

Perceptions of Mathematics Bridging Courses among Diploma Students in Higher Education

By Tirivanhu Muchuweni & Jane Chiedza Pagan'a**

Mathematics bridging courses are widely used in higher education to support students who enter university without the required background in mathematics. This study examined how Diploma of Science Education students in the Virtual and Open Distance Learning (VODL) programme at Bindura University of Science Education (BUSE) perceive a mathematics bridging course, and how these perceptions differ across student characteristics such as gender and age. The study was guided by Expectancy-Value Theory, which explains how students' beliefs about their ability and the value they attach to a task influence their engagement. A qualitative case study design was used. Data were collected from thirty-three students using focus group discussions, in-depth interviews, and questionnaires. The qualitative data were analysed using thematic analysis, while questionnaire data were analysed descriptively to support the findings. The results show that students held both positive and negative views about the course. Many students described the course as useful for building foundational knowledge, while others found it difficult because of abstract concepts and the pace of instruction. Emotional responses, particularly anxiety and low confidence, were also reported. Differences were observed across gender and age, with variations in confidence, participation, and perceived usefulness. The findings suggest that students' perceptions are shaped by confidence, emotional experiences, and perceived course value. The study highlights the need for teaching approaches that strengthen relevance, support confidence, and address differences among students. These insights can help improve the design and delivery of mathematics bridging programmes.

Keywords: academic transition, assessment, bridging courses, mathematics education, student perceptions

Introduction

Students' prior achievement in mathematics often determines access to degree programmes in higher education, particularly in science-related fields where it is treated as a basic requirement (Kaliyeva et al., 2025; Wild et al., 2024). Because of this, students who meet general admission requirements but do not have enough mathematical preparation are often required to take bridging or remedial courses before they continue with their studies (Frye et al., 2024; Marschall et al., 2024). The mathematics bridging course is an Ordinary Level support course designed for students who enrol at Bindura University of Science Education (BUSE) without an Ordinary Level mathematics qualification. It prepares them for external examinations,

*PhD Candidate, Department of Mathematics Education, Rhodes University, South Africa.

*Lecturer, Department of Statistics and Mathematics, Bindura University of Science Education, Zimbabwe.

mainly the Zimbabwe School Examinations Council (ZIMSEC). Black (2024) and Wild et al. (2024) show that these programmes are meant to support academic transition, improve readiness, and reduce dropout among underprepared students. In this way, bridging courses serve not only as preparation but also as a response to increasing access to higher education (Black, 2024; Marschall et al., 2024; Wild et al., 2024).

In mathematics education, bridging and remedial courses have become more important because many students struggle with prior knowledge, confidence, and performance (DeLucia, 2021; Glasener, 2024). Studies (Mgonja & Robles, 2024; Sgobbi, 2022) show that students entering higher education often have gaps in their understanding of mathematics, and this affects how they engage and perform in later coursework (DeLucia, 2021; Mgonja & Robles, 2024; Sgobbi, 2022). At the same time, efforts by institutions to support these students have shown mixed results (Lane et al., 2023; Petillo & Anuszkiewicz, 2023; Zientek et al., 2022). Some studies report improvements in retention and progression, while others show that students still face challenges in completing their studies and achieving good results (Lane et al., 2023; Petillo & Anuszkiewicz, 2023; Zientek et al., 2022). This suggests that academic support alone may not fully explain why some students succeed while others struggle.

Because of this, attention has moved toward students' perceptions and experiences as key factors in mathematics learning (Harrell, 2023; Muchuweni et al., 2026; Ochoa et al., 2026; Steflitsch & Kollosche, 2025). Atkinson and Risser (2023), Harrell (2023), and Steflitsch and Kollosche (2025) show that students' attitudes, beliefs, and emotions play an important role in how they engage with mathematical tasks and how they persist when learning becomes difficult. In particular, how students view the relevance, difficulty, and usefulness of a course can influence how they approach learning and respond to teaching methods (Büdenbender-Kuklinski et al., 2024; Osborne & Hibbard, 2025; Muchuweni & Jojo, 2026a). These findings show that understanding learning experiences is important for explaining differences in participation and outcomes.

Albelbisi et al. (2024), McCullagh et al. (2024), and Namkung et al. (2025) have also shown that emotional factors, especially mathematics anxiety, affect how students experience mathematics courses. Studies (Namkung et al., 2025; Park et al., 2024; Ryan et al., 2025) indicate that anxiety can lower performance, reduce confidence, and limit students' willingness to engage with mathematical content (McCullagh et al., 2024; Namkung et al., 2025; Park et al., 2024; Ryan et al., 2025). In addition, emotional responses are often linked to previous learning experiences, teaching approaches, and assessment practices. This means that perceptions develop through interaction with the learning environment, rather than existing on their own (Leppma & Darrah, 2024; Yarkwah et al., 2024). These findings highlight the need to study perceptions as part of understanding mathematics learning.

Apart from emotional factors, student characteristics also influence how mathematics is experienced. Awoniyi et al. (2025), Barroso et al. (2025), and Mamolo and Labina (2025) show that factors such as gender can affect attitudes, confidence, and performance in mathematics. Although these patterns are not the same in all contexts, they suggest that students may experience and understand learning differently (Gómez-Chacón et al., 2024; Mamolo & Labina, 2025; Rehman et al., 2025). This highlights the importance of considering such differences when examining bridging programmes.

Even though there is a growing body of research on remedial and bridging mathematics education, much of it focuses on outcomes like performance, retention, and progression (Black, 2024; Lane et al., 2023; Zientek et al., 2022). Less attention has been given to how students themselves understand and experience these programmes (Harrell, 2023). Studies (Steflitsch & Kollosche, 2025; Torres, 2023) that do examine student perspectives show that students can hold very different views. Some see these courses as helpful and necessary, while others see them as difficult or discouraging (Black, 2024; Harrell, 2023; Torres, 2023). These differences show the need for a more focused study on students' perceptions, especially within specific institutions.

