

## Sense of Belonging Among Students: Its Effects on test Scores for an online and Conventional Mathematics Class

<sup>1</sup>Wan Anis Nabila Wan Abdullah Zawawi, <sup>2</sup>Zarith Sofiah Othman, <sup>2</sup>Nor Hafizah A Hamid

<sup>1</sup>Faculty of Education, Universiti Teknologi MARA, Cawangan Selangor, Kampus Puncak Alam, Bandar Puncak Alam, 42300 Puncak Alam, Selangor, Malaysia, <sup>2</sup>Centre of Foundation Studies, Universiti Teknologi MARA Cawangan Selangor, Kampus Dengkil, 43800 Dengkil, Selangor, Malaysia

Corresponding Author Email: [zarithsofiah@uitm.edu.my](mailto:zarithsofiah@uitm.edu.my)

Email: [anisnabila1199@gmail.com](mailto:anisnabila1199@gmail.com), [zarithsofiah@uitm.edu.my](mailto:zarithsofiah@uitm.edu.my), [nhafiza41@uitm.edu.my](mailto:nhafiza41@uitm.edu.my)

To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v13-i10/18964> DOI:10.6007/IJARBSS/v13-i10/18964

**Published Date:** 25 October, 2023

### Abstract

The global pandemic stemming from a coronavirus outbreak significantly impacted numerous industries worldwide, including the academic community, which comprises millions of registered students and educators who previously attended regular in-person classes but were compelled to transition to remote learning. From 2019 to 2021, Malaysia, like many countries, introduced distance learning via the internet to ensure the continuity of education. This paper delves into students' perceptions of their sense of belonging during online and traditional learning sessions and explores its influence on their performance in mathematics tests. This quantitative case study involved 189 students, encompassing Form 2 and Form 3 students, at a secondary school in Kelantan, Malaysia. Data were collected through a questionnaire, which sought responses regarding students' sense of belonging during online and traditional learning as well as their experiences with learning mathematics in both settings. A Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) gauged students' attitudes and opinions. The findings suggest that most students feel they can rely on their classmates' support when encountering mathematical challenges during online learning, fostering a strong sense of connection. Similarly, students report feeling connected with their peers when discussing mathematical tasks during traditional face-to-face learning. Furthermore, a majority of students find it easier to engage in classroom discussions in person compared to online platforms. However, most students express increased stress levels when learning mathematics online. Interestingly, paired t-tests reveal that both Form 2 and Form 3 students perform better in mathematics during online learning as opposed to traditional classroom learning.

**Keywords:** Conventional Learning, Mathematics Test Performance, Online Learning, Secondary School Students, Sense of Belonging

### **Introduction**

In the dynamic landscape of modern education, fostering a profound sense of belonging among students is an imperative endeavor. This study embarks on the crucial mission of nurturing students' sense of belonging, particularly within the domain of mathematics education. Its aim is to unravel the profound influence this sense of connection wields over academic performance, discerning the specific impacts within the realms of online and conventional mathematics classes.

As education undergoes a rapid transformation, comprehending the intricate interplay of student engagement and belonging takes precedence. This study not only delves into the 'why' of this pivotal inquiry, but it also illuminates the 'how', presenting actionable insights for educators, policymakers, and institutions alike. Amidst the transition to digital learning spaces and the reconfiguration of classrooms, the essence of students feeling connected and valued emerges as paramount. This study responds to this evolving educational landscape, where the traditional boundaries of the classroom continue to expand. By delving into the repercussions of a sense of belonging on test scores, it equips stakeholders with invaluable knowledge to enrich the learning journey.

