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Impact of the Know-Want-Learn (KWL) Strategy on Academic Mathematics Achievements for International Students

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ABSTRACT

The KWL technique is a metacognitive thinking strategy that emphasises the review and application of the learner's existing knowledge. Tenth-grade students at Sharjah American International School in Sharjah, United Arab Emirates, underwent assessment using the Know-Want-Learn (KWL) strategy. This study utilised a quasi-experimental case study design and included a sample of 53 students from Sharjah American International School in the city of Sharjah. The study consisted of two groups: an experimental group of 27 individuals and a control group of 26 individuals. The control group received standard instruction, while the experimental group received KWL instruction. The acquisition of

materials and equipment for the study was a significant achievement. The data was analysed using IBM SPSS, revealing a statistically significant difference between the two groups. The experimental group students achieved a mean score of 17.96, while the control group students achieved a mean score of 12.19. These results suggest a significant difference in the post-test scores between the two groups. High school teachers and instructors are advised to incorporate the KWL strategy into their teaching methods.

Key terms: Effect, K-W-L, Students' Academic Achievements, Tenth Grade Students.

INTRODUCTION

The capacity to partake in logical reasoning is regarded as a crucial cognitive aptitude, comparable in significance to proficiency in mathematics. The application of logical reasoning requires the engagement of diverse cognitive processes, such as observation, classification, hypothesis generation, experimentation, and both inductive and deductive reasoning. Mathematics is widely regarded as one of the most prominent subjects within the realm of academia. The successful completion of the task necessitates a considerable degree of cognitive aptitude, including the capacity for critical thinking. The educational inclination of the subject matter is apparent through its prioritisation of quantitative data and abstract concepts. Dedicated educators consistently seek opportunities to enhance the quality of classroom instruction. Scholars and professionals persist in their efforts to advance and refine strategies aimed at enhancing students' ability to engage in self-directed learning, elevate their academic performance, and foster the acquisition of decision-making skills for real-life problem-solving scenarios (Usta & Yılmaz, 2020).

According to Aseeri (2020), the efficacy of mathematics education may be compromised if it does not incorporate modern instructional methods that enable students to establish connections between abstract mathematical principles and real-world applications. The conventional approach to learning places emphasis on lectures and the act of memorization as the means to achieve profound understanding (Al-Qatawneh et al., 2020). Ningsih (2020) referred to the fact that one of the keyways of teaching mathematics is the metacognition strategy, where the word metacognition first appeared in the 1970s. It is concentrated on how the learner views himself as a learner, on the one hand, and on his capacity to organise, monitor, and assess his learning, on the other. The focus of the KWL technique, as a metacognitive-based thinking strategy, is on reviewing and operationalizing the learner's prior knowledge. This involves utilising existing knowledge as the primary framework for integrating and relating a students recently acquired mathematical understanding to their prior knowledge.

One effective approach that can aid high school students in approaching their studies in a methodical and structured manner is the KWL strategy (What-

we-know; What-we-want to know; What We Learned), which was originally introduced by Ogle (1986). In order to engage their existing knowledge and establish associations with novel information, individuals commence by delineating their preexisting understanding of a particular subject matter or concern. Subsequently, individuals make a deliberate choice regarding their desired areas of knowledge acquisition, thereby imparting a clear trajectory to their educational pursuits. This deliberate selection serves as a catalyst for their inquisitiveness, prompting them to pose inquiries and engage in research endeavours to find resolutions. The final step involves reflecting on the acquired knowledge, which helps to reinforce the information and establish connections between different pieces of knowledge.

Consequently, their active learning and increased interest are facilitated by this motivation. Thus, students experience enhanced learning engagement and active participation, as it fosters a sense of accountability for their education and cultivates their critical thinking skills. Students also develop the ability to engage in self-reflection and adapt their learning strategies as needed, leading to increased self-awareness (Qwasmi, 2019). The KWL technique has been found to enhance academic performance and foster self-assurance, independence, and motivation in high school students (Taha, 2020). Furthermore, the KWL technique facilitates student engagement, knowledge exchange, and the establishment of learning goals that enhance understanding (Hassan, 2019). Gill and Irena (2020) proposed that the KWL reading strategy enhances comprehension by improving reading skills.