In university settings, mathematics bridging courses are important because they often determine whether students can continue with their studies (Black, 2024; Marschall et al., 2024; Wild et al., 2024). Since these courses can either support or limit academic progress, the way students understand and respond to them can influence their participation, engagement, and overall learning. In addition, this study contributes to mathematics education research by showing how expectancy beliefs, emotional experiences, and task value shape students' views of a mathematics bridging programme within a Zimbabwean university context.

Problem Statement

Black (2024), Marschall et al. (2024), and Wild et al. (2024) show that research on mathematics bridging and remedial programmes has mainly focused on measurable outcomes such as performance, retention, and progression, with less attention given to how students themselves understand and experience these courses. Although some studies (Harrell, 2023; Ochoa et al., 2026) recognise that students have different views about mathematics learning environments, there is still limited evidence that clearly examines the specific perceptions students develop in bridging courses, especially in relation to relevance, difficulty, and overall learning experience (Steflitsch & Kollosche, 2025). This creates a gap in understanding how students' perceptions influence their engagement and participation in these programmes. Without a clear understanding of these perceptions, efforts to support students in bridging courses may not be fully effective. Teaching strategies and institutional support may not match how students actually experience the learning process. This may lead to continued low engagement, irregular participation, and limited success in mathematics bridging courses, even when structured academic support is available (Mgonja & Robles, 2024; Petillo & Anuszkiewicz, 2023). To address this gap, this study focuses on examining how students perceive the mathematics bridging course and how these perceptions differ across selected student characteristics. The following research questions guide the study:

- 1) What perceptions do Diploma of Science Education students hold about the mathematics bridging course?
- 2) How do these perceptions vary across student characteristics (e.g., gender and age)?

Literature Review

This section looks at existing research on students' experiences and views in mathematics learning environments, with a focus on bridging and remedial courses in higher education. It brings together studies that explain how students understand the usefulness, difficulty, and overall value of mathematics courses. It also considers how these perceptions are influenced by learning experiences and teaching practices. In addition, it includes research that examines differences in students' views across factors such as gender and age, to give a broader understanding of how perceptions vary.

Students' Perceptions of Mathematics Bridging Courses

Students' perceptions of mathematics courses are shaped by their experiences in the learning environment, including how teaching is done, how assessments are structured, and how relevant the content appears to them (Atkinson & Risser, 2023; Esona et al., 2026; Harrell, 2023; Steflitsch & Kollosche, 2025; Muchuweni & Jojo, 2026b). Büdenbender-Kuklinski et al. (2024) and Osborne and Hibbard (2025) show that students often decide whether a course is useful based on how well it connects to their academic goals and future careers. When students clearly see this connection, they are more likely to take part actively in learning. However, when the course seems less relevant, their motivation and participation may decrease.

Another important factor is how difficult students perceive mathematics to be (DeLucia, 2021; Mgonja & Robles, 2024). Evidence (Mgonja & Robles, 2024; Sgobbi, 2022) shows that many students find mathematics challenging because of abstract concepts, gaps in prior knowledge, and low confidence in their abilities (DeLucia, 2021; Mgonja & Robles, 2024; Sgobbi, 2022). These perceptions are often stronger in bridging and remedial courses, where students are expected to review basic concepts while also preparing for more advanced learning (Black, 2024; Glasener, 2024; Sgobbi, 2022). Because of this, students may face both thinking difficulties and emotional challenges during the course.

Emotional responses, especially mathematics anxiety, also play a strong role in shaping students' perceptions (McCullagh et al., 2024; Namkung et al., 2025; Ryan et al., 2025). Studies (Namkung et al., 2025; Park et al., 2024; Ryan et al., 2025) show that anxiety affects how students approach tasks, take part in lessons, and judge their own performance (McCullagh et al., 2024; Namkung et al., 2025; Park et al., 2024; Ryan et al., 2025). Students with higher levels of anxiety often see mathematics as stressful and difficult, which can reduce their willingness to engage fully in learning activities.

Students' views on assessment also influence how they see mathematics courses (Atkinson & Risser, 2023; Quane, 2025). Harrell (2023) and Atkinson and Risser (2023) show that when assessments are clear, fair, and well connected to what is taught, students tend to develop more positive attitudes toward the course. On the other hand, when expectations are not clear or when assessments do not match the teaching, students may feel frustrated and become less engaged (Atkinson & Risser, 2023). This indicates that assessment design is an important part of the learning experience.

Past learning experiences (Leppma & Darrah, 2024; Yarkwah et al., 2024) also affect how students view mathematics at university level. Students who had negative

experiences before are more likely to enter new courses with low confidence and higher anxiety (Leppma & Darrah, 2024; Yarkwah et al., 2024). In contrast, those with positive experiences often show more confidence and a better attitude toward learning (Gómez-Chacón et al., 2024; Mamolo & Labina, 2025; Rehman et al., 2025). This means that students' perceptions are influenced by what they have experienced over time.

Black (2024) and Harrell (2023) show that students do not all see bridging and remedial programmes in the same way. Some students describe them as helpful and supportive for building basic knowledge, while others see them as barriers or extra burdens in their studies (Harrell, 2023; Torres, 2023). These different views show that the same course can be experienced differently, depending on the student's background, expectations, and learning situation. These studies show that students' perceptions of mathematics bridging courses are shaped by a mix of thinking, emotional, and contextual factors. Understanding these perceptions helps to explain how students engage with bridging programmes and how their experiences influence their learning outcomes.

Differences in Students' Perceptions Based on Gender and Age

Students do not all see mathematics in the same way, and research shows that these differences are often linked to personal factors such as gender and age (Awoniyi et al., 2025; Mamolo & Labina, 2025). Several studies (Barroso et al., 2025; Ochoa et al., 2026) show that gender can influence how students feel about mathematics, especially in terms of confidence, interest, and participation (Awoniyi et al., 2025; Barroso et al., 2025). In many cases, male students report higher confidence in mathematics, while female students are more likely to feel unsure or anxious, even when their actual performance is similar (Awoniyi et al., 2025; Barroso et al., 2025). This suggests that perceptions are not only based on ability, but also on how students understand their own learning experiences.