In light of the temporary closure of educational institutions during the COVID-19 pandemic, a substantial shift towards online distance learning ensued. This sudden transition raised concerns among educational staff about the social well-being of students. Consequently, when adapting face-to-face education for distance learning, it becomes imperative to consider the social aspects of education, including socialization. A pivotal element of this social dimension is the sense of belonging among students (Dirksen, 2022). Peacock and Cowan (2019) offer a widely referenced definition that we adopt, encompassing feelings of acceptance, value, inclusion, and encouragement from individuals such as teachers and peers in the classroom. This also entails a sense of being an integral part of the learning environment, providing support and respect for students as individuals, beyond the fundamental feelings of warmth and perceived affection. Moreover, within this context, learning mathematics not only fosters higher-order thinking skills but also amplifies real-world problem-solving capabilities (Bajuri and Othman, 2021). With the proliferation of computer applications designed to facilitate remote mathematics instruction, various methods for learning mathematics in online distance education have rapidly emerged. These applications empower students with the flexibility to engage with mathematical concepts from virtually anywhere, often leveraging tools like PowerPoint presentations (Othman et al., 2017).

As a result of the temporary closure of educational institutions in response to the COVID-19 pandemic, the vast majority of academic instruction shifted to online distance learning. This abrupt change in the mode of instruction raised concerns among educational staff about the social well-being of students. Therefore, when redesigning face-to-face education for distance learning, it's essential to consider social aspects of education, including socialization. One critical component of the social dimension of education is a sense of belonging among students (Dirksen, 2022). A widely referenced definition, which we adhere to, comes from Peacock and Cowan (2019). They define a sense of belonging as encompassing feelings of acceptance, value, inclusion, and encouragement from individuals such as teachers and peers in the classroom, along with the sense of being an integral part of the learning environment.

It involves providing support and respect for students as individuals, beyond the fundamental feelings of warmth and perceived affection. In this context, learning mathematics also stimulates higher-order thinking skills and enhances real-world problem-solving capabilities (Bajuri and Othman, 2021). Various methods for learning mathematics in online distance education have emerged rapidly with the proliferation of computer applications designed to facilitate remote mathematics instruction. These applications offer students the flexibility to engage with mathematical concepts from virtually anywhere, often utilising tools like PowerPoint presentations (Othman et al., 2017).

The importance of students developing a sense of belonging has garnered increasing attention in educational contexts over the past few decades. This is due to its positive correlation with student behaviour and its negative association with school dropout rates. Experiencing a sense of belonging has a substantial and favourable impact on various motivational factors, including expectations of academic success, the value attributed to academic work, and self-reported effort (St-Ahmad and Smith, 2017). Enhanced school engagement and academic achievement can both result from an improved sense of belonging at school. However, the shift from traditional in-person learning to online learning has sparked curiosity among educators and other stakeholders about whether students' sense of belonging differs between classroom-based and online learning environments. The absence of a sense of belonging can lead to feelings of isolation and disconnection, particularly among students, making this study particularly pertinent. Therefore, this study aims to investigate whether there is a disparity in students' sense of belonging between online and onsite learning modes and how it impacts their academic test scores, particularly in mathematics.

### **Literature Review**

The concept of belonging holds significant importance in human life, encompassing intimate relationships with various social groups, peers, and colleagues (Schunk, 2021). According to Allen et al. (2021), a sense of belonging represents a subjective feeling of deep connection with social groups, physical places, and individual and collective experiences. It serves as a fundamental human need and serves as a predictor for numerous mental, physical, social, economic, and behavioural outcomes. Strayhorn's (2018) model of belonging includes seven core elements, highlighting that belonging is a universal human need influenced by one's identities, connected to the feeling of mattering and care, and ultimately leading to positive outcomes and success. Bouchard and Berg (2017) emphasise that belonging involves regular personal interactions characterised by minimal disagreements and negative emotions. Baumeister and Leary (2017) underscore the importance of recognising the existence of strong, empathetic, and enduring interpersonal relationships. In the context of schools, belonging encompasses students' sense of affiliation within their peer groups, being accepted as equals in the classroom, having a sense of shared power, engaging in critical citizenship, and experiencing feelings of safety and inclusion (2014).