Study Problem

This study presents an analysis of the impact of the KWL (know-want-to-know-learn) strategy at Sharjah American School in Sharjah. Similar to previous research, the researcher investigated the impact of the KWL Approach on students' mathematical proficiency. The researcher suggests that implementing the KWL Method in arithmetic can facilitate students in utilising their prior knowledge and providing a sense of purpose to their learning. The researcher hypothesised that students' writing KWL charts could be improved to better reflect their knowledge of mathematical concepts, problem-solving abilities in mathematics, and positive attitudes towards learning. This study addresses two questions. Research Question 1: What is the impact of implementing the KWL strategy on the academic performance in mathematics of tenth-grade students at Sharjah American School in Sharjah? Research Question 2 (RQ2): Are there statistically significant differences observed in the post-test results between the experimental and control groups of students at Sharjah American School?

This study has two specific objectives aligned with the research questions: Firstly, this study sought to examine the impact of implementing the KWL Strategy on the academic performance of tenth-grade students. Furthermore, this study aims to compare the scores of the experimental and

control groups of tenth-grade students at Sharjah American School in the post-test phase. This study is highly significant for various reasons. This study proposes a novel instructional approach for high school math teachers to effectively engage students' prior knowledge, retrieve material, and stimulate their curiosity. Encouraging students to take responsibility for their education and fostering critical thinking skills can motivate them to study independently. Additionally, this approach can help students connect prior knowledge with new information. This study contributes to the existing literature on education by introducing new teaching strategies that have the potential to positively influence students' academic performance.

This study has employed various described concepts. The term "effect" refers to the change that occurs as a result of an event, which can be an occurrence, circumstance, or situation that stems from a specific cause (Alsalhi, 2020). Secondly, according to the concept structure and dependent on the constructive theory, the KWL model proposes that a student engages with new and prior knowledge in three stages to construct a concept: What I Know about a Topic? What I Want to Know About a Topic? and What Have I Discovered? (Aseeri, 2020). Furthermore, Bloom's taxonomy encompasses a range of learning outcomes across various levels of knowledge, aligning with the educational goals as defined by Bloom (Alsalhi, 2020). High school Grade Ten students in the second semester of the 2022-2023 academic year. The Sharjah American School

LITERATURE REVIEW

The KWL strategy was introduced by Ogle in 1986 as a simple and powerful reading technique (Hassan, 2019; Sawatpon & Polyiem, 2022). Fengjuan (2010) defined the instructional strategy as a method that facilitates student learning from non-fiction texts across various subject areas. Expository texts, which are predominantly encountered by students, can be enhanced through the use of this approach, thereby improving their comprehension (Fengjuan, 2010). It is argued that it enhances students' comprehension of academic content covered in textbooks. Furthermore, it facilitates the acquisition of knowledge and assists in the structuring and organisation of the information acquired through the reading process. Usta and Yılmaz (2020) state that the KWL strategy promotes analytical reading and the development of critical thinking skills among students in the classroom. There are multiple definitions of KWL, but the primary definition refers to it as a teaching strategy that stimulates students' thinking prior to the introduction of new information on a particular topic (Frambaugh-Kritzer & Buelow, 2022).

There exist numerous definitions of the KWL strategy. A crucial definition pertains to the utilisation of this strategy by teachers to stimulate students' pre-existing knowledge and engagement with the topic prior to introducing new information (Frambaugh-Kritzer & Buelow, 2022). Santa et al. (2000) introduced the Know, Want, learned (KWL) reading strategy, which seeks

to enhance reading comprehension. According to Hassard and Dias (2013), the KWL strategy allows students to predict and discuss content topics with others before reading. According to Hassard and Dias (2013), the KWL strategy allows students to predict and discuss content topics with others. Based on the information the teacher has provided, students then determine and communicate the necessary requirements. In addition, students document their acquired knowledge and highlight the key applications of their learning.

