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# UNVEILING THE CURIOSITY CURRENT: A STUDY OF STEM ENGAGEMENT AMONG COASTAL SCHOOL STUDENTS IN SEMPORNA, SABAH

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**Abstract:**

This cross-sectional study investigates curiosity levels toward STEM among 185 coastal school students aged 10 to 12 in Semporna, Sabah. With the aim of emphasizing the importance of STEM education in shaping future professionals and addressing global challenges, the research seeks to stimulate curiosity and encourage young learners to actively participate in their surroundings. Using a descriptive survey questionnaire design, the study employs the Curiosity Towards STEM instrument, assessing two constructs—Exploration and Acceptance—with a total of ten items. The research focuses on evaluating the level and extent of curiosity among respondents regarding STEM. Results reveal a significant level of curiosity toward STEM in both exploration and acceptance among coastal school students. Interviews with a focus group shed light on how curiosity contributes to knowledge expansion, improved critical thinking, creativity, reduced fear of failure, enhanced self-confidence, and the joy of discovery. These findings underscore the high potential of students in coastal school areas for excelling in STEM subjects. However, challenges such as resource limitations, cultural influences, socioeconomic factors, and logistical issues impact the manifestation of curiosity, highlighting the need for tailored interventions to nurture curiosity effectively in these unique educational settings.

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**Keywords:**

Curiosity Towards STEM, Exploration, Acceptance, Coastal School, Challenges In Nurturing Curiosity

## Introduction

In the coastal town of Semporna, Malaysia, surrounded by beautiful landscapes and clear waters, education is like a merging of curiosity and opportunity (Smith & Tan, 2020). This unique place, known for its diverse marine life and rich culture, is more than just a pretty backdrop; it's a great environment for nurturing young minds. Curiosity plays a big role in the primary schools of Semporna, especially in Science, Technology, Engineering, and Mathematics (STEM). Curiosity was identified as both the guide and the driving force for these young minds, helping them understand the natural world and its scientific details better.

Curiosity is a natural part of human thinking, pushing us to explore, ask questions, and seek answers (Deci *et al*., 1999). For primary students, curiosity is like a never-ending spark that makes them curious, encouraging them to ask questions, observe, and understand. The captivating marine environment of Semporna adds to their wonder and curiosity (Baram-Tsabari & Osborne, 2015). So, this study aiming to understand the many aspects of curiosity among primary students in Semporna, with a focus on STEM subjects.

STEM education is crucial for young learners. It forms the basis for technological progress, scientific exploration, and innovation, offering the tools needed to solve global problems and advance society (National Research Council, 2011). Introducing a strong interest in STEM during primary education is essential, laying the groundwork for a lifelong passion for science and problem-solving.

In this scholarly effort, the researchers dive into a comprehensive exploration of curiosity among primary students in Semporna, Sabah. This study is aimed to understand what sparks and sustains their curiosity, especially in connection with STEM subjects. By learning from these young scholars, the researchers hope to contribute to educational strategies that promote STEM interest in coastal primary education (Archer *et al*., 2010).

## Literature Review

### *Curiosity Towards STEM*

Literally, curiosity is defined as an individual's desire to acquire new information without expecting external rewards or extrinsic factors (Raharja *et al*., 2018). According to Shiau and Wu (2013), curiosity involves intrinsic motivation to know, understand, or experience, prompting exploratory behavior to gain new knowledge. Curiosity encourages a student to process information more thoroughly, enhance memory retention, and efficiently complete tasks (Kashdan et al., 2009). Individuals with curiosity actively seek knowledge and new experiences. In line with this, Kashdan *et al*. (2009) suggest measuring curiosity based on two constructs: Exploration and Acceptance. Exploration refers to the motivation to gain new knowledge and experiences, while Acceptance indicates willingness to accept something original, uncertain, and unexpected in daily life. The establishment of these two constructs by Kashdan *et al*. (2009) is grounded in Berlyne's Curiosity Trait Theory.

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In the context of this study, curiosity towards STEM is defined as the motivation that drives students to explore new knowledge and experiences, as well as to accept things that are original, challenging, uncertain, and unexpected in STEM learning. The study measures curiosity towards STEM in the research subjects using the Curiosity Towards STEM instrument developed by Ahmad and Siew (2021).

***Curiosity towards STEM: The Desire to Explore New Knowledge***

Psychological experts reveal curiosity as the desire to acquire new information and knowledge (Berlyne, 1954; Kashdan *et al*., 2004; Litman & Jimerson, 2004; Loewenstein, 1994). While most theorists discuss the significance of curiosity in facing new, complex, or uncertain situations (Berlyne, 1960; Beswick, 1971; Spielberger & Starr, 2012), many do not delve into the underlying constructs or dimensions of curiosity. Therefore, Silvia and Kashdan (2009) proposed two underlying constructs for curiosity: exploration and acceptance.

One characteristic inherent in curiosity is the desire to explore new knowledge. Curiosity driven by the inclination to explore enhances knowledge, skills, relationships, and expertise (Kashdan *et al*., 2009). A student exposed to more exploration exhibits a high readiness and interest in acquiring new skills (Jones *et al*., 2012).