A sense of belonging can significantly enhance students' motivation, particularly in academic pursuits. Students with a stronger sense of belonging tend to place a higher value on their academics (Yavorsky, 2017). Lee and Burkam's (2003) research indicates that students who cultivate positive social connections at school are less likely to drop out. Grobecjer's (2016) study exploring the relationship between belonging and academic achievement in specific academic programmes, such as baccalaureate nursing students during clinical placements, reveals a positive association between belonging and learning, motivation, and confidence, while it correlates negatively with perceived stress. A similar survey of computing students

concludes that those with a lower sense of belonging are more inclined to contemplate leaving the programme than their counterparts with a stronger sense of belonging. Cox and Halcrow's (2020) research suggests that students with a positive sense of belonging are more likely to have longer school attendance, fewer issues with absenteeism, and better academic performance. Conversely, a lack of belonging is linked to students who have not developed secure attachments during childhood, resulting in lower self-esteem, a more pessimistic worldview, mistrust, and the potential for experiencing rejection (Theisen, 2021). Furthermore, it is associated with mental health challenges, including depression, anxiety, and thoughts of suicide (Theisen, 2021).

Research has consistently shown that students with a stronger sense of belonging tend to achieve better academic grades, as supported by a considerable body of evidence encompassing at least 67 tests reported in primary studies (Korpershoek et al., 2020). Students cultivate a sense of belonging through reciprocal and caring relationships with teachers, forming friendships with peers, and engaging in extracurricular and school-based activities (Bouchard and Berg, 2017). Effective classroom management, relevant content delivery, leading by example in the classroom, positive teacher-student relationships, and school support mechanisms can all contribute to enhancing students' sense of belonging (Cox and Halcrow, 2020). Educational and psychological studies in diverse contexts have consistently demonstrated that students' sense of belonging in school correlates with various academic and non-academic outcomes, including increased motivation to learn, higher levels of academic achievement, and an optimistic outlook on the future (Niemi and Hotulainen, 2016).

### Research Methodology

In order to investigate the impact of students' sense of belonging during online and conventional learning on their mathematics test performance, a quantitative research approach was chosen as the primary methodology for this study. This approach involves the collection and analysis of numerical data using specific statistical techniques to address questions related to who, how much, what, where, when, how many, and how (Apuke, 2017). The target population for this research encompassed 351 Form 2 and Form 3 students at a secondary school in Wakaf Bharu, Kelantan, Malaysia. However, the study successfully gathered data from 189 students across both grade levels, surpassing the recommended sample size of 184 students. Respondents were selected through convenience sampling, a non-probability sampling method that was most accessible to the researcher.

Given the Likert scale's utilisation in this study, ranging from 1 (strongly disagree) to 5 (strongly agree), the reliability of the data was assessed through a reliability test conducted using SPSS software. The results of the test revealed a Cronbach's alpha value of 0.70 for all items, indicating a satisfactory level of reliability (Table 1).

Table 1

#### *Reliability Statistics*

Cronbach's Alpha	N of items
.701	28

The questionnaire is structured into five distinct sections. Part A, dedicated to demographic information, includes four items: name, gender, grade level, and students' mathematics test scores for 2021 and 2022. Upon receiving the questionnaire, students are instructed to

provide their details and mark the applicable statements. Part B is designed to gauge students' sense of belonging during online learning and comprises six items. Conversely, Part C investigates students' sense of belonging during traditional, in-person learning, also encompassing six items. Furthermore, Part D explores students' experiences with learning mathematics in a conventional classroom setting, featuring seven items. Lastly, Part E, consisting of seven items, delves into students' experiences with learning mathematics online.

## Findings and Discussion

### Part A: Demographic Background

The findings for Part A encompass gender and grade level, as illustrated in Table 2 and Table 3 below.

Table 2

*The distribution of respondents based on gender*

Gender	Frequency	Percentage (%)
Male	71	37.6
Female	118	62.4
Total	189	100.0

Table 2 presents the distribution of respondents based on gender, indicating the frequency and percentage. Female students account for the majority, with 118 respondents constituting 62.4% of the total. In contrast, male students make up 71 respondents, representing 37.26%. The cumulative frequency for both genders amounts to 189 respondents.

