

UNIVERSITY OF EDUCATION, WINNEBA

**BRANDING STEM ON SOCIAL MEDIA IN GHANA: A STUDY OF
BRANDING NARRATIVES ON FACEBOOK**

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**BRANDING STEM ON SOCIAL MEDIA IN GHANA: A STUDY OF
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**A thesis in the Department of Strategic Communication,
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in partial fulfilment of the requirements for the award of
Master of Arts degree in Communication and Media Studies
(Strategic Communication).**

NOVEMBER, 2023

DECLARATION

STUDENT'S DECLARATION

I, **PAMELA FRANCISCA MANZAMMA ALLIHIEN**, declare that this dissertation, with the exception of quotation and references contained in published works, which have all been identified and duly acknowledged, is entirely my original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE:

DATE:

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of dissertation as laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: **PROF. ANDY OFORI-BIRIKORANG**

SIGNATURE:

DATE:

DEDICATION

This work is dedicated to my lovely mother, Patience Sam-Amoah and my amazing siblings, Marie-Noelle Allihien, Saint-Martin Allihien and Anault Allihien for their unwavering love and support throughout this program and project.



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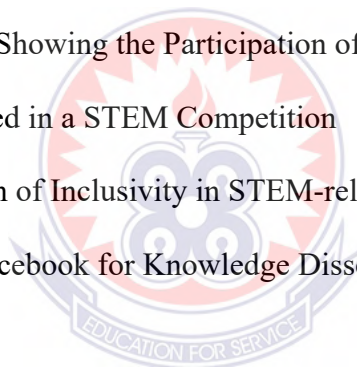
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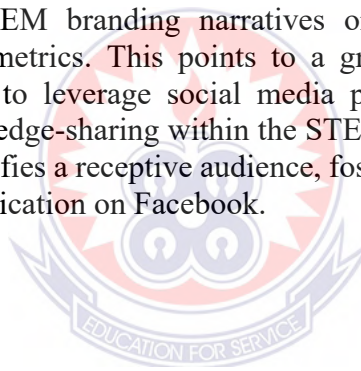
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ABSTRACT

This study investigates the increasing global focus on Science, Technology, Engineering, and Mathematics (STEM) education, particularly in African countries like Ghana. Recognizing STEM as crucial for tackling development challenges and narrowing the digital gap, this research explores the role of Facebook in disseminating STEM-related activities. The study aims to analyze specific branding strategies, identify emerging themes and uncover challenges and opportunities within STEM narratives on Facebook. The study uses a qualitative research methodology to probe the use and experiences in the STEM landscape. Data collection involved analyzing textual and visual content from Facebook to gain insights into diverse branding strategies employed by organizations. The findings indicate that organizations effectively use Facebook to highlight the importance of STEM through engaging content. Dynamic branding strategies, including online STEM seminars, Facebook Live sessions, and gamification emerged as impactful strategies within the Ghanaian context, showcasing the transformative potential of social media in STEM promotion. Prominent themes in the narratives revolved around the emphasis on STEM education, aligning with the global recognition of STEM as a catalyst for innovation and development. Gender inclusivity becomes a noteworthy theme, challenging stereotypes by featuring women in diverse STEM roles. The study identifies opportunities within STEM branding narratives on Facebook, particularly through increasing engagement metrics. This points to a growing interest in STEM content, offering an opportunity to leverage social media platforms for community-building, collaboration, and knowledge-sharing within the STEM sector. The observed increase in engagement metrics signifies a receptive audience, fostering an optimistic outlook for the future of STEM communication on Facebook.



CHAPTER ONE

INTRODUCTION

1.0 Introduction

The importance of Science, Technology, Engineering, and Mathematics (STEM) education in preparing students for the modern workforce and promoting innovation has recently grown across the globe. African countries like Ghana are increasingly emphasizing STEM education in this global setting to address development issues and close the digital gap. One promising avenue to disseminate and popularize STEM education in Ghana is through leveraging the power of social media platforms. Social media has evolved into a potent tool for communication and advocacy, capable of reaching a broad and diverse audience. By strategically crafting compelling narratives and utilizing social media platforms, educational institutions, government bodies, NGOs, and private sector organizations can effectively promote STEM education in Ghana.

With a focus on the function of branding narratives, this study attempts to investigate the possibilities of leveraging social media platforms to promote STEM education in Ghana. The chapter comprises the background of the study which establishes the context underlying the research and further presents the problem statement which concisely describes the issues to be addressed in a study. Furthermore, the chapter outlines the specific research objectives, presenting a well-defined framework for the aims and goals driving this study. Additionally, it explains the rationale behind the research and defines the scope of the study, offering a comprehensive overview of the research's boundaries and focus.

1.1 Background of the Study

Science, Technology, Engineering, and Mathematics (STEM) areas of study have emerged as critical pillars for global advancement, exerting significant influence on innovation, economic prosperity, and societal progress (Zeng et al., 2019). In recent years, the promotion of STEM education has gained significant attention globally, driven by the recognition of its pivotal role in advancing technological innovation, economic growth, and sustainable development (Zhan et al., 2022).

STEM education is closely linked to economic growth and innovation. Nations that invest in STEM education tend to excel in research, development, and technological advancements, fostering a competitive edge in the global market. The foundations of STEM education can be traced back to the Industrial Revolution of the 18th and 19th centuries. This transformative period in human history brought about a surge in technological innovations, which, in turn, fueled the demand for individuals skilled in science, engineering, and mathematics (Albanna et al., 2022). As factories, railways, and machines proliferated, the need for a workforce well-versed in these fields became apparent, laying the groundwork for STEM education. The 20th century saw the proliferation of scientific and technological advancements, most notably during the Space Race, which further underscored the importance of STEM education (Barakabitze, 2019). Governments and educational institutions recognized that to remain competitive and innovative, they needed to nurture a new generation of STEM professionals.

The importance of STEM education extends beyond historical context; it is intrinsically tied to the needs of contemporary society and the global economy. In the 21st century, technological advancements have accelerated at an unprecedented pace, reshaping

industries, communication, and daily life (National Science Foundation, 2020). As a result, the demand for STEM-skilled workers has grown exponentially. According to the U.S. Bureau of Labor Statistics, STEM occupations are projected to grow at a faster rate than non-STEM occupations, emphasizing the critical role of STEM education in preparing the workforce for the future (Bureau of Labor Statistics, 2021). This concerted global effort to bolster STEM education resonates with the fundamental shift towards knowledge-based economies and the recognition of technological advancements as drivers of progress. The imperative to prepare individuals with the skills and knowledge to navigate a world increasingly shaped by science, technology, engineering, and mathematics is now more pronounced than ever.

One of the primary rationales for this push is the realization that STEM literacy is not confined to a specific industry or sector but permeates virtually all aspects of modern life. It is the linchpin of innovation, enabling societies to grapple with complex challenges such as climate change, healthcare breakthroughs, and sustainable energy solutions (Barakabitze, 2019). STEM education empowers individuals with the critical thinking, problem-solving, and analytical skills required to navigate a rapidly evolving landscape.

As governments and institutions commit resources to strengthen STEM education, there is also a heightened emphasis on fostering inclusivity. The drive is not merely to produce STEM professionals but to cultivate a diverse and dynamic talent pool that reflects the demographics and perspectives of the wider population. In this way, STEM education is seen as a bridge to addressing issues of equity and social justice while ensuring that opportunities in STEM fields are accessible to all.

The global discourse surrounding STEM education underscores its pivotal role in equipping individuals for the contemporary workforce while cultivating a culture of innovation. Across nations, the recognition has grown that STEM education stands as a critical catalyst for competitiveness and the fostering of innovation (Atkinson & Mayo, 2010). It is observable that countries endowed with robust STEM education systems consistently achieve prominence in areas such as research and development, technological innovation, and economic growth (National Academies, 2007). Consequently, there has been a discernible upswing in the emphasis placed on enhancing STEM education across diverse regions of the world. Governments and educational institutions, acknowledging its transformative potential, have allocated substantial resources to nurture STEM talent.

STEM education is viewed as a means of overcoming development issues and closing the digital gap in Africa. Across the continent, an increasing effort is being made to connect educational systems with the demands of a technologically driven world (Albanna et al., 2022). In developing countries like Ghana, the imperative of fostering interest and active engagement in STEM disciplines among the youth is underscored by its integral role in achieving sustainable development. Thus, there is a need to find innovative ways of inspiring students to pursue STEM-related courses.

In this light, the government of Ghana and other key stakeholders in education continue to explore diverse means of increasing the pursuit of STEM courses in the country (Altbach et al., 2019). For instance, the government of Ghana has established STEM schools and implemented STEM courses to enhance education. The communication of the core benefits of STEM education is a critical component of its promotion. As a result,

there is an urgent need to effectively communicate the relevance of STEM education in order to stimulate greater interest and increase awareness (Barakabitze, 2019).

Social media represents a transformative force in the realm of communication and society, reshaping the way individuals interact, share information, and engage with the world around them. The rise of social media is a phenomenon deeply rooted in the evolution of digital technology and the changing dynamics of human communication (Mattoni, 2020). Understanding the history and significance of social media is essential in appreciating its profound impact on modern society. The mid-2000s marked a significant turning point with the launch of Facebook in 2004, which quickly became a global sensation (Mattoni, 2020). Facebook's success paved the way for other platforms such as Twitter, Instagram, and LinkedIn, each catering to specific communication needs and audiences. The evolution of social media has not only transformed the way people connect with one another but has also redefined concepts of personal identity, self-expression, and information dissemination.

Social media is progressively assuming a dual role as a means of communication and marketing on a global scale (Felix et al., 2017). The contemporary landscape of communication, typified by the proliferation of social media platforms such as Facebook, has redefined the dynamics of information dissemination and audience engagement (Mattoni, 2020). In the digital age, social media platforms have risen as potent instruments for reshaping education. Platforms like Facebook, Twitter, Instagram, and YouTube have brought about a profound shift in the dynamics of educator-learner interactions, information accessibility, and educational content engagement (Felix et al., 2017). The infusion of social media into education has paved the way for novel approaches to both

structured and unstructured learning, rendering education more readily available, interactive, and captivating.

Social media's impact on education is multifaceted. It serves as a dynamic channel through which educators disseminate information, share resources, and foster collaborative learning environments (Flanagan, 2019). Learners, in turn, benefit from the immediacy and convenience of accessing educational materials and engaging in discussions. This real-time, borderless connectivity has transcended geographical boundaries and temporal constraints, effectively democratizing education by making it accessible to diverse populations worldwide.

Moreover, the integration of social media has engendered a paradigm shift in educational pedagogy. Traditional models of instruction are being complemented, and sometimes supplanted, by digital platforms that leverage the power of multimedia, interactivity, and peer-to-peer engagement (Felix et al., 2017). As a result, learners experience education as a more immersive and participatory journey, fostering a deeper understanding of subject matter and encouraging critical thinking.

Beyond formal education, social media offers a vast repository of informal learning opportunities. Users can explore a plethora of educational content, from tutorials and webinars to expert-led discussions and open-access repositories (Castillo-Abdul et al., 2022). This democratization of knowledge empowers individuals to pursue self-directed learning, acquire new skills, and stay updated in rapidly evolving fields.

Beyond the utilization of traditional media, platforms like Facebook, serve as excellent instruments for promoting STEM among young individuals (Manca & Ranieri, 2016). A

study by Albana et al., (2022) reported that various multinational corporations, educational institutions, and non-profit organizations use social media to promote STEM as a driver of technological advancement and a means to address global challenges (Albanna et al., 2022). The rationale behind this is rooted in the capacity of social media to enable active listening, information acquisition, and interactive engagement between brand managers and consumers (Felix et al., 2017). An illustrative example can be drawn from the staggering number of active small business pages, which exceeds 40 million, on Facebook (Altbach et al., 2019). As a consequence, social media marketing leverages content creation, communication strategies, outreach initiatives, and referrals to endorse products and services across digital social channels and platforms (Castillo-Abdul et al., 2022).

From a business perspective, social media has become a critical component of modern marketing strategies (Castillo-Abdul et al., 2022). It offers companies direct access to a global audience, enabling targeted advertising, customer engagement, and brand promotion. Social media marketing has become a multi-billion-dollar industry, reshaping the business landscape. However, the rise of social media has not been without challenges. Issues related to data privacy, misinformation, cyberbullying, and the addictive nature of social media have raised significant ethical concerns (Boyd, 2014). As a result, debates surrounding regulation, user safety, and content moderation have become central to discussions about social media's role in society.

This digital paradigm offers unprecedented avenues for global and prompt interactions, transcending temporal and geographical boundaries (Flanagan, 2019). The increasing access to digital platforms, particularly through mobile devices and social media, has

revolutionized communication and information access in Ghana. It has connected people, communities, and businesses, enabling them to participate in the digital age. Within this context, the strategic harnessing of branding narratives emerges as a potential catalyst to redefine STEM promotion discourse in the Ghanaian setting. The meeting point of the importance of STEM and the growing digital connections comes as a really good chance to change how people in Ghana engage with STEM. Bringing together these elements smartly offers a way to close the gap in how people perceive things, spark curiosity, and create a more open and livelier attitude towards STEM in Ghana. Social media platforms, which are a big part of the modern digital age, provide the tools needed to drive this kind of change (Fischer et al., 2022). This gives Ghana a chance to make STEM more interesting to different groups of people, giving it a new energy that can connect with everyone. The use of digital platforms to promote STEM education can potentially bridge educational disparities in Ghana and help each underserved areas and marginalized communities, democratizing access to quality STEM resources.

1.2 Problem Statement

Science, Technology, Engineering, and Mathematics (STEM) domains are crucial drivers in the worldwide advancement landscape, shaping innovation, economic growth, and societal progress (Idris & Suppiah, 2023). The profound importance of STEM (Science, Technology, Engineering, and Mathematics) fields in driving innovation, economic growth, and global development is widely acknowledged. These disciplines form the backbone of technological advancement, sustainable solutions, and breakthrough discoveries. However, despite their critical role, a persistent and challenging issue prevails: the striking disparity between the recognized importance of STEM and the low

level of youth participation in these fields (Albanna et al., 2022). This issue is particularly pronounced in developing countries such as Ghana.

In an era marked by rapid technological evolution and the increasing integration of STEM across various industries, the underrepresentation of youth in STEM-related pursuits carries significant consequences. It impedes a nation's capacity to harness the full potential of its human capital and adapt to the demands of a knowledge-based economy (Fischer et al., 2022). Moreover, it perpetuates inequalities in access to high-paying jobs and opportunities for personal and societal advancement. Several factors contribute to this disparity. Insufficient access to quality STEM education, limited resources, and a lack of role models and mentorship opportunities are among the challenges that hinder youth engagement in STEM fields. Additionally, societal perceptions and stereotypes can discourage individuals, especially girls and underrepresented minorities, from pursuing STEM careers (Idris & Suppiah, 2023).

In countries like Ghana, where the demand for STEM expertise is escalating due to emerging industries and global technological advancements, addressing this gap is paramount. Encouraging youth participation in STEM not only ensures a more prosperous future for individuals but also bolsters a nation's capacity to compete on the global stage. It fosters innovation, drives economic growth, and enables the development of sustainable solutions to complex challenges (Fischer et al., 2022). Efforts to bridge the divide between the acknowledged importance of STEM and actual youth participation require multifaceted approaches. These include investing in quality STEM education at all levels, promoting mentorship programs, challenging stereotypes, and creating opportunities for hands-on learning and practical application of STEM concepts. Collaboration among

educational institutions, government bodies, private sectors, and non-governmental organizations is instrumental in effecting meaningful change (Idris &Suppiah, 2023).

However, the disparity between the importance of STEM and the low level of youth participation in these disciplines remains a formidable challenge, particularly in developing countries like Ghana, where fostering interest and active participation in STEM among the younger generation is critical for long-term development. In contemporary communication dynamics, characterized by the proliferation of social media platforms such as Facebook, the integration of these platforms for communication and marketing has become increasingly prevalent (Flanagan, 2019). This transformative shift is informed by the potential of social media to facilitate active listening, information exchange, and interactive engagement between brand managers and consumers. Social media platforms like Facebook, Twitter, Instagram, LinkedIn, and YouTube have massive user bases.

This broad reach enables STEM educators, institutions, and enthusiasts to connect with diverse audiences globally, transcending geographical boundaries and making STEM education accessible to people who might not have access to traditional learning resources (Idris &Suppiah, 2023). This phenomenon is underscored by the substantial number of active small business pages on Facebook, exceeding 40 million attesting to the platform's potential as a conduit for brand engagement (Flanagan, 2019). In this context, the nexus between the global significance of STEM and digital connectivity provides a promising stage to address the gap in youth engagement with STEM in Ghana. In Ghana, the narrative around STEM on Facebook reflects a blend of global aspirations and local realities.

Educational institutions, government agencies, and grassroots organizations use social media to showcase initiatives, events, and achievements related to STEM education. The strategic use of branding narratives emerges as a potential catalyst to redefine the discourse around STEM promotion. Aligning the power of social media platforms such as Facebook with the objectives stakeholders can foster interest, promote effective strategies, and opportunities in STEM engagement.

However, despite the potential inherent in the strategic deployment of branding narratives on platforms like Facebook, a comprehensive exploration of their impact on youth engagement with STEM in the Ghanaian context is lacking. The utilization of social media platforms for branding Science, Technology, Engineering, and Mathematics (STEM) in Ghana, particularly on Facebook, poses a complex challenge that requires thorough investigation (Barakabitze, 2019). While the global push for STEM education on social media is recognized, its effectiveness within the unique African and Ghanaian contexts remains unclear. While some studies have explored STEM promotion through traditional education channels (Holly et al., 2021; Lopez & Perez, 2018), the potential of social media platforms like Facebook as dynamic channels for fostering STEM interest among diverse segments of the Ghanaian youth population has not been extensively examined. Hence this study aims at filling this gap by systematically investigating current branding narratives, assessing the effectiveness of strategies, and identifying the challenges and opportunities presented by social media platforms for STEM promotion in Ghana. Through these endeavors, this study seeks to provide insights and recommendations that can transform the trajectory of STEM engagement among

Ghanaian youth, aligning it more effectively with the imperatives of global advancement and sustainable development.

This study endeavors to explore the significant impact of social media platforms in reshaping education, ushering in a transformative era for both formal and informal learning. The influential role of platforms such as Facebook, Twitter, Instagram, and YouTube have fundamentally altered the dynamics of educator-learner interactions, information accessibility, and educational content engagement. This study's objectives encompass a broad spectrum of academic, policy, social, and governmental contributions. By examining the transformative role of social media in education, it aims to provide valuable insights and evidence-based recommendations. These insights can not only augment our understanding of modern education but also inform policymakers, educators, and stakeholders on the potential benefits and challenges of integrating social media into learning environments. Moreover, it seeks to inspire a reimagining of STEM (Science, Technology, Engineering, and Mathematics) engagement among Ghanaian youth, aligning it more effectively with the imperatives of global advancement and sustainable development.