Emotional responses help to explain these differences further (McCullagh et al., 2024; Ryan et al., 2025). Namkung et al. (2025) and Ryan et al. (2025) show that mathematics anxiety affects how students approach tasks and how they view the subject overall. Students with higher anxiety often see mathematics as difficult and stressful, which can reduce their willingness to take part in class and complete tasks (Park et al., 2024). In contrast, students with lower anxiety are more likely to approach mathematics with confidence and continue working even when tasks are challenging (Egara & Mosimege, 2025; Ersozlu, 2024; Lei et al., 2025). These emotional differences can therefore lead to different views of the same course.

Age also affects how students experience mathematics courses (McCullagh et al., 2024; Ryan et al., 2025). Evidence shows that younger students are often more open to learning and more willing to take part in class activities, while older students may have other responsibilities that affect their time and focus (Park et al., 2024). In some cases, mature students return to education with gaps in their prior knowledge, which can influence how they see the difficulty and usefulness of mathematics courses (Ryan et al., 2025; Sgobbi, 2022). At the same time, older students may also have stronger motivation and clearer goals, which can lead to either more positive or more critical views depending on their experiences.

Previous learning experiences also work together with gender and age to shape students' perceptions (Leppma & Darrah, 2024). Studies (Yarkwah et al., 2024) show that students who had negative experiences in mathematics are more likely to develop low confidence and negative attitudes toward the subject (Leppma & Darrah, 2024; Yarkwah et al., 2024). These experiences often continue into higher education and affect how students respond to new learning situations, including bridging courses (DeLucia, 2021; Sgobbi, 2022). On the other hand, students with stronger mathematical backgrounds may see these courses as useful opportunities to improve their understanding rather than as obstacles (Mgonja & Robles, 2024).

Students also differ in how they view the purpose and value of mathematics courses (Harrell, 2023). Some see bridging courses as important support for their academic success, while others see them as an extra burden that slows down their progress (Torres, 2023). These different views are influenced by personal factors such as gender, age, and past learning experiences. Because of this, students in the same class may respond differently to the same course. In essence, research shows that gender and age play a role in shaping how students understand and respond to mathematics courses. These factors influence confidence, anxiety, participation, and how useful students think the course is. Recognizing these differences helps to explain why students develop different perceptions of mathematics bridging courses, even when they are taught in the same way.

Theoretical Framework

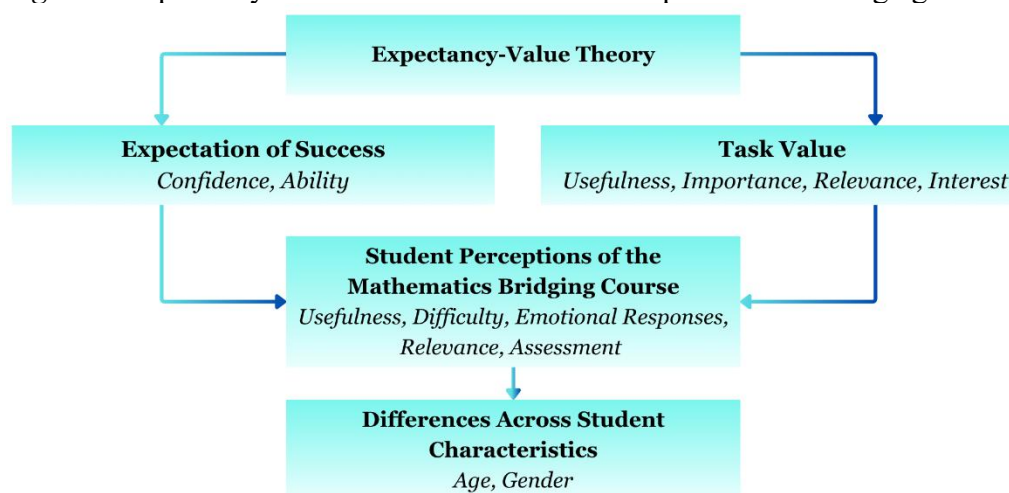
This study is guided by Expectancy-Value Theory (EVT) proposed by Eccles and Wigfield (2002), which explains how students' beliefs and values influence their learning experiences and their engagement in academic tasks. According to this theory, students decide whether to take part in a learning activity based on two main factors: their expectation of success and the value they attach to the task. Expectation of success refers to how much students believe they can perform well, while task value includes how useful, important, or interesting they find the learning activity (Büdenbender-Kuklinski et al., 2024; Mamolo & Labina, 2025; Osborne & Hibbard, 2025).

In mathematics learning, EVT helps explain why students may respond differently to the same course (Büdenbender-Kuklinski et al., 2024; Mamolo & Labina, 2025; Osborne & Hibbard, 2025). Students who believe they can succeed in mathematics are more likely to participate actively and continue working when they face challenges (DeLucia, 2021; Mgonja & Robles, 2024; Sgobbi, 2022). In contrast, students who doubt their ability may feel anxious and withdraw from learning activities. At the same time, students are more likely to value a course when they see it as relevant to their academic goals or future careers. When the course is seen as less valuable, motivation may decrease and negative perceptions may develop.

This theory fits this study because it gives a clear way to understand how students form perceptions about the mathematics bridging course (Harrell, 2023; Ochoa et al., 2026; Steflitsch & Kollosche, 2025). It helps explain how beliefs about ability and the value students attach to the course shape how they see its relevance, difficulty, and usefulness. By using EVT, the study links students' perceptions to their learning

experiences in a clear and structured way. Figure 1 presents the conceptual framework that guided this study. Based on Expectancy-Value Theory (Eccles & Wigfield, 2002), the framework shows that students' expectations of success and the value they attach to the mathematics bridging course influence their perceptions of its usefulness, difficulty, relevance, and the anxiety they experience. The framework also acknowledges that these perceptions may vary according to student characteristics, particularly age and gender.