Table 3

*The distribution of respondents by Form*

Form	Frequency	Percentage (%)
2	93	49.2
3	96	50.8
Total	189	100.0

In Table 3 above, the distribution of respondents is presented in terms of frequency and percentage, distinguishing between Form 2 and Form 3 students. Form 3 respondents constitute 96 students, representing 50.8% of the total, while Form 2 respondents amount to 93 students, equivalent to 49.2% of the sample. The combined total for both Form 2 and Form 3 respondents is 189.

### Part B: Student's Sense of Belonging During Online Learning and Conventional Learning

Table 4

*The distribution of respondent's sense of belonging during online learning*

Items	N	Mean	Std. Deviation
Do you have a feeling of belonging with your classmates during online learning? <i>(Adakah anda mempunyai perasaan kekitaan bersama rakan sekelas semasa pembelajaran dalam talian)</i>	189	2.92	.905
If needed, I could count on my classmates' help if I have difficulty to solve Mathematics question. <i>(Jika perlu, saya boleh mengharapkan bantuan daripada rakan-rakan sekelas saya jika saya mempunyai kesulitan untuk menyelesaikan soalan Matematik)</i>	189	3.97	1.010
I feel comfortable to ask questions related to Mathematics online. <i>(Saya berasa selesa untuk bertanyakan soalan berkaitan dengan Matematik dalam talian)</i>	189	3.00	1.135
Overall	189	3.30	

The findings for Part B are presented in Tables 4 and 5. As indicated in Table 4, the overall mean score for respondents' sense of belonging during online learning is 3.30. Notably, most respondents expressed confidence in their ability to seek assistance from their classmates when encountering mathematical challenges ( $M = 3.97$ ,  $SD = 1.010$ ). Additionally, respondents indicated a relatively high level of comfort when asking mathematics-related questions online ( $M = 3.00$ ,  $SD = 1.135$ ). However, it is noteworthy that respondents disagreed with the notion that they felt a strong sense of belonging with their classmates during online learning, as evidenced by the lowest mean score in respondents' perceptions ( $M = 2.92$ ,  $SD = 0.905$ ).

Table 5

*The distribution of respondent's sense of belonging during conventional learning*

Items	N	Mean	Std. Deviation
I feel supported and respected in my classroom. ( <i>Saya rasa disokong dan dihormati di dalam kelas saya</i> )	189	3.38	.913
My classmates value my opinion when we discuss about Mathematics solution. ( <i>Rakan sekelas saya menghargai pendapat saya apabila kami berbincang tentang solusi Matematik</i> )	189	3.20	.945
There is at least one teacher or classmate I can talk to if I have problem with Mathematics subject. ( <i>Terdapat sekurang-kurangnya seorang guru atau rakan sekelas saya boleh bercerita jika saya mempunyai masalah dengan subjek Matematik</i> )	189	3.69	1.088
Sometimes I do not feel as if I belong here because it is hard for me to understand Mathematics. ( <i>Kadang-kadang saya rasa saya tidak tergolong disini kerana sukar untuk saya memahami Matematik</i> ).	189	3.07	1.169
I feel isolated whenever my groupmate is discussing about Mathematics. ( <i>Saya berasa terasing apabila rakan sekumpulan saya sedang berbincang tentang Matematik</i> )	189	2.67	1.100
Overall	189	3.20	

The overall findings indicate that respondents' sense of belonging during conventional learning yields an average score of 3.20. Notably, the majority of respondents reported having at least one teacher or classmate they can turn to when encountering mathematical challenges, as evidenced by the highest mean score for this statement related to their sense of belonging during conventional learning ( $M = 3.69$ ,  $SD = 1.088$ ). Furthermore, respondents also expressed feeling supported and respected within their classroom environment ( $M = 3.38$ ,  $SD = 0.913$ ). However, the results reveal that most respondents do not feel isolated when their peers discuss mathematics, as indicated by the lowest mean score obtained ( $M = 2.67$ ,  $SD = 1.100$ ).

Subsequently, we proceed to compare the mean scores of students' sense of belonging during online and conventional learning. The hypotheses to be tested are as follows:

$H_0$ : There is no significant difference between students' sense of belonging during online and conventional learning.

