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INVESTIGATING TEACHERS’ AND LEAD TEACHERS' PERSPECTIVES ON THE IMPACT OF STREAM ON ENHANCING TEACHING, LEARNING AND PROFESSIONALISM IN THE EMIRATES SCHOOLS ESTABLISHMENT

Hosam Rashad Ibrahim Badawy

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Cover: Image showing the process of developing STEM into STEAM, then STREAM in three stages that integrate Science, Technology, Engineering, and Math (STEM) to be taught together. It added Reading and Writing to be STEAM, and finally included Art to reach the title of study STREAM.

(Photo: By ktef.2019, https://ktef.pnu.edu.ua/en/2019/10/09/stem-education-festival) (Vasyl Stefanyk Precarpathian National University, 2019).

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Declaration of Original Work

I, Hosam Rashad Ibrahim Badawy, the undersigned, a graduate student at the United Arab Emirates University (UAEU) and the author of this thesis entitled "*Investigating Teachers' and Lead Teachers' Perspectives on the Impact of STREAM on Enhancing Teaching, Learning and Professionalism in the Emirates Schools Establishment,* hereby, solemnly declare that this is the original research work done by me under the supervision of Dr. Ahmed Al Kaabi in the College of Education at UAEU. This work has not previously formed the basis for the award of any academic degree, diploma, or similar title at this or any other university. Any materials borrowed from other sources (whether published or unpublished) and relied upon or included in my thesis have been properly cited and acknowledged in accordance with appropriate academic conventions. I further declare that there is no potential conflict of interest with respect to the research, data collection, authorship, presentation, and/or publication of this thesis.

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Abstract

STREAM education is the latest development of STEM and STEAM educational approaches in the United Arab Emirates schools. It is gaining traction because of the global market's massive economic and technological advancement, as STREAM employment is in growing demand. Educational policymakers and leaders in the UAE advocate for the development and implementation of STREAM to enhance innovation and entrepreneurship skills, leading to a drastic shift in teaching, learning and professionalism. According to the study, the STREAM approach enhances teachers' professionalism, students' creative skills and the learning of 21st century survival skills such as communication, collaboration, creativity, critical thinking, digital competency, innovation and entrepreneurship skills. It teaches students problem-solving-based and project-based lessons to prepare them for the changing future job market. This study investigates the teachers’ and the lead teachers' perspectives on the impact of STREAM on enhancing teaching, learning and professionalism in the Emirates Schools Establishment. The study uses a mixed approach of concurrent research methods with qualitative and quantitative analysis, including a survey and interviews with public school teachers in the Emirates Schools Establishment (ESE) in the United Arab Emirates (UAE). The study based the investigation on six domains, namely: (1) professional knowledge, (2) instructional planning, (3) instructional delivery, (4) student learning assessment, (5) learning environment and (6) professionalism. The survey sample was 462 teachers. The sample of the qualitative phase involved five participants; three were teachers and two were lead teachers. According to the study results, participants have positive perspectives on the impact of STREAM in enhancing teaching, learning and professionalism in the Emirates Schools Establishment. The findings also revealed high awareness among ESE teachers about STREAM's impact on teaching, learning and professionalism. Above all, the study discloses the challenges that STREAM teachers face in STREAM implementation, including integrating curriculums, teaching loads and resources as well as the needed professional development. Finally, the study offers managerial and research implications for future study for policymakers and educators to enhance the application of the STREAM approach in schools to be taught at an early age and for all grade levels in the United Arab Emirates schools.

Keywords: STEM, STEAM, STREAM, Perspectives, Student learning Assessment, Instructional Planning, Learning Environment, Instructional Delivery, Professionalism, Emirates Schools Establishment

Title and Abstract (in Arabic)

استقراء وجهات نظر المعلمين والمعلمين القادة حول تأثير STREAM في تحسين التدريس والتعلم، والمهنية في مؤسسة الإمارات للتعليم المدرسي.

الملخص

يعتبر نهج STREAM أحدث تطور في مناهج STEM و STEAM في مدارس دولة الإمارات العربية المتحدة. إنه يكتسب زخمًا حاليًا بسبب التقدم الاقتصادي والتكنولوجي الهائل في السوق العالمية، حيث يزداد الطلب على وظائف STREAM ويدعو القادة التربويون وصانعو القرار الي تطوير وتنفيذ هذ النهج حيث إنه يعزز مهارات STREAM وظائف الابتكار وريادة الأعمال، مما يؤدي إلى تحول جذري في التدريس والتعلم والمهنية. وفقًا للدراسة يعزز هذا النهج مهنية المعلمين، ومهارات الطلاب الإبداعية، وتعلم مهارات البقاء في القرن الحادي والعشرين مثل التواصل والتعاون والإبداع والتفكير النقدي والكفاءة الرقمية. من خلال هذا النهج يتعلم الطلاب حل المشكلات والدروس المستندة إلى المشاريع، فضلاً عن مهارات الابتكار وريادة الأعمال لإعدادهم لسوق العمل المستقبلي المتغير. تهدف هذه الدراسة إلى التحقيق في وجهات نظر المعلمين حول أثر النهج في تعزيز التدريس والتعلم والمهنية في مؤسسة مدارس الإمارات. تستخدم الدراسة نهجًا مختلطًا لأساليب البحث المتزامنة مع التحليل النوعي والكمي، بما في ذلك استبانة ومقابلات مع معلمي مؤسسة مدارس الإمارات. اعتمدت الدراسة على ستة مجالات هي: (1) المعرفة المهنية، (2) التخطيط التعليمي، (3) تقديم التدريس، (4) تقييم تعلم الطلاب، (5) بيئة التعلم، (6) المهنية. وبلغت عينة الاستبانة 462 معلماً. وتضمنت عينة المرحلة النوعية للمقابلات خمسة مشاركين. ثلاثة من المعلمين واثنان من المعلمين القادة. وفقًا لنتائج الدراسة، كان لدى المشاركين وجهات نظر إيجابية عن تأثير النهج على التدريس والتعلم والمهنية في مدارس مؤسسة الإمارات. وكشفت الدراسة عن وعي كبير لأهمية المشروع في دعم التعليم والتعلم والمهنية بمؤسسة الإمارات للتعليم المدرسي. تكشف الدراسة عن التحديات التي يواجهها المعلمون في تطبيق البرنامج، بما في ذلك دمج المناهج والتكامل بينها والموارد، بالإضافة إلى التطوير المهني المطلوب. أخيرًا، تقدم الدراسة توصيات وتطبيقات إدارية وبحثية للدراسات المستقبلية ولصنّاع السياسات والتربويين لتعزيز وتطبيق النهج بالمدارس في سن مبكرة ولجميع المراحل الدراسية في مدارس دولة الإمارات العربية المتحدة.

مفاهيم البحث الرئيسية: وجهات النظر، المعرفة المهنية، تقييم تعلم الطلاب، التخطيط التعليمي، بيئة التعلم، تقديم التعليم، المهنية، مؤسسة الإمارات للتعليم المدرسي، STEM، STEAM، STREAM.

Author Profile

Hosam Rashad is currently an English teacher and STREAM coordinator at the Ministry of Education, Emirates Schools Establishment and the UAE. He is also a researcher at IGI Global and published a chapter in a book titled Rethinking School Principals' Leadership Practices for an Effective and Inclusive Education with that company in 2022. Hosam has more than 22 years of teaching and leading experience working in three different countries (Egypt-Sultanate of Oman and the UAE). He has had a significant number of certified professional development training and certificates; for five years, he has been a Microsoft Innovative Expert Educator (MIEE). Additionally, Microsoft Company considers him one of the education change-makers. Hosam is also a speaker at national and international educational conferences at the United Arab Emirates University (UAEU). On the innovation day under the title the UAE innovates, he participated in presenting about the STEM revolution in the UAE as a speaker at an international event at EXPO Dubai 2020 under the umbrella of the UAEU, faculty of education and the Leadership Department. Hosam lives in Abu Dhabi with his family. He received his Bachelor of Arts degree in English literature from the Sohag University faculty of Arts in Egypt. His second degree was a postgraduate higher diploma in translating English at Assiut University in Egypt. He was awarded many recognitions and was honored by public figures for his contributions to the people of determination and gifted students. He has received excellent appraisals and high evaluations from his supervisors and school principals as a pioneering teacher, innovative STREAM coordinator and a change maker in education by Microsoft Educational Center.

Acknowledgments

I thank Allah for everything and for leading me on the right path to success. I want to thank my committee for their guidance, support and assistance throughout my preparation of this thesis; special thanks go to my advisor Dr. Ahmed Al Kaabi**,** for his continuous follow-up, support, professionalism and genuine approach to me.

Dedication

I want to dedicate this thesis to my beloved parents, who helped me through hard times; my siblings, who were there to support me; my wife, my children, my friends, and colleagues who encouraged me.

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List of Abbreviations

ESE	Emirates Schools Establishment
MOE	Ministry of Education
STREAM	Science, Technology, Reading, Engineering, Art and Mathematics
STEAM	Science, Technology, Engineering, Art and Mathematics
STEM	Science, Technology, Engineering and Mathematics
UAE	United Arab Emirates

Chapter 1: Introduction

1.1 Overview

Innovation and entrepreneurship are rapidly altering the globe and leading to a drastic shift in teaching and learning. Creativity in education is required more now. The proper combination of multiple courses, such as Math, Technology, Engineering (STEM) and other subjects, can stimulate such creativity and lead to a change and innovation in teaching, learning and professionalism. The change that comes from high levels of instructed and improved education and learning of both teachers and students, as Al-Kaabi (2013) mentioned, instructional improvement is an important goal, a goal worth seeking and a goal when implemented that allows both students and teachers to control their destiny in making a more meaningful learning environment. This is another approach in which (STEM) is a changing force in education nowadays.

Al Murshidi (2019) stated that STEM education is now a well-known learning technique worldwide in the twenty-first century. In the UAE's education system, it is referred to as Science, Technology, Reading, Engineering, Art and Math (STREAM). It aims to imbue innovation and entrepreneurship skills in students by teaching the latest century skills, namely collaboration, communication, creativity and critical thinking, at public schools. Its central goal is to keep up with the global trend to provide new jobs in the ever-changing financial world of business. Students can be better learners when innovative methods and creative teaching offered to them. Retaining “STEM-interested” learners can significantly influence the progress and productivity of the STEM workforce (Nair et al., 2017).

Clements and Sarama (2021) stated that education in the earlier years witnessed a growing interest in STEM. They discussed two tensions or areas of interest in this movement. One of these areas was how STEM could be affected by adding the subject “Arts” (STEAM) or both “Arts” and “Reading” (STREAM) to STEM. The second area was whether it was adequate to incorporate all fields with those already included in STEM thoroughly. The authors concluded that while those inclinations seemed helpful, they might unwittingly harm the essential increase of STEM in prior learning. They introduced a set of adjunct treatments to preserve the beneficial parts of the two notions while avoiding the potential drawbacks (Clements & Sarama, 2021).

Moreover, because students are society's new reality and instruments of social change, it is vital to educate them with the type of learning that gives them information and abilities but also change their views and actions regarding ecological preservation (Nguyen et al., 2020). The beginning of STEM education was in the United States of America. The actual start of STEM, as an acronym created by the American National Science Foundation in the year 2000, was a curriculum encompassing and often integrated the four disciplines of Science, Technology, Engineering and Mathematics (Watson et al., 2020).

Theoretically, the constructivist paradigm underpins STEM education. Di et al. (2021) reported that STEM education seeks to foster innovative talents by improving students' ability to apply interdisciplinary knowledge robustly in solving practical problems by building upon experiences and newly acquired skills. The relationship between the innovation event model and STEM education is established from the perspectives of subject integration and constructivism in STEM education. Education is essentially the result of situational information, tactics and interactions. STEM employment is in the growing market and expansion in STEM output and research across the economy has significant societal advantages (Green & Sanderson, 2018).

Science, Technology, Mathematics and Engineering progress strongly represent a country's economic position. STEM education became the most stressed heavily in the UAE educational reform. However, while STEM education serves all children, not all STEM occupations stimulate them. Students can pursue any career path they like (Eltanahy et al., 2020). STEM education develops critical and creative thinkers, broadens scientific learning and empowers future creators. It allows them to comprehend better how Science, Engineering, Technology and Mathematics affect their verbal dealing and learning abilities and prepares them for advanced schooling and the future job market, as studied in the article by Di et al. (2021). New products, procedures and economic growth are all examples of innovation. The economy of employment of tomorrow is pushing the present classroom’s culture by bringing the education of STEM. Pursuing an education in STEM is no longer only a matter of desire or interest; it is now a matter of survival (Soomro, 2019).

New concerns are being handled daily in the modern era of the industrial revolution, ranging from global warming to breast cancer. These issues must be broken down and resolved. Over the decades, engineers and scientists have agreed that there is no perfect solution to a problem but that a distinctive way of thinking may contribute to identifying solutions for a specific difficulty (Mahil, 2016). Therefore, the researcher seeks to investigate and study the topic of STREAM.

1.2 Statement of the Problem

The Emirati schools strive to provide students with a unique, innovative and revolutionary educational environment and groundbreaking management is one crucial component of that learning environment, based on the aim and purpose statement of the United Arab Emirates (Ministry of Education, 2022). Supporting the notion that creative abilities are essential, as all individuals who get high-quality schooling must be adequately prepared to enter a dynamic economy and develop their entrepreneurial abilities. To accomplish this goal, MOE aims to promote innovative education for leading, knowledgeable and global recognition, with the mission of developing an inventive school reform for a competent and worldwide community. This involves all demographic groups to satisfy upcoming employment market requirements by ensuring the reliability of the Ministry of Education outcomes and the availability of exceptional assistance for intrinsic and extrinsic clients (Ministry of Education, 2022).

The idea of applying the STREAM approach in education started when the Emirati STREAM program was applied in schools in 2018 in three different phases to guide teachers toward developing individuals who want to pursue Engineering, Science, Math and Technology future jobs by making professional abilities possible and available to be competitive in the international economy (Ministry of Education, 2018). The MOE launched phase three of its Emirates STREAM program in 2018 at the Ajman Teachers Training Institute. The program aims to produce an academic environment that supports the integration of STEM subjects and language training to prepare students for success within STEM fields and in the knowledge-based economic culture.

This study addresses the dearth of knowledge regarding the effectiveness of the STREAM project that was launched years ago in the UAE schools. Since integrating STREAM into the school curriculum has significant implications for boosting student learning, it is crucial to explore teachers' perceptions of the effectiveness of STREAM to provide knowledge-based evidence for expanding STREAM programs within UAE schools. There is a dearth of research examining STREAM project in grades PK-12. Only studies in the literature were merely reviews with no empirical data upon which other researchers could build. Al Murshidi (2019) lamented the absence of research concerning STEM. She urged scholars to investigate different aspects of it to reveal more about those with first-hand experience (i.e., teachers, students, schools and so on) with various STEM projects carried out within the UAE.