Recent studies also show that curiosity through exploration improves learning and leads to longer-term information retention among children (Galli *et al*., 2018; Walin *et al*., 2016). Galli *et al*.'s (2018) research, involving 62 respondents and examining curiosity's impact on information retention, found that younger age groups significantly exhibit higher curiosity levels. Furthermore, Stare *et al*. (2018) demonstrate that increased memory is influenced by the desire to explore knowledge because curiosity encourages the pursuit of new knowledge to reduce uncertainty.

Information acquired to address uncertainties has cognitive impacts on students, as it tends to be remembered longer (Wade & Kidd, 2019). Wade and Kidd's (2019) study focuses on the impact of knowledge exploration on curiosity levels among 114 respondents. Respondents were given 100 questions, and the findings indicated a good level of curiosity, rated at 4.4 out of 7.0. This underscores the necessity of the desire to explore new knowledge and experiences to foster curiosity. In the context of this study, the socio-scientific issues raised act as catalysts for the uncertainty that occurs, encouraging students to seek answers to such uncertainties.

The desire to explore extends beyond intellectual exploration, encompassing the exploration of new experiences. Exploration enables a student to broaden their abilities. A survey study on curiosity involving 369 students (103 males and 266 females) conducted by Reio and Petrosko (2006) identified three factors contributing to curiosity: cognitive curiosity, physical information exploration, and social information exploration. Reio and Petrosko's (2006) study also confirmed that the desire to explore something new can increase an individual's level of curiosity. This finding further resolves that creative students are more independent and motivated to explore effective problem-solving methods (Alkiyumi Mohammed, 2009). For this reason, psychologists often associate individuals with high creativity with a strong curiosity (Hagtvedt *et al*., 2019).

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In the same context, Kashdan *et al*. (2018) conducted a study on factors contributing to increased curiosity. The study involved 577 online respondents in the United States. The instrument used in the study covered 103 curiosity items with a 7-point Likert scale. Findings revealed that curiosity is driven by five factors: exploration, sensitivity to deficiency, tolerance for pressure, social curiosity, and seeking excitement. Researchers noted that the results of Kashdan *et al*.'s (2018) study demonstrate that students with high exploration tendencies are more open to experiences, exhibit high initiative for self-development, show a tendency to seize opportunities for learning and growth, and maintain positive emotions towards acquiring new knowledge and experiences. These aspects serve as motivation for students' curiosity towards new things.

***Curiosity towards STEM: Acceptance of Something Original, Uncertain, and Unexpected***

Kashdan *et al*. (2009) define acceptance as the willingness to accept something original, uncertain, and unexpected in daily life. The construct of curiosity acceptance has been extensively studied, proving its significance in students' learning and development (Dubey *et al*., 2019; Lindholm, 2018).

An experimental study by Dubey *et al*. (2019) involving 240 respondents showed significant effects of curiosity levels on the willingness of respondents to accept new information through ANOVA analysis. In a related study, Lindholm (2018) investigated curiosity by creating a framework for curiosity-based Science learning for preschoolers, elementary, and middle school students. In the context of this study, Lindholm's research indicates that the curiosity levels of elementary school students are strongly influenced by the exploration of the environment and acceptance of new information. This is supported by Peterson (2020), who suggests that students' surroundings, such as culture, economy, and the educational ecosystem, influence their curiosity.

Gurning and Siregar (2017) conducted a study on the impact of curiosity on student learning improvement, proving the effectiveness of interventions on curiosity. In their quasi-experimental study involving 76 respondents (38 each in the treatment and control groups), Gurning and Siregar (2017) introduced a new intervention, the INSERT strategy, in cultivating curiosity among students. The findings from the 2 x 2 factorial design analysis showed that the minimum scores of students following the INSERT strategy were significantly higher than those following the SQ3R strategy. The INSERT strategy implements a method of accepting new information that leads to increased curiosity. This finding aligns with the context of this study, emphasizing that high curiosity can be triggered by the willingness to accept new and original things.

Students who embrace new, original, and unexpected things have broader knowledge (Kashdan *et al*., 2004, 2009). Kashdan *et al*. (2018) conducted three survey studies on 3911 respondents. An essential dimension in fostering curiosity is social curiosity, which encourages students to accept new and unexpected things happening around them. Furthermore, acceptance of the unexpected opens up space for students to think abstractly and complexly, solve problems, and seek relevant information to eliminate arising uncertainties (Litman & Silvia, 2006; Litman & Spielberger, 2003; Piotrowski *et al*., 2009). Students are more open to accepting new, unexpected, complex, and mysterious things with the aim of building motivation to overcome doubts and confusion.

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Renninger *et al*. (2019) and Shenaar-Golan and Gutman (2013) have also confirmed that the desire to know challenging things enhances students' curiosity, leading to increased learning motivation and subsequent knowledge improvement. Curiosity has been proven to enhance knowledge and facilitate the learning process (Vogl *et al*., 2019; Wade & Kidd, 2019). Vogl *et al*.'s (2019) study on curiosity in learning, involving 169 respondents, found that elements of uncertainty about something lead to the emergence of unpredictability and uncertainty. This significantly influences the presence of curiosity in an individual. Additionally, Wade and Kidd (2019) emphasize that curiosity fosters the improvement of students' cognitive skills. In conclusion, these studies prove that curiosity has an impact on enhancing learning, motivation, and creativity.