Similarly, Ningsih (2020) asserts that the KWL strategy, commonly referred to as a KWL chart or table, is a visual tool designed to facilitate learning. According to Ali and Shawqi (2019), K.W.L. is a metacognitive strategy associated with constructivist learning. This process entails the definition of prior information, the knowledge that needs to be acquired, and acquired knowledge. It relies on the student's memory of their previous knowledge. This strategy effectively captures students' attention and deviates from the routine schedule of conventional classes. A typical KWL table consists of three columns: knowledge, desire, and learning. The table has been modified to include or exclude information, resulting in its availability in various formats, as depicted in Figure 1.

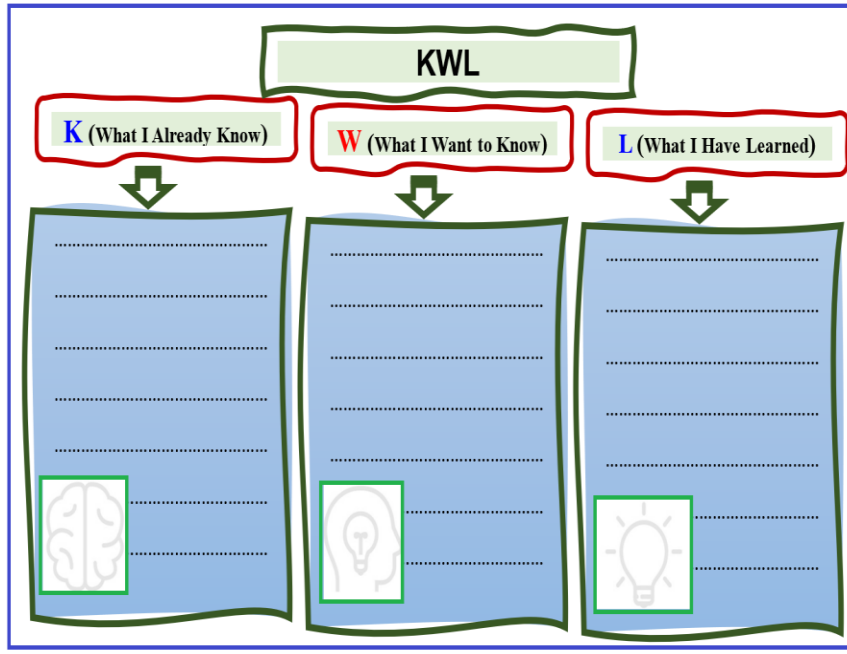

Figure 1. Main columns of the KWL.

Alshaikh (2023) suggests that the materials required for classroom activities vary depending on the nature of the activity. For instance, if the teacher

intends to divide the class into groups to discuss a specific topic, each group should be provided with a single paper containing a KWL chart. However, if the teacher wants students to brainstorm ideas for the assigned topic individually, each student should have their own copy of the student paper. According to Bakhtiar (2018), KWL charts are beneficial for all students, with a particular emphasis on visual learners, young learners, and English as a Second Language students. Based on the study by Alsalhi (2020), graphic organisers in the form of charts can be advantageous for individuals who are visual learners. Blachowicz and Ogle (2008) outline the steps involved in implementing the KWL strategy, as depicted in Figure 2. Fengjuan (2010) emphasised the significance of the sequential completion of steps in determining the effectiveness of the strategy in promoting learning.