Figure 1. Expectancy-Value Model of Students' Perceptions of the Bridging Course



Source: Authors' own elaboration

Methodology

This study adopted a qualitative case study approach to examine students' perceptions of a mathematics bridging course at BUSE. A qualitative design was appropriate because the study focused on how students understood and experienced their learning rather than only measuring outcomes. Research by Harrell (2023) and Steflitsch and Kollosche (2025) shows that qualitative methods are useful for exploring students' views, beliefs, and experiences in educational settings. The case study design allowed the researcher to examine the bridging course within its real-life setting, taking into account institutional conditions and student characteristics (Black, 2024; Torres, 2023).

The participants consisted of Diploma of Science Education students at BUSE who had completed at least one semester of the mathematics bridging course through the Virtual and Open Distance Learning (VODL) programme. A total of thirty-three students participated in the study. The participants were selected purposively to ensure that only students with direct experience of the course were included (DeLucia, 2021; Mgonja & Robles, 2024). The participants were distinct across the data collection methods, with no overlap.

Data were collected using focus group discussions (6 students), in-depth interviews (5 students), and questionnaires (22 students). Between 2012 and 2013, data were collected at the Chindunduma VODL Centre of Bindura University of Science

Education (BUSE) from students enrolled in the mathematics bridging course. Although the data were collected during the researcher's Master's studies, the findings remain relevant because mathematics bridging programmes continue to play an important role in supporting underprepared students in higher education (Black, 2024; Wild et al., 2024). Focus group discussions allowed participants to share and reflect on their experiences collectively, while interviews provided deeper insight into individual experiences. Questionnaires were used to gather additional responses and identify general patterns in students' perceptions. The use of these three data collection methods strengthened the study through methodological triangulation, allowing the questionnaire findings to be compared with the interview and focus group data to identify consistent patterns and strengthen the credibility of the findings.

The questionnaire was developed by the researcher to explore students' perceptions of the mathematics bridging course. It consisted of open-ended questions that focused on key areas such as the usefulness of the course, perceived difficulty, mathematics anxiety, and its relevance to students' academic studies. Before the main study, the questionnaire was pilot tested and reviewed by the research supervisor to improve the clarity, relevance, and appropriateness of the questions. The questionnaire was included to complement the focus group discussions and in-depth interviews by capturing additional individual responses and identifying common patterns across a larger group of participants. These descriptive responses were then compared with the qualitative findings, thereby strengthening the credibility of the study through methodological triangulation.

The data from interviews and focus group discussions were analysed using thematic analysis, which involves identifying patterns and organising responses into themes. The analysis focused on areas such as perceived relevance, difficulty, emotional responses, and views on assessment. Questionnaire data were analysed descriptively to support the qualitative findings and highlight common trends.

Ethical considerations were observed throughout the study. Participation was voluntary, and students were informed about the purpose of the research before data collection. Confidentiality was maintained by ensuring that participants' identities were not disclosed (DeLucia, 2021). To ensure trustworthiness, credibility was supported through the use of multiple data sources, while dependability was maintained through consistent procedures during data collection and analysis. Confirmability was ensured by grounding the findings in participants' responses rather than researcher assumptions.

Results

This section presents the findings from the data collected through focus group discussions, in-depth interviews, and questionnaires. It reports the patterns that appeared in students' responses about how they view the mathematics bridging course. These include their views on its relevance, level of difficulty, emotional experiences, and overall learning value. The section also reports differences seen in students' responses across different groups. A total of thirty-three participants contributed data through focus group discussions, in-depth interviews, and questionnaires.

Students' Perceptions of the Mathematics Bridging Course

Students shared different views about the mathematics bridging course, showing both positive and negative perceptions. A clear pattern in the responses shows that many students described the course as useful, especially in helping them build basic knowledge needed for their main programme. Several participants indicated that the course gave them a chance to strengthen concepts they had not fully understood before entering university. One student explained, *"The bridging course helped me understand the basics that I did not get in high school"* (INT-S2). A similar view was shared during the focus group, where a participant stated, *"It gave us a foundation, especially for topics we had forgotten"* (FC-S3). In these responses, the course was seen as an important step toward academic progress.

At the same time, some students described the course as challenging. Many responses referred to the abstract nature of mathematical concepts and the fast pace at which the content was taught. One participant noted, *"Some of the topics were too abstract, and the lecturer moved very fast"* (INT-S4). Another student added, *"If you did not already know the basics, it was very hard to follow"* (FC-S2). Some participants indicated that they struggled to keep up with lessons, especially when they had gaps in prior knowledge. This is reflected in the comment, *"I was lost most of the time because I did not have a strong background"* (INT-S1). In these cases, the course was described as demanding and, at times, overwhelming.

Emotional responses were also shown in the data. Some students reported feeling anxious when working on mathematical tasks, especially during tests and examinations. One student stated, *"I get nervous when I see the questions, especially in tests"* (INT-S3). Another participant shared, *"Mathematics makes me anxious, especially when I am not sure of the answers"* (FC-S5). These responses included fear of failure and low confidence when solving problems. In contrast, other students reported gaining confidence as they moved through the course. For example, one student explained, *"As time went on, I started to understand better and felt more confident"* (INT-S5), while another noted, *"Practice helped me, and I became less afraid of maths"* (FC-S1). This indicates that emotional experiences were not the same for all students.

Students also spoke about how relevant the course was to their academic goals. Many responses showed that the course was seen as necessary for success in their chosen programmes, especially in science-related fields. One participant mentioned, *"You need this course if you want to pass your Ordinary level mathematics"* (FC-S4). Another stated, *"It is important because most of our courses depend on mathematics"* (INT-S2). However, some participants questioned its immediate usefulness. For example, one student said, *"Sometimes I do not see how this topic connects to the ZIMSEC examination"* (INT-S4). These responses show differences in how students understood the value of the course.