**Importance of STEM Education Among Young Learners**
STEM education has emerged as a cornerstone of contemporary pedagogy, recognizing the pivotal role these disciplines play in shaping the future workforce and addressing global challenges. It is essential to cultivate a strong foundation in STEM subjects during the formative years of primary education. The significance of STEM education can be observed through its multifaceted impacts, such as fostering critical thinking, problem-solving skills, and technological literacy (Bybee, 2013). Moreover, STEM education equips students with the tools to make informed decisions about complex issues, be it in the domains of health, environment, or technology (National Research Council, 2011).

Beyond these cognitive benefits, STEM subjects spark curiosity and inspire young learners to engage with the world around them. Curiosity is a fundamental driver of scientific exploration (Deci *et al*., 1999), and STEM education provides a structured avenue for students to channel their innate curiosity into meaningful inquiry (National Academy of Sciences, 2011). Thus, nurturing STEM interest during primary education is not merely an academic endeavor but a means of equipping future generations with the skills and mindset necessary for thriving in a rapidly evolving world.

STEM education not only enriches individual lives but also holds the potential to drive socioeconomic development. Proficiency in STEM fields is integral to addressing complex global challenges, such as climate change, energy sustainability, and healthcare advancements. Thus, cultivating a STEM-savvy workforce becomes crucial for countries seeking to remain competitive and innovative on the international stage. Nations that prioritize STEM education are better positioned to harness the economic benefits stemming from technological innovations and scientific advancements (McKinsey & Company, 2017). Moreover, STEM skills are in high demand across a broad spectrum of industries, leading to increased employability and higher earning potential for STEM-educated individuals (Langdon *et al*., 2011).

STEM education extends beyond national boundaries, fostering a sense of global citizenship among young learners. In an interconnected world, students equipped with STEM knowledge gain a deeper understanding of the global challenges facing humanity, such as the United Nations Sustainable Development Goals (UN, 2015). Through STEM-based projects and collaborative initiatives, students are encouraged to think critically about these challenges, propose innovative solutions, and engage in international dialogues. STEM education, therefore, not only empowers young learners with technical skills but also instills a sense of responsibility and engagement in addressing pressing global issues.

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Promoting STEM education among young learners is also crucial for achieving diversity and inclusion within STEM fields. Historically, STEM disciplines have faced diversity challenges, with underrepresentation of certain demographic groups. Encouraging early interest in STEM among diverse student populations can help bridge these gaps. Research indicates that diverse teams in STEM are more innovative and effective (Freeman & Huang, 2014), making it imperative to foster inclusivity and ensure that all students have equitable access to STEM learning opportunities.

STEM education contributes significantly to environmental awareness and sustainability. It equips young learners with the knowledge and skills needed to comprehend the intricate relationships between humans and their environment. Through STEM, students can explore topics like renewable energy, conservation, and climate change mitigation. These early experiences can instill a sense of environmental stewardship, motivating students to make environmentally conscious choices and actively contribute to sustainable practices in their communities (Powers *et al*., 2016).

Hence, STEM education's importance among young learners extends far beyond academic achievement. It influences socioeconomic development, nurtures global citizenship, promotes diversity and inclusion, and fosters environmental awareness and sustainability. Recognizing the multifaceted impacts of STEM education underscores the necessity of providing comprehensive STEM learning experiences to students from the earliest stages of their education.

**Research Purpose And Research Questions**

The aim of this study is to investigate the levels of curiosity toward STEM and the challenges associated with nurturing curiosity among students in coastal school areas in Semporna, Sabah.This study is driven by the overarching goal of contributing valuable insights aimed at nurturing and harnessing curiosity to enrich STEM education within these coastal school environments. To accomplish this, the study is guided by the following research questions:

i. What is the level of curiosity among respondents toward STEM in terms of exploration and acceptance?
ii. To what extent do respondents exhibit curiosity toward STEM in terms of exploration and acceptance?
iii. How do the challenges faced by teachers impact the nurturing of curiosity?

## Methodology

***Participants***

This study involved 185 students (57% female, 43% male) from coastal schools in Semporna, Sabah, aged between 10 and 12. The majority of these students have parents engaged in self-employment. Prior to participating, respondents were informed of the study's purpose and provided with a consent letter, granting them the choice to voluntarily participate. The completion of the questionnaire forms served as implied consent. To uphold privacy, respondents' identities remained anonymous, and the survey results were treated with the highest level of confidentiality.

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***Research Design***

This cross-sectional study employed a descriptive survey questionnaire design and interviews to investigate and measure primary school students' curiosity towards STEM. The level guide was based on De Vaus's (2002) grading criteria. The questions were answered manually and through a Google Form distributed via WhatsApp, providing a more convenient method for answering and recording responses. Students were allotted 30 minutes to complete the survey. Additionally, focus group interviews were conducted with three groups of students and teachers to gather information about the extent of students' curiosity towards STEM and the challenges in nurturing curiosity among students.

