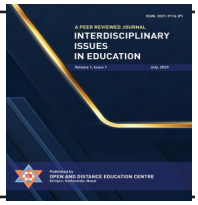
DOI: https://doi.org/110.3126/iie.v2i2.71769

Established by INASP in 2007. Managed by Tribhuvan University Central Library.

Contents lists available at NepJol

Interdisciplinary Issues in Education

Vol. 2, No. 2, 2024 *A Peer-Reviewed, Open Access Journal*



Exploring Mathematics Learning Strategies of High-Scoring Group Students at Secondary-level

Bishnu Khanal [a] ✉, Deb Bahadur Chhetri

✉ bishnu.khanal@mrc.tu.edu.np

[a] Faculty of Education, TU, Nepal
[b] Dhawalagiri Multiple Campus, TU, Nepal

Article Info

Received: June 5, 2024
Accepted: October 19, 2024
Published: November 19, 2024

Abstract

Students' achievement in mathematics at school-level is significant concern in the context of Nepal. Various factors contribute to success and failure in mathematics with learning strategies adopted by the students being crucial element. This study explores the mathematics learning strategies employed by students who secure high core in mathematics and their motivating factors in the context of Nepal. The study employed an exploratory research design within the qualitative research framework, focusing on a select group of high-scoring students. Specifically, the research involved the investigation of only five students from the high-scoring cohort. Two times interview was utilized for data collection and thematic analysis was used for data analysis. Findings revealed that participants reported multiple strategies encompassing rigorous practice, self-regulated learning, and collaborative learning. Their persistent determination, drove by intrinsic motivation and aspirations for the future, emphasizes the crucial significance of positive attitudes in overcoming obstacles. Furthermore, the pivotal contributions of robust support systems from teachers, family, peer group emerged as influential motivational promoters. Highlighting customized instructional approaches and nurturing supportive learning environments show the potential to strengthen mathematics education and promote good achievement worldwide.

Keywords: *High achievement, mathematical learning strategies, motivation*

Introduction

Mathematics is universally acknowledged as a fundamental pillar of scientific knowledge, playing a crucial role in shaping various fields such as science, technology, engineering, and economics. Its importance within the global school curriculum is widely recognized, as it serves as a cornerstone for scientific and technological advancements (Suleiman & Hammed, 2019; Mbugua et al., 2012; Suleiman & Hammed, 2019). However, despite its essential role, mathematics is commonly perceived as a challenging subject by many students (Ali & Jammel, 2016; Akhter & Akhter, 2018; Sharma et al., 2018 a). This perception often leads to issues of poor achievement in mathematics, which are observed not only in specific countries but also on a global scale (Naiker et al., 2020; Sharma et al., 2018 b). Thus, perception plays a pivotal role in determining the achievement in learning mathematics.

Nepal, like many other countries, faces challenges in mathematics education, with notable levels of low achievement among students (Bhetuwal, 2022). This situation prompts a deeper examination of the factors contributing to students' struggles with mathematics. Negative perceptions about the subject and diverse learning styles are among the key factors that hinder students' progress in mathematics (Broun et al., 2008; Mahanta & Islam, 2012). Therefore, the learning approach and methods utilized in studying mathematics play a significant role in determining mathematical achievement.

Despite the prevailing challenges, some students manage to excel in mathematics, achieving high scores in examinations. These high achievers may employ unique learning tactics and strategies that contribute to their success. These tactics encompass a range of approaches tailored to individual learning preferences and styles. Such tactics hold promise not only for improving academic performance but also for informing instructional practices in mathematics education.

Understanding the learning tactics of high-scoring students is crucial for identifying effective strategies that can be disseminated and applied to support the learning needs of all students. By exploring the factors that stimulate students' engagement with mathematics learning, educators can gain insights into how to foster a positive learning environment conducive to academic success.

In light of these considerations, this study aims to investigate the learning strategies of higher-scoring students in mathematics within the context of Nepal, guiding by research questions: What are the mathematics learning strategies employed by high-scoring students? What factors motivate students to engage in mathematics learning?

Literature Review

Some theories and research evidence on success in learning achievement are arranged under this title.