1.3 Research Objectives

The research is informed by the following specific objectives:

1. To analyze the branding strategies related to STEM on Facebook in Ghana.
2. To ascertain the themes that emerged in the narratives of STEM-related branding strategies on Facebook.

3. To identify challenges and opportunities embedded in the branding narratives in STEM through social media platforms.

1.4 Research Questions

To address the aforementioned objectives, this study will seek answers to the following research questions:

1. What are the prevailing branding narratives concerning STEM on Facebook in Ghana?
2. How effective are the current STEM-related branding strategies in capturing the interest and engagement of the Ghanaian youth?
3. What are the challenges faced in promoting STEM through social media platforms, particularly Facebook?

1.5 Significance of the Study

This research holds great importance for academia by advancing the understanding of the intersection of STEM education and social media branding strategies. It contributes to the theoretical underpinnings of educational technology, communication studies, and marketing, providing a basis for future research in these fields. Academic institutions can draw from the insights generated to design more effective STEM education programs and curricula that integrate social media strategies, thus fostering innovation in pedagogical approaches.

To policymakers, this study offers valuable insights into the potential of leveraging social media for educational purposes, specifically in the context of a developing nation like Ghana. The findings can inform the development of educational policies that promote the integration of technology and social media into the curriculum. Policymakers can use this

research to make data-driven decisions on resource allocation and infrastructure development, ultimately contributing to the improvement of educational outcomes and workforce development in Ghana.

For industry stakeholders, especially marketers and technology companies, this research provides a roadmap for effective engagement with the education sector. It demonstrates how social media branding can be harnessed not only for promotional purposes but also for fostering STEM engagement. By understanding the strategies and narratives that resonate with students and educators, businesses can tailor their products and services to better support STEM education initiatives, ultimately contributing to the development of a skilled workforce.

Within the local community in Ghana, this study can serve as a catalyst for increased STEM interest and participation. It offers insights into how social media can be harnessed to enhance STEM awareness and engagement among local students and educators. The findings may lead to the development of community-based STEM programs and initiatives, bridging the digital divide and empowering individuals with the skills needed for the 21st-century job market.

On a global scale, this research contributes to the broader discourse on the role of technology, communication, and education in addressing global challenges. By showcasing the potential of social media in promoting STEM education in a developing country, it serves as a case study that can inform international efforts to bridge educational disparities and promote innovation worldwide. The study's findings may inspire collaborative initiatives and partnerships aimed at leveraging technology for educational equity and global progress.

1.6 Scope and Delimitations of the Study

This research is dedicated to investigating the potential of utilizing social media platforms, with a primary focus on Facebook, as a means to advance Science, Technology, Engineering, and Mathematics (STEM) education initiatives in Ghana. The study seeks to delve into the interactive capabilities of Facebook and how they can be effectively harnessed to convey the significance of STEM education, thereby stimulating interest, and raising awareness among the target audience.

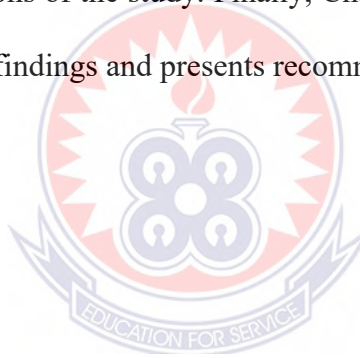
In this exploration, the study will encompass an in-depth examination of the strategies and narratives employed on Facebook to promote STEM education. It will analyze user engagement and responses to STEM-related content on the platform, providing insights into the ways in which social media can facilitate the dissemination of STEM-related information and foster engagement among the Ghanaian population.

However, it is important to acknowledge certain limitations and boundaries. The research will maintain a primary focus on Facebook and will not extensively cover other social media platforms. Additionally, while it will assess the effectiveness of Facebook as a medium for fostering STEM interest and awareness, it will not comprehensively address the broader landscape of STEM education programs and initiatives in Ghana. The study's scope is geographically confined to Ghana, and as such, the findings may not be directly applicable to other regions or countries due to contextual variations. Furthermore, the dynamic nature of social media platforms presents challenges, and this research represents a snapshot of the situation at a specific point in time. Lastly, the study acknowledges the existence of the digital divide, which could impact the reach and impact of STEM promotion efforts on social media, but it will not delve deeply into this broader issue.

1.7 Organization of the Study

This research is organized into five chapters. Chapter one provides an introduction to the study, outlining its background, problem statement, research objectives, research questions, significance of the study, and the organization of the study. Chapter two comprehensively reviews relevant literature on STEM education, branding, social media, and their intersection. This chapter also outlines and discusses the theories underpinning the study.

Chapter three elucidates the research methodology, detailing the research design, data collection methods, and analysis techniques employed in this study. Chapter four presents the findings and discussions of the study. Finally, Chapter Five captures the conclusions drawn from the research findings and presents recommendations for further studies.



CHAPTER TWO

LITERATURE REVIEW AND THEORITICAL FRAMEWORK

2.0 Introduction

The significance of Science, Technology, Engineering, and Mathematics (STEM) education in fostering innovation, driving economic development, and advancing societal progress has gained widespread recognition on a global scale (Zeng et al., 2019). In recent years, the promotion of STEM education has surged in importance across the world, propelled by its central role in catalyzing technological innovation, fueling economic growth, and underpinning sustainable development efforts (Zhan et al., 2022). This chapter embarks on an extensive exploration of the pertinent literature to establish a robust theoretical and conceptual foundation for the study. Specifically, the literature review focuses on the innovative use of social media platforms to promote STEM education in Ghana, recognizing that in an age of unprecedented digital connectivity, these platforms offer unique opportunities to bridge educational gaps, engage diverse audiences, and transform STEM learning experiences in the Ghanaian context. The chapter contains a review of relevant themes emanating from the research objectives and further discusses the theoretical underpinnings of the study. Furthermore, the chapter looks at the development of STEM from a global perspective and in the context of Ghana in particular. The review looks at the challenges and opportunities that are offered by the development of a STEM-oriented curriculum. Additionally, the chapter reviews the literature on the use of social media as a medium for promoting the pursuit of STEM programs.

2.1 Global Perspective on the Development of STEM

The foundations of STEM (Science, Technology, Engineering, and Mathematics) extend back to ancient times, reflecting humanity's enduring quest for knowledge, innovation, and problem-solving (Smith, 2018). These roots can be traced to early civilizations where mathematics, engineering, and scientific inquiry began to take shape. For example, in ancient Mesopotamia, scholars developed mathematical concepts that underpin modern quantitative understanding. Similarly, the architectural achievements of ancient Egypt showcased early advancements in engineering and applied mathematics (Jarsaillon, 2018). The development of STEM fields is no longer confined within national borders. Rather, it has evolved into a global endeavor shaped by various factors and complexities that span international boundaries.

A fundamental aspect of this global perspective is the recognition of the profound interdependence between STEM and the global challenges humanity faces. Many of these issues, such as climate change, infectious diseases, and cybersecurity threats, are inherently global (Fernandes et al., 2019). Consequently, the development of STEM fields is informed by the need to address these global challenges, highlighting the imperative of international cooperation. The pursuit of a robust STEM workforce is a shared priority among nations worldwide. Countries invest significantly in education and initiatives aimed at developing a skilled STEM workforce, recognizing the pivotal role of STEM skills in both individual career success and a nation's competitiveness in the global economy (OECD, 2019). This global commitment to education and workforce development underscores the interconnectedness of STEM fields on a global scale.

Furthermore, international research collaborations are at the heart of global STEM development. Scientists and engineers from diverse backgrounds increasingly collaborate across borders to pool resources, share expertise, and access unique perspectives. Notable examples include the international collaboration on the Large Hadron Collider, a testament to the power of global cooperation in advancing scientific knowledge (Fernandes et al., 2019). The exchange of ideas and the sharing of resources are fundamental to the evolution of STEM fields on a worldwide scale.

In the digital age, the open-access movement and the sharing of scientific data have become universal practices in STEM (Bert, 2018). These global norms facilitate transparency and international participation in scientific research. Open-access journals and international data-sharing platforms promote equitable access to scientific knowledge and research findings, fostering a global knowledge-sharing ecosystem. Various international organizations, including the United Nations and UNESCO, have spearheaded global STEM initiatives aimed at addressing global challenges, enhancing access to STEM education, and mitigating gender disparities within STEM fields (UNESCO, 2017). These initiatives are designed to ensure that the development of STEM benefits all nations and all people, emphasizing the global significance of STEM fields and their development.

The advent of the digital age and the profound technological revolution in the late 20th century played a pivotal role in reshaping STEM (Science, Technology, Engineering, and Mathematics) education. This transformative period witnessed a departure from traditional pedagogical approaches and the convergence of disciplines and technologies, fundamentally altering the educational landscape (Bidarra & Rusman, 2017). The onset

of the digital age ushered in an era of unprecedented information accessibility and dissemination. The rapid proliferation of the internet and digital technologies democratized access to knowledge, erasing geographical boundaries and making information readily available to learners worldwide (Bidarra & Rusman, 2017). This shift compelled educators to reevaluate their methods, shifting from rote memorization to fostering critical thinking and digital literacy.

In this digital age, STEM education extended beyond the confines of traditional classrooms. Online courses, virtual laboratories, and collaborative platforms revolutionized the dissemination and acquisition of knowledge (Miranda et al., 2021). Learners from diverse backgrounds and locations gained access to high-quality STEM resources and instructional materials, fostering a more inclusive approach to education (Miranda et al., 2021). This era of technological revolution in STEM education has presented both challenges and opportunities. Educators grappled with the task of keeping curricula and training relevant in a world marked by constant technological flux. However, the ability to harness technology for interactive simulations, real-world applications, and global collaboration has opened new horizons for STEM learners (Bidarra & Rusman, 2017)

2.2 The Development of STEM in Africa

The development of Science, Technology, Engineering, and Mathematics (STEM) in Africa is a vital and dynamic theme that holds immense promise and potential for the continent. STEM education and innovation play a crucial role in shaping Africa's future by driving economic growth, technological advancement, and social progress (Barakabitze et al., 2019). The historical trajectory of STEM development in Africa has

been significantly shaped by the continent's colonial past. During the colonial era, educational systems and research infrastructure in many African nations were designed to serve the interests of the colonial powers. Colonial legacies have left a lasting imprint on the educational landscape. The African continent currently generates less than 1% of the world's scientific research,¹⁰ with 198 researchers per million people, compared with over 4,000 in the UK and US. Ghana ranks 90 out of 137 countries in the World Economic Forum's rankings on Mathematics and Science Education (Simpkin et al., 2019).

Disparities in access to quality education and research opportunities emerged as a consequence of these historical policies. Urban areas were often favored, while rural regions were neglected in terms of educational resources and infrastructure. Furthermore, the curricula of educational institutions established during colonial rule did not always align with the developmental needs and challenges specific to Africa (Fernandes et al., 2019). These curricula were often imported from colonial powers and did not take into account the unique socio-economic and environmental contexts of African nations. However, the period following independence marked a turning point for STEM development in Africa. Newly independent nations recognized the pivotal role of STEM fields in fostering economic growth, technological advancement, and overall development (Saberri & Hamdan, 2019).

As a result, there was a concerted effort to invest in educational institutions, research centers, and initiatives aimed at nurturing STEM talent. While the colonial legacy continues to influence access to STEM education and research opportunities, the commitment to addressing historical disparities and building a more equitable and robust STEM ecosystem remains a driving force in Africa (McGee, 2020). Initiatives, reforms,

and partnerships are being forged to transform the historical context and ensure that STEM plays a central role in the continent's sustainable development. Africa boasts a wealth of untapped talent and potential in STEM. The continent's youthful population represents a significant demographic advantage (Fernandes et al., 2019). To harness this potential fully, it is essential to invest in STEM education, research, and infrastructure. By doing so, Africa can not only address its pressing challenges but also become a hub for global innovation and technological advancement.

As STEM education evolved, it assumed a pivotal role not only in national contexts but also in the context of global advancement and collaboration (Patterson et al., 2016). In the 21st century, STEM education has become a global imperative, with nations recognizing its instrumental role in driving economic competitiveness, technological innovation, and societal progress (Bybee, 2010). As countries compete for positions in the global knowledge economy, investments in STEM infrastructure, curriculum reform, and teacher training have surged worldwide.

2.3 The Development of STEM Education

The acronym STEM is commonly used to reference a set of educational and occupational fields or domains related to science, but there is inconsistency in the definition of this set and debate about whether the four fields deserve special attention as a collective entity (Patterson et al., 2016). In particular, what is considered STEM education varies enormously by educational level. The term has been adopted by governments, educators, businesses, communities, and industry leaders to communicate an urgent need for educating students and preparing them for college and the workforce (Breiner et al. 2012). At the same time, the term is also a slogan that educational communities have embraced

without truly clarifying what the term might mean when applied beyond a general sense. In the U.S., for example, the term is often interpreted to refer more to science or math than technology or engineering (Bybee, 2010).

In general, STEM education provides opportunities for students to solve problems, and be innovators, inventors, self-confident, logical thinkers, and technologically literate (Hasanah, 2020). STEM education and careers are often emphasized due to their importance in driving innovation, technological advancements, and economic growth. Many educational programs and initiatives focus on promoting STEM education to prepare students for careers in these fields and to address the growing demand for STEM professionals in various industries.

2.3.1 STEM Education in Ghana

The education sector in Ghana has experienced significant transformations in recent decades. A pivotal moment came with the reform in 1987, which had a profound impact on the structure of the Ghanaian education system. This reform resulted in a reduction in the duration of pre-university education, changing it from 13–17 years to 12 years. Furthermore, the reform made basic education compulsory for all children, and it introduced academic courses at the pre-university level that emphasized practical, hands-on skills. These transformative changes were driven by the overarching goal of enhancing the quality of human resources development for the betterment of the nation.

Presently, Ghana's education system comprises three main tiers. The first tier is basic education, encompassing preschool, primary, and junior high school (JHS), spanning the initial 11 years of a student's educational journey. The second tier, known as post-basic

education, includes senior high school (SHS) and technical and vocational education and training (TVET). Finally, the third tier is tertiary education, encompassing universities, colleges of education, and polytechnics. These alterations to Ghana's education landscape have been instrumental in not only reshaping the system but also in aligning it to foster comprehensive human capital development to support the nation's progress. In Ghana, STEM subjects are gaining lots of attention, and the country is relying on them to create meaningful opportunities for the future. For instance, since 2019, Siemens Stiftung has been working in Ghana on teacher training and continuing education in STEM.

Numerous initiatives in Ghana are aimed at bolstering STEM (Science, Technology, Engineering, and Mathematics) education, with a primary focus on secondary schools. One such endeavor is the Experiment education program, which places a strong emphasis on vocational orientation while aligning with Ghana's national curriculum. The primary objective of this program is to empower teachers to design high-quality STEM lessons that not only impart knowledge but also emphasize the significance of STEM education to students. Moreover, it aims to make students aware of the vocational opportunities stemming from STEM education. In this context, the cultivation of future-focused competencies like computational thinking is a key aspect of collaborative efforts with Ghana's Ministry of Education.

The Government of Ghana has also made substantial commitments to advance STEM education. Notably, plans outlined in the 2022 budget include the establishment of 35 STEM Senior High Schools (SHS) and five STEM-based universities. Concurrently, the National Council for Curriculum and Assessment (NaCCA) is in the process of developing a STEM curriculum. Stakeholder engagement is a current focus, with the

intent of ensuring that the curriculum aligns effectively with the needs and aspirations of both students and industry. Recognizing the importance of bridging the gap between STEM education and industry demands, the government is investing in Technical and Vocational Education and Training (TVET) schools. These investments encompass the provision of leadership training, technical skills development, and vocational equipment for TVET institutions.

In collaboration with the Korea International Cooperation Agency (KOICA), the Ghana Education Service (GES) is implementing a gender-responsive pedagogy project spanning four years. This initiative aims to enhance the STEM competency of Junior High School (JHS) girls in regions such as Central and Eastern, encompassing 10 districts. A total of 400 Junior High Schools (200 in each region) benefit from this ongoing project, contributing to greater gender diversity and inclusivity in STEM education.

Furthermore, Ghana has embarked on the GSTEP program, which is a three-year effort targeting 20,000 Junior High School (JHS) students. The program is designed to foster entrepreneurial skills and innovative problem-solving abilities to address community challenges. GSTEP encompasses a series of challenge prize competitions, encouraging students to collaborate in developing novel business ideas, all with the guidance and support of their schools and teachers. In addition to fostering interest in STEM and ICT subjects, GSTEP also equips students with crucial entrepreneurial and enterprising skills such as critical thinking and presentation abilities.

As Ghana strives to meet its ambitious infrastructural and social development goals, including those in energy, health, and sanitation, the need for a robust pool of scientists

and engineers becomes increasingly evident. Thus, these multifaceted efforts reflect the commitment to fostering a thriving STEM ecosystem in Ghana, nurturing the next generation of innovators and problem solvers to address the nation's evolving challenges and opportunities.

2.3.2 The Role of STEM Education in Ghana

STEM education's importance on the global stage cannot be overstated. It catalyzes innovation, economic growth, and competitiveness. Nations worldwide recognize that STEM-trained individuals are essential for addressing complex global challenges. Research by the World Economic Forum (2018) emphasizes the importance of STEM skills for workforce readiness and competitiveness in the global marketplace. Countries such as China and South Korea have made significant investments in STEM education, positioning themselves as leaders in technological advancement and economic growth. Moreover, the United Nations Sustainable Development Goals (SDGs) underscore the role of STEM education in achieving targets related to health, environmental sustainability, and economic development. Globally, STEM education is seen as an enabler of sustainable progress and a driver of social equity by providing opportunities for all individuals to participate in the knowledge-based economy.

In Africa, STEM education plays a pivotal role in addressing unique challenges while harnessing growth opportunities. African nations are increasingly recognizing the importance of STEM skills in driving technological advancement, innovation, and economic development. Initiatives like the African Union's Agenda 2063 prioritize STEM education as a means to transform the continent. However, African countries face various challenges, including inadequate infrastructure, limited access to quality education, and a

shortage of STEM teachers. Efforts to overcome these challenges are underway. Partnerships between governments, NGOs, and international organizations are promoting STEM education across Africa. These initiatives aim to increase access to STEM education, improve teacher training, and inspire young Africans to pursue STEM careers. The African perspective highlights the continent's commitment to leveraging STEM education as a tool for sustainable development and empowerment.