The UAE recently launched STREAM projects with no cumulative research examining the effectiveness of practices as they pertain to STEM. This research aims to diminish that gap in the literature since projects carried out in schools, need rigorous assessment and investigation to measure their impact on student learning, this study responds to the current need to examine the perceptions of teachers and school administrators on the STREAM project.

The Emirates Schools Establishment (ESE) started when The Presidential Regulation (EC No. 15 of 2016) was signed by his highness, the late Sheikh Khalifa bin Zayed Al Nahyan. It took place in January 2021, which served as the foundation for forming Emirates Schools Establishment, striving to enhance and improve the national educational field and incorporate training programs in the state education, delivering exceptional education to all students. Following the vision of visionary leadership and the objectives for the forthcoming five decades (Emirates Schools Establishment, 2021). The ESE's published mission is to improve the school system and the intellectual community by using cutting-edge teaching strategies, developing strong faculty and staff leadership and promoting expertise to foster the growth of vibrant cultures. The advocated ESE vision is promoting public education with innovation and serving as a global role model (Emirates Schools Establishment, 2021).

1.2.1 STREAM Globally and in the UAE

What exactly is STREAM? STREAM is a framework for effective teaching and deep learning, not a new curriculum. Reading and writing are an additional layer of STREAM that is added to STEM and STEAM. Because it involves both critical thinking and creativity, those who support STREAM believe that reading is a crucial component of a well-rounded education. STREAM projects incorporate reading and writing as well as STEM or STEAM components. Through STREAM education, theoretical ideas can be combined with more practical experience across all subject areas. Lessons become more relevant than they would be from a textbook alone when students participate in practical projects that involve problem solving, teamwork and the outcomes of their work. Students can explore their interests by using more technology to improve teaching and learning. The question “why are we learning this?” is answered by giving students access to business professionals who can further introduce them to prospective future occupations.

STREAM purposefully integrates academic fields; content information is intertwined, complex and multilayered; it is not encountered in isolation. The coordination of subjects around overarching themes and the investigation of ideas concerning one another is encouraged by STREAM education for instructors to create a more adaptable, educated workforce for the nation's future and the business world has driven the idea of stressing the subjects of STEM: Science, Technology, Engineering and Math. It has become clear that innovation is currently driving the economy.

The third stage of the Emirates STREAM program has begun at the Ajman Teachers Training Institute, according to MOE. The main goal is to have a generation of children who have the understanding, fundamental concepts and experience as well as capabilities to study Science, Math, language skills, Engineering and Technology, this program will help to make them ready to handle an active part in the knowledge economy societal structure (Ministry of Education, 2018). The initial goal is to create a learning space where individuals can develop an integrated knowledge of STREAM in schools. STREAM education promotes focusing on school resources. Teachers are provided with the needed resources to encourage group planning and develop fun and inventive ways of standard teaching. STREAM recognizes the importance of the larger school-community link to an excellent educational experience. Businesses, academic institutions and cultural organizations in our community are looking for educational opportunities that transcend all STREAM subjects.

The Emirates STREAM initiative develops students who want to pursue subjects or fields of STEM and have the professionalism to compete in the global economy (Ministry of Education, 2018). Following the formal introduction of the initiative, the program began training teachers in three training institutes that comprised instructors from six emirates for five days to execute the initial applications with 36 workshops. It covered cartoon film, educational film production, the fourth industrial revolution and applications of innovative thinking skills. These programs cover the improvised learning of Arabic in terms of teaching methods of reading and reciting and demonstrate structural engineering and how engineering opens the educational portal for intelligent learning, phonetics and discovering space. Further, the training focuses on training qualified trainers at three levels for the Emirates STREAM program, which will lead the implementation of the latest schooling across the country by the Teachers Training Institute (Ministry of Education, 2018).

Teaching in STEM education necessitates using design thinking and interdisciplinary knowledge by teachers and students, which are novel approaches to emergent concerns. The recent economic, social, scientific and technical advancements have raised the demand for rational, creative, inquiring, collaborative and imaginative students with the ability to operate in a team. Innovation is thought to depend heavily on the creativity and communication that “the Arts” foster. STEM education is the best approach to address this requirement (Batdi et al., 2019). Schools provide a comprehensive approach to teaching with STREAM, which uses an interdisciplinary approach to bridge topic areas, thus the essential progression of STEM education is reached. It is a philosophical foundation for providing the best education possible for students in the twenty-first century.

A study by Nuangchalerm et al. (2020) was carried out to investigate the views of primary Thai teachers toward STREAM education. They used the survey approach to find out teachers' opinions on STREAM education to explore their opinions after a workshop for primary teachers of STREAM. Even though none of the teachers is specialists in science or Mathematics, the results showed that all teachers have a positive holistic perspectives and support for STREAM education (Nuangchalerm et al., 2020).

While in Africa, an article by Badmus and Omosewo (2020) entitled “Evolution of STEM, STEAM and STREAM Education in Africa” discussed the implication of the gaps in knowledge and was published in the International Journal on Research in STEM Education. The trend in STEM, STEAM and STREAM approaches is highlighted in this article, along with the justification for each of the evolution's peripheral aspects. The number of covered areas in developing nations and the predicted coverage gap were both carefully examined in this article. Investigation into the knowledge, skill and resource gaps needed to address these new trends for meaningful classroom integration in Africa led to the conclusion that the transition from STEM to STEAM had enormously favorable effects on the linked fields and disciplines. Students' enthusiasm for STREAM in the classroom is just another factor in their determined gaze for a better future optimistically and excitement about the potential for learning the latest thing (Badmus & Omosewo, 2020).

An essay by Kurbakova et al. (2020) about information technologies in education on the application of STREAM technologies discusses using information technology for STREAM learning when instructing students in humanitarian specialties. The presentation of educational content utilizing video materials, a didactic tool that heightens the perception and understanding of teaching information, is one of the authors' considerations of the theoretical viewpoints of researchers on the STREAM learning aspects. According to the survey results from the students, the authors have identified the types of educational activities where this is advisable to involve STREAM technologies in the schooling process. Moreover, the students' attitudes toward using the STREAM learning method as well as the use of educational videos by teachers are also identified. The pros and downsides of adopting STREAM technologies in education are also considered in the paper (Badmus & Omosewo, 2020).

A study by Zsoldos-Marchis and Ciascai (2019) investigated the views of pre-primary and primary pedagogy students about the demonstrating approach and strategy regarding the STEM/STEAM/STREAM in Romania. This study explores the perspectives of 216 students majoring in Basic Schooling Pedagogy on the significance of STEM, STEAM and STREAM activities. A questionnaire comprising 11 five-level likert items relating to the research topic and six demographic questions served as the research tool.

Sucheta (2022) study aimed to determine the effectiveness of the STREAM-based Learning Approach on Achievement in Science of Elementary School Students. It explained that Science, Technology, Reading & writing, Engineering, Art and Mathematics is referred to as STREAM. The main goal of his study is to ascertain how the STREAM-based learning strategy affects science achievement. Forty pupils were chosen from a class based on quantitative research. It was conducted using a quasi-experimental methodology with an unequal control group of children who learned using the traditional technique and kids who learned using the STREAM-based learning strategy who differed, proving his study's validity and were distinguished within the title of Achievement Test in Science. As for academic accomplishment in science, the STREAM-based schooling strategy has a positive effect. It employs a 4D design (Define, Design, Develop and Disseminate) that supports innovation (Sucheta, 2022).

Pebriani et al. (2022) researched “The Effect of STREAM-Based Teaching Materials Using Smart Apps Creator 3 on Students' Scientific Literacy” in the “International Journal of STEM Education for Sustainability” and sought to improve students' scientific literacy with Smart Apps Creator 3. Eleven teachers with STEM knowledge used STREAM-based water teaching materials with 56 respondents and these were the study's data collection and analysis subjects. According to the study, using the latest technological applications to implement STREAM-based learning tactics enhances student learning. STREAM-based teaching materials utilizing SAC 3 (Pebriani et al., 2022) statistically improve students’ literacy of water-related content in online learning during the present epidemic. According to the study, two-thirds of the respondents believe that STEM activities must incorporate reading and the arts. Only 39% of respondents believe it is challenging to organize integrated STEM, STEAM and

STREAM programs at both the preschool and the primary school levels as well (Zsoldos-Marchis & Ciascai, 2019).

In their article, Aâ et al. (2020) reported that critical thinking abilities are one of the latest centuries of life skills that must be acquired during the educational process. The indications of critical thinking skills tested in this study include giving clear explanations, developing fundamental skills, giving further explanations and drawing conclusions. The STEM approach is one possible method for getting pupils involved in their education and helping them develop their critical thinking abilities (Aâ et al., 2020).

1.3 Objectives of the Research

The research aims to disclose teachers' perceptions of implementing STREAM in public schools in the UAE. Its primary goal is to ascertain whether teachers realize the importance of preparing students to be ready and well equipped to join a technology-dominated workforce and build entrepreneurial skills. This objective can be attained by examining teachers' and lead teachers' perspectives on STREAM education and its effect on teaching, learning and professionalism inside schools. The problem is researchable because the STREAM framework can be used to determine how well teachers perceive it.

1.3.1 Research Questions

RQ 1. What perceptions do teachers and lead teachers have about the impact of STREAM on enhancing teaching, learning and professionalism?

RQ 2. What impact do different demographic variables have on teachers' perceptions of the STREAM domains?

RQ 3. What obstacles do teachers face when applying STREAM inside the classrooms?

1.4 Significance and Constraints of the Study

1.4.1 Significance

Both the development of academic talents and 21st century abilities are processes that do not "happen by osmosis". Education has developed beliefs and procedures emphasizing academic accomplishment. However, it has not done as well in helping students acquire the abilities, they will need to succeed in the twenty-first century. All students will require these abilities to succeed in their careers, particularly in the quickly expanding STEM areas of businesses. The United Arab Emirates STREAM Initiative equips students interested in studying science, Technology, Engineering and Math with the professional abilities necessary to compete in the world market (Ministry of Education, 2018).

The study can enhance the practices of educators by providing ideas and proposals, which are sent to instructors with the necessary facts and knowledge on how to establish STREAM-supporting schools for everyone, especially in this fourth-revolution period and the age of artificial intelligence and that STEM education' opportunity is for all, according to Sarah Yousif Al Amiri, Minister of State for Advanced Sciences, Emirati women have made significant achievements in the fields of Science, Technology, Engineering and Mathematics (STEM) thanks to the UAE's leadership's strong support and encouragement as well as the equal opportunities provided to them (Geronimo, 2019). The study will emphasize enhancing the policy that some schools have established, according to which STREAM relies on instructors' practices and students' achievement. Certain schools in the UAE are implementing the STREAM initiative and STEM activities, which are very important for students to be innovative and future entrepreneurs.

1.4.2 Constraints and Limitation of the Study

The current study is carried out in all ESE schools that have adopted the STREAM project in the United Arab Emirates Public schools to investigate their perceptions. Meanwhile, private schools are not included in the study. It is suggested that other studies could also be done in private schools. The study took place in term three of the school year 2021. The length of the study is almost a whole term. It covers all school cycles in the UAE.

1.5 Relevant Literature

STEM symbolizes a distinctive way of learning and teaching based on different individuals' learning interests and methods. STEM education is broad and varied, offering something significant to every student. In STEM education, the emphasis is on integrating technology and subjects and how they are related to one another, unlike the conventional education techniques where stress is given to each subject separately instead of relating them with one another and studying their relationships. It is reported that since the late 2000s, there had been a surge in interest in creating and applying shared metrics in the informal education of Science, Technology, Engineering and Mathematics (STEM) (Grack Nelson et al., 2019). In other words, they believe that STEM education is supposed to be supported via formal and informal paths as well.

1.5.1 How is STEM Different from Other Subjects or Fields

The latest worldwide focus on the education of STEM includes a push toward combining the various STEM disciplines in the educational syllabus through 'integrated STEM (iSTEM). As part of the change toward more student-centered learning environments, iSTEM is analyzed by Çetin and Demircan (2020), Nadelson and Seifert (2017), Moore et al. (2015) and Honey et al. (2014). STEM is different from other subject areas in all ways and people are not cognizant of it. Therefore, they confuse it with being only centered on Science and Mathematics. The following paragraphs explain how STEM is different from other subjects or fields.

1.5.1.1 STEM's Main Subject Areas Are Science and Math

The education of STEM corresponds to schooling in Science, Technology, Engineering and Mathematics. As stated, it often encompasses educational programs from preschool through post-doctorate levels in official and informal contexts (Gonzalez & Kuenz, 2012). Science and Math are significant in STEM, as Technology and Engineering are linked with these subjects. If an architect had to design a 20-story building, to do so, he first had to understand the scientific and mathematical foundations and rules that can make the possible construction. Since that staff are seldom straightforward, there are hundreds of different variations of STEM (including STEAM, STREAM and METALS), but STEM is the most commonly used (Craig, 2017).

1.5.1.2 STEM Is Now Another New Way to Learn Things

STEM combines all four subjects, which forms it so that the students can use the cross-examination method to solve their problems. In other words, there is no memorization or rote-learning concept. In STEM classes, there are hardly any instances where the solution to a problem is direct or explicit; instead, students will have to figure out the answers themselves with all the information they have been provided (Dalton, 2019). It means that to survive as a STEM student, one must be creative with being analytical.

1.5.1.3 There Is Not Enough Choice for Students in STEM

Kaleva et al. (2019) mentioned that setting aside the growing need for STEM abilities, the relationship between subject selections in STEM and their influence on individuals' educational trajectories had received little attention. While in STEM, students cannot choose certain classes for fun, as education requires a solid understanding and base of different subjects. A massive number of registrations dataset that covers students accepted to Finnish universities was used to focus on the mathematics option (Kaleva et al., 2019). Therefore, they do not have enough choice in selecting the courses and the order in which they are taken because these students must master four different areas simultaneously (Dalton, 2019).

1.5.1.4 STEM Education Requires Much Hard Work

For example, Hossain and Robinson (2012) stated that STEM had been a crucial economic engine in the United States. Since the Second World War, American students' performance and passion for STEM education have declined; they added that unless the government takes more steps towards enhancing STEM, the U.S. would be unable to preserve its leadership in STEM fields to inspire a new generation of U.S. students to pursue STEM jobs. STEM has been pushed as a kind of educational reform national project in the United States and Europe. The knowledge of STEM strives to improve the working team connected to this profession and it nurtures literacy to handle the real fundamental issues that confronting the twentieth century (Bybee, 2010) as cited by (Yata et al., 2020, p. 01).

1.5.1.5 STEM Requires the Students to View Education in an Explanatory Manner

STEM necessitates pupils to practice whatever they have acquired, which would be fun learning and enhance students' motivation to study. It means that someone studying STEM would not just have to study it but also build upon it so that they can learn about them in a detailed manner (Dalton, 2019). The role of STEM teachers is to guide students who are learning STEM. El Nagdi et al. (2018) mentioned that new roles for teachers are emerging due to STEM schools' growth worldwide and in the United States of America. These kinds of jobs are accompanied by different changes in the attitudes (El Nagdi et al., 2018).