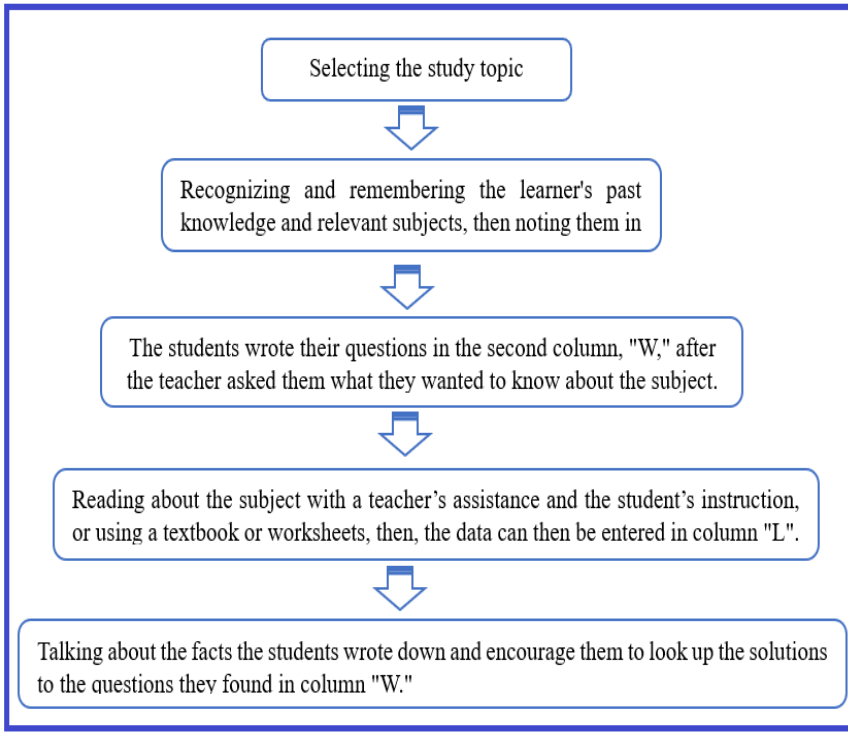

Figure 2. KWL strategy steps (Blachowicz & Ogle, 2008).

The K.W.L. Strategy is considered important in the field of learning as it activates prior knowledge stored in long-term memory, enhances self-reflection and self-monitoring abilities, facilitates the reorganisation of knowledge structures, and improves the sequencing and organisation of thoughts (Dahwi, 2019; Taha, 2020). Assisting in data collection, planning,

and anticipating information sources promotes selective comprehension by fostering analysis and the identification of relevant occurrences in relation to new knowledge. Moreover, it facilitates the generation of original ideas and creative thinking (Farha & Rohani, 2019; Sawatpon & Polyiem, 2022; Sayar & Anilan, 2021; Yan et al., 2023). The utilisation of prior information is imperative for this form of reasoning (Bogdanovic et al., 2022). Additionally, the system endeavours to rephrase the given text using alternative wording. Furthermore, Hassan (2019) highlights the numerous advantages associated with this approach, including facilitating proactive measures by teachers to enhance the classroom learning environment. This supports the argument that prioritising student-centered learning over teacher-centered learning is crucial.

Additionally, it aids instructors in implementing proactive measures to improve the classroom learning environment. Teachers can assist students in mastering challenging subjects by activating prior knowledge and stimulating their curiosity. This approach empowers students to take control of their own learning and effectively communicate their progress (Ahda & Priscylio, 2020; Bogdanović et al., 2022; Usta & Yılmaz, 2020). The teacher's role is to recognise students' self-directed learning accomplishments, regardless of educational level or learning resources (Bogdanović et al., 2021; Widiartini & Sudirtha, 2019). Multiple studies have investigated the relationship between the KWL (know-want-Learn) strategy and student achievement. Notable studies include those conducted by AlAdwani et al. (2022), Ali and Shawqi (2019), Al-Khateeb and Idrees (2010), Alsalhi (2020), and Sawatpon and Polyiem (2022). The studies revealed statistically significant differences in academic achievement between the experimental group and the control group, with the experimental group showing improvement. These findings validate the efficacy of implementing the KWL instructional model as a means of enhancing students' academic abilities within classroom settings.

METHODOLOGY

Study Approach

The researchers used a quasi-experimental approach to examine the impact of the KWL strategy on students' Mathematics achievement, as it was considered appropriate for this study. The experimental design of the investigation is depicted in Figure 3. The experimental group of students received instruction on Unit 5 (Quadratic Equations and Complex Numbers) of the Tenth Grade Integrated II Math textbook using the KWL strategy, while the control group was taught Unit 5 (Quadratic Equations and Complex Numbers) using conventional teaching methods.