$H_1$ : There is a significant difference between students' sense of belonging during online and conventional learning.

Table 6

*Paired Samples Statistics for students' sense of belonging*

	Mean	N	Std. Deviation	Std. Error Mean
Sum_Belonging_Online	19.5556	189	4.24682	.30891
Sum_Belonging_Conventional	19.7566	189	2.79894	.20359

Table 7

*Paired Samples Correlations for students' sense of belonging*

	N	Correlation	Sig.
Sum_Belonging_Online & Sum_Belonging_Conventional	189	.432	.000

Table 8

*Paired Samples Test for students' sense of belonging*

Paired Differences								
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Sum_Belonging_Online - Sum_Belonging_Conventional	-.20106	3.95073	.28737	-.76795	.36583	-.700	188	.485

According to the paired t-test results, there is no significant difference between students' sense of belonging during online learning ( $M = 19.5556$ ,  $SD = 4.24682$ ) and conventional learning ( $M = 19.7566$ ,  $SD = 2.79894$ ) with  $t(188) = -0.700$ ,  $p > .05$ . This indicates that, despite experiencing various learning modes, students' sense of belonging remains consistent between online and conventional learning. Consequently, the null hypothesis is accepted.



### Part C: Respondents' Experience Learning Mathematics Online and Conventionally

Table 9

*The distribution of respondent's experience learning mathematic conventionally*

Items	N	Mean	Std. Deviation
I can see that conventional teaching and learning method can attract my interest on Mathematic subject. <i>(Saya boleh nampak kaedah pengajaran dan pembelajaran boleh menarik minat saya terhadap subjek Matematik)</i>	189	3.71	.964
I found that I do not feel bored with this conventional teaching and learning method. <i>(Saya mendapati bahawa saya tidak berasa bosan dengan kaedah pengajaran dan pembelajaran secara tradisional)</i>	189	3.71	1.099
I feel interesting to study Mathematics by conventional teaching and learning method. <i>(Saya berasa menarik untuk belajar Matematik dengan kaedah pengajaran dan pembelajaran secara tradisional)</i>	189	3.80	.996
I agree if conventional methods are retained in teaching and learning Mathematics subject. <i>(Saya bersetuju untuk mengekalkan kaedah tradisional dalam pengajaran dan pembelajaran subjek Matematik)</i>	189	3.83	1.029
I can understand the mathematics concepts better with conventional learning. <i>(Saya boleh memahami konsep Matematik dengan lebih baik dengan pembelajaran secara tradisional)</i>	189	3.68	1.024
I feel comfortable communicating with my teacher about Mathematics problem in a classroom environment. <i>(Saya rasa selesa berkomunikasi dengan guru saya tentang masalah Matematik di dalam kelas)</i>	189	3.80	3.826
It is easier for me to participate in classroom discussion compared to online discussion. <i>(Lebih mudah untuk saya menyertai perbincangan di dalam bilik darjah berbanding perbincangan dalam talian).</i>	189	4.07	1.084
Overall	189	3.80	

The results for Part C are presented in Tables 9 and 10. As shown in Table 9, the overall findings indicate a moderate mean ( $M = 3.80$ ) for students' experiences in learning mathematics conventionally. Most respondents agree that participating in face-to-face classroom discussions is easier compared to online discussions, as reflected in the highest

mean score ( $M = 4.07$ ,  $SD = 1.084$ ) for this item. Additionally, they express agreement with the retention of conventional teaching methods for mathematical subjects ( $M = 3.83$ ,  $SD = 1.029$ ). However, not all respondents find that they understand mathematics concepts better through conventional learning, as evidenced by the lower mean score ( $M = 3.68$ ,  $SD = 1.024$ ).