1.5.2 General History of STEM Education

In this section, the study investigates the start of STEM in the world and how it started and developed throughout history. It explains the different eras that STEM has been through, moving from STEM to STEAM and then STREAM. One-The Sputnik Era, two NASA, three-The eras of the 1970s to 1980s, four-The era of the 1990s and five-The era of the 2000s. Where it started and how it developed to reach what it is now.

The movement of STEM emerged at the start of the 1990s. Although the National Science Foundation first used the abbreviation "SMET" for phonetic reasons, it was modified into STEM (Martín-Páez et al., 2019, p. 01). Scientific officials at the U.S. National Science Foundation (NSF) first coined the term STEM in 2001(Rogers & Hallinen, 2015). This organization had used the term SMET before when they had to refer to the professions that combined the skills and knowledge of these four fields. The term was then rearranged to STEM by the U.S. national biologist Judith Ramaley, the assistant director of the U.S. National Science Foundation. After that, STEM began to rise in popularity in other different countries like the U.K., China, Australia, Japan and Europe (Rogers & Hallinen, 2015).

1.5.3 Different Eras of STEM

1.5.3.1 The Sputnik Era

The Sputnik era is named after the Russian satellite Sputnik was launched into space in 1957 (Marick, 2018). This was the start of the road toward the growth of areas such as technology, science and innovation in the U.S. After these efforts, Americans felt brave and thus, they increased their efforts to become world leaders in STEM.

1.5.3.2 NASA

In 1958, the U.S. President laid the foundation of NASA, the National Aeronautics and Space Administration agency (Marick, 2018). This agency was formed for the space program of the U.S. After the regime of Eisenhower, John F Kennedy took office and he strived for efforts in STEM. He was the one who sent the first-ever U.S. national to the moon, along with other famous accomplishments.

1.5.3.3 The Era of 1970s to 1980s

As reported by Marick (2018) the efforts toward STEM continued in these eras and many national science programs were started so that more advancements could be made in the area. The very famous achievements in the area of science and technology in the 1980s were the inventions of the first-ever phones, the invention of the permanent artificial heart, the first-ever launched space shuttle and the invention of the first-ever computer by Apple.

1.5.3.4 The Era of the 1990s

In this era, numerous education institutes were established, namely the National Council of Teachers of Mathematics and the National Science Education Standards, so that these councils could help U.S. academicians in the classrooms and follow the curriculum guidelines so that the students are better prepared for STEM. The SMET term was coined to define this era, but then this term was changed to STEM in 2001, as cited by (Marick, 2018).

1.5.3.5 The Era of the 2000s

Many efforts were made to make students more proficient in STEM in this era. A report published by the U.S. National Academies of Science, Engineering and Medicine stated that students of America lacked proficiency in STEM areas compared to other lands. In the year 2009, Obama, the President, started an innovative initiative to educate students in STEM areas and ensure that U.S. students come in the top 10 in areas of STEM (Marick, 2018; Obama, 2010).

1.5.4 Theories on Which STEM Is Based

Theories formulated by the known Russian psychologist and educator Lev Vygotsky currently range from being applied and celebrated across multiple contexts to being considered outdated (Vasileva & Balyasnikova, 2019). Vygotsky's theory introduces and employs pedagogical terms such as constructivism, a popular concept in teacher education programs (Hyslop-Margison & Strobel, 2007). Constructivism is an approach that encourages students to build their knowledge. Proper application of this term in STEM classes will result in the positive experience students require to be passionate about STEM learning. Students socialize in various ways in constructivist classrooms because learning occurs in groups rather than individually. They actively collaborate to solve problems, test hypotheses, investigate, discuss debate and even create unique learning experiences. Although students are at the center of all activities in class, the teacher's role is still critical in the learning process.

The teacher's primary role in constructivist classrooms is to create an appropriate learning environment that promotes student learning and cooperation within the classroom. Most of the time, he or she takes on the mentor role and guides students until they achieve their learning objectives. Without this mentoring, learners cannot independently achieve their learning objectives or pass the old experiences.

1.5.5 Different Approaches of STEM

In this section, four approaches or ways that led to the development of STEM are presented. They are the Pathed approach, the integrated approach, the continuum approach and the STEAM approach:

1.5.5.1 Pathed Approach

According to this approach, there is no integration the four different pathways of S-T-E-M are independent (Mpofu, 2019). In this way of teaching, the focus is on independent subjects without combining them and studying their relevance. In this approach, normal science subjects like Biology, Chemistry and Physics are taught along with Math, Engineering and Technology (Mpofu, 2019). This approach stresses those subjects such as engineering and technology that were not included in the schools' curriculum should also be included.

1.5.5.2 Integrated Approach

In this approach, there is integration and the teachers must deliver knowledge, skills and information by combining everything as one function (Mpofu, 2019). Therefore, the interactions between the teacher and student are of immense importance here so that the collaboration between them can lead to efficient knowledge delivery. Mpofu (2019) added that in this approach, the teaching process is in the way subjects intersect, for example, Mathematics in Science areas and scientific theories in Mathematics.

1.5.5.3 The Continuum Approach

This approach is a combination of both the pathed and the integrated approach. It has four levels. Level four is considered the highest and most integrated (Mpofu, 2019). Level 2 and Level 3 in this approach are known as the connected and the complimentary levels, respectively. In the first level, as mentioned in the pathed approach, all subjects are taught separately along with traditional science subjects, but engineering and technology are included. In level four, everything taught is integrated, as cited in the article Top 6 Advantages of traditional education (UOTP Marketing, 2022).

1.5.5.4 STEAM Approach

STEAM integrates all the STEM components while also incorporating the arts. These initiatives combine creative expression with science-based research. The STEAM approach is the last STEM approach before STREAM; the A here stands for art to be STEAM, so art is also included in this approach as one cannot understand science and Mathematics without understanding simple arts in order to promote the affability of STEM. It was added as art cannot be separated from the reality of life. The main art areas include music, acting, theater, dancing and the visual arts (Mpofu, 2019).

1.5.6 The General Start of STEM in the UAE and Other Countries

Science, Technology, Engineering and Math (STEM) are all included in the curriculum. It is intended to be a complete method, with educators aiming to include some or all STEM components in each lesson rather than teaching each subject separately. Although there are almost unlimited possibilities, typical STEM projects include building bridges and elementary computer programming. The general goals of STEM are to increase STEM literacy and participation and to strengthen the STEM workforce by increasing the number of students who pursue a career in a related field, though the specific goals of each school's STEM program may differ. Many nations have incorporated the STEM approach into their educational curricula.

A study in Taiwan, for example, sought to investigate the effects of Problem-Based Learning (PBL) strategies on female senior high school students' attitudes toward integrated knowledge learning in Science, Technology, Engineering and Mathematics. Data and information about the STEM internet platform, an attitude scale and interview content were gathered for the analysis. The study's findings show that (PBL) strategies can help improve students' attitudes toward STEM learning and exploring future career options. The (PBL) teaching strategy assisted in leading students systematically toward completing the contest's mission and experiencing the meaning of integrated STEM knowledge. The study revealed that students not only can actively apply engineering and science knowledge, but they also tend to gain more solid science and Mathematics knowledge through STEM learning in (PBL) and that (PBL) can enhance students' abilities and provide them with experiences related to knowledge integration and application (Lou et al., 2011). Turkey created the STEM competencies assessment to improve multidisciplinary assessment frameworks (Arikan et al., 2020). Furthermore, the United States trained 100,000 new instructors in Science, Technology, Engineering and Math (Obama, 2010) as cited by (Mubarok et al., 2020, p.02).

In 2010, STEM education was mainstreamed in the UAE when different institutes included the next generation science standards in the syllabus, making it the central part of STEM education in UAE (Al Murshidi, 2019). The vision for UAE in 2021 was introduced in 2010 and education was a primary focus of it so that the students become the best in all fields, such as natural Sciences, Engineering, Mathematics and Technology (STEM) (Al Murshidi, 2019). The vision aimed to put a strategy in place motivated by innovations in science, research and technology instead of growth fueled by investment. The UAE government launched a national innovation strategy in 2015 and an artificial intelligence strategy in 2017. These strategies were focused on practices regarding innovation in education and research in different areas of science.

STEM education in the UAE is held necessary both for schooling and business purposes as this proved to be the best way for individuals to get a ‘‘hands-on’’ experience and learning and to prepare them for excelling in this field (Knowledge Hub, 2021). UAE has different STEM and STEAM labs all over the country, a variety of curriculums and programs for individuals in schools who wish to pursue a career in one of these subjects. These programs have been crafted after careful deliberation and understanding of how important, it is for children to learn about science and technology from a young age and how to apply these concepts in real-life scenarios. STEM camp is also a widely known concept in UAE, where students are taken on field trips and workshops are held so students can learn these concepts in a light environment. These subjects are included with the traditional subjects and taught to students in an engaging way, so students do not get overwhelmed. This education remains fun for them instead of boring (Knowledge Hub, 2021).

The STEM labs in UAE are devised in a way that children gain essential skills from a young age. It promotes communication; these skills are the most critical skills for children to develop to have a smooth conversation with others. It enhances collaboration skills. Therefore, children can work with others in a team in a productive manner. It again enhances critical thinking skills, finding new ways of doing and seeing things differently. It calls for creative skills to get unique ideas and concepts for boosting innovation (Knowledge Hub, 2021).

1.5.7 Framework and Domains of STREAM

This section discusses the main framework and domains of STREAM as per the MOE STREAM project structure. The six domains that the study is based on are teachers' professional knowledge in STREAM, teachers' instructional planning in

STREAM, instructional delivery of STREAM curriculums, learning environment of STREAM, assessment in STREAM and teachers' professionalism in STREAM. These domains are the factors of the survey and interviews, in which the study collects data about the teachers' and the lead teachers’ perceptions of these domains applications and their role in enhancing teaching, learning and professionalism in ESE schools.

1.5.7.1 Teachers' Professional Knowledge in STREAM

Teachers' professional knowledge in STREAM is essential to enable them to be innovative and creative in teaching. For many decades, scholars have focused on what a teacher needs to know and do to teach specific disciplines effectively. The significant knowledge required for effective STEM teaching has gained prominence because of the global STEM education movement. Furthermore, it is assumed that teaching STEM requires teachers to teach in a completely different manner (Chan et al., 2019). The researcher studied the theoretical framework for analyzing STEM teachers' practical knowledge. It investigates the synthesized literature on STEM education and teacher knowledge to identify aspects of teacher knowledge required for effective STEM teaching.

According to a study by Zsoldos-Marchis and Ciascai (2019), two-thirds of the respondents believe that STEM activities must incorporate reading and the arts. Only 39% of respondents believe it is challenging to organize integrated STEM, STEAM and STREAM programs at the preschool and primary school levels (Zsoldos-Marchis & Ciascai, 2019). The effectiveness of the teachers' faith and their stressed importance on STEM directly influence the readiness of students to interact with and implement the STEM syllabus and programs. It has been researched that those students cannot learn much if the teacher's knowledge is not expansive and cannot make the students understand the curriculum (Margot & Kettler, 2019). Teachers with insufficient information cannot contribute with their hundred percent capacity to the STEM activities in the classroom. However, teachers with the right skills and enough knowledge have a high productivity level in the classroom and are effective (Margot & Kettler, 2019).

Teachers' concepts about the importance of STEM are directly related to their capability to learn and develop their abilities as STEM instructors. It means that those teachers who perceive STEM to be critical will reportedly have a better outlook on the curriculum and thus, their responses in the classroom. (Margot & Kettler, 2019). It has been reported that teachers face some challenges while incorporating STEM activities in the classroom. These occur when they must integrate different subjects to teach them in relevance with another, for example, by combining Science and Mathematics. To eradicate these challenges, teachers joined training programs and professional development programs so that their resistance to the STEM activities decreases and they become accustomed to them (Lee et al., 2019).

On the other hand, some teachers think that STEM is essential for students to learn and should be integrated into the curriculum. Teachers believe that STEM should be added to the K12 education of the students. They believed that STEM increases the student's scientific literacy after they finish secondary school. They evolve into students who are better able to think critically about different issues and implications in their personal lives and other areas (Margot & Kettler, 2019).

STEM education brought new disciplines, knowledge and educational pedagogies. It presents excellent practices of modern-day sciences and necessities. It explains how STEM might be able to support future development (Dickson et al., 2019). A study by Anabousy and Daher (2022) explains how the prospects of teachers' demonstrating the design of STEAM bring details on the collaboration of STEM activity. This can create experiences that will inspire elementary school teachers and students. The introduction to STEM's professional development program was the setting for these designing experiences. The results demonstrate several potentials for STEM education (Anabousy & Daher, 2022).

1.5.7.2 Teachers' Instructional Planning in STREAM

Planning is fundamental for any successful lesson; meanwhile, STEM education in interdisciplinary settings is becoming more popular to engage students in authentic tasks that promote innovation. However, concerns have been raised about the impact of interdisciplinary curricula (Tytler et al., 2019). Discussions have emerged in recent years highlighting the importance of STEM education in developing discipline knowledge as well as a range of capabilities, skills and dispositions that are aligned with the needs of young people functioning productively and ethically in dynamic, complex and challenging future work, social and political environments. This combination has been dubbed STEM literacy and is viewed as a desirable outcome of STEM education programs. However, knowledge of how this can be developed in K-12 schools is limited. Providing practical guidance for school-based STEM education planning and implementation is essential (Falloon et al., 2020).

Instructional planning is essential not just in STEM programs but in all other educational programs. Creating an instructional plan is a process that is not just creative but critical too, as teachers must use a varied range of strategies to make sure that the students remain engaged, their performance is being assessed and they are better learners and able to understand the concepts (Chalk, 2020). Instructional planning means that when teachers will enter their classrooms, they will be well prepared for the STEM activities and they will not have to think on the spot about different concepts and ideas to start a discussion. Without a plan, not only will the teachers be lost, but the students will also be unaware of the direction the lesson will go (Chalk, 2020). How can teachers be trained to teach STEM-focused curricula? Hill et al. (2020) examined a recent wave of robust new studies on STEM instructional enhancement initiatives to answer this question.

Hill et al. (2020) discovered that the training programs that focused on developing information for instructors to utilize during instruction function best. These data included the analysis of resources used for teaching STEM, teachers’ expertise in each subject of STEM and their understanding of how students can learn them better. Such learning patterns will bring new opportunities to help instructors, enhancing their professionalism and teaching skills, perhaps by being assisted in making more informed in-the-moment of teaching assessments (Hill et al., 2020).

Nadelson et al. (2013) stated that in primary schools, students develop their core understanding of major basic subjects, so it is better to integrate STEM in that phase. Contrary to popular belief, many primary instructors have little background concepts, confidence and ability to teach them, which may impede students' learning of those subjects. The authors developed and conducted a development program for K-5 teachers to improve their confidence, approach, knowledge and efficacy in inquiry-based teaching STEM. The link between STEM teacher preparation and student accomplishment inspired the authors' professional development program. The authors discovered specific gains in pre- to post-institute measures of teachers' teaching attributes and collected data from two independent cohorts Furthermore, they discovered greater participant interest in connecting STEM curriculum and training to integration requirements implementations and recommendations for future study areas to be covered (Nadelson et al., 2013).