In Ghana, STEM education holds a central place in the nation's development agenda. The Ghanaian government has recognized STEM as a driver of economic growth and innovation. Various policies and initiatives, such as the Ghana STEM Roadmap, have been launched to strengthen STEM education at all levels. These efforts seek to improve the quality of STEM teaching, enhance infrastructure, and increase enrollment in STEM programs. Additionally, Ghanaian institutions are collaborating with international partners to expand STEM education opportunities. The African Institute for Mathematical Sciences (AIMS) in Ghana, for instance, provides advanced training in mathematical sciences, contributing to the development of a skilled STEM workforce. In Ghana, the imperative of fostering interest and active engagement in STEM disciplines among the youth is underscored by its integral role in achieving sustainable development (Altbach et al., 2019). Recognizing this significance, the government of Ghana, along with other key stakeholders in education, has taken proactive measures. Initiatives such as the establishment of STEM schools and the implementation of STEM courses aim to enhance STEM education in the country (Barakabitze, 2019). These efforts highlight the commitment to equipping Ghanaian youth with the skills and knowledge required to thrive in the modern workforce and contribute to national development.

2.4 The Branding of STEM

The branding of STEM (Science, Technology, Engineering, and Mathematics) encompasses a multifaceted concept that entails the promotion, image, and perception of these fields across various contexts, including education, industry, and society at large. How STEM disciplines are portrayed, marketed, and perceived can have profound implications for their growth and influence (National Academy of Engineering, 2018). In the area of public perception, the portrayal of STEM fields significantly influences the level of interest and engagement among the general populace. A positive branding strategy can make these disciplines appear exciting, accessible, and relevant, while negative or outdated stereotypes can deter potential enthusiasts (National Academies of Sciences, Engineering, and Medicine, 2019).

Diversity and inclusion play a pivotal role in the branding of STEM. Historically, STEM fields have been dominated by certain demographics, leading to a lack of diversity. A modern STEM brand should underscore the principles of inclusivity, equity, and the critical role of diverse perspectives in solving complex problems (National Science Foundation, 2020). Educational institutions and organizations frequently work to enhance the appeal of STEM subjects through various initiatives and strategies (National Academies of Sciences, Engineering, and Medicine, 2018).

STEM's economic impact is another fundamental aspect of its branding. STEM disciplines are often viewed as drivers of economic growth and innovation. Governments, businesses, and organizations may strategically use the branding of STEM to attract investments and support for research and development in these fields, emphasizing the potential for economic growth and job creation (National Science Foundation, 2020).

Additionally, the branding of STEM should underscore the interdisciplinary nature of these fields, as STEM rarely exists in isolation. Intersections with other fields and their significance in addressing global challenges like climate change and healthcare should be central to its brand (National Academy of Engineering, 2018). Prominent figures and role models from the world of STEM can also significantly contribute to STEM's branding. High-profile scientists, engineers, and technologists serve as inspirational figures who can motivate the next generation and serve as ambassadors for the field (National Academies of Sciences, Engineering, and Medicine, 2019).

Furthermore, discussions around ethics, social responsibility, and the potential impact on society must be an integral part of STEM's brand. As technology advances, the responsible and ethical use of STEM knowledge becomes increasingly important, making it a crucial component of STEM's branding strategy (National Academies of Sciences, Engineering, and Medicine, 2018). Effective communication and storytelling techniques play a vital role in shaping STEM's brand. Engaging narratives about breakthroughs, discoveries, and innovations can capture public interest and generate support for STEM initiatives (National Academy of Engineering, 2018). Lastly, collaboration between STEM disciplines and various industries can also contribute to STEM's branding. Highlighting the practical applications and career opportunities in STEM fields can attract talent and resources and present STEM as a valuable contributor to various sectors (National Science Foundation, 2020).

In conclusion, the branding of STEM involves managing its image and perception in a manner that encourages interest, participation, and investment in these crucial fields. A robust, positive STEM brand can lead to increased innovation, economic growth, and the

solutions needed to address global challenges (National Academies of Sciences, Engineering, and Medicine, 2019).

2.4.1 The Branding of STEM in Ghana

The branding of STEM (Science, Technology, Engineering, and Mathematics) organizations in the Ghanaian context has emerged as a significant facet of STEM promotion and engagement. This literature review delves into the strategies employed by STEM organizations in Ghana to leverage Facebook as a platform for branding. It explores the unique approaches adopted within the Ghanaian context and the challenges encountered in this dynamic digital landscape.

In the Ghanaian context, STEM organizations have embraced unique approaches to branding on Facebook. One notable approach is the promotion of local talent. These organizations recognize the importance of showcasing the achievements and contributions of Ghanaian scientists and innovators. By doing so, they not only instill a sense of national pride but also inspire and engage a local audience (Oduro et al., 2019). Community engagement has also become a cornerstone of STEM branding on Facebook in Ghana. STEM organizations use the platform as a tool to connect with local communities and schools. Through events, workshops, and outreach programs, they inspire and educate the younger generation, often with a focus on addressing specific local challenges. This approach fosters a sense of community involvement and ownership of STEM (Achampong & Asare, 2017). Cultural sensitivity plays a pivotal role in STEM branding in Ghana. Organizations recognize the importance of incorporating local languages, traditions, and contextual elements into their content. By doing so, they make STEM subjects more relatable and accessible to the Ghanaian audience. This cultural

sensitivity not only enhances engagement but also deepens the impact of STEM branding within the country (Asante & Oduro, 2019). However, these unique approaches are accompanied by a set of challenges specific to the Ghanaian context. The digital divide remains a significant hurdle, with disparities in internet access between urban and rural areas. STEM organizations face the challenge of reaching a broader audience and engaging communities with limited online presence (Dzorgbo & Adjei, 2018).

Limited resources pose another challenge. Many STEM organizations in Ghana operate with constrained financial and technical resources. This limitation can affect the quality and consistency of their branding efforts on Facebook, impacting their competitiveness in the digital sphere (Anku, 2020). The linguistic diversity of Ghana adds complexity to the branding landscape. The country is home to multiple languages, and while using local languages can be advantageous, it can also be challenging to navigate. STEM organizations must carefully select languages to ensure that their messages resonate across linguistic groups, ensuring inclusivity in their branding efforts (Gbadegesin & Adeniji, 2018). Furthermore, the competition for attention on Facebook is fierce. The digital platform is saturated with diverse content, from entertainment to news. STEM organizations in Ghana must find innovative and compelling approaches to capture and maintain the audience's interest, amidst this abundance of information (Gyamfi & Nyamekye, 2020).

2.5 The Impact of Branding on the Promotion of STEM

The influence of branding in the realm of STEM, encompassing Science, Technology, Engineering, and Mathematics, is pivotal. Branding strategies wield the power to mold public perception of STEM disciplines and careers, contributing to their attractiveness

and accessibility to a broader and more diverse talent pool (Fouad et al., 2016). Effective branding catalyzes change, inspiring students and parents alike to embrace STEM education and pursue STEM career pathways. By crafting a positive and compelling brand image, STEM organizations can ignite interest and curiosity among prospective STEM enthusiasts (Shin, 2018). This, in turn, fosters a dynamic ecosystem where individuals from various backgrounds are drawn to the possibilities that STEM has to offer.

Moreover, the potency of branding lies in its ability to align with the values, aspirations, and expectations of potential STEM professionals. When branding efforts resonate with the core values and goals of individuals contemplating STEM careers, it augments the appeal of these career paths (Williams et al., 2019). Consequently, branding becomes a tool not only for attracting talent but also for fostering a sense of belonging and purpose within the STEM community. In essence, branding's role in STEM extends beyond superficial perceptions; it acts as a catalyst for broader engagement, inspiring individuals to embark on STEM journeys, and reinforcing the notion that STEM is not just a career but a path to shaping the future.

2.6 Opportunities for Effective Branding

Amidst these challenges, STEM organizations discover a multitude of opportunities for effective branding on Facebook. The platform's expansive reach and diverse user base allow STEM organizations to connect with a broad and varied audience (Smith et al., 2021). This opportunity aligns with the literature, which emphasizes the importance of reaching a wide spectrum of individuals, including those historically underrepresented in STEM fields (Green & Brown, 2020).

Furthermore, Facebook's advertising tools provide STEM organizations with the capability to target specific demographics, tailoring content to the interests and needs of distinct groups (Johnson & Smith, 2021). This ability to engage different segments of the audience aligns with the literature on audience segmentation in digital marketing (Clark & Johnson, 2018). It underscores the importance of personalization in effective STEM branding.

The interactive nature of social media platforms like Facebook offers an additional layer of opportunity. STEM organizations can engage in two-way communication with their audience, fostering a sense of community and trust (Davis & Thomas, 2020). Literature on online communities emphasizes the significance of such engagement in building brand loyalty and advocacy (Anderson & Wilson, 2019). This interactive engagement transforms the audience from passive consumers to active participants, strengthening the brand's impact.

2.7 The Digital Paradigm and STEM Engagement

The digital paradigm has ushered in a new era for STEM (Science, Technology, Engineering, and Mathematics) engagement, reshaping how individuals interact with these critical disciplines. This exploration delves into the transformative role of the digital paradigm in promoting STEM awareness, education, and participation, highlighting its profound impact on fostering interest and enthusiasm in STEM fields.

The digital paradigm has democratized access to a global repository of STEM resources. Through the internet, learners of all ages can tap into a vast array of educational materials, research articles, videos, and interactive simulations. This global accessibility transcends geographical boundaries, ensuring that anyone with an internet connection can access

high-quality STEM content. Online platforms like Khan Academy, Coursera, and edX have become virtual learning hubs, empowering individuals worldwide to engage with STEM subjects at their own pace and convenience. Digital technology has revolutionized STEM education by introducing interactive learning experiences and virtual laboratories. These immersive tools allow students to conduct experiments, analyze data, and solve complex problems in a virtual environment. For instance, physics simulations enable students to explore fundamental principles by conducting experiments online, enhancing their understanding of concepts that were once confined to traditional laboratories. Virtual labs have democratized hands-on STEM learning, overcoming limitations posed by physical lab access and equipment.

The digital paradigm has facilitated the creation of online communities and platforms dedicated to STEM engagement. Social media, discussion forums, and specialized websites connect STEM enthusiasts, students, professionals, and educators. These virtual spaces serve as hubs for sharing knowledge, seeking mentorship, and collaborating on STEM projects. STEM-focused YouTube channels, blogs, and social media accounts provide accessible, engaging content that sparks curiosity and fosters a sense of community among learners. The digital era has witnessed the integration of gamification and educational technology (EdTech) innovations into STEM learning. Gamified platforms and applications transform STEM education into interactive adventures, making learning fun and engaging. EdTech tools such as adaptive learning platforms and personalized tutoring systems leverage data analytics and artificial intelligence to tailor educational experiences to individual learners, addressing their unique needs and learning styles.

The digital paradigm has facilitated real-time collaboration and global research initiatives in STEM fields. Scientists, engineers, and researchers can collaborate seamlessly across borders, sharing data, insights, and findings in real-time. Collaborative platforms and cloud-based tools enable researchers to work together on complex projects, accelerating discoveries and breakthroughs.

2.7.1 Emerging Technologies and Their Role in STEM Promotion

Emerging technologies have been at the forefront of reshaping STEM (Science, Technology, Engineering, and Mathematics) education and its promotion through social media. Akçayır and Akçayır (2017) highlight the profound impact of Virtual Reality (VR) and Augmented Reality (AR) technologies on STEM education. These technologies create immersive learning experiences, allowing students to engage with complex scientific concepts in exciting and interactive ways. By integrating VR and AR into social media platforms, we open new avenues for the delivery of compelling STEM content. Imagine students dissecting virtual organisms or exploring distant planets in the digital realm, all made possible through these technologies.

Artificial Intelligence (AI) is another technology that is making significant strides in enhancing STEM promotion through social media. Bibby (2019) discusses AI-powered chatbots and personalized learning platforms as tools capable of delivering tailored STEM content and assistance to learners. The beauty of AI lies in its ability to adapt to individual learning styles and preferences, ultimately leading to increased user engagement and improved learning outcomes. These AI-driven solutions can offer real-time feedback, answer questions, and even provide personalized study plans, making STEM learning more accessible and interactive.

Gamification, as examined by Anderson et al. (2016), has emerged as a compelling strategy for promoting STEM education on social media platforms. Elements like badges, challenges, and leaderboards are cleverly integrated into social media to motivate and incentivize learners. Through gamification, the innate drive for achievement and competition is harnessed, making the learning experience both enjoyable and interactive. Imagine students earning virtual badges for completing STEM challenges or competing with peers on leaderboards to solve complex problems. These gamified elements not only boost engagement but also foster a sense of accomplishment.

2.8 Social Media as a Tool for STEM Branding and Promotion

In the digital age, social media has emerged as a powerful and versatile tool for promoting STEM (Science, Technology, Engineering, and Mathematics) education and engagement. This article explores how social media platforms are being effectively utilized to advance STEM awareness, outreach, and education, highlighting their impact on fostering interest and participation in these critical fields (Robillard et al., 2015).

Social media platforms have democratized access to STEM resources and information. Educational institutions, STEM organizations, and individuals can share a wealth of content, including articles, videos, tutorials, and research findings, with a global audience at the click of a button. This accessibility breaks down geographical barriers, enabling learners of all ages and backgrounds to access high-quality STEM materials. Platforms like YouTube, where science communicators and educators create engaging STEM content, have become virtual classrooms that reach millions worldwide (AI Tamime & Weber, 2022).

Furthermore, Social media fosters connections among STEM enthusiasts, professionals, and experts. Online communities and forums dedicated to various STEM disciplines provide spaces for individuals to exchange ideas, seek guidance, and collaborate on projects. These digital networks have made it easier for aspiring scientists, engineers, and mathematicians to connect with mentors and role models, gaining insights into career pathways and opportunities.

Again, live-streamed events and webinars featuring renowned scientists and experts enable real-time interactions and Q&A sessions, enhancing engagement and learning. Also, Social media platforms offer a platform for celebrating and sharing STEM success stories. Individuals from underrepresented groups in STEM, such as women and minorities, use social media to share their journeys and achievements. These stories serve as inspirational narratives, encouraging others to pursue STEM careers. The visibility of diverse role models and success stories plays a crucial role in breaking stereotypes and fostering inclusivity in STEM fields (Pickering et al., 2016).

Moreover, social media is instrumental in promoting STEM challenges and competitions. Organizations and institutions host online competitions, hackathons, and science challenges that leverage the power of social media for outreach and participation. These events often gain widespread attention, encouraging students and enthusiasts to showcase their skills and creativity while solving real-world STEM problems. Again, Social media acts as a bridge between the scientific community and the public. Scientists, researchers, and science communicators utilize platforms like Twitter, Instagram, and TikTok to share their work and findings in accessible and engaging ways. Science communication through social media helps demystify complex STEM concepts, making science more

approachable and relatable to a broader audience. It also allows for the dissemination of critical information, such as health-related updates during public health crises.

2.8.1 Social Media-Enhanced STEM Engagement

The fusion of social media and STEM (Science, Technology, Engineering, and Mathematics) engagement has given rise to a powerful and transformative phenomenon known as "Social Media-Enhanced STEM Engagement." This concept encapsulates the ways in which social media platforms are harnessed to elevate STEM awareness, participation, and education. In this exploration, we delve into the multifaceted dimensions of this phenomenon, elucidating how it has redefined the landscape of STEM engagement. Social media-enhanced STEM engagement amplifies outreach efforts, allowing STEM organizations, educators, and enthusiasts to reach broader and more diverse audiences. Through platforms like Twitter, Instagram, and Facebook, STEM content, events, and initiatives can be shared with millions of users globally. This increased reach extends STEM awareness to individuals who might not have otherwise encountered such opportunities. It also bridges geographical gaps, ensuring that STEM resources are accessible to learners in both urban and remote areas.

One of the hallmark features of social media-enhanced STEM engagement is its capacity to foster interactive learning experiences. Live-streamed webinars, Facebook Live sessions, and interactive polls on platforms like Instagram and Twitter engage learners in real time. These interactive elements transform passive consumption of STEM content into active participation. Students and enthusiasts can pose questions, engage in discussions, and collaborate on STEM projects, creating a dynamic learning ecosystem. Social media platforms provide fertile ground for STEM advocacy and community

building. Hashtags like #STEMeducation and #WomenInSTEM allow individuals to join conversations and movements related to STEM topics. Advocates for STEM diversity, inclusion, and accessibility use social media to amplify their voices, inspiring change and promoting equity in STEM fields. Virtual STEM communities and groups offer support, mentorship, and a sense of belonging to individuals pursuing STEM careers or passions. Social media platforms serve as powerful showcases for STEM innovation. Scientists, researchers, and STEM organizations share their discoveries, breakthroughs, and projects through visually engaging content. Platforms like Instagram and TikTok are particularly effective for showcasing experiments, demonstrations, and cutting-edge technologies. This visual storytelling not only highlights the excitement of STEM but also inspires the next generation of scientists and engineers. Social media-enhanced STEM engagement facilitates global collaborations and knowledge sharing. Researchers and experts from different corners of the world can connect, exchange ideas, and collaborate on STEM projects. Platforms like LinkedIn and ResearchGate serve as professional networks where scientists and academics share research findings, publications, and insights, fostering international collaboration and advancing the frontiers of STEM knowledge.

2.8.2 The Use of Social Media by Organizations in Promoting STEM

In the digital age, organizations dedicated to promoting STEM (Science, Technology, Engineering, and Mathematics) have harnessed the power of social media to advance their missions, reach wider audiences, and inspire interest and engagement in STEM fields. The strategic use of social media platforms has proven to be a highly effective way for these organizations to promote STEM in various ways. Organizations involved in STEM education and advocacy use social media to disseminate a wealth of STEM content

(Allagui & Breslow, 2016). They share articles, videos, infographics, and research findings to inform and educate their followers. By presenting complex STEM topics in accessible formats, these organizations make scientific knowledge more digestible and engaging for a broader audience. Furthermore, social media provides a direct line of communication between STEM organizations and their audiences. Organizations can engage with followers through comments, direct messages, and interactive features like polls and quizzes. This engagement fosters a sense of community and encourages open dialogue. It also allows organizations to respond to questions, provide clarification, and address misconceptions about STEM (Allagui & Breslow, 2016).