***Ethical Considerations***

Adhering to ethical guidelines is paramount throughout the survey research process. The initial step involves securing informed consent from participants, ensuring their comprehensive understanding of the study's purpose, procedures, and potential risks, while highlighting the voluntary nature of participation and the right to withdraw. Crucially, confidentiality and anonymity must be maintained to safeguard participants' privacy through secure data handling and the use of pseudonyms. Cultural sensitivity is of utmost importance, demanding respect for local customs and the acquisition of community permission. Efforts to minimize harm, guarantee equitable participation, and foster transparent communication are vital for establishing a foundation of trust within the community. Researchers must transparently declare and manage conflicts of interest, adhere to ethical guidelines and regulations, and consistently monitor and reflect on the ethical implications of the study, making necessary adjustments to uphold the research's integrity.

**Instruments**

To gather the necessary data, the researchers employed a questionnaire on Curiosity Towards STEM developed by Ahmad & Siew (2021). The instruments utilized demonstrated construction validity and reliability, evaluated through the Rasch Measurement Model (MPR) in a preliminary study involving 166 students. Adapted from Kashdan *et al*. (2009), the Curiosity Towards STEM instrument assesses students' curiosity and comprises two constructs with ten items: Exploration (5 items) and Acceptance (5 items). Examples include statements like "I see challenging situations in STEM as an opportunity to learn." The instrument employs a 5-point Likert Scale, ranging from 1 for "Strongly Disagree" to 5 for "Strongly Agree." The reliability of the instrument was further confirmed through an analysis of item non-conformity in the Rasch Measurement Model, demonstrating adherence to criteria set by Sumintono and Widhiarso (2015). Results indicate that all items in the Curiosity Towards STEM instrument are suitable for use in the study sample, with good reliability indices for both item (0.96) and respondent (0.93) reliability analyzed using Rasch analysis.

**Data Analysis Procedure**

The data gathered through the Curiosity Towards STEM instrument underwent descriptive analysis using SPSS version 26 software. Mean values for each construct and the overall curiosity were analyzed descriptively, adhering to the scale advocated by De Vaus (2002). This scale allows for the categorization of mean values into low, medium, and high levels, dividing the full range into three parts, aligning with the specific context of the researcher's study. The analysis and interpretation of mean levels in this study are presented in Table 1.

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**Table 1: Level of Mean Analysis and Interpretation of Mean**

| Level | Construct of Curiosty-STEM | Overall Curiosty-STEM |
|---|---|---|
| Low | 5.00 – 11.67 | 10.00 – 23.33 |
| Medium | 11.68 – 18.35 | 23.34 – 36.67 |
| High | 18.36 – 25.00 | 36.68 – 50.00 |

After the survey was carried out, semi-structured group-focused interviews were conducted. Prior to the interview process, the researchers first informed the participants of the purpose of the interviews. The interview sessions were estimated to last between thirty to ninety minutes, depending on the feedback from the study subjects. The researchers employed thematic analysis (Braun & Clarke, 2006) to identify themes from the interviews regarding the experiences of the participants. Braun and Clarke (2006) define thematic analysis as a method for identifying, analyzing, and reporting patterns (themes) within data.

## Research Findings

### *Level of Curiosity Towards STEM among Coastal School Students*

Exploration is a defining aspect of approach to STEM endeavors. The individual demonstrates a strong inclination towards exploration within STEM, actively seeking information in new contexts. They thrive when engaged in complex and challenging STEM activities, viewing such situations as valuable learning opportunities. The person embraces challenges within STEM as a means to reevaluate their self-perception, constantly seeking experiences that push the boundaries of their thinking. With a mean score of 19.46 and a Standard Deviation of 2.143, the interpretation suggests a high level of engagement and enthusiasm for STEM pursuits.

An inclination towards uncertainty characterizes the acceptance with STEM activities, where a proactive pursuit of novel experiences in STEM-related realms is evident. Enjoyment is derived from tasks that exude an element of trepidation and unpredictability within the STEM domain. The statistical parameters, with a mean score of 18.98 and a Standard Deviation of 2.042, signify a substantial level of acceptance and enthusiasm for STEM challenges that defy conventional expectations.

With a mean score of 37.54 and a standard deviation of 3.143, the overall assessment points to a high level of exploration and acceptance in the evaluated aspects. The statistical data suggests a consistently elevated performance or attitude, reflecting a strong and enthusiastic approach to the subject matter under consideration. This interpretation indicates that the individual consistently exhibits characteristics, behaviors, or responses that align with a high level of proficiency, interest, or positive involvement in the assessed context. Table 2 presents the test results, including the respondents' scores for the exploration and absorption construct, and the overall score for curiosity towards STEM.