Theoretical Views on Academic Success

There are different theories describe the root causes of academic success and failure. Some success related to psychological aspect and some related to individual aspects. Some believe that consistent positive reinforcement and feedback are crucial, arguing that rewards and incentives can significantly boost motivation and performance. Additionally, the influence of social interactions and environmental factors cannot be overlooked, as supportive relationships with teachers, peers, and family members play a pivotal role in shaping students' academic achievements. Several theories can be found that explain academic success. The theories explain the root cause of academic success and its cause of failure.

Some relevant theories are summarized in Table 1.

Table 1

Academic success theories

Theorist	Name of theory	Theoretical Claim
Deci, E.L., and Ryan, R.M. (1985)	Motivation theory	Intrinsic motivation has an important role in learning achievement. A student's engagement and accountability in their education are fostered by their enthusiasm for learning, discovery of significance, and pleasure derived from self-improvement through education.
Werner and Smith (1992)	Resilience theory	Flexibility and social backing play crucial roles in students' achievements. The capability of students to devise strategies for overcoming challenges, including the potential for failure, empowers them toward success.
Bandura (1977)	Social theory of learning	Collaboration with the group, social interaction, and active group participation are influencing factors in academic success.
Deci and Ryan (2000)	Self-determination theory	The individual satisfaction in their fundamental psychological need like autonomy, competence and social connectedness. The fulfilment of these needs motivates them to learn and promote academic success.
Zimmerman (2002)	Cognitive emotional Self-regulation Theory.	Students who can regulate their thoughts, emotions and thoughts can achieve academic success.
Steele and Aronson (1995)	Theory of Stigma and Stereotypes	Negative attitudes, behavior and beliefs of an individual and groups negatively impact academic performance.
Lev Vygotsky (1978)	Constructivist theory	Social interaction in learning enhances understanding and retention by offering diverse perspectives, active engagement, feedback, validation, and collaborative learning within a cultural and social context.

These theories were utilized to prepare an interview protocol and observe the results.

Factors Related to Achievement in Mathematics

The students' perception is directly connected with the students' perception towards mathematics. The lower scorer group have a negative perception and the higher score group of students have a positive perception towards mathematics and have more confidence in comparison to the lower scorer group (Kunwar, 2021). Additionally, high-achiever students perceived mathematics as an interesting subject and low achievers perceived it as a difficult subject (Khanal, 2015). The students' positive attitude helps the students to grasp the mathematical contents (Akhter & Akhter, 2018). Therefore, the student's positive attitude and their confidence influence their mathematics learning achievement. Sufficient focus, effective time management, and consistent dedication are strong predictors of students' success in mathematics (Eyong et al., 2020). Adequate concentration is required for learning mathematics which creates positive attitudes towards mathematics (Farooq & Shah, 2008; Mohammad, 2002). Hence more focus and time management enhances mathematics learning achievement. The study habits of students correlated with their achievement in mathematics (Salimaco, 2020). Therefore, the student's regular labor and focus on mathematics ensure a high score in mathematics achievement. The achievement-based motivation also a role in students' achievement. The different types of motivation like achievement motivation (Villa & Sebastian, 2021) impact achievement in mathematics.

Role of Engagement in Achievement

Cognitive engagement, affective engagement, and behavioural engagement have significant positive correlations with achievement in mathematics (Maamin et al., 2022). The students' engagements with the teacher collaboration improve the students' achievement (Saka, 2021). The duration of engagement and the ratio of mastered to practised topics are notable factors predicting students' scores in mathematics (Mills, 2021). Therefore, the habit of engagement in learning mathematics consistently impacts mathematics achievement.

Role of Visualization and Strategies in Achievement in Mathematics

Bakker et al. (2022) noted that spatial visualization is a significant predictor of high achievement in mathematics. Additionally, the utilization of a variety of strategies for learning mathematics was found to ensure high achievement. The differentiated teaching strategies contribute to increased achievement in mathematics (Awofala & Lawani, 2020). Additionally, collaborative learning strategies and teachers' higher support in learning mathematics help to ensure high scores in mathematics achievement (Muraina, 2019). Therefore, the efficacy of teaching and learning strategies directly influences academic achievement in mathematics.