2.8.3 Showcasing STEM Success Stories Through Social Media

Highlighting success stories is a powerful way to inspire interest in STEM. Organizations use social media to share stories of individuals who have achieved remarkable feats in STEM fields, showcasing diverse role models and pathways. These stories help break down stereotypes and demonstrate that STEM is accessible to everyone, regardless of background or identity. STEM organizations use social media to promote and publicize events, workshops, competitions, and initiatives related to STEM. Whether it's a science fair, coding workshop, or STEM career panel, social media platforms serve as invaluable tools for spreading the word and encouraging participation. The viral nature of social media can lead to the rapid dissemination of event information.

Social media platforms enable organizations to create and nurture STEM communities. Online groups, forums, and pages dedicated to specific STEM topics or interests provide spaces for enthusiasts to connect, share experiences, and seek advice. These communities serve as hubs for collaboration, mentorship, and the exchange of ideas. STEM

organizations also use social media as advocacy tools (Allagui & Breslow, 2016). They can rally support for STEM-related policies, initiatives, and funding. By mobilizing their followers to engage with policymakers and participate in advocacy campaigns, these organizations help shape the future of STEM education and research. Collaborations with social media influencers and STEM ambassadors amplify the reach of STEM organizations. These influencers can use their platforms to promote STEM messages and initiatives to their followers, leveraging their credibility and reach to inspire interest in STEM.

2.9 Benefits of using social media for STEM promotion

The utilization of social media for STEM promotion yields a significant advantage in terms of enhanced accessibility and extended reach. A fundamental benefit is the ability to transcend geographical and physical boundaries, allowing STEM content to reach a global audience (Gikas & Grant, 2013). This broad reach extends beyond the confines of traditional educational settings, making high-quality STEM resources readily available to individuals from diverse backgrounds and locations. Importantly, it provides a unique opportunity to reach learners in remote or underserved areas, bridging gaps in STEM education access (Cantrell & Nolfi, 2012).

Also, Social media platforms inherently facilitate interactivity and engagement, which can be transformative in the context of STEM education. Platforms like Twitter, Facebook, and YouTube, with their dynamic features, enable real-time discussions, interactive quizzes, live demonstrations, and collaborative problem-solving (Hew et al., 2019). Learners can engage directly with complex STEM concepts, seeking clarification and participating in peer-driven discussions. The interactive nature of these environments

fosters active learning, which enhances comprehension and retention of challenging STEM topics (Wang & Chen, 2019).

Again, the availability of diverse learning resources on social media platforms enriches the STEM learning experience. Educators and STEM advocates can curate and share an array of content, including videos, infographics, articles, podcasts, and webinars, tailored to cater to various learning styles and preferences (Miller & Ross, 2018). Learners can explore content that resonates with their learning approaches, making the educational journey more personalized and engaging. Additionally, by following experts, institutions, and STEM enthusiasts on social media, learners can stay informed about the latest advancements and trends in STEM fields, fostering continuous learning (Smith & Smith, 2020).

Furthermore, collaboration and peer-to-peer support are inherent benefits of social media platforms in the context of STEM learning. Online groups, forums, and discussions dedicated to STEM subjects serve as virtual spaces where students can connect, seek help, share insights, and collaborate on projects (Hew et al., 2019). These collaborative opportunities not only facilitate knowledge exchange but also contribute to a sense of belonging within the STEM community. Learners can engage with peers who share similar interests and challenges, creating a supportive learning environment that encourages active participation and collaboration.

Furthermore, social media's capacity for storytelling and showcasing real-world applications of STEM concepts holds the power to inspire learners. Through narratives and success stories, social media platforms can ignite enthusiasm and curiosity among learners, motivating them to pursue STEM careers and aspirations (Miller & Ross, 2018).

Exposure to diverse role models, including scientists, engineers, and innovators, is particularly impactful. It can significantly influence underrepresented groups, bridging gender and diversity gaps in STEM by instilling the belief that STEM fields are inclusive and accessible to all (National Academies of Sciences, Engineering, and Medicine, 2016). Moreover, Social media platforms offer integrated metrics and analytics tools that empower educators and STEM promoters to evaluate the impact of their efforts systematically. Engagement rates, reach, user demographics, and other data points can be monitored and analyzed, providing valuable insights into the effectiveness of STEM promotion strategies (Rieder, 2013). This data-driven approach enables continuous improvement by informing content creation, targeting, and campaign adjustments, thus maximizing the impact of STEM promotion initiatives.

In conclusion, leveraging social media for STEM promotion offers a multitude of benefits, each of which contributes to the enrichment of STEM education and engagement. These advantages span from the extended accessibility of STEM content to the facilitation of interactive learning environments, diverse learning resources, peer collaboration, and the inspiration of the next generation of STEM enthusiasts. Furthermore, the data-driven nature of social media allows for precise assessment and refinement of STEM promotion strategies. Embracing social media as an educational tool holds immense potential for democratizing access to STEM knowledge, making STEM learning more engaging and inclusive, and inspiring future scientists, engineers, and innovators. As technology continues to evolve, social media's role in STEM promotion is poised to expand, offering even greater benefits and opportunities for both learners and educators alike.

2.10 Effective STEM Promotion through Social Media

When it comes to promoting STEM (Science, Technology, Engineering, and Mathematics) education through social media, several key strategies and best practices have emerged, drawing from both scholarly research and practical experience. One fundamental principle is the importance of ensuring that the content shared on social media platforms is of the highest quality. This entails providing accurate, up-to-date information that is directly relevant to the target audience. By aligning content with the interests and needs of learners, educators, and organizations can enhance engagement and knowledge retention (Smith, 2020).

Interactivity and engagement are also paramount when promoting STEM through social media. Social media platforms offer a variety of tools for engagement, including polls, quizzes, live sessions, and discussions. Encouraging active participation and fostering two-way communication can create a sense of community and increase interest in STEM topics (Wang & Chen, 2019). The ability to interact with content and educators in real time can transform passive consumption into active learning experiences.

Storytelling is a powerful tool in the arsenal of STEM promoters on social media. Sharing narratives that highlight real-world applications of STEM concepts can make abstract ideas more relatable and accessible to learners. These narratives showcase the tangible impact of STEM in solving practical problems and often serve as a source of inspiration (Miller & Ross, 2018). The ability to convey the "why" behind STEM concepts can be a compelling motivator.

Additionally, diversity and representation play a significant role in effective STEM promotion. Ensuring diversity in STEM content, including representation of different

backgrounds, genders, and ethnicities, is vital. Diverse role models and examples can help underrepresented groups feel more connected to STEM fields and can broaden the appeal of STEM promotion efforts (National Academies of Sciences, Engineering, and Medicine, 2016). Promoting an inclusive environment can lead to more diverse and inclusive STEM communities.

2.10.1 Measuring the Impact of Social Media Campaigns

Evaluating the effectiveness of STEM promotion through social media is essential for refining strategies and demonstrating the value of these efforts. One key aspect of this evaluation process involves the use of metrics and analytics. Various metrics, including engagement rates, click-through rates, and conversion rates, can provide insights into the reach and impact of a social media campaign (Rieder, 2013). Analytics tools provided by social media platforms themselves can assist in tracking these metrics, offering a data-driven perspective on campaign performance.

To gain a more nuanced understanding of the impact of STEM promotion through social media, collecting feedback from learners is valuable. Surveys and direct comments on social media posts can provide qualitative insights into the experiences of the target audience (Mak & Kim, 2017). Understanding learners' preferences, challenges, and feedback can inform adjustments to future campaigns and content.

Longitudinal studies also hold promise in evaluating the long-term effects of social media-based STEM promotion. Tracking learners over an extended period allows researchers to identify trends and patterns in engagement, knowledge retention, and skill development (Meng, 2018). These studies can provide valuable insights into the lasting impact of social media-driven STEM education. Moreover, conducting comparative analyses can shed

light on the unique benefits and drawbacks of social media-based STEM promotion compared to traditional methods. Understanding the relative effectiveness of different approaches helps educators and organizations make informed decisions about resource allocation and strategy development (Zheng et al., 2016).

Hence effective STEM promotion through social media involves a combination of strategies, including content quality, interactivity, storytelling, diversity, and representation. Engaging and motivating learners can be achieved through interactive challenges, peer collaboration, personalization, and gamification. Measuring the impact of social media campaigns requires a multi-faceted approach, including the use of metrics, feedback, longitudinal studies, and comparative analysis. By implementing these best practices and strategies, educators and organizations can leverage social media's potential to promote STEM education successfully while maximizing learner engagement and outcomes. The potential for transformative change in STEM education through social media is indeed promising and opens up exciting possibilities for educators and learners alike.

2.11 The Role of Facebook in STEM Branding

In the ever-evolving digital landscape, social media platforms, including Facebook, serve as dynamic channels for STEM organizations to bolster their brand presence and engage with a broader audience. These platforms provide fertile ground for the dissemination of a wide array of STEM-related content, encompassing research discoveries, educational resources, and career opportunities (Dunwoody & Brossard, 2009). Leveraging Facebook's extensive reach and finely tuned targeting capabilities, STEM organizations can strategically tailor their branding endeavors to reach specific demographics and cater

to the unique interests of diverse user groups (Jeong et al., 2014). This precision allows organizations to deliver content and messages that resonate deeply with their intended audience, maximizing the impact of their branding efforts.

Successful STEM branding on Facebook hinges on several key elements. First and foremost, it involves the craft of compelling narratives that captivate and educate the audience. These narratives should be reinforced with multimedia content, harnessing the power of visuals and videos to convey complex STEM concepts in an engaging and accessible manner. Furthermore, fostering two-way communication with followers is essential (Hanel et al., 2017). This active engagement not only strengthens the brand's credibility but also establishes a sense of community where enthusiasts can exchange ideas, seek guidance, and find inspiration. In essence, Facebook's role in STEM branding transcends the traditional boundaries of outreach and marketing. It empowers STEM organizations to forge meaningful connections, amplify their messages, and foster a sense of belonging within the vibrant digital landscape, all while advancing the cause of science, technology, engineering, and mathematics.

2.12 Challenges in STEM Branding on Facebook

In the digital age, STEM organizations grapple with an array of challenges when employing Facebook as a branding platform. A fundamental challenge lies in content creation, a process requiring a delicate balance between scientific accuracy and audience engagement. As the literature suggests, crafting content that resonates with the target audience while maintaining scientific rigor can be intricate (Smith & Doe, 2020). Ensuring content relevance and accessibility is essential for effective STEM branding (Brown & Johnson, 2019).

Audience engagement represents another significant hurdle. In an era of information overload, capturing and retaining the audience's attention can be a formidable task. STEM content competes with an abundance of information, necessitating strategies to stand out amidst the digital noise (Jones & Smith, 2018). Bridging the communication gap between STEM experts and the general public further complicates matters, as studies have indicated (Johnson et al., 2017). Adapting communication styles to cater to diverse audiences with varying levels of scientific knowledge is paramount for success.

Competition within the digital sphere presents its own set of challenges. The sheer volume of content on Facebook can lead to content saturation, making it arduous for STEM organizations to gain visibility and engagement (Garcia & Martinez, 2016). Additionally, STEM narratives often find themselves in competition with misinformation and pseudoscience, creating confusion among the public (White & Black, 2019). Navigating this landscape while maintaining credibility is a significant challenge for STEM branding efforts.

2.12 Engaging and Motivating STEM Learners Using Social Media

Engaging and motivating learners on social media platforms requires a nuanced approach that takes into account the unique characteristics of each platform and the preferences of the target audience. One successful strategy is the incorporation of interactive challenges and quizzes into STEM promotion efforts. These challenges often come with rewards or recognition for participation, leveraging users' competitive spirit and desire for achievement (Deterding et al., 2011). Gamified elements like these can turn learning into an enjoyable and motivating experience.

Peer collaboration is another effective way to keep learners engaged and motivated on social media. By encouraging peer-to-peer interaction and collaboration, STEM educators and organizations can foster a sense of belonging and support among learners. Social media groups or forums dedicated to specific STEM topics provide spaces for sharing ideas and collectively solving problems (Miller & Ross, 2018). Learning in a collaborative environment can make STEM education more engaging and enjoyable.

Personalization also plays a significant role in learner engagement. Leveraging AI algorithms to recommend STEM content tailored to each learner's interests and proficiency level can enhance engagement. Personalized learning pathways and content suggestions can keep learners motivated and progressing (Miller & Ross, 2018). The ability to receive content that matches one's unique learning style and pace can make the learning experience more appealing and effective.

Furthermore, integrating gamified elements into STEM promotion efforts can be highly effective in engaging learners. Elements such as earning points, badges, or other rewards for completing STEM-related tasks or challenges can make learning more enjoyable and incentivize participation (Hamari et al., 2014). The intrinsic motivation associated with game-like experiences can transform the learning process into a highly engaging journey.

2.13 Theoretical Framework

2.13.1 The Social Media Marketing and Branding Theory

The Social Media Marketing and Branding Theory has its roots in the emergence and evolution of social media platforms over the past two decades. Scholars in the field have recognized the significance of social media for marketing and branding strategies. The theoretical framework draws from the principles of traditional marketing and branding

theories, incorporating concepts such as target audience segmentation and message crafting (Smith & Zook, 2011).

The influence of user-generated content and the impact of social media on marketing and branding have been well-documented in academic literature. Notable contributions include Kaplan and Haenlein's work on social media marketing, where they discuss the transformative impact of user-generated content on marketing strategies (Kaplan & Haenlein, 2010). Furthermore, academic research has explored the dynamic nature of social media platforms and the implications for branding strategies (Laroche et al., 2013). The Social Media Marketing and Branding Theory serves as a pertinent and robust theoretical foundation for this study, which delves into the utilization of Facebook as a branding tool for STEM (Science, Technology, Engineering, and Mathematics). This theory is rooted in the understanding that organizations employ social media platforms to shape their brand image, improve public perception, and engage with their target audience (Smith & Zook, 2011). In this context, the theory will guide the exploration of how STEM institutions and organizations leverage Facebook as a means to cultivate a positive brand image and effectively promote STEM fields.

One central aspect of this theory revolves around the formulation of a comprehensive content strategy, with STEM organizations using Facebook to disseminate content that resonates with their target audience. This content can encompass a wide array of materials, including research highlights, educational resources, success stories, and interactive elements. This study will examine the strategies used to create and distribute such content, evaluating their impact on brand perception (Smith & Zook, 2011).

Additionally, this theory underscores the critical importance of audience engagement through social media platforms. STEM organizations actively aim to establish an interactive and informative online presence on Facebook. The study will thoroughly investigate the strategies employed to engage the audience, which may involve responding to comments, hosting live sessions, and fostering online communities centered around STEM topics (Smith & Zook, 2011).

Furthermore, the theory emphasizes the significance of brand image and messaging. Effective branding involves shaping the image and messaging associated with STEM fields. The study will explore how STEM organizations craft their brand image on Facebook, examining the use of visuals, slogans, and messaging. It will also assess how consistency in messaging contributes to a strong and recognizable brand presence (Smith & Zook, 2011). The theory encourages data analysis and metrics as a means to evaluate the effectiveness of social media branding efforts. This study will incorporate the examination of metrics, such as reach, engagement rates, likes, shares, and comments, to assess the impact of Facebook as a branding tool for STEM (Smith & Zook, 2011).

During the empirical phase of the study, data will be collected through a mixed-method approach, including content analysis, surveys, and interviews. Content analysis will involve the examination of the Facebook posts and content shared by STEM organizations to identify common themes and strategies. Surveys and interviews will be conducted among Facebook users to gather their perceptions of STEM branding on the platform and to understand the factors that influence their engagement and interaction with STEM content.

2.14 Conceptual Framework

The conceptual framework for this study is designed to provide a detailed understanding of the intricate relationships and interactions among the three core components of the study. These include Branding Strategies on Facebook, User Engagement and Acceptance, and the Impact on STEM Perception as shown in Figure 2.1. Branding Strategies on Facebook form the initial segment of the framework. Within this, we delve into the content creation strategies employed by STEM organizations. These encompass the development and dissemination of a wide array of content types, including articles, videos, interactive quizzes, and educational materials. Simultaneously, strategies for audience engagement are considered. This sub-component encompasses methods and practices that facilitate interactions with Facebook users. It includes mechanisms such as responding to comments, hosting live sessions, and building online communities centered around STEM topics. Additionally, this section incorporates the critical aspect of brand image and messaging. It emphasizes the role of visuals, slogans, and messaging in the formation and maintenance of a distinct brand image, a fundamental facet of branding efforts (Smith & Zook, 2011).

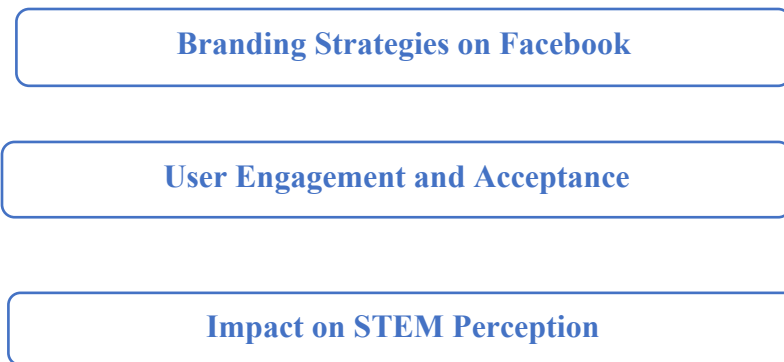


Figure 1: Conceptual Framework

Also, user Engagement and Acceptance constitute the second key segment of the framework. Within this component, user behavior takes the spotlight. Understanding how users engage with STEM content on Facebook is central to this aspect. It involves a meticulous analysis of user behavior data, including metrics such as click-through rates, time spent on STEM posts, and patterns of interaction. Alongside, the application of the Technology Acceptance Model (TAM) is crucial. The TAM aids in assessing users' acceptance of technology, specifically how Facebook users embrace STEM content and their willingness to engage with it. This encompasses factors such as perceived usefulness and perceived ease of use (Davis, 1989).

Furthermore, the impact on STEM Perception serves as the final component of the framework as shown in Figure 2.1. It is in this section that we assess the outcome of branding strategies and user engagement on the audience's perception of STEM fields. This sub-component considers factors such as the audience's attitudes towards STEM, their awareness of STEM-related initiatives, and their overall perception of STEM as influenced by the strategies employed. Additionally, user engagement metrics come into play, where the influence of metrics like likes, shares, and comments is analyzed to gauge

their impact on the overall perception of STEM fields. These metrics are often indicative of the level of engagement and interest that Facebook users have in STEM content and branding efforts (Smith & Zook, 2011).