Views on assessment were also reported. Several students described tests and assignments as helpful in preparing them for final examinations. One participant explained, *"The tests helped me prepare for exams because they showed the type of questions"* (FC-S6). At the same time, others expressed concern about the difficulty and pressure linked to these assessments. One student stated, *"The tests were too difficult, and there was a lot of pressure"* (INT-S1). Some responses pointed to a mismatch between what was taught in class and what was tested, as reflected in the

comment, *“Sometimes what we learn is not exactly what comes in the test”* (FC-S2), while others showed satisfaction with how assessments were structured. The responses show that students held different perceptions of the mathematics bridging course. These perceptions reflected differences in understanding, confidence, emotional experiences, and how useful the course was seen to be. Table 1 presents a summary of the key perception themes identified from the data.

Table 1. Summary of Key Perception Themes

Theme	Description
Usefulness	Course helped build foundational knowledge
Difficulty	Abstract concepts and fast pace
Emotional Response	Anxiety vs growing confidence
Relevance	Linked vs not clearly linked to programme
Assessment	Helpful vs challenging/misaligned

Variations in Students' Perceptions Across Gender and Age

Differences were observed in how students described their experiences of the mathematics bridging course when responses were compared across gender and age groups. The responses show variation in confidence, emotional reactions, and engagement with the course.

The data suggest that some male students more often described themselves as confident when working on mathematical tasks. Their responses included willingness to attempt problems and take part in class activities. One male student explained, *“I usually try the questions even if I am not sure, because I believe I can get it”* (INT-S2). A similar view was shared in the focus group, where a participant stated, *“I like challenging questions, they make me think more”* (FC-S4). In contrast, several female students reported lower confidence and expressed concerns about making mistakes, especially during tests and examinations. One student shared, *“I am afraid of getting the wrong answer, especially in tests”* (INT-S3), while another noted, *“Sometimes I do not answer because I feel I might be wrong”* (FC-S1). These responses also included feelings of anxiety when working on mathematical problems.

Emotional experiences also differed across groups. Some students described feeling stressed during assessments, while others reported handling these situations with more confidence. One participant stated, *“Tests make me very nervous, I panic even when I know the work”* (INT-S1). Another explained, *“I feel pressure during exams, and it affects how I think”* (FC-S5). Higher levels of anxiety were more often reported among students who showed low confidence in their mathematical ability. At the same time, some participants reported gaining confidence over time. For example, one student noted, *“After practicing more, I started to feel better about maths”* (INT-S5), while another added, *“Now I can try questions without fear like before”* (FC-S2). This suggests that emotional experiences changed for some students as they became more familiar with the course.

Differences were also seen across age groups. Younger students often described themselves as more active in class, with regular participation in lessons and group

discussions. One participant stated, *“I like participating in class because it helps me understand better”* (FC-S3). Another explained, *“I ask questions when I do not understand”* (INT-S4). Older students, on the other hand, referred to challenges related to balancing academic work with other responsibilities. One student shared, *“It is difficult to study all the time because I have other responsibilities”* (INT-S1). Another added, *“Sometimes I do not have enough time to practice because of other commitments”* (FC-S6). These responses included limited study time and difficulty keeping up with course demands.

Differences also appeared in how students viewed the usefulness of the course. Some participants described the course as an important step toward achieving their academic goals. For example, one student stated, *“This course is important for my future studies”* (INT-S2), while another noted, *“It helps me prepare for other subjects”* (FC-S4). In contrast, others saw it as a requirement that delayed their progress. One participant explained, *“It feels like it is slowing me down before I start my main programme”* (INT-S3). These views were found across both gender and age groups, showing that students understood the purpose of the course in different ways. The responses show that students’ perceptions of the mathematics bridging course were not the same. Differences in confidence, emotional responses, participation, and views on usefulness were observed across gender and age groups. Table 2 presents a summary of the variations in students’ perceptions across gender and age.

Table 2. Summary of Variations in Students’ Perceptions

Factor	Variation Observed
Gender - Confidence	Some male students reported higher confidence, some female students were more cautious
Gender - Emotion	Some female students reported higher levels of anxiety
Age - Participation	Younger students were more active in class participation
Age - Challenges	Older students faced time and responsibility constraints
Perceived Value	The course was seen as helpful by some students and as delaying progress by others

Discussion

This section explains the findings by linking students’ reported experiences with existing research and the guiding theoretical framework. It focuses on how students’ views about usefulness, difficulty, emotional responses, and assessment can be understood in relation to their beliefs about success and the value they attach to the course. It also considers how individual differences influence these perceptions, helping to explain why students experience the same learning environment in different ways.

Interpreting Students' Perceptions of the Mathematics Bridging Course

The patterns in the findings show that students' perceptions of the mathematics bridging course are closely linked to how they judge their ability to succeed and how much value they attach to the course. When students described the course as useful and important for their academic progress, this reflects a strong sense of task value, which is a key idea in Expectancy-Value Theory (Büdenbender-Kuklinski et al., 2024; Mamolo & Labina, 2025). Similar findings are reported in studies showing that students are more likely to engage in learning when they see clear links between course content and their academic or career goals (Osborne & Hibbard, 2025; Muchuweni & Jojo, 2026a, 2026b). This highlights that perceived relevance plays an important role in shaping positive attitudes toward the course.

At the same time, the challenges and difficulties reported by students point to differences in their expectations of success. Students who experienced the course as demanding were often those with gaps in prior knowledge or lower confidence in mathematics. Research shows that low confidence is linked to lower participation and greater difficulty in engaging with mathematical tasks (DeLucia, 2021; Mgonja & Robles, 2024; Sgobbi, 2022). This suggests that perceptions of difficulty are not only about the content itself but also about how students evaluate their ability to manage the learning demands, which reflects differences in expectancy beliefs.

This suggests that the effectiveness of mathematics bridging programmes depends not only on the mathematical content provided but also on whether the programme intentionally builds students' confidence alongside conceptual understanding. Simply revising mathematical concepts may not be sufficient if students continue to doubt their ability to succeed. Bridging programmes should therefore incorporate teaching strategies that gradually strengthen students' confidence through scaffolded learning experiences, constructive feedback, and opportunities for early success.