Mathematics Learning Strategies and Achievement

Learning strategies have an important role in achievement in every learning. There are three theoretical roots of learning strategies as explained by different scholars: metacognitive strategies (Flavell, 1979; Brown, 1973), Cognitive strategies (Mayer, 2002) and Social/affective (Vygotsky, 1978). Active learning strategies including intellectual engagement, physical engagement and social engagement have an impact on mathematics learning achievement (Vale & Barbosa, 2023). Similarly, learning strategies have a significant role in good achievement in mathematics. Under above mentioned broad strategies, peer learning, elaboration, help-seeking, effort management, rehearsal, organization, Time and study management, metacognition and critical thinking are utilized by Nepalese school students (Khanal, 2015; Khanal et al., 2021). Among these strategies, one-third of students have been utilizing multiple methods however metacognition and critical thinking strategies are less prioritized by the student in the context of Nepal (Khanal et al., 2021). Repetition, effective time allocation, and peer collaboration emerged as the most impactful learning tactics essential for achieving higher academic success (Khanal, 2015). Hence, School students utilized multiple methods for learning mathematics.

Motivation and Mathematics Achievement

Motivation plays a crucial role in mathematics achievement, influencing students' engagement, persistence, and performance in the subject. When students are motivated to learn mathematics, they are more likely to invest effort in understanding concepts, solving problems, and mastering skills. Achievement motivation positively correlated with the student's achievement in mathematics (Villa & Sebastian, 2021) and Achievement motivation has a significant role in teaching-learning of mathematics (Hasan & Sarkar, 2018). Hence achievement motivation has a crucial role in enhancing mathematical achievement at the school level. Motivation and achievement in mathematics have a significant

positive correlation (Tran & Nguyen, 2021). Motivation is highly correlated with achievement, however, maladaptive motivation decreases students' achievement in mathematics (Xai et al., 2022). Therefore, positive and good motivation helps the students to improve their learning achievement in mathematics.

Research Methodology

Accessible research site should be selected based on objective because researcher access is important for their engagement in data collection activities (Yan, 2018). Therefore, Baglung district specially Baglung Municipality was selected as research site. The study focuses on exploring the students' experience behind their high achievement in mathematics. For such purposes, exploratory research design is suitable (Merriam, 2009). Therefore, this study utilized an exploratory research design within the qualitative approach. The purpose of study was to explore the learning strategies of high score group student. To meet this objective higher score students, need to be selected therefor purposive sampling was used to select the students. Thus, students who achieved high scores (More than B^+ grade) in the School Examination (SEE) of Baglung municipality were selected as participants. Creswell and Poth, (2016) suggests sample size for qualitative research in case of in-depth interview for sample size is five. So, based on this suggestion five high scoring students were selected for in-depth interview. As Patton (2002) emphasizes, in-depth interviews are especially valuable for exploring individuals' lived experiences, subjective interpretations, and personal narratives. Therefore, an in-depth interview was utilized to collect the data. An interview protocol containing open-ended questions for students focusing on their mathematics learning strategies was employed, and the interviews were recorded using mobile documented through note-taking. Familiarization with data, coding, searching themes, reviewing themes, defining themes and write-up are stages of analyzing qualitative data (Clarke & Braun, 2013). These stages were adopted to analyze the data. Among the criteria outlined by Lincoln and Guba (1985), member checking and peer debriefing and thick description were utilized to ensure credibility, and transferability of the study findings.

Findings and Discussion

The Interview served as a means to explore the learning approaches utilized by high-achieving students in mathematics. Through this discussion, participants from the high-scoring group shared numerous strategies they employ to excel in the subject. Furthermore, they highlighted the motivating factors that drive their engagement with mathematics. These findings regarding learning strategies and motivational influences are articulated within the context of specific themes.

Demographic Status of Respondent

The study included five participants, who were from different schools in different locations of Baglung municipality. All participants were aged 16, with a mix of genders and ethnicities. Among them, two identified male and three female. Ethnic backgrounds varied, with one Brahmin, one Chhetri one Dalit and two Janajati. Performance in mathematics, as measured by SEE scores, ranged from B^+ to A^+. Table 2 displays the details.