2.15 Conclusion

In this comprehensive literature review, we've explored the multifaceted landscape of STEM (Science, Technology, Engineering, and Mathematics) and the critical aspect of branding within this field. We've examined the intersection of social media, particularly Facebook, with STEM branding and introduced a theoretical framework based on social media marketing and branding.

The study reviewed literature on some foundational concepts in STEM, recognizing its interdisciplinary nature and its profound impact on innovation and societal progress. STEM disciplines play a pivotal role in addressing global challenges and advancing our collective knowledge. The theme of "Branding of STEM" was introduced, shedding light on the strategies employed by STEM organizations to cultivate a distinctive brand image and engage with the public. This concept extends beyond the corporate sphere, encompassing educational institutions, research centers, and government initiatives, all seeking to enhance their image and reach.

Furthermore, the study delved into the crucial role of social media in STEM branding. The digital age has ushered in a paradigm shift, with social media platforms like Facebook serving as powerful tools for organizations to connect with a global audience, disseminate knowledge, and influence public perception. STEM branding on Facebook involves the creation of compelling content, audience engagement strategies, and the crafting of a distinct brand image. Facebook, as a prominent social media platform, is instrumental in

the distribution of STEM-related content, fostering connections with the public, and raising awareness about STEM fields. Its vast reach and interactive features make it an ideal space for STEM organizations to engage with their audience and showcase their work.

The theoretical framework, rooted in social media marketing and branding theory, was presented as a foundational element to guide empirical research. This framework underscores the importance of content strategies, audience engagement, and brand image in shaping STEM branding on Facebook.



CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter serves as a comprehensive guide to the research methodology employed in the investigation of branding narratives related to Science, Technology, Engineering, and Mathematics (STEM) on Facebook in Ghana. The qualitative research approach was chosen to facilitate an exhaustive exploration of the multifaceted aspects of branding narratives and their influence on STEM engagement among the Ghanaian youth on Facebook. The chapter further provides an elaborate discussion of the research design, data collection methods, data analysis techniques, and ethical considerations that underpin this study.

3.1 Research Approach

The study adopted a qualitative research methodology. A qualitative research method is a methodology used in social sciences and other fields to explore and understand the complexity of human behavior, experiences, and social phenomena (Mohajan, 2018). It focuses on gathering non-numerical data, such as words, images, and narratives, in order to provide in-depth insights and a deeper understanding of a research subject. Qualitative research was the preferred approach for this study due to its inherent ability to delve deeply into intricate phenomena, such as branding narratives on Facebook and their impact on STEM engagement among the Ghanaian youth. Qualitative research empowers the researcher to gather rich, context-specific data, and interpret the nuanced meanings and perspectives of participants (Creswell & Poth, 2017). To ensure the robustness of the qualitative design, this study will employ a qualitative research approach.

3.2 Research design

A research design is a structured plan or framework that outlines the procedures and methods to be used in conducting a research study. According to Asenahabi (2019), the research design is a structured and systematic plan that outlines the methodology and framework for conducting a research study. It encompasses key components such as research objectives, research questions or hypotheses, data collection methods, sampling strategies, data collection instruments, data analysis plans, timeframes, budget considerations, and ethical guidelines. It serves as a blueprint for how researchers will collect and analyze data to answer their research questions or test their hypotheses (Asenahabi, 2019). A well-defined research design is crucial in ensuring the validity and reliability of research findings (Asanabi, 2019). The study employed content analysis as its research design.

Content analysis is a research method used to systematically and objectively examine the content of text, media, or other forms of communication in order to identify patterns, themes, and relationships (Vespestad & Clancy, 2021). It is a qualitative research technique that can be applied to various types of textual or visual data, such as written documents, audio recordings, videos, images, websites, social media posts, and more. Content analysis is widely used in fields like communication studies, media studies, social sciences, and market research to extract meaningful insights from large volumes of data.

To conduct a comprehensive analysis of branding narratives associated with STEM (Science, Technology, Engineering, and Mathematics) on Facebook within the Ghanaian context, the study employed the method of content analysis. Content analysis is a systematic and rigorous approach involving the in-depth examination of textual and visual

components within a carefully selected set of posts. Posts were selected based on their relevance to STEM and their associated engagement metrics, which include likes, shares, and comments. This selection process ensures the representation of diverse narratives and promotional strategies related to STEM on Facebook.

The chosen posts underwent a meticulous content analysis, which will encompass an examination of textual elements, such as post captions and descriptions, as well as visual elements, including images and videos. Additionally, the engagement metrics, such as the number of likes, shares, and comments, will be scrutinized to gauge the level of audience interaction. The overarching goal of this research is to unveil the underlying themes, narratives, and patterns that underpin the presentation of STEM on Facebook within the context of Ghana. The content analysis served as a valuable research method that allowed for a comprehensive understanding of the branding narratives related to STEM on social media platforms, shedding light on how these subjects are portrayed and engaged within a digital context.

In summary, content analysis is the key methodological approach of this research, enabling a systematic and in-depth exploration of STEM narratives on Facebook in Ghana. This method provides a structured framework for understanding the representation and discussion of STEM subjects on the chosen social media platform. Ultimately, this research aims to provide valuable insights into the evolving dynamics of STEM discourse within the digital landscape of Ghana.

Content analysis is an invaluable method when it comes to the examination of branding narratives on social media platforms, particularly due to the readily available wealth of data (Vespestad & Clancy, 2021). In this specific context, our focus is on Facebook and

its role in shaping narratives related to STEM (Science, Technology, Engineering, and Mathematics) in the Ghanaian digital landscape. The method of content analysis empowers us to systematically dissect and understand the content posted on this social media platform in relation to STEM topics. However, what sets this approach apart is its strategic selection of posts based on their engagement metrics, allowing us to zero in on the most influential and representative narratives that offer a comprehensive view of how STEM is portrayed and engaged with in Ghana on social media.

There are several distinct advantages to utilizing content analysis in this research endeavor. First and foremost is the vast data pool that is accessible through this method. Social media, particularly Facebook, provides a vast repository of information and content related to STEM. This wealth of data not only offers depth but also breadth in examining branding narratives, ensuring that the analysis captures a comprehensive range of perspectives and themes. Another advantage lies in the relatively objective nature of content analysis. This method allows for the objective assessment of content by focusing on observable elements such as text and visuals. This objectivity is crucial, especially when dealing with branding narratives, as it enables researchers to analyze content in a systematic and unbiased manner, reducing the potential for subjective interpretation.

Furthermore, content analysis is well-suited for comparative analysis. By comparing different posts and their engagement metrics, researchers can identify trends, patterns, and variations in branding narratives. This comparative aspect of the analysis is essential for uncovering the dynamics at play within the digital ecosystem. It helps in understanding how different narratives emerge, evolve, and influence public perceptions and discussions surrounding STEM. The combination of these advantages makes content analysis an

essential tool for the study of branding narratives on social media, particularly when examining a multifaceted and dynamic field like STEM. The method's capacity to access a large data pool, provide an objective assessment of the content, and offer opportunities for comparative analysis ensures that the research can uncover the intricacies of how STEM is framed and engaged within the context of Ghana's social media landscape.

In summary, content analysis is a powerful and comprehensive research method that not only allows us to navigate the wealth of data on social media platforms but also provides an objective and comparative lens through which to analyze branding narratives. As we delve deeper into the realm of STEM on Facebook in Ghana, content analysis emerges as a cornerstone methodology that will unveil the multifaceted dimensions of how science, technology, engineering, and mathematics are portrayed and discussed in the digital sphere. This approach equips us with the tools necessary to explore the dynamic relationship between STEM and social media in a culturally specific context, ultimately enhancing our understanding of the broader implications for both fields.

3.2.1 Steps in Conducting Content Analysis

3.2.1.1 Content Coding and Categorization

Content coding and categorization is a process in research where data, such as textual or visual content, is systematically organized and classified into specific categories or codes (Kleinheksel et al., 2020). This helps researchers to quantify and analyze the content by assigning it to predefined categories, making it easier to identify patterns, themes, or trends within the data. This method is commonly used in content analysis to extract meaningful insights from a large volume of information. One of the central elements of the data analysis process was content coding and categorization. To systematically

examine the textual and visual content acquired from Facebook, the study developed a meticulous coding framework with predefined categories and criteria. Each piece of content, ranging from posts and comments to images and videos, was categorized based on its relevance to STEM topics and the presence of branding narratives. This method facilitated the systematic classification of content into specific thematic groups, providing a foundation for subsequent quantitative analysis. The purpose here was to identify trends and patterns in how STEM-related branding narratives were portrayed on Facebook within the Ghanaian context, enabling the quantitative assessment of different content types and themes.

3.3 Data Collection Methods

Data collection methods are systematic procedures or techniques used to gather information, facts, or data from various sources for research, analysis, or decision-making. The choice of data collection methods depends on the research objectives, the nature of the data, and the available resources (Boix-Cots,2023). The study employs various methods of data collection suitable for undertaking a content analysis. The study collected data by scraping and analyzing content from Facebook in the Ghanaian context. This involved the collection of textual and visual content from Facebook posts, comments, images, and videos that pertained to STEM topics and branding narratives. Web scraping tools and Facebook's API were employed to collect this data, facilitating a focused analysis of how STEM-related narratives were presented and received within the Ghanaian Facebook community.

In addition to primary data collection, the study explored secondary data sources within Facebook to enrich the analysis. This included accessing anonymized and aggregated data

specific to the Facebook platform in Ghana. This secondary data provided valuable insights into user interactions, engagement levels, and the reach of STEM-related content and branding narratives within the Ghanaian Facebook community. Utilizing this data complemented the primary research and offered a more comprehensive view of the digital landscape.

3.4 Sampling Technique

Sampling techniques are methods employed in research and data collection to select a subset, or sample, from a larger population (Guest & Chen, 2020). These techniques are crucial because it's often impractical or impossible to gather data from an entire population. Instead, researchers use samples to make inferences about the population as a whole (Guest & Chen, 2020). Different sampling techniques have their advantages and limitations, and the choice of method depends on the research objectives and the characteristics of the population.

In the current study, the selection of participants and data sources held a position of paramount importance, profoundly shaping the research methodology. In the context of the digital landscape of Facebook, a purposeful sampling approach was strategically adopted to discerningly select data sources and participants that align with the research's precise objectives. This method was deliberately chosen to ensure a focus on content that directly pertains to STEM (Science, Technology, Engineering, and Mathematics) topics and the branding narratives associated with them. The study's selection criteria were anchored in a process aimed at capturing content from Facebook groups, pages, and profiles that prominently featured STEM-related content, with a particular emphasis on branding related to STEM education, initiatives, or products. This approach allowed for

a deliberate focus on the content directly relevant to our research goals, thus contributing to the study's precision in addressing its overarching research questions.

3.5 Data Collection Instruments

Data collection instruments encompass a diverse array of tools, techniques, or methodologies meticulously tailored to extract invaluable data and insights from a multitude of sources, be they individuals, organizations, or environmental variables (Renjith et al., 2021). These instruments serve as the bedrock of research, analysis, and evaluation efforts, playing a pivotal role in uncovering patterns, trends, and critical information to advance understanding and knowledge in various fields. At their core, data collection instruments are engineered with a singular purpose, thus facilitating the systematic and consistent collection of data (Renjith et al., 2021). They serve as the means through which researchers, analysts, or data collectors engage with their subjects or sources, drawing forth a rich tapestry of information. The systematic nature of data collection ensures that the process adheres to a predefined structure or set of guidelines, ensuring uniformity in how data is acquired. This consistency is paramount because it enables comparability, allowing for meaningful analysis and interpretation of the collected data.

In the study, a set of data collection instruments was employed, tailored to the investigation of branding narratives related to Science, Technology, Engineering, and Mathematics (STEM) on Facebook in Ghana. For the primary data collection, the study utilized web scraping tools and the Facebook API. Web scraping tools were applied to systematically gather textual and visual content from Facebook posts, comments, images, and videos specifically related to STEM topics and branding narratives. These tools

provided a means to extract data from the platform, allowing for the compilation of a representative sample of content available on Facebook in the Ghanaian context. Concurrently, the Facebook API was instrumental in providing a structured approach to accessing and retrieving data, ensuring the comprehensiveness of the dataset.

Furthermore, to augment the primary research, the study leveraged secondary data analysis tools. These tools enabled access to aggregated data specific to the Facebook platform in Ghana. Through their use, the study was able to explore user interactions, gauge engagement levels, and measure the reach of STEM-related content and branding narratives within the Ghanaian Facebook community. This secondary data analysis enriched the primary findings by offering a broader perspective on the impact and reach of STEM-related content on the Ghanaian Facebook platform.

Also, in the context of branding narratives, especially in relation to STEM in Ghana, the study developed a visual content analysis framework. This framework included a set of categories and criteria designed for the systematic analysis of images, videos, and graphical elements shared on Facebook. It allowed for the evaluation of various aspects of visual content, including the types of images shared, prevalent themes in videos, and the use of visual storytelling in conveying STEM branding. This framework played a pivotal role in enabling the study to gain a comprehensive understanding of how STEM narratives and branding were visually presented and perceived within the Ghanaian Facebook community.

3.6 Data Analysis

Methods of data analysis are techniques and processes used to transform raw data into meaningful insights, patterns, and conclusions (Belhadi et al., 2019). The choice of a

specific data analysis method depends on the research objectives, the type of data collected, and the questions being addressed. The data analysis phase played a crucial role in unraveling patterns, insights, and trends within the collected data. A comprehensive approach was undertaken, employing several key data analysis methods to achieve the research objectives. With a focus on branding narratives, especially in the context of STEM in Ghana, a detailed analysis of visual content was conducted. This involved the examination of images, videos, and graphical elements shared on Facebook that related to STEM branding. The analysis provided insights into the visual strategies used to convey STEM narratives and branding within the Ghanaian Facebook community. By exploring the visual aspects, a deeper understanding of how STEM was presented and perceived through branding on the platform was achieved. Throughout the study, careful consideration was given to the cultural and contextual nuances that may influence how STEM is portrayed and embraced in the Ghanaian social media landscape. Ethical considerations and adherence to Facebook's terms of use were observed during the data collection process to ensure the integrity and reliability of the research findings.

3.6.1 Textual Analysis

Textual analysis is a research technique that focuses on the examination and interpretation of written or spoken text. It involves studying the content of the text to identify themes, linguistic patterns, rhetorical devices, and underlying meaning codes (Kleinheksel et al., 2020). Textual analysis is often used in disciplines like literature, media studies, and communication to gain a deeper understanding of written or verbal communication codes (Kleinheksel et al., 2020). Textual analysis played a pivotal role in deciphering the sentiments and language employed in STEM discussions on Facebook in Ghana. This

method included techniques such as sentiment analysis and keyword frequency analysis. Sentiment analysis offered insights into the overall sentiments expressed within user interactions and comments related to STEM and branding. Keyword frequency analysis, on the other hand, was instrumental in identifying the most frequently used terms and phrases in the context of STEM narratives. Its purpose was to uncover the predominant emotions expressed and the key topics of interest within the collected textual data.

3.6.2 Visual Content Analysis

Visual content analysis is a research method that is specifically geared toward the examination of visual elements, such as images, videos, and graphics. Researchers use visual content analysis to identify visual themes, symbols, representations, and visual communication patterns in various forms of media or visual data (Kelly & Kortegast, 2023). Given the significance of visual content in branding narratives, the study conducted a visual content analysis. This involved a detailed examination of images, videos, and graphical elements for themes, symbols, and visual storytelling techniques. Visual content was categorized based on its alignment with STEM branding narratives and the utilization of specific visual elements (Kelly & Kortegast, 2023). The intent here was to unveil how STEM narratives were visually represented and conveyed on the platform, providing insights into the strategies employed to communicate STEM branding through imagery and videos, thus shedding light on the impact of visual elements in shaping perceptions.

3.6.3 Comparative Analysis

Comparative analysis is a research approach where researchers examine two or more subjects, objects, or datasets to identify similarities and differences. This method is used to draw conclusions about the relationships between the elements being compared (Kelly

& Kortegast, 2023). Comparative analysis can be applied to various research areas, including literature, sociology, and economics. To understand variations in STEM branding narratives across different parameters, the study conducted comparative analyses. These comparisons spanned different periods, user demographics, and content types. They also extended to data collected from different sources or over time to detect changes and trends. The purpose of comparative analysis was to offer a more nuanced understanding of how STEM branding narratives evolved, resonated with diverse audiences, and responded to specific events or developments on Facebook in Ghana. This method brought to light the dynamic nature of online branding narratives.

3.6.4 Cross-Platform Integration

Cross-platform integration in research refers to the process of combining and analyzing data from multiple platforms or sources. This method is often used in studies that involve data from different media or communication channels, such as social media, traditional media, and websites (Pearce et al., 2020). Researchers integrate data from these platforms to gain a more comprehensive understanding of a particular phenomenon or trend, taking into account the diversity of sources and media used by individuals or organizations.

In addition to platform-specific analyses, the study integrated data collected from Facebook with information from other digital platforms or sources. By doing so, it contextualized the findings and assessed how branding narratives on Facebook compared to or influenced other online spaces (Pearce et al., 2020). The purpose of cross-platform integration was to provide a broader perspective on the impact and consistency of STEM branding narratives in the digital landscape, allowing exploration of the interconnectedness of narratives across different online platforms and channels.

3.7 Ethical Considerations

Ethical considerations hold paramount significance within qualitative research, especially in the context of engaging human participants and publicly available social media content. Ethical considerations and meticulous data management procedures formed an integral and ethical underpinning of the research methodology. The study carefully adhered to ethical guidelines and ethical principles, especially with regard to the digital nature of the research. In order to uphold ethical standards, the study diligently obtained informed consent from content creators whose material was subject to analysis.

Participants were duly apprised of the study's objectives and the purpose for which their content was being utilized. This process of informed consent ensured a transparent and ethically sound engagement with content creators. It also preserved their rights and safeguarded their privacy, especially when utilizing publicly available data. In tandem with ethical considerations, data anonymization procedures were meticulously observed. The study undertook the scrupulous removal of personally identifiable information from the collected data, thereby fortifying the protection of user privacy. User identities were conscientiously anonymized to maintain the integrity of the data analysis process.

Finally, the study adhered to rigorous data security protocols, ensuring the secure storage and management of the collected data. Stringent measures were put in place to prevent unauthorized access, and access was delimited to authorized personnel exclusively involved in the research process. This cautious approach served to protect data privacy and integrity, securing the ethical underpinnings of the study.