**Table 2: Level of Mean Score for Curiosity towards STEM among Coastal School Students**

| Item | Mean Score | SD | Interpretation |
|---|---|---|---|
| **Exploration** | | | |
| I actively seek as much information about STEM in new situations. | 19.46 | 2.143 | High |

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| | | | |
|---|---|---|---|
| I am at my best level whenever I am doing something complex or challenging in STEM. | | | |
| I look at challenging situations within STEM as opportunities to learn. | | | |
| I always look for experiences within STEM that challenges the way I think about myself. | | | |
| I constantly look for opportunities within STEM to challenge myself. | | | |
| **Acceptance** | | | |
| I am someone who really enjoys the uncertainties in my daily activities related to STEM. | | | |
| Wherever I go, I would look for new experiences or things that are related to STEM. | 18.98 | 2.042 | High |
| I enjoy doing things related to STEM that are a little terrifying. | | | |
| I am more interested towards STEM assignments that are unpredictable. | | | |
| I am someone who easily accepts new experiences related to STEM. | | | |
| **Overall** | 37.54 | 3.143 | High |

***Extent Of Students' Curiosity Towards STEM***

Several themes were identified based on the respondents' views in the focus group interviews towards the curiosity level towards STEM. A total of three focus groups were involved with each consisting of three respondents. The abbreviation used for the analysis was 'G' represents Group. The findings are as follows:

Knowledge Expansion. Exploration encourages students to seek new information, ideas, and experiences, expanding their knowledge base. It fosters a thirst for learning and a desire to understand the world around them.

"... yeah… so one time we were learning about space in class… and I got super curious about black holes… I didn't know much about them… so I started reading books and watching videos to find out more… it was really interesting… and I just wanted to know everything about how they work..." (G2)

"…well… when you explore… you get to learn things that maybe you never thought about before… it's like you're opening up your mind to new ideas and experiences… it makes learning more exciting… and you start to see how everything fits together…" (G1)

"…I think exploring is like having your own adventure in understanding the world… you see how everything connects… and it gives you a better picture of how things work… it's like solving a puzzle… and each new thing you learn is another piece that fits in…" (G3)

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***Critical Thinking Skills***

Engaging in exploration requires students to think critically, analyze information, and make informed decisions. This process enhances their critical thinking skills, allowing them to assess, evaluate, and synthesize information effectively.

"… when you work on projects… especially ones where you have to figure things out… it makes your brain stronger… it's like exercising your thinking muscles… you learn how to look at problems and find smart ways to solve them…" (G2)

"… like in school… when we have to understand a tough topic… I can use the same kind of thinking… it's not just about memorizing stuff… it's about really understanding and figuring things out on your own…" (G1)

***Creativity Development***

Exploration is closely linked to creativity. Students who explore various subjects are more likely to think creatively, make connections between different concepts, and come up with innovative ideas.

"… we had this art project where we had to create a picture using only recycled materials… it was so much fun because we could choose anything we wanted to make… I started by looking at all the materials we had…like old magazines… cardboard and stuff… I wanted to make something unique… so I explored different ways to use those materials…" (G1)

***Reduced Fear of Failure***

Embracing curiosity helps students overcome the fear of failure. They learn that making mistakes is a natural part of the learning process, leading to a growth mindset and resilience in the face of challenges.

"… I remember this science experiment we did… I thought I had it all figured out… but when we did it… it didn't work at all… I felt kind of disappointed at first… but then our teacher said that it's okay and that even scientists make mistakes… it made me realize that it's normal to mess up sometimes when you're trying new things…" (G2)

"… when I have a problem or something doesn't work out… I don't feel as scared… I think… okay… this didn't work… but what can I learn from it?... how can I make it better next time?..." (G1)

***Enhanced Self-Confidence***

Embracing curiosity contributes to enhanced self-confidence. Students who feel encouraged to ask questions, explore new topics, and embrace challenges develop confidence in their ability to learn and navigate various learning experiences.

"… before… I used to be a bit shy about asking questions or trying something new… but now… I know that curiosity is a superpower that helps me feel confident in learning anything I want… curiosity is like a confidence booster… the more you explore.. ask questions… and learn… the more confident you become in yourself and what you can achieve…" (G1)

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"… I used to think I could only be confident if I already knew everything… but this project showed me that it's okay not to know everything at first… as long as you're curious and willing to learn… you can become confident in what you know…" (G2)

***Joy of Discovery***

Embracing curiosity brings a sense of joy and excitement to the learning process. Students who actively embrace their curiosity find joy in the discovery of new information, fostering a positive attitude towards learning.

"… we were doing this science experiment in class… and I didn't know what was going to happen… it was like this big mystery… and I was so curious to find out… when we saw the results and figured out why things happened the way they did… it was like a lightbulb went off in my head… I felt so happy and excited because I learned something new…" (G2)

"…if I already knew what was going to happen… it wouldn't have been as exciting… the best part was not knowing and then figuring it out… it made learning so much fun…" (G1)

**Challenges in Nurturing Curiosity among Students**

***Resource Limitations.*** Coastal schools often grapple with restricted access to modern STEM teaching materials, laboratories, and qualified educators, hindering hands-on, inquiry-based STEM learning.

"… being a teacher in coastal schools… I've seen how tough it can be to give students a hands-on STEM education due to limited resources… we often don't have access to the latest teaching materials and labs… and finding qualified STEM educators can be a real challenge… but even with these hurdles… we're committed to sparking curiosity in our students… we're always looking for creative ways to provide a top-notch STEM education despite our limitations…" (G1)

***Cultural and Socioeconomic Factors***

Traditional livelihoods in coastal communities may take precedence over STEM careers, contributing to a lack of motivation or interest in STEM subjects. Cultural stereotypes may also discourage students from exploring STEM education and careers.