Table 10

*The distribution of respondent's experience learning mathematic online*

Items	N	Mean	Std. Deviation
Online learning helps me to enhance my Mathematics' test score. <i>(Pembelajaran dalam talian membantu saya meningkatkan markah ujian Matematik saya)</i>	189	2.15	.913
I prefer to learn Mathematics online instead of the conventional way. <i>(Saya lebih suka belajar Matematik dalam talian berbanding secara tradisional)</i>	189	2.04	.944
I am motivated to learn Mathematics online. <i>(Saya bersemangat belajar Matematik dalam talian)</i>	189	2.25	.966
Learning Mathematics online helps me to think critically. <i>(Pembelajaran Matematik dalam talian membantu saya berfikir secara kritikal)</i>	189	2.53	.998
Learning Mathematics online makes me become more stressed. <i>(Pembelajaran Matematik secara online membuat saya menjadi lebih stres)</i>	189	3.65	1.137
I can actively communicate online with my teacher to ask about Mathematics if I have any difficulty. <i>(Saya dapat berkomunikasi secara aktif dalam talian bersama guru saya untuk bertanyakan tentang subjek Matematik jika saya mempunyai sebarang kesulitan)</i>	189	2.76	.979
I have difficulty to access the internet connection during online learning to join my Mathematics class. <i>(Saya mempunyai kesukaran untuk mengakses sambungan internet semasa pembelajaran dalam talian untuk menyertai kelas Matematik)</i>	189	2.87	1.146
Overall	189	2.61	

Based on Table 10 presented above, the overall findings suggest that respondents might have had a challenging experience learning mathematics online ( $M = 2.61$ ). The majority of them believe that learning mathematics online increases their stress levels, as evidenced by the highest mean score ( $M = 3.65$ ,  $SD = 1.137$ ). This is followed by statements indicating difficulties in accessing the internet connection during online learning for math classes ( $M = 2.87$ ,  $SD = 1.146$ ) and limited active communication with their teacher online to seek help with math subjects if needed ( $M = 2.76$ ,  $SD = 0.979$ ). Lastly, most respondents express a

preference for conventional learning over online learning for mathematics, with the lowest mean score recorded ( $M = 2.04$ ,  $SD = 0.944$ ).

Next, we compare the mean mathematics test scores between online learning and conventional learning among Form 2 students.

$H_0$ : There is no significant difference between mathematics test scores in online learning and conventional learning among Form 2 students.

$H_1$ : There is a significant difference between mathematics test scores in online learning and conventional learning among Form 2 students.

Table 11

*Paired Samples Statistics among Form 2 students*

	Mean	N	Std. Deviation	Std. Error Mean
Mathematics test scores in 2021	4.52	93	1.633	.169
Mathematics test scores in 2022	3.33	93	1.528	.158

Table 12

*Paired Samples Correlations among Form 2 students*

	N	Correlation	Sig.
Mathematics test scores in 2021 & Mathematics test score in 2022	93	.423	.000

Table 13

*Paired Samples Test among Form 2 students*

Paired Differences								
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Mathematics test scores in 2021 – Mathematics test score in 2022	1.183	1.700	.176	.833	1.533	6.710	92	.000

A significant difference exists between the mathematics test scores during online learning ( $M = 4.52$ ,  $SD = 1.633$ ) and conventional learning ( $M = 3.33$ ,  $SD = 1.528$ ) among Form 2 students, as indicated by  $t(92) = 6.710$ ,  $p < .05$ . This demonstrates the acceptance of the alternative hypothesis, resulting in the rejection of the null hypothesis. Form 2 students perform better in mathematics during online learning.

Furthermore, the study will also compare the means of the mathematics test scores during online learning and conventional learning among Form 3 students.

$H_0$ : There is no significant difference between the mathematics test scores during online learning and conventional learning among Form 3 students.

$H_1$ : There is a significant difference between the mathematics test scores during online learning and conventional learning among Form 3 students.