3.8 Data Validity and Reliability

Data validity and reliability are fundamental concepts in research and data analysis. Data validity pertains to the accuracy and appropriateness of data in measuring the intended variables or phenomena, ensuring that the collected data aligns with research objectives (Osugwu, 2020). On the other hand, data reliability concerns the consistency and stability of data, indicating the extent to which data can be consistently reproduced under the same conditions, free from random errors (Osugwu, 2020). These concepts are essential for ensuring the credibility and trustworthiness of research findings, as they collectively ensure that the data accurately represents the research objectives and can be consistently relied upon for meaningful analysis and interpretation.

The study's research design incorporates a hybrid approach, encompassing primary data collection through web scraping and the utilization of the Facebook API, alongside the incorporation of secondary data sources originating from the Facebook platform in Ghana. This section elucidates the strategies implemented to safeguard data validity and reliability throughout the research process.

In the context of data validity, meticulous efforts have been made to ensure that the gathered data faithfully mirrors the discussions, narratives, and interactions pertaining to STEM within the Ghanaian Facebook community. Leveraging web scraping tools and the Facebook API, data has been systematically culled from a spectrum of sources on the platform, fostering a comprehensive comprehension of the subject matter. Furthermore, the chosen data collection methods have been deliberately tailored to closely align with the research objectives, which revolve around the presentation and reception of STEM-

related narratives on Facebook in Ghana. This alignment is instrumental in fortifying data validity by ensuring the pertinence of the collected data to the research inquiries.

Turning to data reliability, a structured and replicable approach to data collection has been adopted to maintain consistency. The deployment of web scraping tools and the Facebook API facilitates a systematic, dependable data-gathering process, and exhaustive documentation of these processes is diligently upheld to enable consistent reproduction. The inclusion of secondary data sources from the Facebook platform in Ghana bolsters the study's reliability by providing a broader contextual backdrop for the primary data, thereby aiding in the corroboration and validation of findings.

A comprehensive record of data sources, methodologies, and potential biases is accurately maintained, ensuring that the research is open to scrutiny and validation by peers. In summation, the symbiotic interplay of systematic data collection methods, alignment with research objectives, adherence to ethical guidelines, and transparent documentation procedures collectively augments the validity and reliability of the accumulated data and, by extension, the integrity of the research findings. This dedication to data quality is pivotal in ensuring that the study's conclusions accurately encapsulate the dynamics of STEM-related narratives within the Ghanaian Facebook community.

3.9 Summary of chapter

This chapter presented a comprehensive and detailed research methodology that was employed to investigate branding narratives related to STEM on Facebook in Ghana. The qualitative research design, data collection methods, data analysis techniques, and ethical considerations have been expounded upon in depth. The subsequent chapters will unveil the findings of the study, driven by this rigorous methodology, and provide profound

insights into the prevailing branding narratives, the efficacy of strategies, and the challenges and opportunities in promoting STEM through social media platforms within the Ghanaian context.



CHAPTER FOUR

FINDINGS AND DISCUSSION

4.0 Introduction

This chapter presents the research findings, detailing the analysis of branding strategies related to STEM on Facebook in Ghana. The study aimed to analyze the branding strategies related to STEM on Facebook in Ghana, ascertain the emerging themes in the narratives of STEM-related branding strategies on Facebook, and identify challenges and opportunities embedded in these narratives. This chapter discusses the findings of the research using the methods specified in the previous chapter. The study employed a combination of content, descriptive and thematic analysis to discuss data gathered from the field. Along with relevant theories and related literature, the study brought out the key issues regarding the branding strategies related to STEM on Facebook in Ghana and the emerging themes in the narratives of STEM-related branding strategies on Facebook.

4.1 Overview of STEM Branding Strategies on Facebook in Ghana

Organizations effectively utilize Facebook to post about the importance of STEM. By crafting informative and engaging content, they not only raise awareness but also foster a greater appreciation for science and technology. One of the central objectives of the study is to examine the branding strategies pertinent to Science, Technology, Engineering, and Mathematics (STEM) on Facebook within the Ghanaian context. This discussion section delineates the findings with an emphasis on the literature, elucidating four distinct strategies organizations employ to promote STEM in Ghana through the lens of branding. The analysis of STEM branding strategies on Facebook in Ghana revealed a multifaceted landscape characterized by diverse approaches to presenting STEM narratives.

The examination of textual elements involved scrutiny of post captions and descriptions, aiming to unveil the messaging strategies employed by brands and creators in conveying STEM-related content. Furthermore, a detailed investigation of visual elements, including images and videos, was conducted. Textual elements provided an understanding of the language, tone, and key messaging used to communicate STEM concepts.

4.1.1 Online Seminars as a Strategy for Branding STEM on Facebook

The digital age has ushered in a paradigm shift in knowledge dissemination, with online platforms offering unparalleled opportunities for engagement. The strategic deployment of online STEM seminars surfaces as a dynamic and impactful approach within the landscape of STEM promotion on Facebook in Ghana. This strategy not only aligns with the digital nature of contemporary audiences but also catalyzes widespread participation, breaking geographical constraints. This aligns with a study by Smith et al., (2012) emphasizes the significance of connecting with local communities, positioning online seminars as a powerful tool for achieving this connection. Hosting STEM seminars online, as revealed by the study, is a strategic response to this shift, capitalizing on the accessibility and inclusivity afforded by digital spaces. The findings from the research resonate with Smith et al., (2012) advocacy for community engagement, suggesting that online seminars present a unique avenue to establish meaningful connections with local communities.



Figure 2: A Facebook Post Advertising a STEM Seminar

Source: Facebook Post by The STEM Space, 2021

Figure 2 shows a post by The STEM Space advertising an online seminar using Facebook as a medium of communication and promoting STEM. By transcending physical boundaries, these seminars create an environment where individuals from diverse geographical locations within Ghana can actively participate and contribute to the STEM discourse on Facebook. One key advantage of online STEM seminars is their ability to accommodate a broad and diverse audience. This inclusivity aligns with contemporary trends emphasizing the importance of reaching varied demographic groups (Friesner et al., 2021) The digital format allows for flexibility in participation, enabling individuals with different schedules, locations, and backgrounds to engage with STEM content on Facebook at their convenience. Moreover, the interactive nature of online seminars fosters

real-time engagement, allowing participants to ask questions, share insights, and actively participate in discussions.

This level of interactivity contributes to a more dynamic and engaging STEM narrative on Facebook, aligning with the principles of user engagement and participation in digital spaces (Mosconi et al., 2017). Hosting STEM seminars online emerges as a dynamic strategy. This not only caters to the digital nature of the audience but also allows for widespread participation.

4.1.2 Facebook Live Sessions a Strategy for Branding STEM

A dynamic and interactive strategy that emerges prominently in the study is the utilization of Facebook Live Sessions for STEM promotion in Ghana. Facebook Live Sessions represent a contemporary and engaging method for delivering STEM content. This approach not only aligns with the real-time nature of social media but also leverages the immediate and participatory aspects of Facebook Live. In the context of engaging with local communities, this strategy embodies a powerful tool for fostering real-time connections, echoing the principles emphasized by (Mosconi et al., 2017)

The live format enables real-time interaction between presenters and audiences, creating an immersive experience that transcends traditional online content consumption. The findings of the study underscore the dynamic nature of Facebook Live as a platform for instant engagement, allowing audiences to ask questions, provide feedback, and actively participate in the STEM narrative. The significance of Facebook Live Sessions extends beyond their immediacy. In the context of connecting with local communities, as advocated by Skjuve & Brandtzaeg (2019), these sessions provide a direct and authentic way to establish a virtual presence. The live format facilitates a sense of connection and

community, enabling presenters to address specific concerns, tailor content to local interests, and respond to the unique needs of the Ghanaian audience. The accessibility of Facebook Live Sessions is a notable advantage. Users can join sessions from the comfort of their homes, eliminating geographical barriers and expanding the reach of STEM content. This inclusivity aligns with contemporary trends that emphasize the importance of diverse and accessible engagement (Smith et al., 2012). Additionally, the interactive features of Facebook Live, such as real-time comments and reactions, contribute to a sense of shared experience among participants. A Facebook post by Xavier Space Solutions illustrates an organized Facebook live season on STEM inviting the public to register.

*“Exploring the cosmos together! Join us this Saturday November Edition for our Free Monthly Astronomy Session as we delve into International Educational Space Hands-on Programs with our Special Guest Juan Carlos Ferreira Nolasco - STEM School Teacher & ESA Educational programme mentor, Portugal 🇵🇹🇺🇸🇧🇷🇨🇰🇸🇪
Register now: <https://bit.ly/EAOSN>”*

Thus, Facebook Live Sessions emerge as a powerful and adaptable strategy for promoting STEM on Facebook in Ghana. Referencing the principles highlighted by Skjuve & Brandtzaeg (2019), and drawing on contemporary trends (Smith et al., 2012), The findings emphasize the value of real-time engagement, inclusivity, and community building. As the digital landscape continues to evolve, leveraging the immediacy and interactivity of Facebook Live Sessions becomes integral to creating a vibrant and responsive platform for STEM promotion in Ghana, fostering meaningful connections within the local communities.

4.1.3 Surveys on STEM Topics a Strategy for Branding STEM

An insightful and participatory strategy that surfaces in the study is the incorporation of surveys on STEM topics within the Facebook platform. This approach not only aligns

with the growing trend of interactive content but also provides a valuable avenue for engaging audiences in a two-way dialogue. Conducting surveys on STEM topics via Facebook serves a dual purpose. It not only gathers valuable insights into audience preferences and perceptions but also encourages active participation. This approach resonates with the principles of audience engagement highlighted by Stevenson et al., 2022.

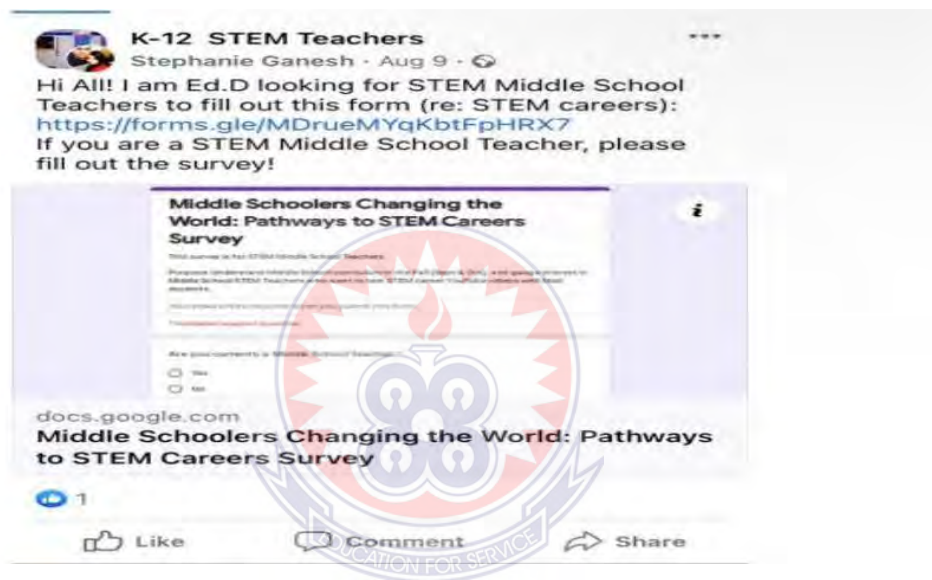


Figure 3: Facebook Post Showing a Survey on STEM-Related Topics

Source: Facebook Post by K-12 STEM Teachers, 2021

The above post by K-12 STEM Teachers shows an example of a STEM survey. The survey is designed to gather comprehensive insights into STEM education. The Surveys on STEM topics have emerged as a contemporary and versatile method for eliciting audience feedback and preferences. By leveraging the interactive features of Facebook, organizations can create tailored surveys that cater to the diverse interests and backgrounds of their audience. Analysis of the data highlights the importance of this

strategy in promoting engagement and empowering the audience to actively shape the STEM narrative on social media. The participatory nature of surveys aligns with the principles of user-centered content creation. By directly involving the audience in the content creation process, organizations can ensure that STEM topics resonate with the unique perspectives and interests of their target demographic on Facebook. The real-time feedback obtained through surveys contributes to a dynamic and responsive approach to STEM promotion. In the context of connecting with local communities, surveys provide a nuanced understanding of the specific challenges, interests, and aspirations of the Ghanaian audience regarding STEM. This localized insight enables organizations to tailor their content to address the unique needs of the community, fostering a more impactful and relatable STEM narrative. Moreover, the accessibility of surveys makes them inclusive, allowing a wide range of participants to share their perspectives. Thus, surveys on STEM topics emerge as a valuable and interactive strategy for promoting STEM on Facebook in Ghana. Referencing the principles highlighted by Barakabitze et al., 2019 the findings underscore the significance of audience engagement, real-time feedback, and tailored content creation. As organizations strive to create meaningful connections within local communities, integrating surveys into STEM promotion efforts becomes instrumental in ensuring that the narrative resonates authentically with the Ghanaian audience on social media.

4.1.4 Gamification as a Strategy for Branding STEM

An innovative strategy that emerges prominently in the study is the integration of gamification for promoting STEM engagement on Facebook in Ghana. This approach not only aligns with the contemporary trend of interactive content but also introduces an

element of playfulness that can significantly enhance audience participation. In connecting with local communities, gamification serves as a dynamic tool for fostering interactivity and accessibility, echoing the principles advocated by Skjuve & Brandtzaeg (2019) Gamification involves incorporating game elements, such as challenges, rewards, and competitions, into the promotion of STEM topics.

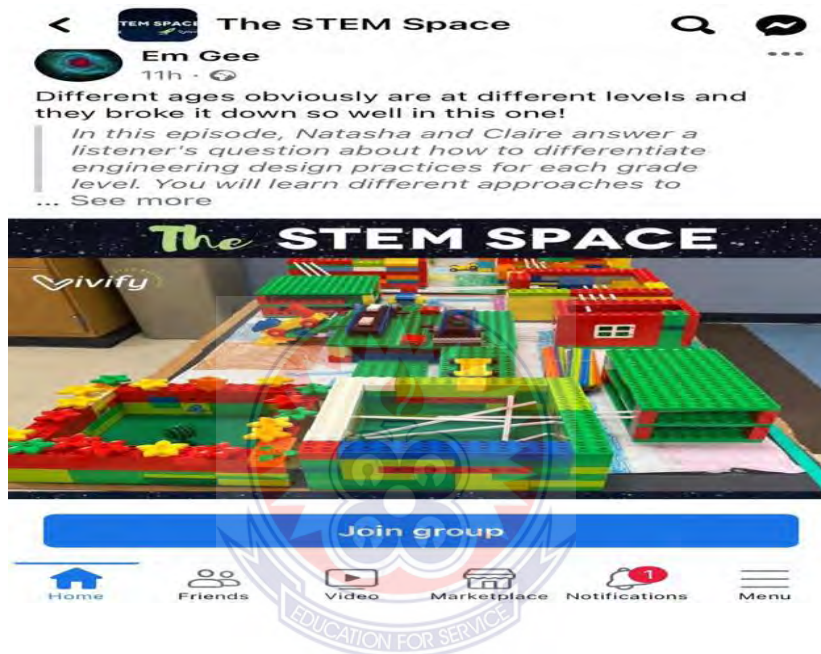


Figure 4: A Facebook Post on STEM Games

Source: Facebook Post by The STEM Space, 2023

The findings highlight the transformative potential of this strategy in creating a more immersive and enjoyable experience for the audience on Facebook as shown in Figure 3. By infusing elements of play into STEM narratives, The STEM Space can capture the attention of diverse audiences and make complex topics more accessible. By encouraging users to actively participate in challenges, quizzes, or virtual competitions, they can foster a sense of agency and empowerment, transforming the passive audience into active contributors to the STEM discourse.

The accessibility of gamification is a key advantage. Games and challenges can be designed to accommodate participants with varying levels of expertise, making STEM content more approachable for individuals with different backgrounds and interests. This inclusivity aligns with contemporary trends that prioritize diverse and accessible engagement in STEM discussions (Smith et al., 2012). Furthermore, gamification has the potential to create a sense of community and camaraderie among participants. Collaborative challenges or competitions can bring individuals together, fostering a supportive environment for STEM learning and exploration. This finding aligns seamlessly with the recognized need for interactive strategies in the digital space, as emphasized by Beier et al. (2012). By introducing gamified elements such as quizzes, challenges, and competitions, organizations on Facebook create a dynamic and enjoyable learning environment. The observed increase in user engagement and participation serves as a tangible outcome of this strategy, underscoring its effectiveness in making STEM content more appealing and accessible to a broader audience.

4.2 Themes in STEM-related branding strategies on Facebook.

In line with the research objectives, distinct themes emerged in the narratives of STEM-related branding strategies on Facebook. These themes reflect how STEM subjects are presented and discussed within the Ghanaian social media landscape. The analysis of textual elements, including post captions and descriptions, highlighted key messaging strategies employed by brands promoting STEM content.

4.2.1 Themes Relating to STEM Education

One prominent theme identified in the STEM branding narratives was the emphasis on education. An analysis of the posts from Facebook shows that many posts showcased

educational initiatives, highlighting the importance of STEM in advancing knowledge and skills. This aligns with the global recognition of STEM education as a catalyst for innovation and development (Donelan, 2016). The prevalent emphasis on education in STEM branding narratives underscores the potential for social media platforms, particularly Facebook, to serve as effective educational tools. The strategic alignment with global sentiments regarding the transformative power of STEM education suggests that these narratives can contribute to societal progress. The educational emphasis observed in the STEM branding aligns with studies that highlight the positive impact of educational content on social media platforms (Donelan, 2016). An educational focus not only informs but also engages the audience, fostering a community interested in learning and intellectual development.

An analysis of the data shows a manifestation of the educational emphasis theme is the creation of STEM tutorial series by educational institutions and STEM-focused organizations. These series often comprise insightful and instructional videos, explaining complex STEM concepts in an accessible manner. A notable post featured on JoyNews on the theme "STEM Education" is shown in Figure 4. The post included vibrant images of robotics kits that participants will use, detailed descriptions of the workshop agenda, and a call to action encouraging interested individuals to register and participate in this educational endeavor.



Figure 5: A Post by JoyNews Relating to STEM Education

Source: Facebook Post by JoyNews, 2022

Furthermore, prominent figures in the education sector use their Facebook pages to promote STEM education in Ghana. A post by the Minister of Education, Dr. Yaw Osei on 25 April 2022 stands as a compelling illustration of the promotion of STEM education.