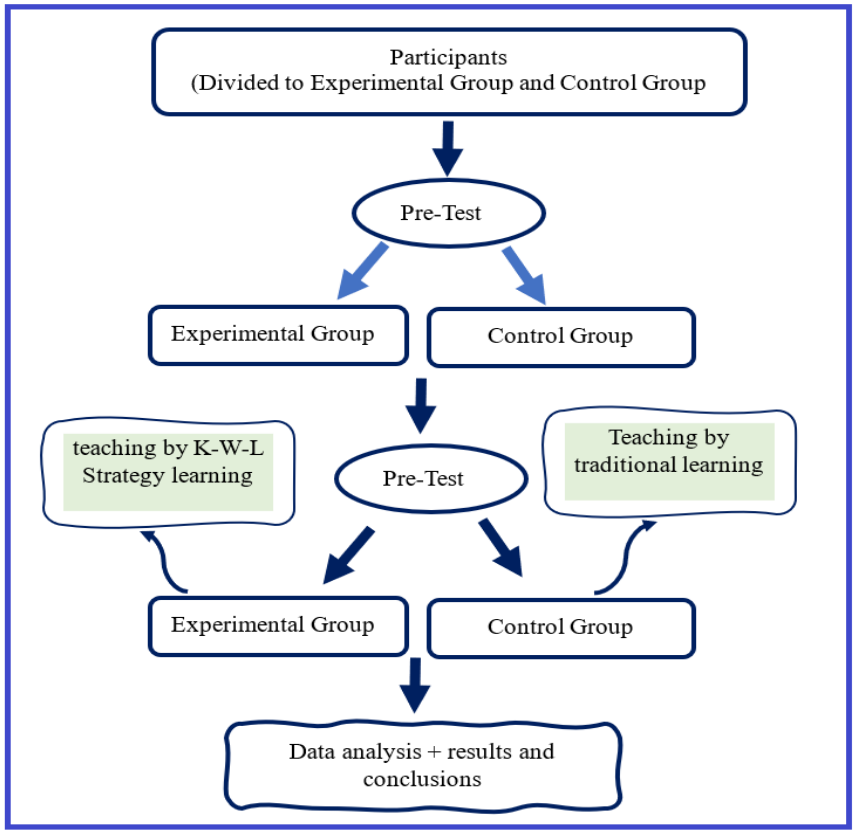

Figure 3. Experimental design of the study (design by authors).

During the second semester of the 2022-2023 academic year, both groups of students received simultaneous instruction on the same subjects covered in the mathematics textbook. Table 1 provides a summary of the specific topics covered in the unit focused on quadratic equations and complex numbers. The instructor developed pedagogical exercises based on the KWL instructional approach to effectively teach these subjects.

Table.1. Topics of the unit Quadratic Equations and Complex Numbers.

Name of the unit	Topics	Pages
Quadratic Equations and Complex Numbers	Lesson 1 Complex numbers and operations	160-180
	Lesson 2 Completing the square	180-200

Study Participants

The research sample consisted of 53 tenth-grade students. The participants were divided into two groups: an experimental group consisting of 27 individuals and a control group consisting of 26 individuals. The study was conducted during the second semester of the academic year 2022-2023. Table 2 displays the participant information.

Table.2. Demographic information for participants

Group	N	Level	Method of teaching
Control	26	High School	Traditional teaching
Experimental	27	High School	KWL Strategy teaching
Total	53		

Study instrument

The researcher conducted a thorough review of pertinent studies and literature related to the research topic, including the contributions of Alsalhi (2020), Sawatpon and Polyiem (2022), and Ali and Shawqi (2019). Subsequently, the researchers proceeded to construct the research instrument in the form of an achievement test. The researcher evaluated the effectiveness of teaching the experimental group of students using the KWL strategy through the administration of an achievement test. The test was created by the researchers and the teacher, based on Bloom's cognitive domain classification (Hyder & Bhamani, 2016). Table 3 contains the specifications table for this test. The assessment consisted of twenty multiple-choice questions, each with four options, one of which was the correct answer. The examination was allocated a total of 60 minutes.