1.5.7.3 Teachers' Instructional Delivery of STREAM Curriculum

It is now commonplace to say that relationships between Science, Technology, Engineering and Mathematics disciplines are strengthening, permeating the workplace and creating new demands for solving day-to-day work-related problems. Discussing the incorporation of STEM practices into the curriculum and highlighting approaches to developing a conceptual framework that may aid in teaching and integrating STEM concepts. The purpose is to contribute to ongoing discussions among educators, employers, parents and everyone interested in teaching and integrating STEM concepts and curriculums (Asunda, 2014).

A study by Vasquez et al. (2013) mentioned that S.T.E.M. supporters claim that it can improve student learning and lives as well as global economies, as S.T.E.M.'s promise has gained enough confidence that several countries have adopted it. Through mandates and funds, it has begun to implement its ideas. If S.T.E.M. is a viable answer for future learning, design and technology, educators must investigate how S.T.E.M. concepts should be incorporated into their curriculum they aim to demonstrate the S.T.E.M. education methods and their applications within a technical education course (Vasquez et al., 2013).

A study on Canadian STEM teachers by DeCoito and Estaiteyeh (2022) investigated the Canadian subject teachers who experienced remote schooling during the pandemic of COVID-19. The authors used the TPACK framework and self-efficacy theory to examine curriculum production and implications in virtual contexts, testing methods and their results and instructor perceptions of student results DeCoito and

Estaiteyeh (2022). Their findings demonstrate that instructors used a range of platforms and that engagement and user-friendliness were key considerations when choosing a platform. Educational staff prioritized curriculum goals and subject matter over creative and student-centered instructional approaches (DeCoito & Estaiteyeh, 2022). Two popular teaching techniques are recorded audio and visual lectures and the integration of self-teaching via Self-Directed Learning (SDL), in which students must go through assigned tasks to perform on their own.

Ismail et al. (2022) stated that according to earlier studies in STEM education, almost every learner strived hard to link the knowledge they learned at school with their professional life. Their developed skills were not adequate for the professional field. It made the application of their abilities hard enough to bring desired results. Because they could not recognize STEM as a set of interconnected disciplines, they also believed that STEM lectures were inflexible, dull, unchanging and only applicable to a small set of topics. Six school science students from classes of six to eight were chosen as a study group for this study, which examines the students' perspectives on STEM lessons. The informants' perspectives on STEM lessons were investigated through semi-structured interviews. According to the study's analysis of the interviews, STEM instructors' instructional approaches continue to emphasize a teacher-centered approach and getting pupils ready for tests (Ismail et al., 2022).

A teacher can become a better STEM instructor and efficiently deliver a successful STEM class in some ways. These methods are mentioned below:

1.5.7.3.1 By Connecting the Classroom with the Outside World

People are working towards solving global problems with STEM. Teachers can incorporate the same problems in the classroom and ask students to bring solutions by thinking out-of-the-box solutions (Thimble Online, 2020). Learning in this century emerges from new reforms of cultural diversity and social values of digital knowledge and represents a considerable transition from traditional information access to problem solving. Instead, modern work settings focus on managing complex information streams in conjunction with sophisticated ‘settling down a problem’ activities requiring competence from different STEM study cultures (Jamaludin & Hung, 2017).

1.5.7.3.2 Regularly Engage with Other Teachers for Proper Planning

Stohlmann et al. (2012) mentioned in their journal that the quality of S.T.E.M education is critical for students' long-term learning. The skills, expertise and training educators need to teach in inclusive S.T.E.M. education successfully need more investigation and discussion. Integrated education with S.T.E.M. subjects is one approach to making schooling more relevant and linked. The study shows a middle school collaboration with S.T.E.M. for 365 days and the results disclosed the establishment of support, teaching, efficacy and resources for the S.T.E.M. model of concerns. Teachers may use the S.T.E.M. model to help them adopt and enhance integrated S.T.E.M. instruction (Stohlmann et al., 2012). S.T.E.M. teachers do not have to do everything on their own. They can coordinate with all other teachers and then develop a lesson plan. This reduces the burden on each teacher (Thimble Online, 2020).

1.5.7.3.3 Ask as Many Questions as Possible

Asking questions to guide and help solve a problem is part of STEM education, for encouraging students to think critically, teachers should ask as many questions as possible to their students. This refers to asking philosophical questions in which students must use critical and creative thinking (Thimble Online, 2020). At the same time, Blank and Covington (1965) claimed that asking questions is a vital part of all problem-solving. When the information in the problem description is inadequate for resolution, questions may be aimed at gathering the needed information (Blank & Covington, 1965, p. 22). At the same time, a study by Burton et al. (2022) investigates the link between the action of STEM lesson planning and the effective dispositions of elementary teacher candidates. After taking part in an online STEM session, teachers' affective attitudes toward STEM education and lesson design were evaluated. Inductive analysis was used to code answers to questions about affective dispositions, which are the subject of this article. The following themes were recognized as having favorable attitudes: confidence, using inquiry and open-ended inquiries and teaching integrated STEM. The statistics indicate that while learning, witnessing and preparing for STEM classes can be valuable experiences for professional development, more work must be done to link instructional behaviors with affective dispositions connected to STEM education (Burton et al., 2022).

1.5.7.3.4 Use Flipped Classroom Teaching Methods

Students will be aware of any idea or concept at home by watching a video or reading an article. When they come to school prepared with all their questions, they can do any activity in a group or alone so that teachers can have more time for instruction (Thimble Online, 2020). Aspridanel et al. (2022) investigated how teachers view STEM-integrated E-Modules in flipped classrooms to enhance students' capacity for creative thinking. Fifty junior high school science teachers took part in the research, which was done in the Indonesian province of Lampung. Sequential Explanatory Design is a qualitative and quantitative methods approach employed in their study. Data were obtained via a questionnaire and descriptive analysis was used to examine the results. The poll results demonstrate that instructors see the STEM approach favorably. The analysis also demonstrates that most teachers have not implemented the STEM method in teaching science in their classrooms. Additionally, teachers have not used educational resources integrating STEM (Aspridanel et al., 2022).

1.5.7.3.5 Project-Based Learning for Students

Project-Based Learning (PBL) for Students is a method that will motivate students to learn and apply skills by becoming a part of a project. The students will work on a project by researching and finding a solution to any problem or query they might have encountered (Future Learn, 2021). Examples of this learning could be, for example, creating a sample of a real-life project, designing a website or an app, or creating model. In an article by Owens and Hite (2022) titled "Enhancing student's STEM communication competencies using virtual global collaboration Project-Based Learning (PBL)". They suggested that teaching faculty must deploy such pedagogies that will bring up students' verbal, professional and working skills to prepare them for globalization. In the world of global interactions, online zoom meetings (hereafter, global PBL) will offer students an exceptional pathway to practice verbal communication and professionalism through their learning by utilizing videoconferencing and Learning Management System technologies, bridging classrooms internationally, Project-Based Learning (PBL) has shown success in improving students' communication skills. However, to what extent global PBL has synergistic benefits in enhancing students' STEM communication abilities is unknown.

These results of the concepts of the teacher and research analyses presented that the global PBL enhanced students' capacity to communicate and comprehend ideas, express those ideas using a variety of representations and be more open to viewpoints other than their own. This study concluded that using global PBL as a teaching tool can help STEM teachers in grades K–12 strengthen their students' communication skills (Owens & Hite, 2022).

1.5.7.3.6 Problem-Based Learning for Students

Problem-Based Learning (PBL) for Students, this method is like project-based learning. However, the main difference is that in this method, the students are provided with a problem from the start and do not have to research it. They must analyze this problem and get a solution for it. Therefore, this method requires a high concentration level from students and encourages them to work in teams and groups to collaborate and solve problems (Future Learn, 2021).

Su and Chen (2022) have a study examining the development of interdisciplinary learning notions and the efficacy of case study-based learning in STEM teaching materials for students. Thirty-five learning efficiency assessment items were developed for the STEM tool with the help of five specialists who also helped with their substance, interface, construct validity and consistency. The Taiwan University of Technology's entire student body participated in this study. The before and after quantitative test analyses showed that most students had improved their STEM cognitive skills for (PBL) and had a capacity for logical thinking in the classroom. A descriptive statistical examination of similar STEM-related studies showed that learners demonstrated positive thinking skills for integrating the interdisciplinary (PBL) and STREAM into critical knowledge. The results had implications for STEM cognitions in a (PBL) educational setting to increase their practical proficiency in baking class (Su & Chen, 2022).

Another study by Anggraini et al. (2022) aims to ascertain the impact of implementing the Problem-Based Learning (PBL) approach for environmental teaching resources based on the local South Sumatra reality on students' environmental literacy abilities used in STEM subjects. Quasi-experimental design using nonequivalent is the name of the procedure. Students from Biology Education Study Program served as the research subjects. Using a questionnaire, the data analyses were carried out and it was improvised according to local teaching resources in South Sumatra. Finally, the study concluded that the (PBL) learning approach impacts raising students' environmental literacy levels (Anggraini et al., 2022).

Another study by Sumarni et al. (2022) intends to investigate how creative thinking can lead to the development of problem-solving skills and examine the impact of using intellect-based learning with a STEM approach in understanding the culture (STEM-PBL-local culture). Their study uses an experimental design with an unequal test group for the data collection before and after the test. Purposive sampling was used to choose 72 future teachers who took introductory chemistry courses at teacher training schools. Authenticated open-ended questions make up the exam instrument. An impartial t-test was utilized in the data analysis. Pearson's product-moment correlation test is performed to learn about the relationship between creative thinking and problem-solving skills. According to the study, the experimental group got STEM-PBL-local culture. Their students visualized a better space in the medium category of their ability to think creatively and solve problems. In contrast, the control group improved less. The Pearson product-moment correlation test demonstrates a significant association between problem-solving abilities and creative thinking with a high degree of correlation (Sumarni et al., 2022).

1.5.7.3.7 Inquiry-Based Learning for Students

Lupión-Cobos et al. (2022) study offered an inquiry-based teaching paradigm incorporating STEM. In this method, the student's central role in the whole learning proves that they are motivated to inquire as far as they want on a specific topic. This way, students can develop many skills (Future Learn, 2021). Students, instructors and experts discuss the teaching pattern situations that reflect the educational activities, associated scientific knowledge and student competencies. They examined how teachers and students perceived how students' STEM learning was progressing. They draw findings and make contributions to the teaching of STEM subjects through the way of incorporating design teaching and building relationships with student's interests and motivations, such as causal relationships of content or the professionalization of teachers supported by allocation between scientists and teachers (Lupión-Cobos et al., 2022).

1.5.7.4 Student Learning and Learning Environment of STREAM

Providing a suitable learning environment for STEM education is essential to promote innovation and creativity in students' learning processes in a novel way. The STEM learning environment is the practice of students' class problem-solving. They solve the problem by combining two or more STEM disciplines (Rusydiyah, 2021). Student learning is maximized in STEM classrooms due to out-of-the-box activities and critical thinking. The integration of STEM activities in high school supports students. When they graduate, they become literate enough in Science, Engineering and Mathematics not to have difficulty getting started in the STEM areas. The method in which STEM subjects are incorporated, how concepts from other non-STEM disciplines are introduced, the length of the integrated STEM learning episode and the purpose of the learning that occurs within a STEM integration environment have an impact on how STEM integration is described and used (Bussey et al., 2020, p. 03).

There are several steps that institutes can take to ensure a conducive learning environment. For example, setting up a formal room for STEM activities, these activities are primarily done in small groups. Teamwork and communication are boosts between the children fostering a healthy learning environment. Promoting the use of technology in classrooms is another essential component of learning in STEM. Students can use technology to gather data and research different topics, creating a perfect environment to brainstorm and gather data. Giving students different challenges and learning STEM subjects from the start as it is better to give them those STEM challenges since they are naturally curious and will pose questions that will broaden their minds. It could be solving a problem or having a new project (Fischer, 2017).

1.5.7.5 Assessment in STREAM

Assessment is needed to find out about the skills that students acquire or to judge their final product. Developing valid and reliable assessments of interdisciplinary learning in STEM has proven difficult. A study by Gao et al. (2020) thoroughly examines the assessment of interdisciplinary STEM education over the last two decades. They utilized an initial library of 635 articles focusing on interdisciplinary STEM education that yielded 49 empirical research articles. To examine the literature, they created two-dimensions. The first dimension concerns the nature of the evaluated disciplines and is divided into monodisciplinary, interdisciplinary and transdisciplinary. The second-dimension concerns learning objectives, which are divided into four categories: knowledge, skill, practice and effective domain. The findings show that most assessments focused on monodisciplinary knowledge, monodisciplinary effective domains and transdisciplinary effective domains. They added that many programs aimed to improve students' interdisciplinary understanding or skills, but their assessments did not match. Based on their review, future directions for developing assessments for interdisciplinary STEM educational programs are proposed.

The students retaining assessments in STEM classrooms are of immense importance in determining whether the lessons are delivered in the right way. STEM education has attracted more and more attention. Nevertheless, creating accurate and rigorous assessments of transdisciplinary learning in STEM has proven difficult. In their essay, Gao et al. (2020) explained that assessment is a conscious attempt to monitor student learning through various techniques to assess where each student is concerned with one or more particular learning outcomes (Gao et al., 2020). STEM education is one of the most effective strategies for enabling children to be self-regulated learners. Students are given several opportunities to refine their thinking in STEM education classes (Anwari et al., 2015).

1.5.7.6 Teachers' Professionalism in STREAM

Teachers' professionalism in STREAM when applying STREAM classes is crucial. Facilitating teaching and learning across STEM fields requires high professionalism from the teachers’ side. Teachers’ professionalism in STEM arises from the reformation of content for instruction across STEM fields that has shifted STEM educators' roles in the classroom from “dictator” to “facilitator” of students' activities (Ejiwale, 2012). More importantly, this new paradigm and professional orientation for

STEM educators is not limited to intuitively delivering instruction but also to effectively facilitating students' activities. In this regard, the STEM educator must now take on the role of creating effective educational environments for learning and teaching. This is aided by an instructional strategy and delivery that integrates various students, strategies, technologies, societies and subjects (Ejiwale, 2012).

Teachers are among the essential sources of the most up-to-date scientific knowledge. Nevertheless, many believe that teachers do not have the knowledge and abilities necessary for this position, especially in STEM fields, as STEM is connected to many different academic fields (Saat et al., 2021). Teachers' professionalism in STEM means they have all the required skills, knowledge, practice and experience to become educators of STEM education. The teachers should have enough knowledge and proficiency in the subjects they teach. This means that they are ready to learn new teaching methods and adopt new ways of grasping the attention and better understanding of the students, as this will lead to students becoming attentive in class. This also means that teachers can better respond to the student’s queries.