Emotional responses, especially anxiety, give further insight into how students experience the course. Reports of stress and fear during assessments are consistent with findings in previous studies, where mathematics anxiety is shown to affect both performance and engagement (McCullagh et al., 2024; Namkung et al., 2025; Park et al., 2024; Ryan et al., 2025). In this context, anxiety can reduce students' expectations of success and make the course appear more difficult. At the same time, the increase in confidence reported by some students suggests that positive learning experiences can gradually strengthen students' beliefs about their ability to succeed.

These findings suggest that mathematics anxiety should not be viewed as a separate emotional issue but as a factor that directly influences students' willingness to participate, persist, and engage with mathematical tasks. This means that mathematics bridging programmes should support both conceptual understanding and students' emotional confidence. Creating supportive learning environments, providing regular encouragement, and offering opportunities for early success may help reduce anxiety and improve students' engagement with the course.

Students' views on assessment also show the importance of alignment between teaching and evaluation. When assessments were experienced as clear and supportive, students were more likely to develop positive perceptions of the course. This is in line with research showing that well-structured assessment practices can improve student

engagement and understanding (Atkinson & Risser, 2023; Harrell, 2023). In contrast, when assessments were perceived as difficult or not aligned with teaching, negative perceptions were more likely to develop, indicating that unclear expectations can weaken both confidence and perceived value. These interpretations show that students' perceptions of the mathematics bridging course are shaped by a combination of perceived value, confidence, emotional experience, and assessment practices. These factors interact to influence how students engage with the course and how they respond to its demands. This aligns with Expectancy-Value Theory, where engagement is influenced by expectations of success and the value attached to the task.

Interpreting Variations in Students' Perceptions Across Gender and Age

The differences shown in the findings indicate that students do not experience the mathematics bridging course in the same way, and these differences are closely linked to variations in confidence, emotional responses, and personal situations identified in the data. The higher confidence observed among some male students suggests stronger expectations of success, which are associated with greater participation and willingness to attempt mathematical tasks. Similar patterns are reported in research showing that confidence plays an important role in how students approach mathematics, even when performance levels are similar across groups (Awoniyi et al., 2025; Barroso et al., 2025). This indicates that the variation in participation observed in the study reflects differences in expectancy beliefs.

In contrast, the lower confidence and higher levels of anxiety identified among some female students highlight the role of emotional factors in shaping learning experiences. Research shows that mathematics anxiety can reduce participation and make tasks appear more difficult, especially when students doubt their ability to succeed (Namkung et al., 2025; Ryan et al., 2025). In this study, these emotional differences help explain why some students engaged less with tasks despite being exposed to the same learning conditions. From an Expectancy-Value perspective, anxiety reduces expectations of success, which weakens engagement.

Differences across age groups also reflect patterns observed in the findings. The higher levels of participation associated with younger students suggest fewer external pressures and greater flexibility in engaging with the course. In contrast, the challenges reported by older students, including limited time and competing responsibilities, show how external factors shape learning experiences. Studies show that such factors influence engagement and performance, especially in demanding subjects like mathematics (McCullagh et al., 2024; Park et al., 2024). This suggests that variations in participation and perceived difficulty are influenced not only by the course itself but also by the broader context in which students are learning, affecting both expectancy and value.

The differences in how students viewed the usefulness of the course also reflect variation identified in the findings. Students who saw the course as important for their academic progress showed more positive engagement, while those who viewed it as delaying their progress were less motivated. Similar findings in previous research show that how students value a course influences their level of engagement and persistence (Black, 2024; Torres, 2023). This highlights the role of task value in shaping students' responses to the course. These findings show that gender and age influence how

students understand their experiences, but they do not act independently. Instead, they interact with confidence, anxiety, prior experiences, and personal circumstances to shape overall perceptions. As a result, differences observed in the study can be explained as variations in expectations of success and perceived value, which together influence how students engage with the mathematics bridging course.

Limitations

This study is limited to one institution, which means the findings may not represent all mathematics bridging courses in other universities. In addition, the study focused on a relatively small group of students, and their responses were based on their own experiences and opinions. This may limit the transferability of the findings to a wider population. These limitations were addressed by including students with direct experience of the mathematics bridging course through the Virtual and Open Distance Learning (VODL) programme, which provided detailed insight into students' learning experiences. The use of multiple data collection methods, including interviews, focus group discussions, and questionnaires, also helped to strengthen the findings by allowing comparison across different sources. The study examined age and gender as the student characteristics of interest, consistent with the research questions. Other factors, such as socioeconomic status, prior mathematics achievement, educational background, motivation, and institutional support, may also influence students' perceptions of mathematics bridging courses and should be explored in future research. Despite these limitations, the study provides a reliable understanding of students' perceptions within the context examined.

Conclusion

This study examined how students understand and experience a mathematics bridging course in a university setting. The findings show that students understood and experienced the course differently, with their views shaped by a mix of confidence, prior learning experiences, emotional responses, and how they judged the value of the course for their academic progress. One clear outcome is that students' views are closely linked to how they see their chances of success and how useful they believe the course is. When students see the course as important for their studies, they are more likely to take part and stay engaged. In contrast, when the course is seen as difficult or not clearly connected to their goals, participation becomes weaker. This suggests that perceptions are influenced not only by the course itself, but also by how students understand their role in the learning process.

The findings also show that differences among students play an important role in shaping these views. Differences linked to gender and age show that students bring different levels of confidence, emotional experiences, and life situations into the same learning environment. This helps explain why students in the same class can respond in different ways, even when they are taught under the same conditions. Another important point is that students' experiences are influenced by more than just what is taught. Emotional factors, especially anxiety, and practical factors, such as time and outside responsibilities, also shape how students understand the course. This means

that learning in bridging programmes is influenced by both academic and non-academic factors.