Table 14: Paired Samples Statistics among Form 3 students

	Mean	N	Std. Deviation	Std. Error Mean
Mathematics test scores in 2021	4.81	96	1.402	.143
Mathematics test scores in 2022	2.78	96	1.331	.136

Table 15: Paired Samples Correlation among Form 3 students

	N	Correlation	Sig.
Mathematics test scores in 2021 & Mathematics test scores in 2022	96	.356	.000

Table 16

*Paired Samples Test among Form 3 students*

Paired Differences								
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Mathematics test score in 2021 – Mathematics test score in 2022	2.031	1.552	.158	1.717	2.346	12.821	95	.000

Additionally, many students express a preference for participating in face-to-face classroom discussions over their online counterparts. This aligns with the findings of a prior study, which indicated that students generally find in-person learning more enjoyable than online learning (Bringula et al., 2021). Classroom discussions can foster student engagement and interest by enabling them to share their perspectives and explore diverse viewpoints from their peers. A well-executed question-and-answer session can encourage students to think critically and establish connections based on the responses provided.

Furthermore, a significant number of students perceive learning mathematics online as more stressful. This perception may stem from the perception of a heavier workload compared to in-person learning. Additionally, the presence of siblings and parents at home can introduce distractions and stress as students juggle completing schoolwork with family demands. However, despite the preference for classroom learning, students tend to achieve better scores in mathematics tests during online learning compared to conventional methods. This observation aligns with earlier research by Elfaki et al (2019), which found that students engaged in online learning tend to earn higher grades than in conventional learning. These outcomes also support previous research indicating that online learning positively impacts students' academic achievements. Thus, students appear to perform more effectively academically during online learning than in face-to-face settings.

The implications of this study are pertinent for educators, parents, and students, providing insights into monitoring students' sense of belonging and its influence on their mathematics test scores. Notably, the findings highlight that students often turn to their peers for help rather than teachers, likely due to concerns about potential criticism when seeking

clarification from teachers. Therefore, teachers should focus on fostering a strong sense of belonging in the teacher-student relationship, ensuring students feel comfortable asking questions and seeking assistance, regardless of the subject matter.

Additionally, parents play a crucial role in helping students alleviate stress. Given that a majority of students in the study reported feeling stressed during online learning, parents can support their children by refraining from assigning tasks or running errands during class time. Spending quality time with their children, even if just for an hour, and providing academic assistance can convey love and support, alleviating some of the students' burdens.

Lastly, students should actively collaborate and assist each other during classes. The study reveals that students feel more at ease seeking help from their peers, as they believe their classmates possess effective strategies for explaining complex topics, particularly in mathematics. Consequently, students can quickly grasp and comprehend the material when it is conveyed by their peers. Therefore, teachers should continuously enhance their teaching methods and strategies to make the learning experience engaging and effective.

### **Conclusion**

In conclusion, this study delved into the intricate relationship between students' sense of belonging in online and onsite learning environments and its impact on their mathematics test scores. The results reveal several noteworthy insights.

Firstly, the findings underscore that students, regardless of the learning mode, exhibit a high level of confidence in their ability to seek help when encountering mathematical challenges. Whether in online or traditional classroom settings, students believe they can rely on their peers or teachers for support. This common thread suggests that students maintain a robust sense of belonging in both educational settings, highlighting the resilience of social connections across different modes of learning.

Furthermore, the study unveils a particularly compelling observation: students generally achieve higher mathematics test scores during online learning compared to traditional face-to-face sessions. This outcome aligns seamlessly with previous research, which posited that students engaged in online coursework tend to perform better academically when they possess a strong sense of belonging (Al-Kumaim et al., 2021). The rationale behind this phenomenon lies in students' immediate ability to harness the power of their sense of belonging, which serves as a driving force propelling them towards greater academic accomplishments, especially in mathematics.

These findings carry substantial implications for educators, students, and parents alike. Educators should recognise the vital role of fostering a sense of belonging within the teacher-student relationship, ensuring that students feel welcomed to ask questions and seek help in any subject matter. Simultaneously, parents can actively contribute to reducing students' stress levels during online learning by refraining from assigning tasks or errands during class hours and providing academic support. Lastly, students should leverage the supportive dynamics of peer-to-peer interactions, utilising their classmates' effective strategies for understanding complex topics, particularly in mathematics. By doing so, they can enhance their learning experiences and improve their academic performance.

In essence, this study underscores the enduring nature of students' sense of belonging in different learning environments and highlights the potential for improved academic outcomes, particularly in mathematics, when this sense of belonging is harnessed effectively.

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