The success rate of STEM programs is directly proportional to teachers' concepts. If they have positive perceptions and strong attitudes, their response toward the STEM programs will lead to the children excelling in this area. STEM education has seen significant modifications recently (Dare et al., 2019). A conceptual model of a specific phenomenon is part of defining that phenomenon; in this case, the subject under investigation is STEM education. Models and visualizations have long been regarded in education as a tool for students to reflect on their knowledge. A conceptual model is an individual's understanding of an idea, phenomenon, or system (Struyf et al., 2019).

Tripon (2022) mentioned in a study that aimed to investigate how STEM teachers emotionally constructed professional identities because of STEM education reform. He mentioned that STEM education is becoming increasingly important in China and worldwide, adding that there is a deep understanding of STEM teachers’ emotions and professional identities is required to keep up with the rapid development of STEM education (Tripon, 2022).

1.6 Summary of Chapter One

In this chapter, it was clear from studying the literature and going through the development of STEM in different eras that it went through many different stages to reach what it is like now. Teachers should clearly understand the importance of STEM for future generations in schools. Moreover, because students are society's new reality and instruments of social change, it is vital to educate them with learning that gives them information and abilities but also changes their views and actions regarding ecological preservation (Nguyen et al., 2020). Innovation and entrepreneurship are rapidly altering the globe and leading to a drastic shift in learning. This study fills the gap from previous studies about the challenges and suggestions for better applications of STREAM in the UAE context by investigating teachers' and lead teachers' points of view and perceptions.

The main domains on which the study is built upon are the six domains of the STREAM framework from MOE. Namely, they are professional knowledge, instructional planning and instructional delivery of curriculums, learning environment, assessment and teachers’ professionalism in STREAM. Together with the two constructivism theories (Piaget's cognitive constructivism and Vygotsky's social constructivism) and the four STEM approaches, STEM has been through (the Pathed approach, the integrated approach, the continuum approach, the STEAM approach); this study takes its significance from being the first of its type about STREAM in the ESE schools within the Emirati context. It highlights the research gaps in the participants’ perceptions regarding the STREAM impact on teaching, learning and professionalism to provide evidence-based knowledge suggestions to improve future STREAM practices. The next chapter will explain the methodology and data collection different stages to answer the research questions that guided the study by analyzing the collected data and getting a clear vision of teachers and lead teachers’ perceptions of the STREAM approach and its impact on teaching, learning and professionalism in the ESE schools.

Chapter 2: Methods

2.1 Research Design

This study is guided by three research questions as follows:

RQ 1. What perceptions do teachers and lead teachers have about the impact of STREAM on enhancing teaching, learning and professionalism?

RQ 2. What impact do different demographic variables have on teachers' perceptions of the STREAM domains?

RQ 3. What obstacles do teachers face when applying STREAM inside the classrooms?

In order to answer the research questions, the study utilizes a mixed concurrent research method, qualitative and quantitative, that includes surveys and interviews with public teachers in the UAE's Emirates Schools Establishment (ESE). When doing qualitative and quantitative methodology research, a concurrent design is a methodology that demands the gathering of data concurrently or parallels within the same study, with a single method, either qualitative or quantitative dominating. In a single or multiphase study, these approaches entail collecting, analyzing and integrating quantitative and qualitative data (Hanson et al., 2005).

The Mixed Methodology (MM) is a rising star in the field of social science. Many researchers are dissatisfied with mono-method conceptions for their research endeavors. They are experimenting with new ways of mixing or integrating various procedures and methodological approaches (Mayring, 2007). Mixed-Methods sampling (MM) involves integrating well-established qualitative and quantitative methodologies in novel ways (Teddlie & Yu, 2007).

The researcher used thematic analysis to analyze the collected data to explore the teachers' perspectives on the impact of STREAM in enhancing teaching and learning in the Emirates Schools Establishment. The researcher created a 5-point likert scale survey as the research tool to gather primary quantitative data on the educators' understandings of the “Impact of STREAM in the enhancement of schooling in the Emirates Schools

Establishment” from the perspective of educators as they recognize STREAM notions and the Ministry of Education's goals and objectives as well as its mission and vision.

The study collects qualitative and quantitative data that were granted ethical approval by the UAE University and the ESE approval to facilitate the researcher's work to collect the needed data at the public schools from the official departments and through formal channels. The quantitative data was collected via the survey done on Microsoft Forms. Statistical tools are used in quantitative social research to analyze observable phenomena (Barth & Blasius, 2021). The survey link was sent to the teachers' emails via the ESE school operation department office. The targeted sample was all the ESE teachers from public schools, those who applied STREAM in the seven emirates to cover the whole country of the United Arab Emirates public schools.

An interview in a concurrent method collected the qualitative data. The researcher emailed 12 schoolteachers and the lead teachers to run the interview. However, only five gave their consent and agreed to have the interview with the researcher, one Arabic teacher, two English teachers, one Math lead teacher and one IT lead teacher. The ethical side was there, as the researcher informed the interviewees that their identities would be anonymous and that the recording would be kept safe. The researcher started introducing himself and the target of the interview. Interviewees were informed that they were free not to answer any questions or stop whenever they wanted. Interviews were held face-to-face at schools.

The correlation between the two instruments (survey and the interview) was intended to consolidate the researcher's knowledge about the realistic opinion and perspectives of the teachers and lead teachers about the impact of teaching STREAM classes on teaching, learning and professionalism. The interviews were done after and during the distribution of the survey. This was done simultaneously to assess the teacher's and the lead teachers' perception face-to-face. The researcher used the answers to the survey questions and the interviews to reach a realistic conclusion about the teachers' perspectives on the impact of STREAM in enhancing teaching, learning and professionalism in the Emirates Schools Establishment.

Primary quantitative data is collected about the teachers' and the lead teachers' perceptions regarding the impact of STREAM on enhancing teaching, learning and professionalism in the Emirates Schools in regard to the Ministry of Education (MOE) vision and mission. The researcher based the investigation on six domains, namely: (1) professional knowledge, (2) instructional planning, (3) instructional delivery, (4) student learning assessment, (5) learning environment and (6) professionalism in STREAM.

The researcher developed a 5-point likert scale questionnaire as the study instrument. The survey was sent to all ESE schools and 462 replies were received from teachers from all school cycles. The rationale for collecting this type of data is to learn about teachers' and lead teachers' points of view and how they perceive STREAM's impact on teaching, learning and professionalism in ESE schools.

The study concluded to the results using Statistical Package for the Social Sciences (SPSS) software v.27, which produced Cronbach's Alpha of the survey, Descriptive Statistics for the categories of all domains and the individual elements. A One-Sample t-Test for the six categories and each element, a sample t-test of independent category, Levane's Test and One way-ANOVA and testing for the variables' normality and other assumptions of the tests (Xu et al., 2017). The value of the Cronbach's Alpha of the 31 items in the survey was $\alpha = .989$, which shows that the internal consistency of the survey is exceptionally high with high reliability between questionnaire variables. One-sample T-test for the six domains and each element was used to find the statistically significant differences compared to a hypothesized population mean equal to three (indicates neutral). The test analysis reveals that the ESE teachers' perceptions of the six domains and their items are positive, indicating that STREAM has a statistically significant impact on teaching, learning and professionalism.

2.2 The Quantitative Data Collection

The survey domains and elements were analyzed using (SPSS) to look at the consistency of the score of individual instrument items later. The United Arab Emirates University professors granted the survey validity. Its reliability was assured by having a pilot survey trial at the researcher's school for each domain and item to ensure its internal consistency. The sample was all ESE teachers; only 462 participants' replies were received on the Microsoft form that was sent via emails to all ESE schools.

2.2.1 The Survey Summary Includes Demographics, Domains and Items

The survey was administered to the targeted public schools implementing STREAM in the UAE. The survey includes six components of STREAM education: professional knowledge, instructional planning, instructional delivery, student learning assessment, learning environment and professionalism. Its statements were determined following the academic and school environment regulations of The Emirates Schools Establishment.

The answers to the questions and statements within the questionnaire will follow the likert scale of five points, including Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree. The number of items was 31. The last two items were close ended, asking about any challenges teachers face in implementing STREAM inside classes and seeking suggestions to overcome these challenges if there were any. The researcher put those two questions to give space and opportunity to write freely about their real awareness and perceptions of STREAM practices, challenges and suggestions. This guided and supported the researcher to dig deep into the teachers' opinions and their actual situation concerning opportunities and challenges they might face at their schools and their ideas and suggestions.

2.2.2 The Survey Content Validity in Two Steps

Psychologists have extensively researched the concept of validity; Kline (2015) determined that “a test is valid if it measures what it claims to measure”. This means the test's validity or acceptance level is high if and only if it produces the desired results. The survey's face validity went through two steps. Step one; three university professors from the United Arab Emirates University read and validated the survey themes. Step two; English native teachers from schools reviewed the survey's clarity and wording as it targeted English speakers as well. One Arabic Coordinator checked the Arabic version for the same aim. Other Teachers, lead teacher's, subject coordinators and the school Academic Vice Principal (AVP) read and proofed the clarity of the survey.

2.2.3 The Survey Reliability

A survey is one of social science research's most commonly used data collection tools. The primary goal of a survey in research is to collect relevant information most reliably and validly possible. Thus, survey or questionnaire accuracy and consistency are essential aspects of a research methodology known as validity and reliability (Taherdoost, 2016). The survey results were analyzed using Statistical Package for the Social Sciences (SPSS) software version 27, which produced Cronbach's Alpha of the survey. The value of the Cronbach's Alpha of the 31 items in the survey was $\alpha = .989$, which shows that the internal consistency of the survey is exceptionally high with reliability between questionnaire variables.

2.2.4 The Survey Population

The survey population is all ESE schoolteachers, including schools that adopt the STREAM program from all cycles as the sample. A sample type is a group of survey participants (respondents) chosen from a wider population. A population is a collection of people, things, or things from which samples are drawn to quantify anything, such as a population of managers, professors, texts, or students (Mugo, 2002). The sample type is a cluster one. A cluster sample is produced using essential random sampling to choose clusters from the population. A census of each randomly chosen cluster makes up the sample (Mugo, 2002). As the researcher chose the ESE teachers in the whole United Arab Emirates public schools to investigate their perspectives on the STREAM project and its impact on teaching, learning and professionalism in public schools, meanwhile the private schools were not included. The sample selection criteria were sending emails to all public schools, the sample size was 462 respondents, the way of communication was via school operations department that sent the emails to the schools and the UAEU granted the ethical consent before sending the emails. There were no incentives for the participants in the interviews. Microsoft form sent via work emails by the ESE research office and the department of school operation and research.

2.3 The Qualitative Data Collection

Research interviews are essential for specialists and researchers because they provide significant advantages in eliciting distinct data and perceptions about the research setting. It is easy to underestimate the difficulties of conducting research interviews, such as obtaining reliable responses, organizing and presenting the findings and avoiding subjective involvement by the researcher (Hannabuss, 1996).

Five teachers and lead teachers were interviewed as a purposeful sample. In qualitative research, purposeful sampling is employed to identify and select cases with abundant information about the topic of interest (Palinkas et al., 2015). Since the researcher selected whom to meet as a purposeful approach to meet English, Science, Math, Arabic and Design and Technology teachers to dig deep and consolidate the survey results in a professional and friendly way, they all expressed their high perception of the importance of using STREAM education daily. They agree that it has a good impact on student learning. The interviews got their validity and reliability from the supervisors and the other college professors from the United Arab Emirates University.

2.3.1 The Interview Questions Summary

Interview questions were more related to the survey nature of investigating teachers' perceptions of using STREAM. There were 13 questions; “1-What does STREAM education look like in your school?” “2-Is the understanding of STREAM education reflected in the content and instructions in your classroom?” “3-How important do you think STREAM education is in the UAE? Why?” “4-Do you think STREAM instills innovative skills in students? How?” “5-How would you describe the STREAM lessons in your school?” “6-Do you think integrating STREAM into existing curricula supports teaching and learning? How?” “7-Using instructional strategies in STREAM classes promotes innovation and entrepreneurship. What do you think of this text?” “8-Do you think STREAM provides meaningful knowledge by integrating study topics? How?” “9-Does incorporating project-based lessons make students more creative and innovative?” “10-What challenges do teachers face when implementing STREAM education? What do you suggest?” “11-Do you think different STREAM activities enhance students' motivation to learn? How?” “12-Do you receive effective professional development support in STREAM Education in your school? Mention any example?" Yet the researcher considered six questions as per the participants' preferences.

2.3.2 The Interview's Face Validity

The interview's validity was done in two steps. In step one, three university professors reviewed the questions and determined their relevance to the topic and the survey. Step two; teachers and lead teachers from schools read the interview questions stating that the statements are clear and not ambiguous: teachers, lead teachers' subject coordinators and Academic Vice Principal (AVP) who expressed their understanding of the interview questions.

2.3.3 The Interview Sample

The sample was purposeful sampling, a form of non-probability sampling in which the researcher relies on his judgment when choosing members of the population to participate in the interviews. Making informed sampling decisions is essential to raising the standard of research synthesis. The published literature has little discussion on the many procedures for purposeful sampling that may be applied to research synthesis, even though some qualitative research synthesizes have advised purposeful sampling for synthesizing qualitative data (Suri, 2011).

Table 1: Overview of Teachers and Lead Teachers of the Interview Sample

Pseudonym	**Gender**	**Subject**	**Role**	**Age**
Ansha	Female	English	Teacher	50
Rishdi	Male	Arabic	Lead teacher	45
Ihsan	Male	Math	Lead teacher	32
Kiram	Male	DTI	Teacher	27
Fahmi	Male	Math	Teacher	25

Table 2 shows the interview sample demographics: the interviewee pseudonyms, genders, the subject they teach, their roles and ages. The sample selection criteria were based on choosing different subjects' teachers and lead teachers. The sample size was five teachers, the way of communication was via emails and the ethical consent was explicit that they may stop any time they wanted or avoid answering any questions they felt like not answering. There were no incentives. The interviews were held face-to-face, recording the two-way questions and answers. There was coding with confidentiality about keeping the recording safe and in a safe place to ensure the ethical considerations are there and provided to the interviewees.

2.4 Summary of Chapter Two

This research aims to investigate and examine the teachers’ perceptions about the impact of STREAM on ESE teachers' and lead teachers' teaching, learning and professionalism. By understanding the teachers’ perceptions, the study will determine the importance of teaching STREAM. The study utilizes a mixed concurrent research method, qualitative and quantitative, that includes surveys and interviews with public teachers and lead teachers in the UAE's Emirates Schools Establishment (ESE). The qualitative and quantitative data collection process was granted ethical approval by the United Arab Emirates University and the ESE approval to facilitate the researcher's work to collect the needed data at the public schools from the official departments and through formal channels. The quantitative data was collected via the survey done on Microsoft Forms. Five teachers and lead teachers were interviewed as a purposeful sample to collect qualitative data. There were 13 questions, yet the interviewees agreed to answer a selection of six questions only. Interview questions were more related to the survey nature of attempting to investigate teachers' and the lead teachers' perceptions toward using STREAM. They were consistent with the study’s six domains as well.