Table 3. Test specifications table

Topics	The number of teaching sessions	The relative weight of topics	Questions of Lower-level thinking	Questions of Higher-level thinking	Total of questions
Complex Numbers.	2	16.7%	2	2	4
Algebra of Complex Numbers	2	16.7%	2	1	3
The Modulus and the Conjugate of a Complex Number	3	25.0%	3	3	6
Argand Plane and Polar Representation	2	16.7%	2	1	3
Quadratic Equations	3	25.0%	2	2	4
Total	12	100%	11 (55%)	9 (45%)	20 (100%)

Validity and Reliability

A virtual validity test was conducted to determine the validity of the achievement exam. The test was administered in its original format to a panel of eight highly qualified faculty members from prestigious universities, who served as arbitrators. We improved the validity of our test by removing certain questions and incorporating others, based on their recommendations. Researchers verified the reliability of the achievement test using the test-retest procedure. The Pearson correlation coefficient between the two applications was calculated using a representative sample of 24 students from a different educational institution in the same geographical region. The test was subsequently re-administered after a two-week interval. The dependability coefficient (0.813) in this study was considered appropriate.

Pre- Test

The researchers conducted an assessment before the intervention to compare the performance of the two study groups on the subject matter covered in the mathematics book unit, as shown in Table 4. The current study did not find any statistically significant difference between the control group and the experimental group at the conventional significance level of 0.05, as shown in Table 4. The p-value of 0.395 is greater than the significance level of 0.05, indicating that there is no significant difference between the two study groups.

Table 4. Control and experimental pre-test results.

Group	N	Mean	Std. deviation	P value
Pre-Control	26	10.73	1.08	0.395
Pre-Experiment	27	10.81	1.21	

*Statistically significant at ($p<0.05$)

Setting up a manual for a scientific textbook

The KWL strategy has resulted in the development of a guide for teachers to facilitate instruction on specific mathematics topics. After completing the manual, an experienced mathematics teacher implemented the KWL strategy on students from a neighbouring school to test its effectiveness. After implementing the KWL strategy, we evaluated the experiment and student interaction levels, and made necessary modifications.

Procedure

The subsequent steps were taken:

- The researcher instructed the experimental group students on how to use

the KWL Chart and provided it to them as a Warmup and an Exit ticket during each session of Unit 5, which focused on quadratic equations Complex numbers), Lesson 1: Complex numbers and operations and Lesson 2: Completing the square.

- The researcher developed comprehensive teaching materials for all topics covered in the mathematics course, which were intended for student use.
- The study participants were divided into experimental and control groups by the researchers (n=27 and 26
- Teaching took place for a total of 4 weeks during the second semester of 2022/2023.
- Results were gathered and statistically analyzed, and a post-test was given to the two groups, for the purpose of measuring the development of student's achievements in the experimental group after they had finished the instructional components of the material.

Statistical Treatment

The researcher utilised SPSS software to address the research inquiries. The post-test results were subjected to analysis using independent samples, with a focus on the arithmetic means and standard deviations of the experiential and control groups. This analysis aimed to identify any statistical differences between the two groups.

FINDINGS

Findings related to RQ1

What is the impact of implementing the KWL strategy on the mathematics academic performance of tenth-grade students at Sharjah American School in Sharjah? To investigate the initial question, we conducted a t-test for two independent samples to compare the mean scores of students in the experimental and control groups. Specifically, we focused on their posttest performance in mathematical achievement. Table 5 displays a comparison of the arithmetic mean and standard deviation for the control group and experimental group after the implementation of the KWL Strategy. The experimental group of students achieved a significantly higher arithmetic mean score (17.96) on the achievement test compared to the control group, which had an arithmetic mean score of 12.19. This finding indicates an increase in mathematical proficiency among 10th grade students, supporting the effectiveness of the KWL technique in teaching mathematics.