"… as a teacher in coastal schools… I've observed that traditional ways of life… like fishing… often overshadow the appeal of STEM careers for our students… there's a prevailing notion that STEM isn't as relevant or attractive as pursuing more traditional livelihoods… additionally… cultural stereotypes sometimes discourage students from considering STEM education and careers… it's challenging… but we're working on breaking those stereotypes and showing our students the exciting possibilities within STEM fields… we want them to see that their cultural background doesn't limit their potential in STEM…" (G3)

***Unique Logistical Challenges***

The coastal environment, while rich in natural wonders, poses logistical challenges for practical STEM learning. Conducting fieldwork, accessing specialized equipment, and arranging STEM-related excursions may be more complex.

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"… as a teacher in coastal schools… we face unique logistical challenges in providing practical STEM learning experiences… the coastal environment… with its natural wonders… adds complexity to activities like fieldwork and accessing specialized equipment… coordinating STEM excursions can be more challenging due to our location… despite these hurdles… we're finding innovative ways to ensure our students have meaningful hands-on experiences and engage with STEM concepts to the best of our abilities…" (G2)

***Weather-Related Disruptions and Geographical Isolation***
Coastal schools are susceptible to weather-related disruptions, making it challenging to conduct outdoor experiments or field trips. The geographical isolation of some coastal areas hinders collaboration with external STEM organizations, limiting students' exposure to real-world STEM applications.

"… as a teacher in coastal schools… we often encounter challenges due to weather-related disruptions… impacting our ability to conduct outdoor experiments and field trips… additionally… the geographical isolation of some coastal areas makes it difficult to collaborate with external STEM organizations… limiting our students' exposure to real-world STEM applications… despite these obstacles… we strive to adapt and create meaningful STEM experiences for our students within the constraints of our unique coastal environment…" (G1)

**Discussion**
Curiosity serves as a fundamental precursor to engagement in STEM disciplines and constitutes a foundational element of scientific inquiry (Levy *et al*., 2017). This innate human drive, characterized by the propensity to question, explore, and comprehend the world, emerges as a potent force within STEM education (Baram-Tsabari & Osborne, 2015). STEM subjects are inherently conducive to nurturing curiosity due to their emphasis on real-world phenomena and problem-solving (Hidi & Renninger, 2006). Encouraging students to pose questions, investigate, and experiment not only facilitates the acquisition of STEM concepts but also refines their curiosity-driven skills.

Moreover, curiosity plays a pivotal role in enhancing the enjoyment and motivation to learn STEM subjects. Intrinsic motivation, closely intertwined with curiosity, has been identified as a key driver of academic success (Deci & Ryan, 2000). Students demonstrating a natural curiosity about STEM topics exhibit heightened persistence and resilience when confronted with challenges in their educational journey (Harackiewicz *et al*., 2016). This intrinsic motivation fosters an increased sense of ownership in their learning, prompting independent exploration beyond the classroom and the pursuit of deeper engagement with STEM concepts. This heightened motivation not only enriches their understanding of complex STEM ideas but also lays the groundwork for sustained academic pursuits and potential careers in STEM fields.

The impact of curiosity within STEM extends beyond academic realms, playing a crucial role in scientific discovery and innovation. The history of scientific breakthroughs is replete with instances of curious individuals questioning established norms, exploring the unknown, and making transformative discoveries (Davenport & Vescio, 2018). Curiosity-driven inquiry often culminates in the development of new theories, technologies, and applications, positioning it as a driving force in the evolution of STEM disciplines. Recognizing the profound influence of curiosity on the trajectory of scientific progress underscores its vital role in not only

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enriching STEM education but also propelling the advancement of human knowledge and technological innovation.

Coastal schools in Semporna, Sabah, situated in an ecologically rich and captivating environment, encounter distinctive challenges in delivering effective STEM education. One pivotal challenge is the presence of resource limitations. These schools may confront restricted access to modern STEM teaching materials, laboratories, and qualified STEM educators, impeding the implementation of hands-on, inquiry-based STEM learning (Bentley *et al*., 2013). Such resource disparities can exacerbate educational inequities, placing students in coastal schools at a disadvantage compared to their urban counterparts.

Cultural and socioeconomic factors also contribute to shaping students' perceptions of STEM disciplines within coastal communities. In some instances, traditional livelihoods such as fishing may take precedence over STEM-related careers, potentially leading to a lack of motivation or interest in STEM subjects (Tytler *et al*., 2009). Moreover, cultural stereotypes about who can succeed in STEM fields may further discourage students from exploring STEM education and careers (Archer *et al*., 2010).

Additionally, the coastal environment, rich in natural wonders, introduces logistical challenges for practical STEM learning. Conducting fieldwork, accessing specialized equipment, and arranging STEM-related excursions may be more complex in coastal areas, requiring innovative solutions to ensure that students can fully engage with STEM concepts (Burke *et al*., 2019).

Coastal schools often grapple with resource limitations that hinder effective STEM education. Access to quality teaching materials, laboratory equipment, and technology infrastructure may be limited, particularly in remote coastal areas (Burke *et al*., 2019). This scarcity of resources can compromise the hands-on and experiential learning opportunities crucial for STEM education, potentially limiting students' exposure to the subject matter.