The survey's validity went through two steps. Step one; three university professors from the United Arab Emirates University read and validated the survey domains. Step two; English native teachers from schools reviewed the survey's clarity and wording as it targeted English speakers as well. One Arabic coordinator checked the Arabic version for the same aim. Other teachers, lead teachers' subject coordinators and the school Academic Vice Principal (AVP) participated in proofreading and checking the interview and survey clarity as well. The interview's validity was done in two steps: three university professors reviewed the questions and determined their relevance to the topic and the survey. Step two; colleagues from schools read the interview questions stating that the statements are clear and not ambiguous. They were mainly teachers, lead teachers, subject coordinators and the school Academic Vice Principal (AVP).

Chapter 3: Results

Findings and results are the incredible goals and objectives of any research study. In this chapter, there will be a summary of how the data was collected and the statistical descriptions of them. The interview responses and the survey results of conducting the study. This section addresses the main results of the study. It provides an overview of the main findings and results of the current study.

3.1 Overview of the Main Findings

This study aimed to explore and investigate the participants' perceptions about the impact of the STREAM approach on enhancing teaching, learning and professionalism in ESE schools. The study used a Mixed concurrent Method (MM) to collect qualitative and quantitative data. The main research questions were as follows:

1- What perceptions do teachers and lead teachers have about the impact of STREAM on enhancing teaching, learning and professionalism?
2- What impact do different demographic variables have on teachers' perceptions of the STREAM domains?
3- What obstacles do teachers face when applying STREAM inside the classrooms?

3.2 Profile and Statistics of Respondents

The sample demographics data presents Gender, Qualification or Degree, Teaching subject, Emirate, Years of experience in teaching, Years of experience in conducting STREAM and Training Received in STREAM data, respectively. Figures that represent the relation between the demographics data and the normal distribution to give an impression of the skewness of the data are shown below:

3.2.1 Gender

Figure 1 shows that the sample included the majority of participants who were females (63.2%), while (36.8%) of participants were males.

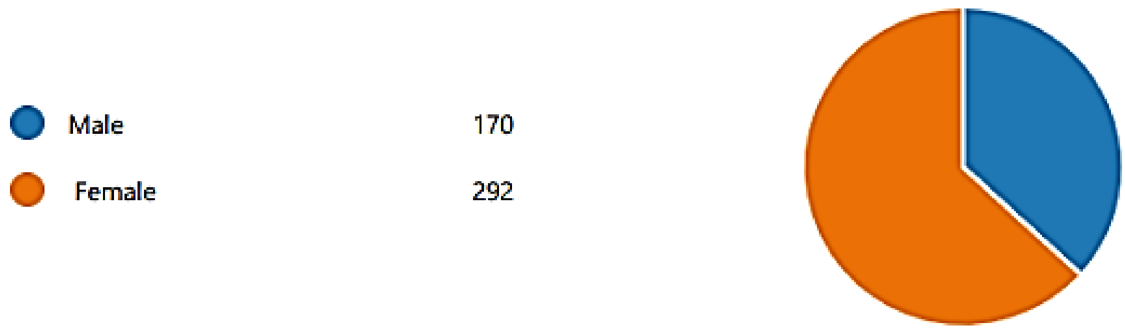

Figure 1: Gender Proportion in the Survey

3.2.2 Highest Qualification

In Figure 2, it is clear that most participants have a bachelor's degree (55%), whereas (33.5%) of the sample have a master's degree, (6.5%) have a Post Graduate Diploma, (6%) have a Diploma and (4.3%) have a Ph.D. / Doctorate Degree.

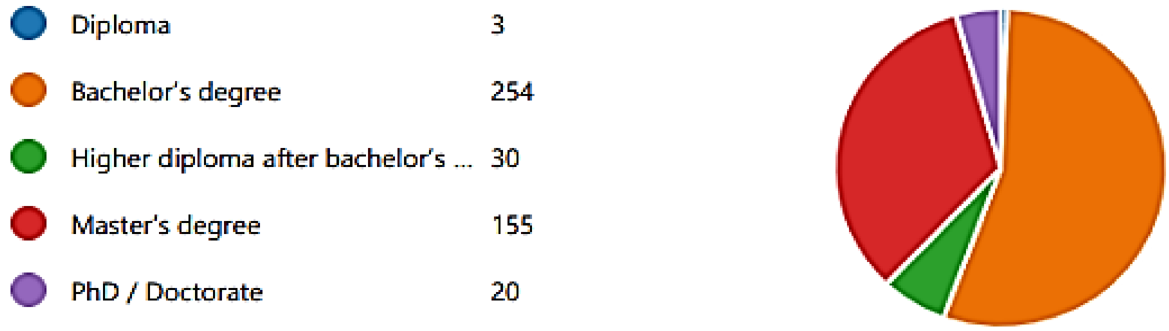

Figure 2: Qualification of Participants

3.2.3 Teaching Subject

Figure 3 shows the highest number of participants were Science teachers (19%), whereas Mathematics teachers (16.6%) and (16.5%) of the sample were English language teachers, (10.6%) were Arabic language teachers, (6.1%) were Design and Technology and (4.8%) were Social Studies teachers. The lowest two percentages were for Islamic Studies teachers (2.8%) and (3.7%), who were Arts teachers.

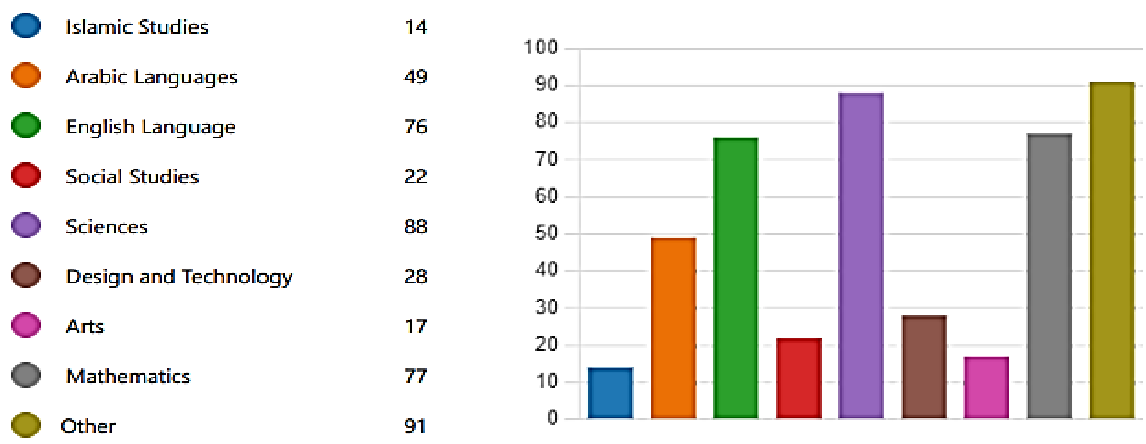

Figure 3: Subjects Taught by Participants

3.2.4 Emirate

Figure 4 shows that the majority (54.1%) of participants worked in Abu Dhabi emirate public schools. While There were participants from the other emirates who participated in fewer numbers; Ras Al-Khaimah (13.6%), Sharjah (10.4%), Fujairah (8.7 %), Dubai (7.4%), Ajman (3.7%) and Umm Al-Quwain (2.2. %).

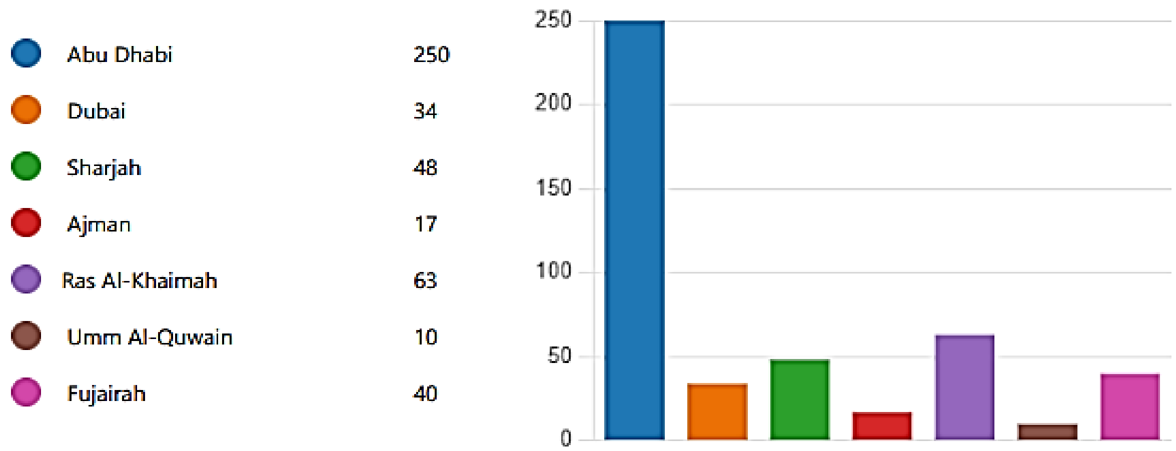

Figure 4: Responses Generated from Different Emirates

3.2.5 Years of Experience in Teaching

Figure 5 explains that the biggest group that participated in the survey had years of experience more than 20 years, representing (28.1%) of the sample; the second largest group was the employees who had between 15 and 20 years of experience (21.0%). (18.2%) of the participants have between 10 to 15 years of experience. The lowest two percentages were extreme cases; (16.7%) of respondents have from 6 to 10 years and (16.0%) of the participants have five years of experience or less.

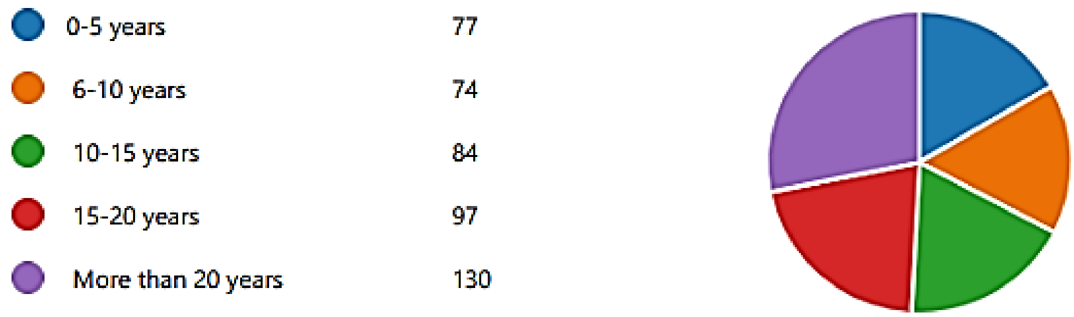

Figure 5: Years of Teaching Experience

3.2.6 Years of Experience in Conducting STREAM

Figure 6 shows that the great majority of participants (84.5%) participated in conducting STREAM between 0 and 05 years. The second largest group was the employees who participated in conducting STREAM from 5 to 10 years (18.8%). The lowest percentage was (8.0%) of respondents with 10 to 15 years of experience conducting STREAM.

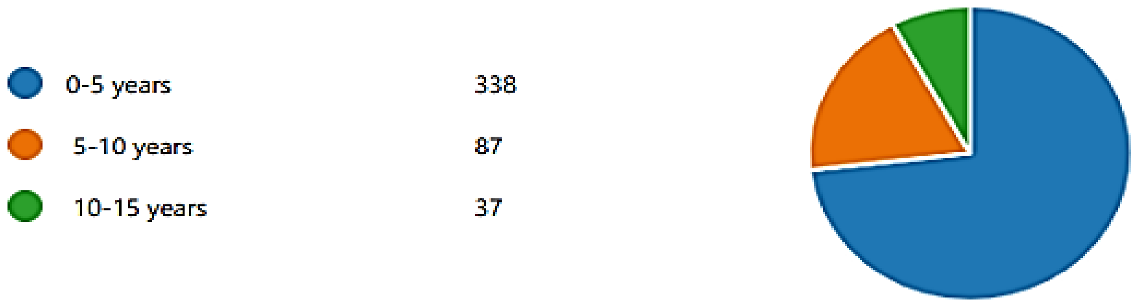

Figure 6. Participants' Years of Teaching STREAM

3.2.7 Training Received in STREAM

Figure 7 shows that most participants have received STREAM training for five years or less and represented 85.2% of the sample. The second group was the employees who had training for 5 to 10 years (9.3%). The lowest two percentages were (3.6%) of respondents who had training for 10 to 15 years and about (1.9%) for participants with more than 15 years of STREAM training.

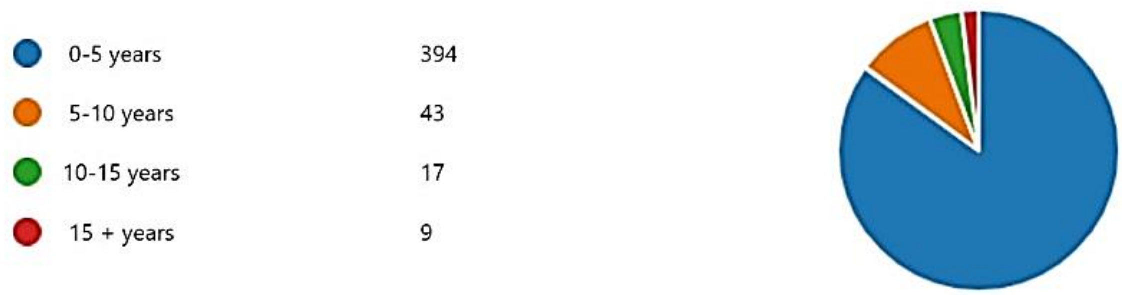

Figure 7: Participants' Years of Training Received in STREAM

3.3 Reliability of Individual Influence Scales

The survey results were analyzed using Statistical Package for the Social Sciences (SPSS) software version 27, which produced Cronbach's Alpha of the survey's six domains and the 31 items.

As Table 2 shows, the value of Cronbach's Alpha of the survey's (six domains) was α = .978, which shows that the internal consistency of the survey is very high with reliability between questionnaire variables.

Table 3: Reliability Statistics for the Six Domains

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.978	.978	6

Table 3 shows that the value of the Cronbach's Alpha of the (31 items) in the survey was α = .989 which shows that the internal consistency of the survey is very high with high reliability between questionnaire variables.

Table 4: Reliability Statistics for the Thirty-One Items

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.989	.989	31

3.4 Descriptive Statistics of the Survey Domains and Items

3.4.1 Overall Average Statistics

The overall average of each of the six domains is higher than four, as displayed in Table 4, which again reflects a tendency towards agreeing with the survey statements indicating that there is high awareness and perception of STREAM's impact on teaching, learning and professionalism of ESE teachers.

The highest mean was in domain one, “Professional Knowledge” (M = 4.2835, SD = 0.72179).

With skewness of -1.41, indicating that the distribution was left-skewed with a long-left tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this domain and with kurtosis of 3.395, indicating that the distribution was leptokurtic, more peaked, or heavy-tailed which means that tends to create more outliers than the normal distribution.