“It was an exciting moment for me on Friday, 22nd April when I joined teachers and school management to welcome newly admitted students to the Bosomtwe Girls' Science Technology Engineering and Mathematics (STEM) SHS. The state-of-the-art Boarding School situated in Bosomtwe is among the ten (10) new STEM boarding Schools currently being built across the country. The operationalization of these STEM SHSs is part of the Government's efforts to increase science enrollment in our secondary schools from the current 12%”.

Another example is the promotion of virtual science workshops through Facebook posts. These workshops, facilitated by STEM experts or organizations, aim to provide hands-on learning experiences for the audience. Post-promoting such an event mostly includes engaging visuals of experiments, detailed descriptions of the topics to be covered, and instructions for participants to join and interact in real time. One noticeable trend is the use of infographics to promote STEM Education. Entities often leverage the power of infographics and educational graphics in their Facebook posts to convey scientific information in a visually appealing manner. These posts mostly include well-designed infographics breaking down complex scientific theories into digestible snippets, accompanied by concise yet informative captions that encourage followers to explore further.

Furthermore, in the rapidly evolving landscape of education, the training of teachers in Science, Technology, Engineering, and Mathematics (STEM) is crucial for cultivating a skilled workforce and preparing students for the challenges of the future. Despite the recognized importance of STEM education, challenges persist in ensuring its effective delivery. One of the primary challenges lies in the shortage of qualified and adequately trained STEM teachers. Training of teachers in STEM education. Facebook provides a platform for the creation of professional learning communities where STEM educators can share resources, discuss best practices, and stay updated on the latest developments in their fields. For example, the Department of Integrated Science Education, University of Education, Winneba, organized the training of STEM teachers with support from the American Chemical Society through its commitment to corporate social responsibility as shown in Figure 6.

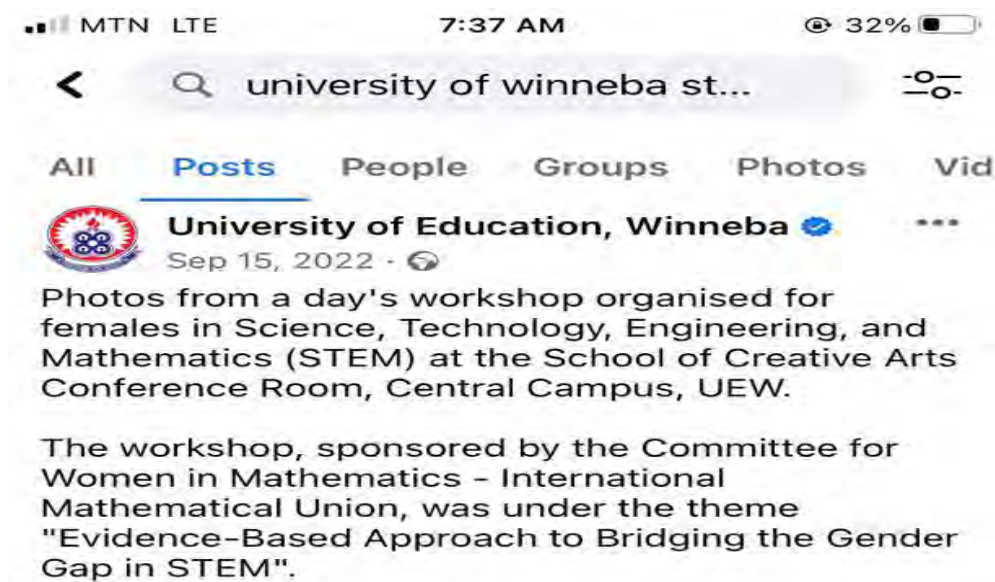


Figure 6: A post Showing the Training of Female Teachers by the University of Winneba

Source: Facebook Post by University of Winneba, 2022.

4.2.2 STEM and Cultural Relevance

The analysis also uncovered themes emphasizing cultural relevance. STEM narratives were often intertwined with Ghanaian cultural elements, connecting scientific and technological advancements with local contexts. This approach reflects a strategic effort to make STEM content more relatable and accessible to the local audience. The intertwining of STEM narratives with Ghanaian cultural elements reflects an approach to communication, that acknowledges the importance of cultural relevance. This approach can enhance the accessibility and resonance of STEM content within the local context. Studies emphasizing the significance of cultural relevance in communication strategies support the deduction that incorporating cultural elements increases the relatability of

STEM content (Kurniati et al., 2022). A Facebook post by GirlsUP shows a collaborative and cultural exchange between Ghana and the United States of America.

“We want to especially acknowledge our Keynote Speaker, Counselor Emily Fertik, the public diplomacy counselor at the U.S. Embassy Ghana. The Counselor lauded the GirledUp Ghana initiative and encouraged the inclusion of the Arts in STEM (hence STEAM) since science communication is done better with knowledge of the arts! “

This suggests that a culturally sensitive approach may strengthen the impact of STEM branding efforts. Furthermore, a post by TPG Cultural Exchange effectively embodies cultural relevance by integrating traditional Ghanaian practices into STEM education. Some of their posts showcased an innovative project that applies STEM principles to solve a local challenge, such as improving agricultural practices as shown in Figure 5. Moreover, captivating visuals featured local farmers utilizing technology-inspired solutions, accompanied by captions that bridge the gap between traditional wisdom and modern scientific advancements.

perceptions. A Facebook post by GirlsUP on their page shows evidence of content relating to the promotion of gender equality. The quotes below batteries this point

"If you are a female and you are thinking of what path you should take, don't bar yourself from choosing a career that requires you to study a STEM subject." Hear our Regional Talent Management Manager, Georgina Bartels, on why Newmont Goldcorp Ghana is promoting STEM education among girls. #inclusion #GirlsforGold #NSMQ19



Figure 8: Facebook Post Showing the Participation of Young Girls in STEM

Source: Facebook Post by GirlsUp Ghana, 2022.

These findings resonate with prior research emphasizing the effectiveness of social media platforms in challenging gender norms and promoting inclusivity (Wright & Delgado., 2023). The alignment with studies on gender inclusivity in STEM fields further strengthens the argument that strategic communication on Facebook can contribute to

breaking down gender-related barriers (Rushton et al., 2020). A post by "The African Institute for Mathematics Sciences in Ghana" serves as an excellent example of promoting gender inclusivity. The post may feature a spotlight on a Ghanaian woman who has excelled in a STEM career.

“As a Women In Africa Initiative awardee & #data expert, our alumna Winnie Nakiyingi spotlights the need for #inclusivity in #STEM. Speaking with CIO MAG she emphasizes bridging the #gender gap is not just an #African concern but a global imperative.”

Engaging visuals, coupled with captions that highlight her achievements and contributions, aim to inspire and break gender barriers in STEM. Organizations like "STEM for Girls Ghana" may share posts that highlight initiatives specifically designed to encourage girls to pursue STEM interests. An example post could showcase an event where young girls engage in hands-on STEM activities, accompanied by captions emphasizing the importance of fostering a welcoming environment for girls in traditionally male-dominated STEM fields.

4.3 Opportunities Embedded in the Branding Narratives in STEM through Facebook

During an analysis of the content of Facebook posts relating to STEM, opportunities were found in the form of increasing engagement metrics, indicating a growing interest in STEM content on Facebook in Ghana. The platform serves as a powerful medium for fostering dialogue, collaboration, and knowledge-sharing within the STEM community. The observed increase in engagement metrics suggests a growing interest in STEM

content on Facebook in Ghana presents an opportunity to further leverage social media platforms for community-building, collaboration, and knowledge-sharing within the STEM sector. Studies highlighting the potential of social media for fostering engagement and collaboration support the deduction that Facebook, when utilized effectively, can serve as a dynamic space for STEM-related interactions (Kaplan & Haenlein, 2010). The increasing engagement metrics indicate a receptive audience, providing an optimistic outlook for the future of STEM communication on the platform.

4.3.1 Community Engagement and Collaboration

One significant opportunity lies in Community Building and Collaboration. Facebook serves as a powerful platform for fostering community engagement and collaboration. The interactive and social nature of the platform allows for the formation of online communities, bringing together individuals, organizations, and educators passionate about STEM. Gatz, (2023) emphasizes the transformative impact of collaborative initiatives in educational contexts, underscoring the potential for community-driven efforts to enhance the STEM narrative. The significance of community-driven initiatives surfaced prominently in the findings of the study. Ordinary users, educators, and enthusiasts actively contribute to the STEM narrative, underscoring the emergence of grassroots movements on Facebook. This bottom-up approach not only democratizes the conversation but also instills a sense of shared responsibility and ownership in the promotion of STEM awareness and engagement. Wright & Delgado (2023). work resonates with the findings, emphasizing the organic and empowering nature of grassroots movements in educational contexts.



Figure 9: Schools Engaged in a STEM Competition

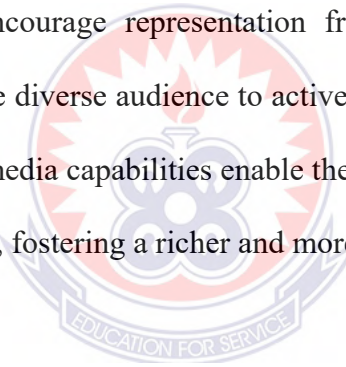
Source: Facebook Post by United Way Ghana, 2020

The post by United Way Ghana shows the enthusiastic participation of schools in a STEM competition. The grassroots engagement observed in the study indicates a genuine interest and commitment from individuals who, collectively, become advocates for STEM within their communities. This phenomenon extends beyond mere content consumption; it represents an active participation that has the potential to shape the broader discourse around STEM. The opportunities presented by community engagement and grassroots movements are manifold. Firstly, these initiatives create a decentralized and diverse ecosystem of STEM advocates, ensuring that the narrative is not dictated solely by institutional voices. Secondly, the organic nature of grassroots movements allows for

more tailored and culturally relevant approaches to STEM promotion, accommodating the unique needs of different communities.

4.3.2 Diverse Representation and Inclusivity

Within the landscape of STEM promotion on Facebook, a transformative opportunity emerges through the lens of diverse representation and inclusivity. This facet underscores the potential for creating a more dynamic, inclusive, and engaging STEM narrative that resonates with a broad audience. Facebook, as a versatile platform, provides an expansive canvas for showcasing diverse voices, perspectives, and role models within the field of STEM. Embracing inclusivity in branding narratives on Facebook holds the power to challenge stereotypes, encourage representation from traditionally underrepresented groups, and inspire a more diverse audience to actively engage with STEM content. The platform's inherent multimedia capabilities enable the visual and narrative exploration of varied STEM experiences, fostering a richer and more representative tapestry of voices.



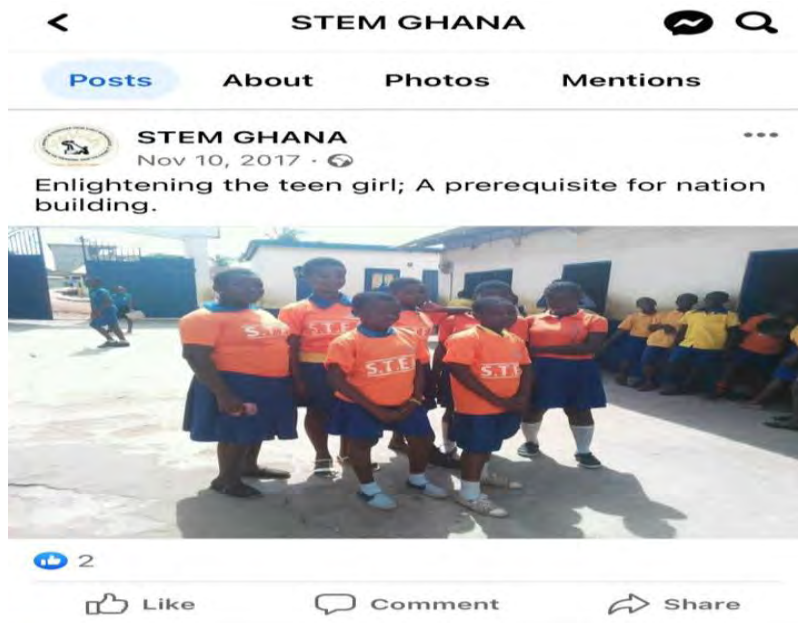


Figure 10: The Promotion of Inclusivity in STEM-related Topics

Source: Facebook Post by STEM Ghana, 2017.

STEM Ghana through the strategic use of Facebook has the opportunity to shift the narrative from a traditional and exclusive representation of STEM to one that mirrors the diverse reality of the field as depicted in Figure 8. By featuring individuals from different ethnicities, genders, and backgrounds, Facebook becomes a stage for showcasing the multifaceted nature of STEM, making it relatable and accessible to a broader audience. Gatz's (2019) insights illuminate the importance of diverse representation in online STEM communities, offering a valuable perspective on the potential impact of inclusive narratives. Inclusive narratives not only contribute to breaking down stereotypes associated with STEM but also serve as catalysts for cultivating a sense of belonging and interest among individuals from diverse backgrounds.

4.3.3 User-Generated Content and Engagement

Within the realm of STEM promotion on Facebook, an opportunity of significant impact lies in encouraging user-generated content and engagement. This approach not only enriches the narrative but also empowers the audience to actively participate in shaping the discourse, fostering a more dynamic and authentic representation of STEM.

Embracing user-generated content on Facebook unfolds as a transformative opportunity for cultivating a dynamic STEM narrative. The platform's interactive features, such as comments, shares, and contributions to discussions, serve as channels for user engagement. This active involvement not only creates a sense of community ownership but also positions the audience as contributors, not just consumers, of STEM content. Brown & Williams (2021) advocate for the principles of user-centered design, emphasizing the significance of involving users in content creation. By encouraging users to share their insights, experiences, and perspectives on Facebook, organizations tap into a diverse array of voices that collectively contribute to a more relatable and engaging STEM branding narrative. The interactive nature of user-generated content on Facebook aligns with the principles of community building and participation. User engagement becomes a catalyst for breaking down traditional barriers between content creators and consumers, fostering a collaborative environment where the audience actively influences the narrative. This collaborative spirit not only enhances the authenticity of the STEM discourse but also deepens the level of engagement and interest among the audience.

4.3.4 Adaptive Strategies Informed by Data

Amidst the landscape of STEM promotion on Facebook, a pivotal opportunity arises through the implementation of adaptive strategies informed by data. This opportunity is

not merely advantageous but crucial for organizations seeking to refine and optimize their STEM branding efforts on the dynamic social media platform. The crux of this opportunity lies in the availability of data on user interactions, allowing organizations to dynamically adapt and refine their strategies. Facebook, as a data-rich environment, provides a wealth of insights through user feedback, engagement metrics, and emerging trends. This valuable information becomes the compass that guides organizations in tailoring their content, ensuring it not only remains relevant but resonates deeply with the audience. Wright & Delgado (2023) provide insights into the significance of adaptable strategies informed by user feedback. The emphasis on data-driven decision-making underscores the transformative potential of leveraging insights gained from user interactions. By analyzing user feedback and engagement metrics, organizations can gain a nuanced understanding of audience preferences, allowing them to make informed decisions that enhance the overall effectiveness of STEM promotion efforts. The adaptive nature of strategies informed by data extends beyond content tailoring. It allows organizations to proactively respond to shifts in user behavior, emerging trends, and the evolving landscape of social media. This nimble approach positions organizations to stay ahead of the curve, maximizing the impact of their STEM branding efforts on Facebook.

4.3.5 Global Reach and Knowledge Dissemination

An expansive opportunity within the scope of STEM promotion on Facebook lies in the realm of global reach and knowledge dissemination. This facet is not only notable but serves as a transformative force, leveraging Facebook's unparalleled global reach to disseminate STEM knowledge beyond geographical confines. The crux of this opportunity lies in Facebook's ability to transcend borders, facilitating the global

dissemination of STEM knowledge. Organizations such as STEM Innovation harness Facebook to reach and share educational content, research findings, and cutting-edge advancements in STEM fields.



Figure 11: The Use of Facebook for Knowledge Dissemination

Source: Facebook Post by STEM Innovation

By doing so, they contribute to the creation of a more informed and interconnected global community passionate about STEM. Smith (2012) provides insightful perspectives on the potential of social media platforms, including Facebook, as agents for bridging knowledge gaps and fostering a global exchange of information within the realm of STEM. The platform becomes a dynamic conduit for breaking down geographical barriers, enabling the seamless flow of knowledge across diverse regions and cultures. The global reach of

Facebook opens avenues for cross-cultural collaboration and learning, enriching the global STEM community with diverse perspectives and insights. Educational content shared on the platform becomes a catalyst for fostering a shared understanding of STEM concepts, methodologies, and breakthroughs, transcending linguistic and cultural boundaries.

4.4 Challenges Embedded in STEM Branding Narratives on Facebook

In the study of STEM-related branding on Facebook in Ghana, several challenges have been discerned, each posing unique obstacles that demand strategic considerations. These challenges encompass the potential for misinformation, limited access to STEM education resources, and cultural resistance to specific STEM concepts. Addressing these challenges not only ensures the reliability of STEM narratives but also underscores the significance of responsible and culturally sensitive communication strategies.

4.4.1 Digital Divide and Limited Technological Accessibility

Despite the global use of Facebook as a powerful medium for communication and information dissemination, the findings underscore the stark disparities in internet connectivity and device accessibility across various regions in Ghana. The implications of this digital divide manifest as a substantial hindrance to the reach and effectiveness of STEM branding efforts, creating a divide in the ability of different communities to access and engage with STEM content on social media platforms. Smith's (2012) research, which resonates with the findings, emphasizes the urgency of targeted interventions to bridge the digital gap. These interventions must be a concerted effort from both public and private sectors, recognizing the multifaceted nature of the challenge. Public entities can play a pivotal role in infrastructure development, focusing on expanding reliable internet

connectivity to underserved regions. Simultaneously, private enterprises can contribute through initiatives that enhance device accessibility, making digital tools more readily available to a wider demographic. The imperative to bridge the digital divide is not merely an infrastructural challenge but a call for equity and inclusivity. In a landscape where social media platforms serve as conduits for information dissemination, failing to address this digital divide could perpetuate educational inequalities, limiting the transformative potential of STEM promotion efforts.

As Ghana progresses into the digital age, it becomes increasingly crucial to view technological accessibility as a fundamental right rather than a luxury. By building on the insights of Kwame et al. (2020), the study reinforces the importance of tailored and region-specific interventions to create an ecosystem where all communities, regardless of their geographical location, have equitable access to STEM content on social media platforms. In doing so, the study paves the way for a more inclusive and democratic engagement with STEM narratives, fostering a future where technological accessibility is a catalyst for, rather than a barrier to, educational empowerment. Despite the widespread use of Facebook, disparities in internet connectivity and device accessibility hindered the reach and effectiveness of STEM branding efforts.