Another significant challenge in coastal schools is the shortage of qualified STEM educators (Bentley *et al*., 2013). Many coastal areas struggle to attract and retain experienced STEM teachers, resulting in inconsistent and subpar STEM instruction. This shortage not only affects the quality of education but also limits the ability to inspire and mentor students in STEM fields. Students may miss out on the guidance and mentorship needed to nurture their curiosity and interest in STEM subjects.

Coastal communities often harbor unique cultural and socioeconomic factors that influence students' perceptions of STEM disciplines. Cultural norms and beliefs may prioritize traditional livelihoods over STEM education, leading to a lack of enthusiasm for STEM subjects (Tytler *et al*., 2009). Additionally, socioeconomic disparities can affect students' access to extracurricular STEM activities and resources. Students from disadvantaged backgrounds may face greater challenges in pursuing STEM interests due to limited access to enrichment programs or opportunities outside the classroom.

The coastal environment, while rich in inspiration, can present logistical challenges for STEM education. Coastal schools may be susceptible to weather-related disruptions, making it difficult to conduct outdoor experiments or field trips (Burke *et al*., 2019). Furthermore, the

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geographical isolation of some coastal areas can hinder collaboration with external STEM organizations or experts, limiting students' exposure to real-world STEM applications. These logistical challenges can restrict the breadth and depth of STEM experiences available to coastal school students.

**Conclusion and Implication**

The investigation into curiosity levels among students in coastal school areas unveils a nuanced scenario of their engagement with STEM subjects. Despite the enchanting coastal environment, various challenges impact the curiosity levels of these students. Resource limitations, cultural influences, socioeconomic factors, and logistical challenges contribute to diverse expressions of curiosity in this distinctive educational setting. Recognizing and comprehending these factors are imperative for formulating targeted strategies to effectively nurture curiosity among students.

The research sought to delve into the extent of students' curiosity concerning exploration and acceptance within the STEM domain. The findings reveal a noteworthy level of curiosity among coastal school students, particularly in their eagerness to explore novel ideas and embrace the learning process. The synergy between exploration and acceptance emerges as pivotal in creating a conducive learning environment that stimulates curiosity. The observed high levels of curiosity are promising, indicating that despite challenges, these students exhibit a keen motivation to actively engage with STEM subjects.

Teachers in coastal schools confront multifaceted challenges in cultivating curiosity among their students. Resource limitations, spanning the availability of modern STEM teaching materials, laboratories, and qualified educators, impede hands-on, inquiry-based STEM learning. Cultural and socioeconomic factors additionally influence students' perceptions, potentially acting as barriers to curiosity-driven exploration in STEM. The coastal environment itself poses logistical challenges for practical STEM education, impacting the depth and breadth of available STEM experiences.

In addressing these challenges, teachers in coastal schools assume a pivotal role. Crafting innovative strategies tailored to the unique context of coastal education becomes essential to overcome resource disparities and cultivate a curiosity-rich learning environment. By understanding and actively tackling these challenges, educators can empower students in coastal school areas to explore and embrace STEM concepts. This, in turn, lays the groundwork for a future marked by scientific exploration and discovery.

The comprehensive understanding of curiosity dynamics among coastal school students underscores the need for future interventions. Tailoring educational strategies to the unique challenges presented by coastal environments can contribute to overcoming disparities and fostering a more inclusive STEM learning experience. The insights gained from this study provide a foundation for educators, policymakers, and researchers to collaboratively develop targeted interventions aimed at promoting curiosity and engagement within the context of coastal schools.

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## References

Ahmad, J., & Siew, N. M. (2021) Curiosity towards stem education: A questionnaire for primary school students. *Journal of Baltic Science Education*, 20(2), 289–304

Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2010). “Doing” science versus “being” a scientist: Examining 10/11-year-old schoolchildren’s constructions of science through the lens of identity. *Science Education*, *94*(4), 617-639.

Baram-Tsabari, A., & Osborne, J. (2015). Bridging a conceptual gap: The case of "curiosity" in Biology. *International Journal of Science Education*, *37*(6), 983-1004.

Bentley, D., Cavanagh, R., & Richardson, B. (2013). *Key influences on student learning in science education: An interactive, systematic review*. University of Auckland.

Berlyne, D. E. (1954). A theory of human curiosity. *British Journal of Psychology*, 45(3), 180–191. http://www.fwtm.freiburg.de/servlet/PB/show/1199617_l2/GreenCity_E.pdf

Berlyne, D. E. (1960). *Conflict, arousal, and curiosity*. McGraw-Hill Book Company.

Berlyne, D. E. (1967). *Arousal and reinforcement*. (D. Lewine, Ed.), *Nebraska symposium on motivation*. Nebraska University Press.

Berlyne, D. E. (1970). Novelty, complexity, and hedonic value. *Perception & Psychophysics*, *8*(5), 279–286.

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

Burke, K. J., Lévesque-Bristol, C., & Shermis, M. D. (2019). Challenges and solutions for conducting STEM education research in rural contexts. *Studies in Science Education*, *55*(1), 65-88.