The second highest average was in the fifth domain, “Learning Environment” (M = 4.2527, SD = 0.73336).

Table 5: Descriptive Statistics of the Six Domains

	Mean	**Std. Deviation**	**Skewness**		**Kurtosis**	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Domain 01	4.2835	.72179	-1.414	.114	3.395	.227
Domain 02	4.2291	.71609	-1.298	.114	2.981	.227
Domain 03	4.2464	.70733	-1.288	.114	3.064	.227
Domain 04	4.1758	.74956	-1.287	.114	3.022	.227
Domain 05	4.2527	.73336	-1.413	.114	3.550	.227
Domain 06	4.1593	.74233	-1.261	.114	3.145	.227
Valid N (listwise)						

With skewness of -1.41, indicating that the distribution was left-skewed with a long-left tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this domain and with a positive kurtosis of 3.55, indicating that the distribution was leptokurtic, more peaked, or heavy-tailed which means it tends to produce more outliers than the normal distribution as shown in Table 4.

The two lowest means were for domain six, "Professionalism" (M = 4.1593, SD = 0.74233, skewness = -1.26, kurtosis = 3.15) and domain four, "Student Learning Assessment" (M = 4.1758, SD = 0.74956, skewness = -1.29, kurtosis = 3.02).

3.4.2 Domain One, Professional Knowledge, Statistics

The overall average of each of the six items is shown in Table 5, which explains that it is higher than four, which again reflects a tendency towards agreeing with the survey statements indicating high awareness and perception of STREAM's impact on teaching, learning and professionalism of ESE teachers.

There was a very slight variation in the means of the five elements. Four elements have a mean equal to 4.28. Only the third element has a slightly higher mean (M = 4.29, *SD* = 0.774).

Table 6: Descriptive Statistics of Domain One Items

	Mean	**Std. Deviation**	**Skewness**		**Kurtosis**	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
STREAM instills innovative skills in students.	4.28	.764	-1.283	.114	2.799	.227
STREAM equips students with knowledge for the future	4.28	.759	-1.212	.114	2.400	.227
STREAM provides a meaningful learning experience for students.	4.29	.774	-1.296	.114	2.656	.227
STREAM emphasizes acquiring problem-solving skills.	4.28	.801	-1.366	.114	2.882	.227
STREAM provides interdisciplinary knowledge through the integration of subject matter.	4.28	.792	-1.331	.114	2.738	.227

In general, the skewness of all elements was negative, ranging from -1.21 to -1.37, indicating that the distribution was left-skewed with a long-left tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this domain. Where they have negative kurtosis with values less than three ranging from 2.40 to 2.889, indicating that the distribution was platykurtic, flatter, or slightly tailed, which means it tends to produce fewer outliers than the normal distribution, indicating that most teachers' perceptions were focused on the mean (slightly less or slightly more than 4.28) as shown in Table 5. Figure 8 explains the participants' responses to the items of Domain one, professional knowledge.

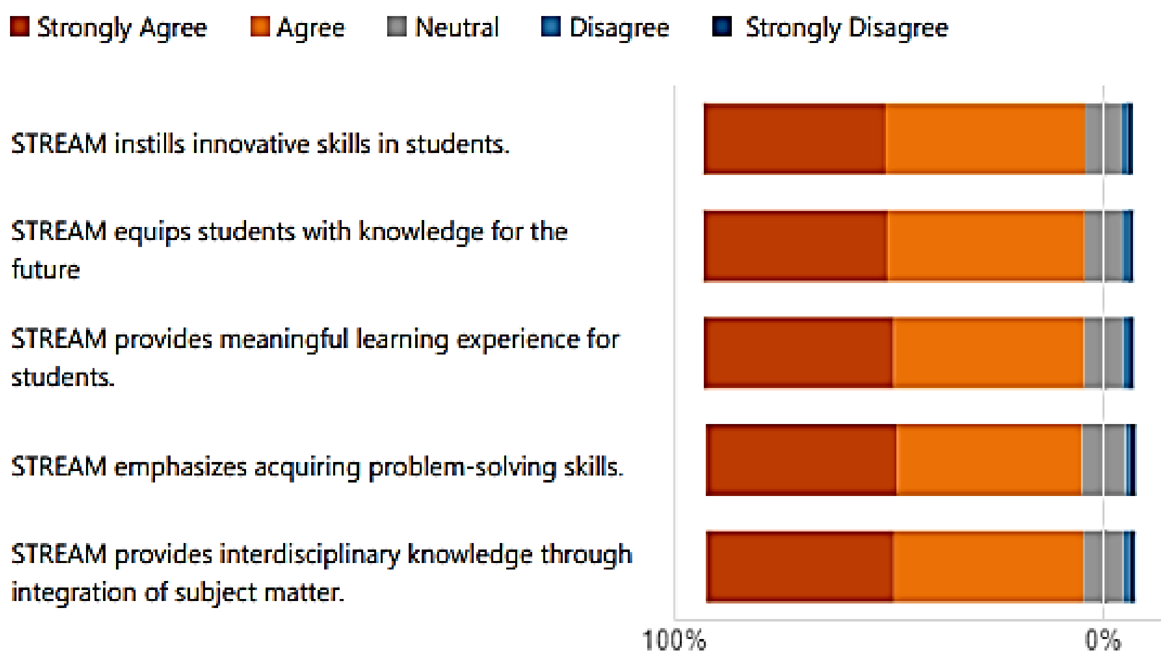

Figure 8: Survey Results for Domain One

3.4.3 Domain Two, Instructional Planning, Statistics

The overall average of each of the six items is higher than four, as displayed in Table 6, which again reflects a tendency towards agreeing with the survey statements indicating high awareness and perception of STREAM's impact on teaching, learning and professionalism of ESE teachers.

The highest mean was in the fourth element, "Teaching real-life, tangible activities enrich students' learning experience" (M = 4.34, SD = 0.751).

With skewness of -1.28, indicating that the distribution was left-skewed with a long left tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this domain and with a negative kurtosis of 2.508, which is less than three, indicating that the distribution was leptokurtic, more peaked, or heavy-tailed indicating that the distribution was platykurtic, more flat, or slightly tailed which means it tends to produce fewer outliers than the normal distribution, indicating that most teachers' perceptions were focused around the mean (slightly less or slightly more) than 4.3.

The second highest average was equal to 4.27 for both the second and the third elements, “Integrating Project-Based Lessons makes students more innovative and creative” (SD = 0.783)” and “Integrating project-based lessons makes students more innovative and creative” (SD = 0.808), respectively.

Both have a negative skewness with the values -1.22 and – 1.27, respectively, indicating that the distribution was left-skewed with a long left-tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this domain.

Where they have a negative kurtosis of 2.308 and 2.326, respectively, which are less than three, indicating that the distribution was leptokurtic, more peaked, or heavy-tailed indicating that the distribution was platykurtic, flatter, or slightly tailed, which means it tends to produce fewer outliers than the normal distribution, indicating that most teachers' perceptions were focused on the mean (slightly less or slightly more than 4.34). The two lowest means were for domain six, “Professionalism” (M = 4.1593, SD = 0.74233, skewness = -1.26, kurtosis = 3.15) and domain four, “Student Learning Assessment” (M = 4.1758, *SD* = 0.74956, skewness = -1.29, kurtosis = 3.02).

There was a subtle variation in the means of the five elements. Two elements have a mean equal to 4.27. Only the fifth element has a slightly lower mean (M = 4.08, SD = 0.884), while the higher mean was 4.34, SD = 751. The last one was the first one with a mean (M = 4.16, SD, .832).

Table 7: Descriptive Statistics of Domain Two Items

	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Integrating STREAM with the current curriculums supports participatory teaching and learning	4.16	.832	-1.132	.114	1.908	.227
Integrating Project-Based Lessons makes students more innovative and creative.	4.27	.783	-1.218	.114	2.308	.227
Using different STREAM activities enhances students' motivation to learn.	4.27	.808	-1.273	.114	2.326	.227
Teaching real-life, tangible activities enriches students' learning experience	4.34	.751	-1.276	.114	2.508	.227
STREAM planning will help teachers execute meaningful STREAM activities.	4.25	.787	-1.323	.114	2.996	.227
As a teacher, I am able to do STREAM planning and implement it in my classes	4.08	.884	-1.123	.114	1.719	.227

In general, the skewness of all elements was negative, ranging from -1.121 to -1.323, indicating that the distribution was left-skewed with a long left-tail indicating higher values showing that teachers' perceptions agree with the statements of the elements in this domain as shown in Table 6. Figure 9 explains the participants' responses to the items of domain 2, ''Instructional Planning''.

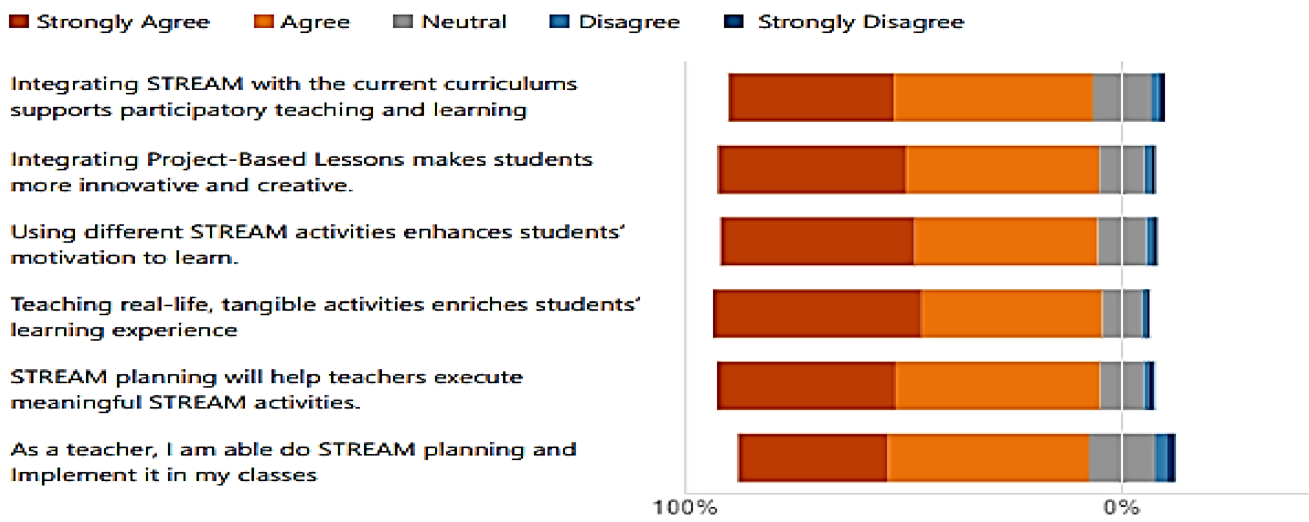

Figure 9: Survey Results for Domain Two

3.4.4 Domain Three, Instructional Delivery, Statistics

The overall average of each of the six items is higher than four, as displayed in Table 7, which again reflects a tendency towards agreeing with the survey statements indicating high awareness and perception of STREAM's impact on teaching, learning and professionalism of ESE teachers as shown in Figure 9. A skewness of 1.168 indicates that the distribution was left-skewed with a long-left tail indicating higher values showing those teachers' perceptions agree with the statements of the elements in this domain. The highest mean was in item one, “Instructional resources such as videos, PowerPoint Presentations and the use of technology in STREAM encourage students to be engaged” (M = 4.29, SD = 0.765). This means that teachers are aware of the importance of using instructional resources such as videos and PowerPoint Presentations and using technology in STREAM to encourage students to be engaged in STREAM classes.

Table 8: Descriptive Statistics of Domain Three Items

	Mean	**Std. Deviation**	**Skewness**		**Kurtosis**	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Instructional resources such as videos, PowerPoint Presentations and the use of technology in STREAM encourage students to be engaged.	4.29	.765	-1.168	.114	2.088	.227
STREAM promotes various instructional strategies that fit what is being taught, such as collaboration, project-based lessons and teamwork.	4.25	.762	-1.172	.114	2.318	.227
The use of instructional strategies in STREAM classrooms promotes innovation skills.	4.24	.759	-1.070	.114	1.981	.227
The use of instructional strategies in STREAM classrooms promotes entrepreneurial skills.	4.20	.779	-1.027	.114	1.710	.227
Teaching STREAM inside classrooms promotes problem-solving in different subjects.	4.24	.776	-1.195	.114	2.405	.227
In STREAM classes, students learn life skills and critical thinking.	4.25	.799	-1.349	.114	3.051	.227
Valid N (listwise)						

While the lowest mean was in item four, ‘‘The use of instructional strategies in STREAM classrooms promotes entrepreneurial skills’’. (M = 4.20, SD = 0. 779), which reflects that teacher are aware of the importance of using instructional strategies in STREAM classrooms to promote entrepreneurial skills but at a low value. There was a very slight variation in the means of the five elements. Four elements have a mean equal to 4.28. The third element has a slightly higher mean (M = 4.29 to 4.20, SD = 0.799) as shown below in Table 7.

With skewness of -1.349, indicating that the distribution was left-skewed with a long left tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this domain, in general, the skewness of all elements was negative, ranging from -1.027 to -1.195 indicating that the distribution was left-skewed with a long left-tail indicating more higher values showing that teachers' perceptions agree with the item statements of the elements in this domain. With kurtosis of 3.051 indicates that the distribution was leptokurtic, more peaked, or heavy-tailed. This reflects that it tends to create more outliers than the normal distribution, indicating that most teachers' perceptions were focused on the mean (slightly less or slightly more) than 4.25. Figure 10 explains the participants' responses to the items of domain 3, ‘‘Instructional Delivery’’.

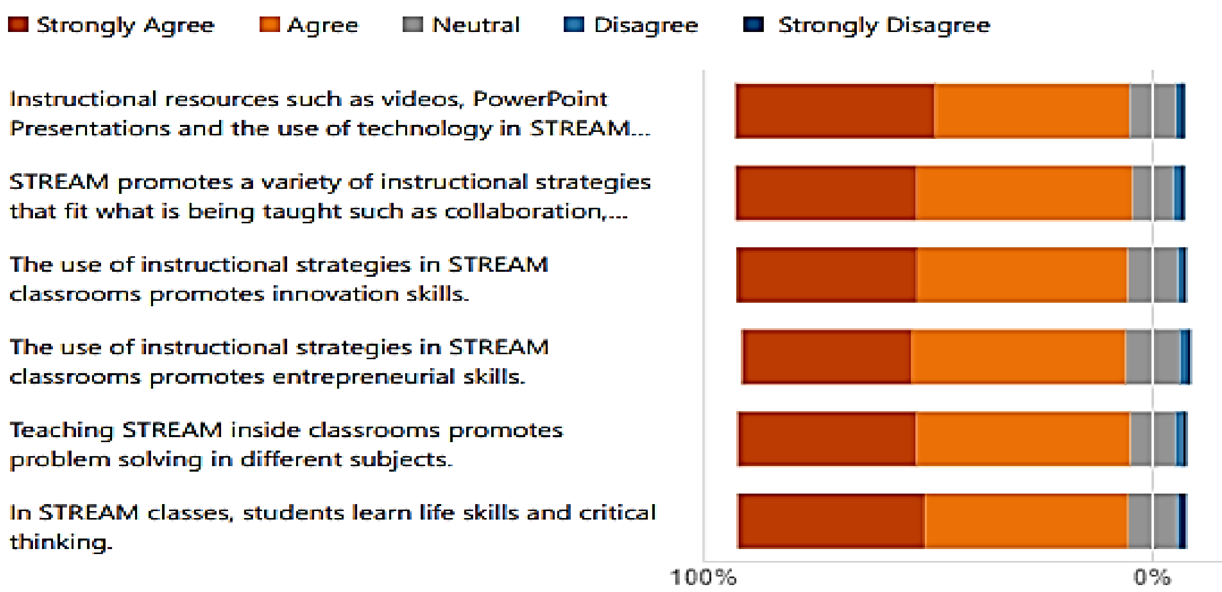

Figure 10: Survey Results for Domain Three

3.4.5 Standard Four, Student Learning, Statistics

The overall average of each of the four items is higher than four, as displayed in Table 8, which again reflects a tendency towards agreeing with the survey statements indicating high awareness and perception of STREAM's impact on teaching, learning and professionalism of ESE teachers.