This study contributes to mathematics education research by providing evidence of how students' perceptions of a mathematics bridging course are shaped by the interaction between confidence, emotional experiences, prior learning experiences, and the value they attach to the course within a Zimbabwean university context. By applying Expectancy-Value Theory to interpret these experiences, the study extends understanding of the factors that influence engagement in mathematics bridging programmes. The findings also have practical significance by showing that effective bridging programmes should address not only mathematical knowledge but also students' confidence, emotional well-being, and individual learning needs. Recognising these factors can help lecturers and programme designers develop more supportive and learner-centred bridging courses that promote successful academic transition.

Implications for Practice and Recommendations

The findings of this study show that students' perceptions of mathematics bridging courses are influenced by how they understand the value of the course, how confident they feel, and how they experience learning activities. This has important implications for how these courses are designed and delivered. Instructors and programme designers need to clearly link the bridging course to students' main fields of study so that students can see its relevance. When students understand how the course supports their academic goals, they are more likely to engage with the content and take part actively in learning.

There is also a need to focus on building students' confidence in mathematics. Some students enter the course with low confidence and gaps in their prior knowledge. Teaching approaches that support step-by-step understanding and provide regular feedback can help improve their learning experience. A supportive classroom environment, where students feel free to ask questions and make mistakes, can also reduce anxiety and encourage participation. Assessment practices need to match what is taught. When students clearly understand what is expected and see a strong link between teaching and assessment, they are more likely to respond positively to the course. Providing practice activities and feedback before major assessments can help students prepare better and reduce stress.

The findings also show the importance of considering differences among students. Students come from different backgrounds and face different challenges, so flexible support systems are important. For example, extra support sessions or structured study opportunities can help students who are struggling, while still keeping more confident students engaged. Improving mathematics bridging courses requires attention to both teaching and student needs. Making the course clear, supportive, and relevant can help create a better learning experience and support students in reaching their academic goals.

References

- Albelbisi, N. A., Al-Adwan, A. S., Habibi, A., & Rasool, S. (2024). The relationship between students' attitudes toward online homework and mathematics anxiety. *International Journal of Mathematical Education in Science and Technology*, 55(1), 4–22. <https://doi.org/10.1080/0020739x.2021.2023769>
- Atkinson, D., & Risser, H. S. (2023). Exploring students' responses to reading assignments in first-year university mathematics courses. *Journal of College Reading and Learning*, 53(1), 38–57. <https://doi.org/10.1080/10790195.2022.2126415>
- Awoniyi, F. C., Brenya, E. K., Asomah, R. K., & Donkor, P. B. K. (2025). The influence of gender disparities on high school students' mathematics performance. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, 120–134. <https://doi.org/10.23917/jramathedu.v10i2.7052>
- Barroso, C., Ganley, C. M., & Casanova, A. (2025). Investigating the link between negative interpretation bias and anxiety in a mathematics context. *SAGE Open*, 15(3), 21582440251361765. <https://doi.org/10.1177/21582440251361765>
- Black, A. M. (2024). The role of bridging programmes in supporting student persistence and prevention of attrition: A UK case study. *Studies in Higher Education*, 49(9), 1519–1531. <https://doi.org/10.1080/03075079.2023.2269246>
- Büdenbender-Kuklinski, C., Hochmuth, R., & Liebendörfer, M. (2024). Exploring the perceived relevance of university mathematics studies by first-semester teaching students. *International Journal of Research in Undergraduate Mathematics Education*, 10(1), 138–171. <https://doi.org/10.1007/s40753-022-00188-7>
- DeLucia, C. A. (2021). *Factors that contribute to the success of first-year students enrolled in an online summer remedial mathematics course at a large selective research university* (Doctoral dissertation, Northeastern University). <https://doi.org/10.17760/d20410384>
- Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, 53(1), 109–132. <https://doi.org/10.1146/annurev.psych.53.100901.135153>
- Egara, F. O., & Mosimege, M. (2025). Reducing mathematics anxiety among Nigerian students using rational emotive behavior therapy: A randomized control trial. *School Psychology International*, 46(5), 542–562. <https://doi.org/10.1177/01430343251376777>
- Ersozlu, Z. (2024). The role of technology in reducing mathematics anxiety in primary school students. *Contemporary Educational Technology*, 16(3). <https://doi.org/10.30935/cedtech/14717>
- Esona, N., Muchuweni, T., & Tatira, B. (2026). Learners' experiences in solving probability problems in Grade 11 in selected schools in Mthatha area. *Athens Journal of Education*, 12, 1–23.
- Frye, A. G., Cooper, M. E., & Bullard, L. G. (2024). Retrospective analysis of the effect of an online bridging course sequence on student success in chemical engineering graduate studies. *Chemical Engineering Education*, 58(4), 235–239. <https://doi.org/10.18260/2-1-370.660-135099>
- Glasener, K. C. (2024). *The experiences of students taking developmental mathematics courses* (Doctoral dissertation, Kent State University).
- Gómez-Chacón, I. M., Bacelo, A., Marbán, J. M., & Palacios, A. (2024). Inquiry-based mathematics education and attitudes towards mathematics: Tracking profiles for teaching. *Mathematics Education Research Journal*, 36(3), 715–743. <https://doi.org/10.1007/s13394-023-00468-8>
- Harrell, N. B. (2023). Examining students' perceptions and experiences in a community college mathematics course. *Practitioner to Practitioner*, 12(1), 8–10.