Table 5. Post-test results for the control group and the experimental group.

Group	N	Mean	Std. deviation
Post-Control	27	12.19	2.06
Post-Experiment	26	17.96	1.48

*Statistically significant at ($p<0.05$)

Findings Related to RQ2

Are there any statistically significant differences in the post-test scores between the experimental and control groups of students at Sharjah American School? To address research question 2 and assess potential statistical differences between the experimental and control groups, the findings are presented in Table 6. Table 6 illustrates this phenomenon. The KWL technique was implemented in a tenth-grade class at Sharjah American School in Sharjah. The results showed significant differences between the experimental and control groups, with a p-value of 0.000, which is below the threshold of 0.05. Table 5 displays a statistically significant difference in the arithmetic mean between the experimental and control groups. The arithmetic mean in the experimental group was 17.96, whereas in the control group it was 12.19. The experimental group at Sharjah American School observed a significant improvement in student performance when implementing the KWL method during math sessions for a 4-week period, compared to the performance of the traditional control group.

Table 6. Post-Test results for the Control group and the Experimental group.

	Levene's Test for Equality of Variances		t-test for Equality of Means					
					Significance			
	F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference
Equal variances assumed	1.693	0.199	11.747	51	0.000	0.000	5.7707	0.4912
Equal variances not assumed			11.676	45.283	0.000	0.000	5.7707	0.4942

*Statistically significant at ($p<0.05$)

DISCUSSION

Table 5 presents the findings related to the primary research question, investigating the influence of KWL learning on the academic achievement of tenth-grade students in mathematics at Sharjah American School.

The study found a significant difference in the average scores of the experimental group before and after using the KWL Strategy in math classrooms. The students in the experimental group showed a clear advantage in their scores after implementing the KWL learning approach. The mean post-test score for students in the experimental group who were taught using the KWL learning approach was 17.96. In contrast, the control group, which received instruction through the traditional method, achieved an average score of 12.19. This study indicates that students in the experimental group, who were taught using the KWL technique, showed greater comprehension in mathematics themes compared to the students in the control group. This observation indicates that the use of the KWL technique has led to improved academic performance in the experimental group compared to the control group. The researchers suggest that the observed outcome can be explained by the use of the KWL strategy. This approach enables students to set their own learning goals and effectively utilise their prior knowledge and experiences while learning new mathematical concepts and subjects. Therefore, this teaching approach promotes a learning environment that prioritises the needs and engagement of students (Bader, 2007).

The second research question aimed to analyse the significant differences in math achievement between the control and experimental groups following the implementation of the KWL Strategy. Table 6 displays the results, highlighting significant differences in sample size (n) between the experimental and control groups. The p-value of 0.000, below the predetermined significance level of 0.05, indicates a significant difference in the average scores of the experiment. The experimental group demonstrates a significant advantage with a mean difference of 5.77 (17.96–12.19) compared to the control group. The KWL method has been found to improve students' academic progress. This novel pedagogical approach offers a viable method for high school mathematics educators to effectively utilise students' prior knowledge, facilitate the retrieval of relevant information, and foster their intellectual curiosity. Moreover, it acts as a catalyst for self-directed learning by fostering accountability and developing students' critical thinking abilities. Moreover, it improves students' capacity to integrate prior knowledge with new information. The findings suggest that tenth-grade students in the experimental group at Sharjah American School showed improved academic performance in mathematics after using the KWL strategy for four weeks, compared to the control group who received traditional teaching methods.