Table 2

Socio-demographic Summary of Respondent

s.n.	Pseudo name	Gender	Ethnicity	Age	SEE Grade in Mathematics
1	A	Male	Brahmin	16	A^+
2	B	Male	Janajati	16	A^+
3	C	Female	Janajati	16	A
4	D	Female	Chhetri	16	A
5	E	Male	Dalit	16	A^+

Major Learning Strategies

During the interviews, participants elaborated on their past experiences related to attaining high scores in mathematics, organized within the following thematic framework.

More Engage in Practice of the Contents

The primary strategy employed by students to learn mathematics is the practice of content covered in their mathematics classes. This involves regular practice of mathematics by using book, reference book like practice book and follow the teachers' guidelines for problem solving practice. "I dedicate at least an hour each day to practicing mathematics problems from my textbook and practice book" (Interview, 28 July 2023). Similarly, Respondent B highlighted the significance of the practice, stating, "Repeating problem solving practice that helps me solidify my understanding of mathematical concepts" (Interview, 28 July 2023). Respondent C expressed, "I find that the more I practice, the more confident I become in my abilities to tackle math problems" (Interview, 28 July 2023). Therefore, consistent practice in solving mathematical problems contributes them significantly to achieving success in the subject. Hence more engage in mathematical problem solving helps to increase achievement.

The finding that increased engagement in practice for mathematics problem-solving contributes to academic achievement is strongly supported by recent literature. Maamin et al. (2022) found a significant positive correlation between cognitive, affective, and behavioural engagement and achievement in mathematics. This suggests that actively engaging with mathematical content, both mentally and emotionally, is linked to higher academic performance. Furthermore, Saka (2021) highlighted the positive impact of students' engagement collaborative learning on their achievement in mathematics. This indicates that collaborative learning environments can enhance engagement and subsequently improve mathematics outcomes. Additionally, Mills (2021) identified the duration of engagement and the ratio of mastered to practice topics as key factors predicting students' scores in mathematics. In this study students highlighted regular engage in learning which supported by Mills study.

Scheduled Learning and Self-Regulated Learning

During the interview, participants articulated a distinct preference for self-regulated learning methodologies over traditional pedagogical directives, particularly evident in their approach to mathematical studies. Participant Eelucidated the efficacy of personalized schedules, remarking, "I find it advantageous to devise personalized schedules for my academic endeavors, facilitating enhanced organization and sustained focus" (Interview, 30 July 2023). Participant concurred, asserting, "I assume responsibility for my academic pursuits by accurately planning the temporal and procedural aspects of my mathematical studies. Furthermore, Participant A corroborated this sentiment by delineating a steadfast commitment to self-regulated learning practices, affirming, "I diligently prepare and adhere to structured schedules for the pursuit of mathematical proficiency, a habit I have diligently maintained up to class 8" (Interview, 27 July 2023). These narratives collectively underscore the pronounced efficacy of individually tailored learning schedules in cultivating academic excellence and reflect the proactive engagement of participants in their educational journey.

The participant's preference for self-regulated learning mirrors Zimmerman's theory, emphasizing strategic planning and emotional regulation (Zimmerman, 2002). Their meticulous scheduling reflects Deci and Ryan's notion of autonomy and competence, fostering ownership and scholastic advancement (Deci & Ryan, 2000). Participant A's commitment echoes intrinsic motivation principles, driving proactive engagement in learning (Deci & Ryan, 1985). This finding is supported by the finding of Khanal et al. (2021) finding that effective time allocation has a connection with higher achievement in mathematics. Collectively, these narratives highlight the efficacy of tailored schedules in fostering academic excellence, bridging theory with real-world educational practices.

Following the Collaborative Learning

During the interview, participants emphasized the collaborative nature of their learning process, particularly in the context of mathematical problem-solving. Participant D articulated this sentiment, stating, "I share my problems with friends and teachers to get answers and share what I know with friends, which helps clarify mathematical problems" (Interview, 29 July 2023). This highlights the value of peer and teacher support in navigating challenges and deepening understanding. Similarly, Participant A echoed this collaborative approach, affirming, "I often collaborate with friends and teachers to tackle difficult mathematical problems, pooling my knowledge and resources to achieve mastery" (Interview, 27 July 2023). By leveraging the collective expertise of peers and educators, Participant A underscores the importance of collaborative problem-solving in enhancing learning outcomes. Participant E further emphasized the role of collaboration in his learning journey, stating, "Working with peers, doing mathematics in our group, sharing learnt thing and teachers allows me to identify areas of difficulty and develop strategies for mastery in mathematical content" (Interview, 30 July 2023). This highlights the collaborative process of identifying challenges and devising effective

solutions through shared expertise and support.