- Kaliyeva, S. A., Khajiyeva, G. U., Lebedeva, D. V., & Buitek, E. K. (2025). Robotization of higher education and its importance for bridging the gap between the university education market and the job market. In *Bridging the gap between the higher education and labor markets: Relevance of the fourth industrial revolution* (pp. 131–137). Springer. https://doi.org/10.1007/978-981-96-1933-7_15
- Lane, F. C., Zientek, L. R., Sechelski, A., & Shupp, S. (2023). Effects of timely enrollment in college-level mathematics on degree completion. *Journal of College Student Retention: Research, Theory & Practice*, 25(1), 208–228. <https://doi.org/10.1177/1521025120973949>
- Lei, Q., Liu, D., Chen, X., Hirni, M., Wang, J., Abdelnaby, H., & Wei, S. (2025). Mathematics anxiety, trait emotional intelligence, and self-concept: Pathways to mathematics performance in students with and without mathematics learning difficulties. *Journal of Research in Special Educational Needs*, 25(4), 945–957. <https://doi.org/10.1111/1471-3802.70020>
- Leppma, M., & Darrah, M. (2024). Self-efficacy, mindfulness, and self-compassion as predictors of math anxiety in undergraduate students. *International Journal of Mathematical Education in Science and Technology*, 55(4), 883–898. <https://doi.org/10.1080/0020739x.2022.2054740>
- Mamolo, L. A., & Labina, C. S. (2025). A cross-sectional study on the secondary school students' subjective happiness and attitudes towards mathematics. *Journal of Education and Learning (EduLearn)*, 19(4), 2201–2211. <https://doi.org/10.11591/edulearn.v19i4.23632>
- Marschall, M., Falk, S., & Klug, C. (2024). Social events, bridging courses, and academic skills trainings—participation in first-year courses and higher education dropout in Germany. *Studies in Higher Education*, 49(11), 1789–1804. <https://doi.org/10.1080/03075079.2023.2279246>
- McCullagh, O., Ryan, M., & Fitzmaurice, O. (2024). Mathematics anxiety in undergraduate business studies students. *Teaching Mathematics and Its Applications*, 43(2), 125–146. <https://doi.org/10.1093/teamat/hrae001>
- Mgonja, T., & Robles, F. (2024). Identifying critical factors when predicting remedial mathematics completion rates. *Journal of College Student Retention: Research, Theory & Practice*, 26(2), 355–377. <https://doi.org/10.1177/15210251221083314>
- Muchuweni, T., Tatira, B., & Jojo, Z. (2026). Innovative use of escape games in teaching secondary mathematics: A systematic review for inclusive and sustainable practice. *Athens Journal of Education*, 13, 1–21.
- Muchuweni, T., & Jojo, Z. (2026a). Gamification in the U.S. mathematics classrooms: International teachers' perceived impact on student engagement and motivation. *International Journal of Learning, Teaching and Educational Research*, 25(3), 1033–1050. <https://doi.org/10.26803/ijlter.25.3.46>
- Muchuweni, T., & Jojo, Z. (2026b). Gimkit's instructional value in secondary mathematics education: An integrative review. *International Journal of Learning, Teaching and Educational Research*, 25(3), 1051–1074. <https://doi.org/10.26803/ijlter.25.3.47>
- Namkung, J. M., Peng, P., & Goodrich, M. J. (2025). The relation between mathematics anxiety and mathematics competence. *Learning Disability Quarterly*, 48(2), 143–153. <https://doi.org/10.1177/07319487241301410>
- Ochoa, J. M. V., Salazar, O. C., López, R. I. G., & Ibarra, L. A. N. (2026). Tendencies in research on attitudes towards learning mathematics: A bibliometric analysis. *International Journal of Education in Mathematics, Science and Technology*, 14(1), 111–148. <https://doi.org/10.46328/ijemst.5132>
- Osborne, M., & Hibbard, B. (2025). The relationship between student attitude toward mathematics and student mathematics achievement. *Journal of Mathematics Education at Teachers College*, 16(1), 1–8. <https://doi.org/10.52214/jmetc.v16i1.12858>

- Park, S. W., Cho, M. H., Lim, S., & Hwang, S. (2024). Predicting students' negative emotions in college remedial mathematics courses. *European Journal of Psychology of Education*, 39(1), 171–188. <https://doi.org/10.1007/s10212-023-00697-2>
- Petillo, A. E., & Anuszkiewicz, M. J. (2023). Co-requisite remediation: An access ramp for college completion. *PRIMUS*, 33(4), 402–413. <https://doi.org/10.1080/10511970.2022.2073622>
- Quane, K. (2025). The confluence of attitudes towards mathematics and pedagogical practice. *Mathematics Education Research Journal*, 37(2), 369–398. <https://doi.org/10.1007/s13394-024-00494-0>
- Rehman, N., Huang, X., & Mahmood, A. (2025). Altering students' attitude towards learning mathematics through project-based learning. *South African Journal of Education*, 45(1), 1–14. <https://doi.org/10.15700/saje.v45n1a2491>
- Ryan, M., Fitzmaurice, O., & Johnson, P. (2025). Investigating mathematics anxiety among mature students. *International Journal of Mathematical Education in Science and Technology*, 56(1), 4–28. <https://doi.org/10.1080/0020739x.2023.2179950>
- Sgobbi, F. (2022). The effectiveness of remedial courses. *Education Economics*, 30(3), 320–337. <https://doi.org/10.1080/09645292.2021.1974343>
- Steflitsch, D., & Kollosche, D. (2025). Students' perceptions of critical mathematics education. *Educational Studies in Mathematics*, 120(2), 225–247. <https://doi.org/10.1007/s10649-025-10423-y>
- Torres, R. V. (2023). *When remedial mathematics acts as a gatekeeper* (Doctoral dissertation, University of Wisconsin–Madison).
- Wild, S., Rahn, S., & Meyer, T. (2024). Participation in bridging courses and dropouts among cooperative education students in engineering. *International Journal of Education in Mathematics, Science and Technology*, 12(2), 297–317. <https://doi.org/10.46328/ijemst.3270>
- Yarkwah, C., Kpotosu, C. K., & Gbormittah, D. (2024). Effect of test anxiety on students' academic performance. *Discover Education*, 3(1), 245. <https://doi.org/10.1007/s44217-024-00343-z>
- Zientek, L. R., Lane, F. C., Sechelski, A., & Shupp, S. (2022). Effects of delaying college-level mathematics course enrollment. *Journal of College Student Retention*, 24(2), 474–498. <https://doi.org/10.1177/1521025120923113>