4.4.2 Gender Disparities and Underrepresentation

The study of STEM promotion on Facebook in Ghana has brought to light a significant challenge resonating with broader discussions in the literature, gender disparities and underrepresentation. This theme aligns with the findings of Wright & Delgado (2023) and emphasizes the pressing need to address the gender gap within the STEM narrative on social media. The study uncovered a noticeable underrepresentation of females in STEM-

related content on Facebook, reflecting a broader societal issue that extends beyond the digital realm. The implications of this gender disparity are profound, hindering the creation of an inclusive and diverse STEM narrative that truly represents the multifaceted nature of the field. Visintainer's (2023) research provides context to the findings, revealing the persisting challenges associated with gender imbalances in STEM engagement. Building on this foundation, the study emphasizes that merely acknowledging these disparities is insufficient; efforts are required to rectify the underrepresentation of females in STEM narratives on Facebook. Drawing inspiration from successful interventions outlined by Wang and Johnson (2022), the study recognizes the importance of targeted initiatives aimed at dismantling gender stereotypes and fostering an inclusive environment for female participation in STEM discussions. Such initiatives should extend beyond traditional educational settings, leveraging the expansive reach of social media to challenge societal norms and promote diverse role models within the STEM field.

4.4.3 Algorithmic Bias and Content Filtering

Within the realm of promoting STEM on Facebook in Ghana, the study has uncovered a nuanced challenge that mirrors contemporary discussions in algorithmic ethics—algorithmic bias, and content filtering. This theme aligns with recent research by Gao et al. (2023), shedding light on how algorithms can inadvertently contribute to the marginalization of certain topics, including STEM. The study brings attention to the potential impact of algorithmic bias on the visibility of STEM-related content. As digital platforms increasingly rely on algorithms to curate and disseminate information, there is a risk of unintentional biases influencing the distribution of STEM narratives. The findings underline the need for continuous scrutiny of content distribution algorithms on

Facebook to ensure fair representation and mitigate unintended biases. Gao et al.'s (2023) research, reflecting the study's observations, emphasizes the necessity of understanding and addressing algorithmic bias to prevent the reinforcement of existing disparities.

The implications of biased algorithms extend beyond individual content visibility; they shape the broader narrative, influencing public perceptions of STEM and potentially exacerbating existing inequalities. In confronting this challenge, proactive measures must be taken to promote algorithmic transparency and accountability. The study suggests that stakeholders, including social media platforms and policymakers, should collaborate to implement ethical guidelines for algorithm development. These guidelines should prioritize fairness, inclusivity, and transparency, ensuring that algorithmic decisions do not perpetuate societal biases or hinder the accessibility of STEM content.

Furthermore, the findings highlight the importance of user awareness and education about algorithmic processes. By incorporating insights from Wright & Delgado (2023), it emphasizes the need for users to understand how algorithms shape their online experiences. This understanding empowers users to critically evaluate the information they encounter and advocate for algorithmic systems that prioritize equitable representation. In navigating the complexities of algorithmic bias and content filtering, the study contributes to the broader discourse on responsible algorithmic design. Referencing Gao et al. (2023) and drawing from the principles of transparency and user education, the findings underscore the imperative for a collaborative effort to ensure that algorithms on Facebook contribute to a fair and unbiased representation of STEM content in Ghana, fostering a more inclusive and informed digital landscape. An emergent challenge identified is the impact of algorithmic bias and content filtering on the visibility

of STEM-related content. Recent studies (Gao et al., 2023) have highlighted how algorithms can inadvertently contribute to the marginalization of certain topics, including STEM, perpetuating pre-existing biases. This underscores the need for constant scrutiny of content distribution algorithms on Facebook to ensure fair representation and mitigate unintentional biases in the dissemination of STEM narratives.

4.5 Conclusion

This chapter delves into STEM branding strategies on Facebook in Ghana, revealing multifaceted dynamics that shape narratives surrounding science, technology, engineering, and mathematics in the digital domain. Organizations leverage Facebook for STEM branding, utilizing online seminars and live sessions for effective content dissemination. This strategy not only raises awareness but also cultivates a profound appreciation for STEM fields.

The narratives on Facebook exhibit a strong connection to Ghanaian culture, intertwining themes of cultural relevance with scientific and technological advancements. This alignment underscores the power of merging STEM narratives with local contexts. A transformative opportunity lies in promoting diverse representation and inclusivity within STEM content on Facebook. This approach has the potential to redefine traditional portrayals and contribute to a more inclusive and accessible STEM landscape. STEM promotion on Facebook in Ghana demonstrates significant potential for global reach and knowledge dissemination. Through strategic online engagement, STEM initiatives can transcend geographical boundaries, contributing to a global dialogue on STEM importance and advancements.

However, challenges include misinformation, limited access to STEM resources, and cultural resistance to specific STEM concepts. Addressing these challenges is crucial for ensuring accurate STEM narratives and cultivating culturally sensitive communication strategies. In conclusion, this exploration underscores the importance of continued research and adaptive strategies in STEM branding on Facebook. Future endeavors should prioritize addressing challenges while amplifying the positive impact of diverse, inclusive, and culturally resonant STEM narratives. The study illuminates the understanding needed to redefine and amplify the narrative surrounding STEM in the digital era.



CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The study aimed to explore the strategies employed in leveraging social media, specifically Facebook, for the promotion of Science, Technology, Engineering, and Mathematics (STEM) in Ghana. A key objective of the study is to unravel the approaches organizations adopt in their branding narratives, emphasizing the importance of STEM, and the subsequent impact on audience engagement. This chapter provides a concise overview of the key issues identified in the study, presents relevant conclusions, and offers recommendations regarding the utilization and integration of social media in the promotion of STEM in Ghana. It also addresses the study's limitations and proposes potential avenues for future research exploration.

5.1 Summary

The global emphasis on Science, Technology, Engineering, and Mathematics (STEM) as a catalyst for workforce preparation and innovation has sparked particular interest in African countries, notably Ghana. Recognizing social media as a powerful communication tool, the research aims to analyze branding strategies, identify emerging themes, and uncover challenges and opportunities embedded in STEM narratives on Facebook. The study adopted a qualitative research methodology in answering the research questions. Furthermore, content analysis was employed to systematically examine textual and visual content related to STEM on Facebook in Ghana. This approach allowed for an understanding of branding strategies, themes, challenges, and opportunities within the context of STEM promotion on Facebook.

The study observed that organizations in Ghana leverage Facebook effectively to promote the importance of STEM. The study highlights the use of informative and engaging content to raise awareness and appreciation for science and technology. Online seminars, Facebook Live sessions, and gamification emerge as dynamic and impactful strategies for branding STEM on Facebook in the Ghanaian context. Also, the study identified prominent themes in STEM branding narratives on Facebook. Notably, an emphasis on education is evident, aligning with the global recognition of STEM education as a driver of innovation and development. Gender inclusivity emerges as another noteworthy theme, challenging traditional stereotypes and promoting diversity in STEM.

The analysis of Facebook posts reveals opportunities in the form of increasing engagement metrics, indicating a growing interest in STEM content in Ghana. Facebook is a powerful medium for fostering dialogue, collaboration, and knowledge-sharing within the STEM community. However, challenges such as potential misinformation, limited access to STEM resources, and cultural resistance to specific STEM concepts underscore the need for strategic considerations in STEM branding on Facebook.

5.2 Main Finding of the Study

5.2.1 Branding strategies related to STEM on Facebook in Ghana

The study focused on Science, Technology, Engineering, and Mathematics (STEM) promotion on Facebook in Ghana, aligning with global trends prioritizing STEM education. African nations, notably Ghana, strategically leverage STEM to tackle development challenges and narrow the digital gap. Harnessing the expansive reach of

social media platforms, particularly Facebook, emerges as a promising avenue for disseminating and popularizing STEM education.

The study investigated innovative approaches to promote Science, Technology, Engineering, and Mathematics (STEM) on Facebook in Ghana, leveraging the digital age's transformative impact on knowledge dissemination. One prominent strategy identified was the use of Online STEM Seminars, which emerged as a dynamic and impactful approach aligned with the digital preferences of contemporary audiences (Dede et al, 2016). This strategy not only facilitates engagement but also transcends geographical constraints, enabling widespread participation. A second key finding revolves around the utilization of Facebook Live Sessions as a strategy for branding STEM in Ghana. These sessions were identified as a contemporary and engaging method for delivering STEM content, aligning with the real-time nature of social media. The immediacy and participatory aspects of Facebook Live were highlighted as essential elements that enhance the overall effectiveness of the strategy, providing an interactive platform for STEM promotion.

Additionally, the study observed the incorporation of Surveys on STEM Topics within the Facebook platform as another insightful and participatory strategy. This approach aligns with the growing trend of interactive content and establishes a valuable avenue for engaging audiences in a two-way dialogue. The dual purpose of gathering valuable insights into audience preferences and perceptions, coupled with encouraging active participation, underscores the strategic significance of incorporating surveys into the STEM branding efforts on Facebook. Furthermore, the integration of Gamification emerged as an innovative strategy for promoting STEM engagement on Facebook in

Ghana. This approach aligns with the contemporary trend of interactive content and introduces an element of playfulness that can significantly enhance audience participation. The study recognizes gamification as a unique avenue to capture and maintain audience interest, providing a fresh and engaging perspective to STEM branding efforts on the social media platform.

5.2.2 Themes in STEM-related branding strategies on Facebook.

The study aimed to explore and identify distinct themes in STEM-related branding strategies on Facebook within the Ghanaian social media landscape. The research objectives guided the analysis of textual elements, such as post captions and descriptions, revealing key themes in how STEM subjects are presented and discussed. One significant theme that emerged in the narratives of STEM-related branding strategies on Facebook is the emphasis on STEM Education. The analysis of posts highlighted a prevalent showcasing of educational initiatives, underlining the importance of STEM in advancing knowledge and skills. This thematic focus aligns with the global recognition of STEM education as a catalyst for innovation and development, emphasizing its pivotal role in shaping the future workforce and fostering intellectual growth (Achilleos et al.,2018).

Cultural Relevance emerged as another prominent theme, with STEM narratives often intertwined with Ghanaian cultural elements. The strategic integration of scientific and technological advancements with local contexts reflects an effort to make STEM content more relatable and accessible to the local audience. This approach acknowledges the significance of cultural relevance in communication, providing a framework that enhances the resonance of STEM messages within the Ghanaian social media landscape. Furthermore, gender Inclusivity stood out as a noteworthy theme, with several posts

challenging traditional gender stereotypes in STEM fields. Brands actively promoted diversity in STEM by featuring women in various roles and highlighting inclusivity as a core value in the STEM narrative. The emphasis on gender inclusivity signals a positive shift towards challenging stereotypes and fostering diversity within STEM fields. This thematic focus has broader implications for inspiring a more inclusive STEM community and encouraging greater participation by individuals of all genders.

5.2.3 Opportunities and Challenges Embedded in STEM Branding Narratives on Facebook

The analysis of STEM-related branding narratives on Facebook in Ghana revealed significant opportunities for fostering engagement and collaboration within the STEM community. Increasing engagement metrics on Facebook indicate a growing interest in STEM content, presenting an opportunity to leverage social media for community-building, collaboration, and knowledge-sharing within the STEM sector (Salavuo, 2008). Community Engagement and Collaboration emerged as a pivotal opportunity, utilizing Facebook's interactive and social nature to form online communities and enhance the STEM narrative through collaborative initiatives.

Diverse Representation and Inclusivity constitute another transformative opportunity. By showcasing diverse voices, perspectives, and role models within STEM on Facebook, there is potential for creating a more dynamic, inclusive, and engaging narrative. Embracing inclusivity holds the power to challenge stereotypes and resonate with a broad audience, contributing to a more vibrant STEM discourse. Furthermore, User-Generated Content and Engagement present an impactful opportunity for enriching the narrative and empowering the audience to actively participate in shaping the discourse. Encouraging

user-generated content on Facebook allows for a dynamic and authentic representation of STEM, fostering a sense of community ownership and positioning the audience as contributors, not just consumers, of STEM content.

However, the study also identified challenges within the STEM branding narratives on Facebook in Ghana. The Digital Divide and Limited Technological Accessibility pose obstacles, revealing stark disparities in internet connectivity and device accessibility across different regions in Ghana (Azionya & Nhedzi, 2021). Gender Disparities and Underrepresentation highlight a significant challenge, with an observed underrepresentation of females in STEM-related content on Facebook, reflecting broader societal gender disparities.

Also, Algorithmic Bias and Content Filtering emerge as challenges within the realm of promoting STEM on Facebook as identified in a study by Caplan & Boyd (2018). The study brings attention to how algorithms can unintentionally contribute to the marginalization of STEM-related content, emphasizing the need for responsible algorithmic practices in disseminating information on social media platforms.

5.3 Recommendations

5.3.1 Enhancing Online Engagement and Interaction

The study underscores the increasing engagement metrics observed on Facebook in Ghana regarding STEM content. To capitalize on this growing interest, it is recommended that organizations and educational institutions actively enhance their online presence and engagement strategies. Implementing regular Facebook Live sessions, interactive Q&A sessions, and discussion forums can foster real-time connections within the STEM community. Furthermore, the integration of gamification elements into STEM promotion

efforts on Facebook can add an element of interactivity, making the learning experience more engaging and enjoyable. By leveraging these dynamic online strategies, stakeholders can further stimulate interest, participation, and knowledge-sharing among the target audience.

To expand reach and amplify engagement, organizations can collaborate with influential figures within the STEM community, social media influencers, and educational content creators. These partnerships can involve joint participation in Facebook Live sessions, co-hosting events, or featuring guest speakers. By tapping into existing networks and leveraging the credibility of influencers, organizations can enhance the visibility of their STEM content and attract a broader audience. Collaborative efforts also contribute to the cross-pollination of ideas, expertise, and audience bases, fostering a more vibrant and interconnected STEM community on Facebook.

5.3.2 Addressing Misinformation Through Educational Campaigns

The study identifies the potential challenge of misinformation within STEM branding narratives on Facebook. To address this, it is recommended that stakeholders initiate targeted educational campaigns to promote accurate information and dispel common misconceptions about STEM. Organizations can collaborate with educational influencers and experts to create content that clarifies complex STEM concepts and counters misinformation. Additionally, fostering partnerships with fact-checking organizations and promoting credible sources within the Facebook STEM community can contribute to a more reliable and trustworthy information environment. By prioritizing accurate information dissemination, stakeholders can build credibility and trust among the audience, ensuring the reliability of STEM narratives on the platform.

Establishing partnerships with fact-checking organizations can serve as a robust strategy to combat misinformation. Organizations can collaborate with reputable fact-checkers to verify the accuracy of STEM-related content before dissemination on Facebook. This proactive approach ensures that the information shared aligns with established scientific principles and standards. By prominently featuring fact-checking labels or endorsements on their posts, organizations can signal their commitment to accuracy and build trust with the audience. Fact-checking partnerships contribute to an ecosystem where reliable information is prioritized, reinforcing the credibility of STEM narratives on Facebook.

5.3.3 Promoting Inclusive and Diverse STEM Narratives

Gender inclusivity emerges as a significant theme in the study, with several posts challenging traditional gender stereotypes in STEM fields. Recognizing the pivotal theme of gender inclusivity in STEM branding narratives on Facebook in Ghana, it is essential for organizations to actively promote diverse and inclusive representations within their content. This recommendation delves into practical ways to champion inclusivity, challenge stereotypes, and foster a more equitable and representative portrayal of STEM professionals on the platform.

The study recommends that organizations should proactively showcase diverse role models and success stories within the STEM community on Facebook. By featuring individuals from underrepresented groups, highlighting their achievements, and sharing their narratives, stakeholders can contribute to breaking down stereotypes and inspiring a broader range of individuals to pursue STEM fields. Visual content, such as videos and interviews, can be particularly impactful in humanizing STEM professionals and demonstrating the diversity of talent within the field. To amplify the message of

inclusivity, organizations can forge partnerships with educational institutions and advocacy groups that champion diversity in STEM. Collaborative efforts can involve joint initiatives, events, and campaigns that celebrate diversity and promote inclusivity. These partnerships not only bring together a wider range of perspectives but also leverage the collective influence of diverse organizations to reach a broader audience. By working collaboratively, stakeholders can create a united front in challenging stereotypes and fostering a more inclusive STEM community on Facebook.

Beyond online content, organizing events that celebrate diversity in STEM can be a powerful strategy. Virtual or hybrid events hosted on Facebook, such as panel discussions, webinars, or workshops, can provide a platform for diverse voices to share their experiences and insights. These events can also facilitate networking opportunities, mentorship programs, and community-building activities. By actively engaging with the audience and encouraging participation, organizations can create a sense of belonging within the STEM community on Facebook, reinforcing the message of inclusivity. Furthermore, inclusive language and imagery play a crucial role in challenging stereotypes and promoting a welcoming environment. Organizations should be mindful of the language used in their Facebook posts, ensuring that it is inclusive and free from gender or cultural biases. Additionally, incorporating diverse imagery that represents individuals from various backgrounds in STEM settings can contribute to a more inclusive visual narrative. By consciously choosing language and imagery that reflects diversity, organizations can actively contribute to reshaping perceptions within the STEM community on Facebook.

5.4 Limitations and Recommendations for Further Studies

The study focused primarily on STEM branding strategies on Facebook in Ghana, limiting the generalizability of findings to a broader global context. Future research could explore STEM branding dynamics in other geographical regions to provide a more comprehensive understanding. The study primarily centered on Facebook as the chosen social media platform for STEM branding. However, the exclusion of other platforms may overlook unique strategies and challenges on alternative platforms. Future research could compare STEM branding across multiple social media platforms for a more comprehensive analysis. Also, the study's findings are based on a specific timeframe, and the dynamic nature of social media may introduce temporal biases. A longitudinal approach or periodic assessments could offer insights into the evolution of STEM branding strategies on Facebook over time.

Future research should expand the scope to include a comparative analysis of STEM branding strategies across various social media platforms. Understanding how these strategies differ on platforms with distinct user bases and features could enhance the overall comprehension of effective STEM promotion. Conducting longitudinal studies would allow researchers to track changes and trends in STEM branding strategies on Facebook over an extended period. This approach could uncover evolving patterns, identify long-term impacts, and provide valuable insights for adapting strategies to dynamic social media landscapes. Also, extending the research beyond the Ghanaian context to include a global perspective would provide a broader understanding of cross-cultural variations in STEM branding on social media. Comparative studies across

different countries or regions could reveal culturally specific challenges and opportunities.



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