The finding emphasizing collaborative learning because students reported that they learn in their peer group and and sharing the known things which is aligned with Vygotsky's constructivist theory (1978), which posits that social interaction enhances cognitive development. This is supported by Deci and Ryan's self-determination theory (2000), emphasizing the role of social connectedness in fulfilling psychological needs (Deci & Ryan, 2000). Bandura's social theory of learning (1977) further highlights the importance of group collaboration in academic success, reinforcing Vygotsky's perspective (Bandura, 1977). In essence, collaborative learning environments provide opportunities for cognitive and emotional regulation, as proposed by Zimmerman's cognitive emotional self-regulation theory (2002) (Zimmerman, 2002), fostering academic achievement within a sociocultural context.

Visualization and Algorithm

Participants reported employing cognitive strategies such as making diagram of problem-solving solving process and nature of mathematical problem and algorithmic approaches to enhance their retention and problem-solving abilities during mathematics learning. These strategies serve as mnemonic devices, aiding in the organization and recall of complex verbal problems akin to mental maps. Furthermore, participants demonstrated cognizance of selecting appropriate algorithms tailored to specific problem-solving contexts, indicating a deliberate and strategic approach to mathematical learning.

Participant A reported, "I prepared a diagram for the complex problem to solve that consists of the steps and process" (Interview, 27 July 2023). Additionally, participant E articulated the experience that "I utilized the diagram of a process of solving the complex problem of mathematics" (Interview, 30 July 2023). The finding that participants employ cognitive strategies like diagrammatic representations and algorithmic approaches during mathematics learning aligns with research suggesting the significance of spatial visualization and diverse learning strategies in achieving high academic performance in mathematics. Bakker et al. (2022) highlighted spatial visualization as a significant predictor of mathematical achievement, indicating that the use of diagrams and visual representations can enhance understanding and problem-solving capabilities.

Similarly, Awofala and Lawani (2020) emphasized the importance of employing a variety of strategies for learning mathematics, with differentiated teaching strategies contributing to increased achievement. Moreover, collaborative learning strategies and higher teacher support have been identified as factors contributing to high scores in mathematics achievement (Muraina, 2019) This is supported by the findings of Khanal (2015) and Khanal et al. (2021) which highlighted students use more than one strategies for learning mathematics where collaborative strategy takes more place than other strategies. Thus participants utilized multiple strategy and it enables in more engagement in learning mathematics.

Motivating Factors for Learning Mathematics

Participants in the study indicated that several key factors contributed to their motivation to learn mathematics. These factors are explored under the following thematic categories.

Future Goal and Career

Throughout the interview, the focus was centered on the central question: "What factors motivate individuals to pursue mathematics for success?" participants articulated a range of motivations. They highlighted specific career aspirations, such as pursuing studies in science, aspiring to become a doctor, and charting a path in accounting, or engineering, as driving forces. Additionally, the desire to achieve high academic grades and secure a promising future career served as further incentives, stimulating their dedication to practising and excelling in mathematics.

During the interview investigating the factors influencing success in mathematics, participant B emphasized the importance of practical skill of mathematical competence, stating, "Proficiency in math is crucial for engineering." (Interview, 28 July 2023). This sentiment aligns with the broader theme identified in the discussion, where participants emphasized the importance of specific career aspirations, such as pursuing studies in science, medicine, accounting, or engineering, in motivating their dedication to mathematics. Likewise, Participant E highlighted the pervasive application of mathematics across scientific domains, asserting, "Math is heavily involved in the sciences" (Interview, 30 July 2023). This recognition of mathematics' interdisciplinary relevance further underpins the motivational dynamics discussed within the group. Additionally, Participant D shed light on the tangible impact of mathematical proficiency on academic

performance, stating, "Math can significantly impact my GPA" (Interview, 29 July 2023). These diverse perspectives collectively illuminate the multifaceted nature of motivations driving individuals' engagement with mathematics for success.