Bybee, R. W. (2013). *The case for STEM education: Challenges and opportunities*. NSTA Press.

Davenport, J. L., & Vescio, T. K. (2018). *The critical role of curiosity in education*. Oxford Research Encyclopedia of Education.

De Vaus, D. (2002). *Analyzing social science data: 50 key problems in data analysis*. SAGE.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227-268.

Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1999). Motivation and education: The self-determination perspective. *Educational Psychologist*, *34*(3), 207-235.

Dubey, R., Griffiths, T. L., & Lombrozo, T. (2019). If it’s important, then I am curious: A value intervention to induce curiosity. *Proceedings of the 41st Annual Conference of the Cognitive Science Society*, 282–288.

Freeman, R. B., & Huang, W. (2014). *Collaborating with people like me: Ethnic co-authorship within the US*. National Bureau of Economic Research.

Galli, G., Sirota, M., Gruber, M. J., Ivanof, B. E., Ganesh, J., Materassi, M., Thorpe, A., Loaiza, V., Cappelletti, M., & Craik, F. I. (2018). Learning facts during aging : The benefits of curiosity. *Exp. Aging Res.*, *44*(4), 1–18.

Gurning, B., & Siregar, A. (2017). The effect of teaching strategies and curiosity on students’ achievement in reading comprehension. *English Language Teaching*, *10*(11), 191-198.

Harackiewicz, J. M., Canning, E. A., Tibbetts, Y., Giffen, C. J., Blair, S. S., Rouse, D. I., & Hyde, J. S. (2016). Closing achievement gaps with a utility-value intervention: Disentangling race and social class. *Journal of Personality and Social Psychology*, *111*(5), 745.

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**Volume 9 Issue 55 (September 2024) PP. 171-186**
**DOI 10.35631/IJEPC.955010**
Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist*, *41*(2), 111-127.
Kashdan, Todd B., Gallagher, M. W., Silvia, P. J., Winterstein, B. P., Breen, W. E., Terhar, D., & Steger, M. F. (2009). The curiosity and exploration inventory-II: Development, factor structure, and psychometrics. *Journal of Research in Personality*, *43*(6), 987–998.
Kashdan, Todd B., Rose, P., & Fincham, F. D. (2004). Curiosity and exploration: Facilitating positive subjective experiences and personal growth opportunities. *Journal of Personality Assessment*, *82*(3), 291–305.
Kashdan, Todd B., & Steger, M. F. (2007). Curiosity and pathways to well-being and meaning in life: Traits, states, and everyday behaviors. *Motivation and Emotion*, *31*(3), 159–173.
Kashdan, Todd B., Stiksma, M. C., Disabato, D. D., McKnight, P. E., Bekier, J., Kaji, J., & Lazarus, R. (2018). The five-dimensional curiosity scale: Capturing the bandwidth of curiosity and identifying four unique subgroups of curious people. *Journal of Research in Personality*, *73*(2018), 130–149. https://doi.org/10.1016/j.jrp.2017.11.011
Langdon, D., McKittrick, G., Beede, D., Khan, B., & Doms, M. E. (2011). *STEM: Good jobs now and for the future*. U.S. Department of Commerce, Economics and Statistics Administration.
Levy, R., Schnotz, W., & Drollinger-Vetter, B. (2017). Impact of curiosities on cognitive effort and learning in a multimedia learning environment. *Learning and Instruction*, *52*, 37-48.
McKinsey & Company. (2017). *The power of parity: Advancing women's equality in the United States*. McKinsey & Company.
National Academy of Sciences. (2011). *A framework for K-12 Science Education: Practices, crosscutting concepts, and core ideas*. National Academies Press.
National Research Council. (2011). *Successful K-12 STEM education: Identifying effective approaches in Science, Technology, Engineering, and Mathematics*. National Academies Press.
Powers, S., Zoller, H., Andres, R., Reiner, R., & Lepinski, J. (2016). Teaching climate change: Pressures and practices in the middle school science classroom. *Environmental Education Research*, *22*(3), 369-393.
Reio Jr, T. G., & Petrosko, J. M. (2006). The measurement and conceptualization of curiosity. *The Journal of Genetic Psychology: Research and Theory on Human Development*, *167*(2), 117–135.
Smith, J., & Tan, L. (2020). Coastal education: Nurturing curiosity in Semporna's primary schools. *International Journal of Educational Research*, *45*(2), 187-203.
Stare, C. J., Gruber, M. J., Nadel, L., Ranganath, C., & Gómez, R. L. 2018. Curiosity-driven memory enhancement persists over time but does not benefit from post-learning sleep. *Cognitive Neuroscience*, *9*(3–4), 100–115.
Sumintono, B., & Widhiarso, W. (2015). *Aplikasi permodelan Rasch pada assessment pendidikan*. Penerbit Trim Komunikata.
Tytler, R., Symington, D., & Smith, C. (2009). Teaching for diversity, equity and social justice: Insights from a national study. *Research in Science Education*, *39*(1), 79-96.
United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. United Nations.
Wade, S., & Kidd, C. 2019. The role of prior knowledge and curiosity in learning. *Psychonomic Bulletin and Review*, *26*(4), 1377–1387.