a conversation to take place within that community." (Obar, Zube and Lampe, 2012: 15).

Furthermore, social media educationally helps students study more easily by learning new ideas, skills and knowledge. A respondent stated that, '*it enhances by providing easy access to anything to everything*.' University students can have access to a variety of helpful information for assignments or presentations apart from what lecturers give in class. This suggests that students can enhance their understanding by gathering information from various sources, deepening their knowledge on specific topics, broadening their perspective of the world, and staying updated with the latest global developments.

Social media continues to play a significant role in supporting students' educational and social engagement. One respondent highlighted its convenience, stating that *'social media is important as it can help to do research whenever students want to, rather than going to the library.'* They continued about its practical use in the classroom settings, noting that it allows for quick access to information that can be used to teach or inform children without delay.

Beyond research and academic convenience, frequent use of social media contributes to the development of personal interactive communication skills. Through the constant exchange of messages, users enhance both their language and interpersonal abilities. As shown in Figure 4.10, a significant 89% of respondents agreed that social media enables effective communication, while 8% disagreed and 3% were unsure.
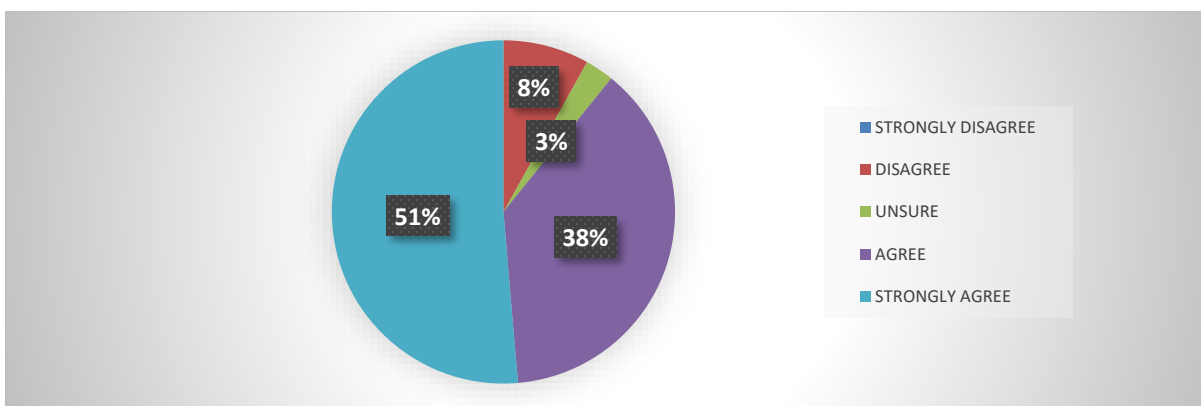
Figure 10: Respondents' view of social media enabling effective communication with others

Further supporting this, one respondent shared that platforms like Facebook and WhatsApp help students *'communicate effectively with colleagues,'* enhancing interaction both on and off campus. Another participant echoed this by stating that, *'social media helps students to consult others quickly, stay in touch with friends regularly',* and in doing so*, 'enrich their daily learning experience.'*

Data highlighted that adopting social media in university contexts offers substantial benefits. From accessing information to collaborative learning, to emotional well-being, these platforms provide engagement in modern education. Success depends on mindfulness, digital literacy, and a culture of responsible use.

Conclusion and recommendations

Findings have shown that there are benefits and implications of social media on learning. The research study focused on how social media platform usage benefited and impacted learning at a university level. Challenges faced in the research have been drawn as conclusions and recommendations for further research.

Conclusions

As shown by the research, the usage of social media brings many benefits and implications to university students' learning. The overall findings of this report are as follows:

- Social media has a high usage amongst university students in an informal manner, but can be regulated as a learning management system to share ideas or learning materials apart from MOODLE.
- Social media platforms can be used by universities or higher educational institutions seeing it as an opportunity or bridge to advance teaching and learning but should be applied and managed well.

- Concepts or behavior shown through the research can be adopted by the university or higher education institutions to enhance or strengthen the existing educational learning mechanism.
- Creating a social media page like WhatsApp page or Facebook page for university students of a level or a unit/course should be administered well, to use that social media platform for shared learning or educational discussion. It can create a difference in students' learning or acquisition of knowledge and skills, or for dissemination of knowledge and communication. This can educationally give real meaning or purpose to social media usage in a higher education institution.

Recommendations

- As universities navigate the integration of technology, social media should be seen as a powerful ally in shaping holistic, 21st century learning experiences.
- University students need to be encouraged to use social media in a formal setting at the university for critical shared learning and discussions.
- When lecturers or tutors use a social media platform, such as WhatsApp or Facebook with university students of a particular level for a unit or course, they need to manage it by updating the page regularly. The social media page should be protected and restricted to students enrolled in the unit or course, and the kind of information that is posted is to maintain standards and to prevent cyber-bullying.
- Further research on the views of educators on the impact or addiction of social media and learning should be done extensively. As well, blended learning is to see how higher learning institutions can adopt the vast knowledge that is out there to benefit teaching and learning. Due to time constraints, views were limited to final Year Four students.
- Policy-makers, lecturers, tutors, university students/student-teachers, and other stakeholders should look positively at the advantages that social media, such as Facebook, brings and utilize it, and mitigate the negatives.

The exploratory research has shown that there are benefits and impacts of using social media platforms but it can be adapted to suit learning at the university. "These technologies create a whole new world of knowledge, learning and opportunity." (Deloitte Digital's chief executive officer cited in Eunson, 2012, p. 715).

Social media platforms are accessible to anyone. Students use social media to communicate and create relationships, send and receive information instantly, synchronously, or asynchronously through online discussion by sharing knowledge as long as internet is available.

Thus, negative impacts of social media are inevitable; it takes away precious time for learning, causes emotional stress, causes tiredness, and lack of concentration due to insufficient rest. If used, managed, and applied well, social media can be adopted for learning amongst university students as a motivational component assisting existing learning systems.

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Author

Terence Subam lectures at OLSH Kabaleo Rabaul Campus (Faculty of Education), Divine Word University. He has a wide range of teaching experience at the primary and tertiary levels. His educational qualifications are a Diploma in Teaching, a Bachelor of Education with Honours (Teacher Education), and a Master of Educational Leadership. Email: tsubam@dwu.ac.pg