The participants' specific career aspirations, such as pursuing studies in science, aspiring to become a doctor, and charting a path in accounting, or engineering, align closely with Deci and Ryan's self-determination theory (2000), which emphasizes the fulfilment of fundamental psychological needs such as autonomy, competence, and social connectedness as motivators for learning and academic success. By pursuing careers aligned with their interests and goals, participants are inherently satisfying these intrinsic needs, thereby fostering motivation and dedication to practising and excelling in mathematics. Furthermore, the desire to achieve high academic grades and secure a promising future career resonates with Bandura's social theory of learning (1977), which emphasizes the influence of collaboration, social interaction, and active participation in group settings for academic success. Participants' recognition of the importance of academic achievement in realizing their career aspirations underscores the interconnectedness of intrinsic motivation and external incentives in driving their engagement with mathematics.

Positive Attitude

Participants expressed a resilient attitude towards mathematics, indicating that despite its inherent difficulty and the necessity for extensive practice, they remained undeterred and motivated by their future career aspirations. Participant A conveyed a sense of perseverance, stating that they were never deterred by the challenges posed by mathematics, recognizing its demanding nature while remaining committed to continuous learning (Interview, 27 July 2023). Similarly, Participant B echoed this sentiment, affirming their unwavering dedication to mastering mathematics, driven by the recognition of its importance in shaping their future career trajectory (Interview, 28 July 2023). Participant E articulated the motivational influence of plans, acknowledging that despite encountering difficult problems, the anticipation of achieving high scores and advancing towards their career goals served as a powerful stimulus for learning mathematics (Interview, 30 July 2023). This resilient mindset, characterized by a steadfast commitment to learning despite challenges, aligns with the broader theme of intrinsic motivation driving academic engagement, as participants draw inspiration from their future aspirations to navigate the complexities of mathematical learning.

Participants' positive attitude towards mathematics, fueled by their future ambitions, underscores the role of intrinsic motivation in academic engagement (Deci & Ryan, 2000). Despite acknowledging the subject's difficulty, participants exhibit resilience and perseverance, aligning with Werner and Smith's resilience theory (1992). Their dedication to mastering mathematics reflects the fulfilment of psychological needs for autonomy, competence, and social connectedness, as outlined in self-determination theory (Deci & Ryan, 2000). Furthermore, their recognition of mathematics' significance in shaping their future career trajectory resonates with Bandura's social theory of learning (1977), emphasizing collaboration and active participation in achieving academic success. Thus, participants' positive attitude, driven by intrinsic motivation and future aspirations, highlights the importance of motivational factors in promoting academic achievement in mathematics, as supported by theoretical frameworks.

Powerful Support

The encouragement provided by teachers, family, and the school environment plays a pivotal role in motivating students to engage with and excel in mathematics. Participant B emphasized the support received from their family, teachers, and friends, highlighting the significant role of social support systems like motivate them, making learning environment, providing etc. (Interview, 28 July 2023). Participant E echoed this sentiment, acknowledging the ongoing support from teachers and family members during their mathematics studies (Interview, 30 July 2023). Consequently, students are motivated by the backing they receive from their school teachers and families, aligning with Lev Vygotsky's assertion that social support is instrumental in the learning process (Vygotsky, 1978). This finding underscores the importance of a supportive social environment in fostering academic success in mathematics.

Conclusion and Implications

The findings from the study indicate that students of high-score groups in mathematics utilize consistent diverse strategies for learning mathematics. A more remarkable point is that the regular practice of mathematics helps them for high achievement. Through rigorous practice, self-regulated learning, collaborative learning, as well as the utilization of diagram to separate the nature of mathematical problem in same topic. Remembering the process of solving complex problem and theorem proving. These students demonstrate a multifaceted approach to mastering mathematical concepts.

Their motivations, rooted in career aspirations, positive attitudes, and the supports of teachers, family, and peers, emphasize the importance of intrinsic motivation and social support in fostering academic engagement. These insights not only align with established theories such as self-determination theory and social cognitive theory. By recognizing the significance of personalized instructional learning strategies, collaborative learning environments, and robust support systems, stakeholders can effectively nurture students' mathematical proficiency and promote academic excellence. Thus, this study contributes valuable insights to the ongoing discourse on educational practices aimed at fostering optimal learning outcomes in mathematics. This was conducted with a limited sample size and solely through in-depth interviews, necessitating further investigation through the utilization of surveys with larger sample sizes and employing multiple methods of data collection and analysis.