This study found that implementing the KWL strategy in mathematics instruction led to a significant improvement in academic performance for students in the experimental group compared to the control group, which received traditional instruction methods. Additionally, the use of the KWL technique in teaching involves interactive elements, as evidenced by the studies conducted by Al Rasheed (2014) and Tok (2013). The active

engagement of students in the experimental group is demonstrated through their involvement in various stages of the instructional process. This includes assessing their prior knowledge, addressing their questions, and evaluating their ability to document newly acquired information related to the subject matter. The findings are consistent with previous research that has also demonstrated the positive impact of the KWL strategy on student academic outcomes and performance, in comparison to traditional instructional methods (Ali & Shawqi, 2019; Alsalhi, 2020; Aseeri, 2020; Dahwi, 2019; Frambaugh-Kritzer & Buelow, 2022; Sawatpon & Polyiem, 2022; Sholeh et al., 2020; Zouhor et al., 2017).

CONCLUSION

The study found that implementing the KWL strategy led to significant improvements in the mathematical achievement and abilities of tenth-grade students. Compared to the control group, which received traditional instruction, the students using the KWL strategy showed a significant increase in mean scores. The study's findings have significant implications for the educational environment, as teachers can use the KWL strategy to foster critical thinking skills in students. The KWL strategy is useful for investigating the growth of scientific knowledge due to its focus on information processing, planning, execution, and review. This implies that integrating the KWL strategy with classroom interaction can enhance the effectiveness of education. The KWL strategy enhances instructional engagement through interaction.

This is demonstrated by the active involvement of students in the experimental group throughout the teaching process. This involvement includes assessing their prior knowledge, addressing their inquiries, and evaluating their ability to effectively document newly acquired information on the subject matter. Further research is needed to explore the potential application of the KWL method in improving essential skills and subject knowledge in mathematics education. Based on the findings of the study, the researcher proposes the following recommendations. Teachers should be encouraged to use new teaching strategies, such as the KWL strategy, particularly in high school where students tend to rely more on their learning. Additionally, teachers must incorporate contemporary instructional approaches into the mathematics curriculum.

THEORETICAL AND PRACTICAL IMPLICATIONS

This research has significant theoretical and practical implications. Theoretical evidence suggests that KWL strategies are significant for the learning of mathematics students. This research addresses a gap in the existing body of knowledge by examining the effectiveness of KWL strategies in

comprehensive student learning, an area that has not been extensively studied before. This study highlights the need for updated teaching strategies and emphasises the potential effectiveness of modern teaching methods in achieving strategic work objectives. The study emphasised the effectiveness of an integrated teaching approach in promoting improved education outcomes for students. Therefore, this study makes a unique theoretical contribution and identifies important relationships that were not previously reported in the existing literature on knowledge.

The implications of this study are of practical importance and have the potential to impact the field of education. Educators may opt to incorporate the KWL strategy into their instructional practises as a pedagogical approach, thereby fostering the cultivation of critical thinking abilities in students. Moreover, the KWL strategy's focus on information processing, strategic planning, implementation, and evaluation renders it a highly effective tool for inquiries pertaining to the progression of scientific knowledge.

This suggests that incorporating the KWL technique within educational environments, coupled with heightened classroom engagement, holds promise for augmenting the efficacy of education. Incorporating the KWL technique into the instructional process introduces an interactive element. This is evidenced by the extent of student engagement observed in the experimental group during various phases of the instructional process, including assessing their prior knowledge, addressing their queries, and evaluating their ability and competence in documenting newly acquired information related to the topic. Therefore, it is recommended that additional research be undertaken to explore the potential utilisation of the KWL technique in enhancing various crucial skills and subject domains within the realm of mathematics education.

LIMITATIONS

The study's results are subject to the following limitations. The study is restricted to tenth-grade students at Sharjah American School in Sharjah Campus. The study period is scheduled for the second semester of the academic year 2022-2023. Furthermore, it should be noted that this study is restricted to a single unit of study, specifically focusing on complex numbers and operations. The study is limited to examining the impact of the KWL Strategy on students' math achievements. The study was subject to several limitations that impacted the generalizability of the research findings. The study was restricted to Unit 5, specifically Lesson 1: Complex numbers and operations, and Lesson 2: Completing the square. The study was restricted to tenth-grade students at Sharjah American International School in Sharjah. This study is limited to the second semester of the academic year 2022/2023.

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