This study provides valuable insights that can inform educational practices and interventions to enhance mathematics education and improve achievement in mathematics at the school level in Nepal and beyond.

References

Akhter, N., & Akhter, N. (2018). Learning in mathematics: Difficulties and perceptions of students. *Journal of Educational Research, 21*(1), 1027–9776. https://jer.iub.edu.pk/journals/JER-Vol-21.No-1/11.pdf

Ali, H. H., & Jameel, H. T. (2016). Causes of poor performance in mathematics from teachers, parents, and students' perspectives. *American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS), 15*(1), 122–136.

Awofala, A. O., & Lawani, A. O. (2020). *Increasing mathematics achievement of senior secondary school students through differentiated instruction.* https://doi.org/10.31258/JES.4.1.P.1-19

Bakker, M., Torbeyns, J., Verschaffel, L., & De Smedt, B. (2022). The mathematical, motivational, and cognitive characteristics of high mathematics achievers in primary school. *Journal of Educational Psychology, 114*(5), 992–1004. https://doi.org/10.1037/edu0000678

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215. https://doi.org/10.1037/0033-295X.84.2.191

Bhetuwal, K. P. (2022). School level students' academic achievement in Nepal: A case analysis. *Journal of Research & Method in Education (IOSR-JRME) 5*(12), https://www.researchgate.net/publication/364226620_School_Level_Students'_Academic_Achievement_in_Nepal_A_Case_Analysis/citation/downloa

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology, 3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Brown, A. L. (1978). Knowing when, where, and how to remember: A problem of metacognition. In R. Glaser (Ed.), *Advances in instructional psychology 1*,77-165. Hillsdale, NJ: Erlbaum.

Brown, M., Brown, P., & Bibby, T. (2008), I would rather die: Reasons given by 16-year-olds for not continuing their study of mathematics. *Research in Mathematics Education, 10*(1), 3-18. https://doi.org/10.1080/14794800801915814

Clarke, V., & Braun, V. (2013). Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. *The psychologist*, *26*(2), 120-123. https://www.researchgate.net/publication/269928387_Teaching_thematic_analysis_Overcoming_challenges_and_developing_strategies_for_effective_learning

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Springer.

Deci, E. L., & Ryan, R. M. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Eyong, E. I., Ugada, C., & Aminu, A. (2020). Indicators of improved achievement of students in mathematics. *The Universal Academic Research Journal*, *2*(1), 29-37. https://doi.org/10.17220/tuara.2020.01.3

Farooq, M. S., & Shah, S. Z. (2008). Students' towards mathematics. *Pakistan Economic Social Review, 46(1),* 75-83.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-development inquiry. *American Psychologist,* 34 (10), 906-911. https://doi.org/10.1037/0003-066X.34.10.906

Hasan, M., & Sarkar, R. (2018). Achievement motivation and academic achievement of the secondary level students in Uttar Dinajpur District. *Research Review International Journal of Multidisciplinary, 3*(10), 249-252. RRIJM

Khanal, B. (2015). *Learning strategies of mathematics students* [Doctoral dissertation, Tribhuvan University]. http://archive.nnl.gov.np/bitstream/123456789/334/2/Final%20PhD%20Dissertation%20Bishnu%20Khanal.pdf

Khanal, B., Panthi, R. K., Kshetree, M. P., Acharya, B. R., & Belbase, S. (2021). Mathematics learning strategies of high school students in Nepal. *SN Social Sciences, 1*, 156. https://doi.org/10.1007/s43545-021-00165-y

Kunwar, R. (2021). A study on low performing students' perception towards mathematics: A case of secondary level community school students of Nepal, *Researcher 1* (5).

learning strategies of high school students in Nepal. *SN Social Sciences*, *1*(7), 156. https://doi.org/10.1007/s43545-021-00165-y

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.

Maamin, M., Maat, S. M., & H. Iksan, Z. (2021). The influence of student engagement on mathematical achievement among secondary school students. *Mathematics*, *10*(1), https://doi.org/10.3390/math10010041

Mahanta, S., & Islam, M. (2012). Attitude of secondary students towards mathematics and its relationship to achievement in mathematics. *International Journal of Computer and Applications, 3(2),* 713–715

Mayer, R. E. (2002). Cognitive theory and the design of multimedia instruction: An example of the two-way street between cognition and instruction. *New Directions for Teaching and Learning, 89*, 55-71. https://doi.org/10.1002/tl.47

Mbugua, Z. K., Kibet, K., Muthaa, G. M., & Nkonke, G. R. (2012). Factors contributing to students' poor performance in mathematics at Kenya certificate of secondary education in Kenya: A case of Baringo county, Kenya. *American International Journal of Contemporary Research, 2*, 87–91.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. CA: Jossey-Bass.

Mills, N. J. (2021). ALEKS constructs as predictors of high school mathematics achievement for struggling students. *Heliyon*, *7*(6). https://doi.org/10.1016/j.heliyon.2021.e07345

Mohammad, R. F. (2002). *From theory to practice: An understanding of the implementation of in-service mathematics teachers learning from university into the classroom in Pakistan* [D.Phil. thesis University of Oxford]. UK.

Naiker, M., Sharma, B., Wakeling, L., Johnson, J. B., Mani, J., Kumar, B., et al. (2020). Attitudes towards science among senior secondary students in Fiji. *Waikato Journal of Education*. Advanced online publication. https://doi.org/10.15663/wje.v25i0.704

Patton, M. Q. (2002). *Qualitative research and evaluation method* (3rd ed.). Sage Publication.

Saka, O. A. (2021). Can teacher collaboration improve students' academic achievement in junior secondary mathematics? *Asian Journal of University Education*, *17*(1), 33-46. https://doi.org/10.24191/ajue.v17i1.8727

Salimaco, R. J. (2020). Mathematics achievement of senior high school students: Impact of study habits and anxiety. *International Journal of English and Education*, *9*(3), 202-213. Salimaco, R. J. (2020).

Sharma, B., Fonolahi, A., Bali, A., & Narayan, S. (2018). The online mathematics diagnostic tool for transformative learning in the Pacific. In A. Singh, S. Raghunathan, E. Robeck, & B. Sharma (Eds.), *Cases on Smart Learning Environments* (pp. 63–80). Hershey, Pennsylvania: IGI Global.

Sharma, B., Lauano, F. J., Narayan, S., Anzeg, A., Kumar, B., & Raj, J. (2018b). Science teachers accelerated programme model: A joint partnership in the Pacific region. *Asia Pacific Journal of Teacher Education, 46*(1), 38–60. https://doi.org/10.1080/1359866x.2017.1359820

Steele, C., & Aronson, J. (1995). Stereotype threat and the intellectual test-performance of African-Americans. *Journal of personality and social psychology, 69*. 797-811. https://doi.org/10.1037/0022-3514.69.5.797

Suleiman, Y., & Hammed, A. (2019). Perceived causes of students' failure in mathematics in Kwara state junior secondary schools: Implication for educational managers. *International Journal of Educational Studies in Mathematics 6*(1), 19–33. EDUGARDEN

Tran, L. T., & Nguyen, T. S. (2021). Motivation and mathematics achievement: A Vietnamese case study. *Journal on Mathematics Education, 12*(3), 449-468. http://doi.org/10.22342/jme.12.3.14274.449-468

Vale, I., & Barbosa, A. (2023). Active learning strategies for an effective mathematics teaching and learning. *European Journal of Science and Mathematics Education, 11*(3), 573-588. https://doi.org/10.30935/scimath/13135

Villa, E. A., & Sebastian, M. A. (2021). Achievement motivation, locus of control and study habits as predictors of mathematics achievement of new college students. *International Electronic Journal of Mathematics Education*, *16*(3), https://doi.org/10.29333/iejme/11297

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Harvard University Press.

Werner, E. E., & Smith, R. S. (1992). *Overcoming the odds: High-risk children from birth to adulthood.* Cornell University Press.

Xia, Q., Yin, H., Hu, R., Li, X., & Shang, J. (2022). Motivation, engagement, and mathematics achievement: An exploratory study among Chinese primary students. *Sage Open 12*(4). https://doi.org/10.1177/21582440221134609

Yin, R. K. (2018). *Case study research and applications: Design and methods*. Sage Publications

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, *41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2