The highest mean was in item two, in STREAM, ‘‘Collaborative learning assessments enrich students' learning with more working experience” (M = 4.21, SD = .798). This means that teachers are aware of the importance of collaborative assessments in STREAM.

With a skewness of -1.278, indicating that the distribution was left-skewed with a long left-tail indicating more higher values showing that teachers' perceptions agree with the item statements of the elements in this domain and with kurtosis of 2.743, indicating that the distribution was leptokurtic, more peaked, or heavy-tailed which means it tends to produce more outliers than the normal distribution.

Table 9: Descriptive Statistics of Domain Four Item

	Mean	**Std. Deviation**	**Skewness**		**Kurtosis**	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
STREAM helps teachers gauge learner development over time	4.18	.795	-1.187	.114	2.527	.227
In STREAM, collaborative learning assessments enrich students' learning	4.21	.798	-1.278	.114	2.743	.227
Formative evaluation supports STREAM teaching practices.	4.15	.848	-1.130	.114	1.759	.227
STREAM helps teachers make responsive instructional decisions to the students’ needs based on the student learning data to enhance learning.	4.17	.808	-1.085	.114	1.911	.227
The usage of self-assessments in STREAM makes students cognizant of their learning progress.	4.17	.833	-1.224	.114	2.412	.227

The second highest average was in the first item, “STREAM helps teachers gauge learner development over time” (M = 4.18, SD = .795).

With skewness of -1.87, indicating that the distribution was left-skewed with a long left tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this domain and with a positive kurtosis of 2.527, indicating that the distribution was leptokurtic, more peaked, or heavy-tailed which means it tends to produce more outliers than the normal distribution indicating that most teachers' perceptions were focused on the mean (slightly less or slightly more) than 4.18.

The two lowest means were for items three, “Formative evaluation supports STREAM teaching practices” (M = 4.15, SD = 0.848, skewness = -1.130, kurtosis = 2.743) and four, “STREAM helps teachers make responsive instructional decisions to the students need based on the student learning data to enhance learning” (M = 4.1758, SD = 0.808, skewness = -1.085, kurtosis = 1.911). Figure 11 explains participants’ responses to the items of domain 4, ‘‘Student Learning’’.

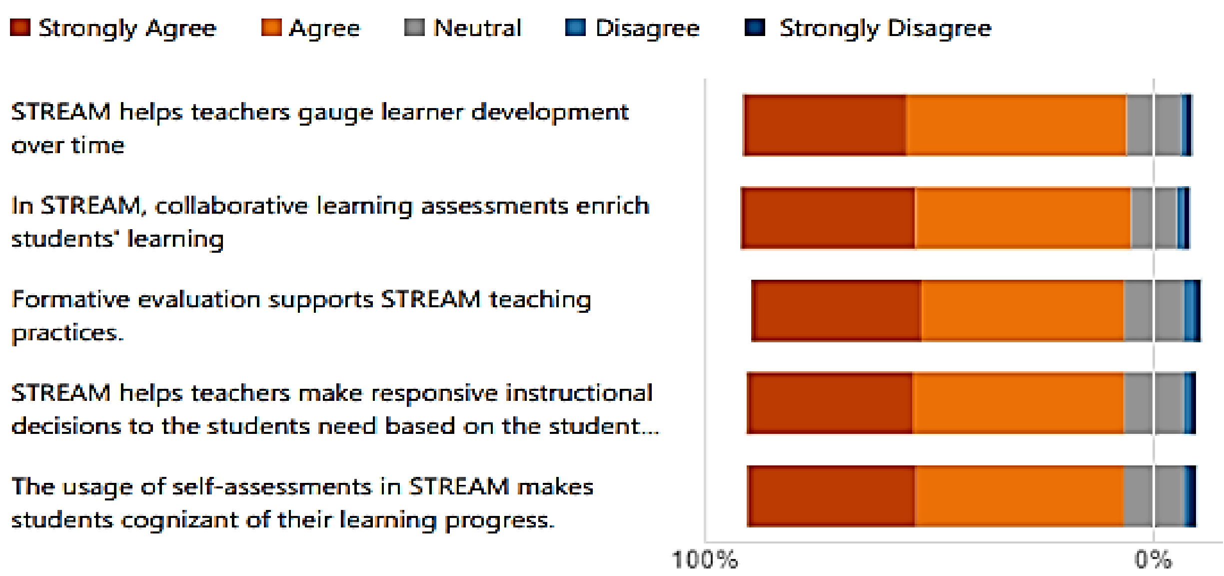

Figure 11: Survey Results for Domain Four

3.4.6 Domain Five, Learning Environment, Statistics

The overall average of each of the four items is higher than four, as displayed in Table 9. It again reflects a tendency towards agreeing with the survey statements indicating high awareness and perception of STREAM's impact on ESE teachers' teaching, learning and professionalism.

The highest mean was in item two, “STREAM supports the usage of rich resources to provide different learning experiences” (M = 4.27, SD = 0.758). This means that teachers are aware that STREAM supports the usage of rich resources to provide different learning experiences.

With skewness of -1.215, indicating that the distribution was left-skewed with a long left-tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this item and with kurtosis of 2.635, indicating that the distribution was leptokurtic, more peaked, or heavy-tailed which means it tends to produce more outliers than the normal distribution.

Table 10: Descriptive Statistics of Domain Five Items

	Mean	**Std. Deviation**	**Skewness**		**Kurtosis**	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
STREAM supports the usage of a rich resource to provide different learning experiences.	4.27	.758	-1.215	.114	2.635	.227
STREAM creates a supportive environment for innovation, a 21st Century Collaborative Learning Environment.	4.25	.797	-1.308	.114	2.788	.227
STREAM promotes a productive learning environment.	4.25	.769	-1.267	.114	2.895	.227
STREAM teaches students the skill of a growth mindset.	4.24	.787	-1.278	.114	2.847	.227
Valid N (listwise)						

The second highest average was in the third item, “STREAM creates a supportive environment for innovation a 21st Century Collaborative Learning Environment” (M = 4.25, SD = 0.797) with skewness of -1.308, indicating that the distribution was left-skewed with a long left-tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this item and with kurtosis of 2.788 indicating that the distribution was leptokurtic, more peaked, or heavy-tailed which means it tends to produce more outliers than the normal distribution and the fourth item “STREAM promotes productive learning environment”. (M = 4.2527, SD = 0.769).

With skewness of -1.267, indicating that the distribution was left-skewed with a long left-tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this domain and with a positive kurtosis of 2.895, indicating that the distribution was leptokurtic, more peaked, or heavy-tailed which means it tends to produce more outliers than the normal distribution.

The two lowest means were for item one, “The usage of self-assessments in STREAM makes students cognizant of their learning progress” (M = 4.17, SD = 0.833, skewness = -1.22, kurtosis = 2.42) and item five “STREAM teaches students the skill of growth mindset” (M = 4.24, SD = 0.787, skewness = -1.27, kurtosis = 2.847). Indicating that most teachers' perceptions were focused on the mean (slightly less or slightly more than 4.24). Figure 12 explains participants’ responses to the items of domain five, “Learning Environment”.

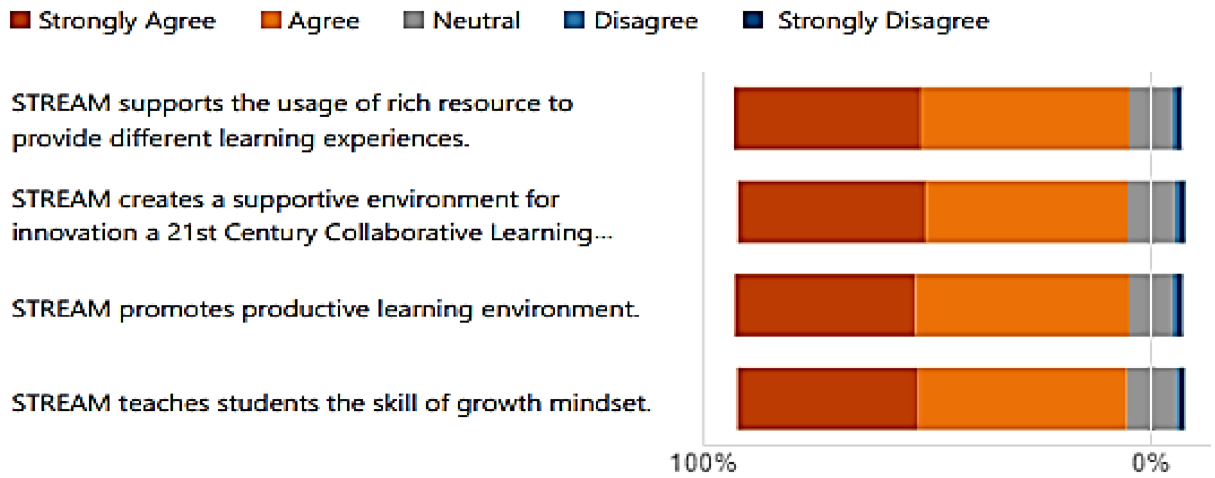

Figure 12: Survey Results for Domain Five

3.4.7 Domain Six, Professionalism, Statistics

The overall average of each of the five items is higher than four, as displayed in Table 10, which again reflects a tendency towards agreeing with the survey statements indicating high awareness and perception of STREAM's impact on teaching, learning and professionalism of ESE teachers. The highest mean was in item five, “STREAM develops pedagogical creativity of teachers” (M = 4.20, SD = 0.826) this means that teachers are aware that STREAM develops pedagogical creativity of teachers. With a skewness of -1.341, indicating that the distribution was left-skewed with a long left-tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this domain item and with kurtosis of 2.857, indicating that the distribution was leptokurtic, more peaked, or heavy-tailed which means it tends to produce more outliers than the normal distribution. The second highest average was in the third item, “STREAM promotes leadership skills” (M = 4.18, SD = 0.800). With skewness of -1.260, indicating that the distribution was left-skewed with a long-left tail indicating more higher values showing that teachers' perceptions agree with the statements of the elements in this domain and with a positive kurtosis of 2.841, indicating that the distribution was leptokurtic, more peaked, or heavy-tailed which means it tends to produce more outliers than the normal distribution.

Table 11: Descriptive Statistics of Domain Six Items

	Mean	**Std. Deviation**	**Skewness**		**Kurtosis**	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
There is a commitment to ethical practices in STREAM	4.16	.801	-1.057	.114	1.922	.227
STREAM creates a culture of collaboration among staff.	4.14	.823	-1.218	.114	2.436	.227
STREAM promotes leadership skills.	4.18	.800	-1.260	.114	2.841	.227
STREAM provides effective professional development programs for teachers.	4.12	.857	-1.124	.114	1.884	.227
STREAM develops the pedagogical creativity of teachers.	4.20	.826	-1.341	.114	2.857	.227

Table 10 shows that the three lowest means were for items one "There is a commitment to ethical practices in STREAM” (M = 4.16, SD= .801, Skewness = -1.057, Kurtosis 1.922) two “STREAM creates a culture of collaboration among staff” (M = 4.14, *SD* = 0.823, skewness = -1.26, kurtosis = 3.15) and four “Professionalism” (M = 4.1593, *SD* = 0.823, skewness = -1.214, kurtosis = 1.884), indicating that most teachers' perceptions were focused on the mean (slightly less or slightly more than 4.18). Figure 13 explains participants’ responses to the items of domain six, “Professionalism”.

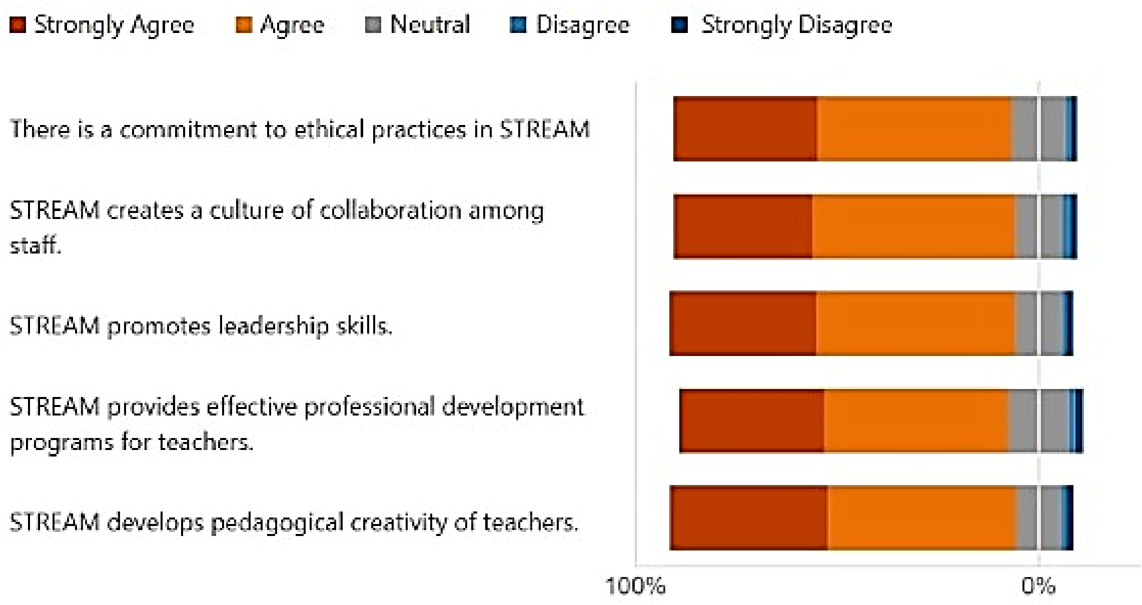

Figure 13: Survey Results for Domain Six

3.5 The Results of the Three Research Questions

3.5.1 The Results of the First Research Question

RQ 1. What perceptions do teachers and lead teachers have about the impact of STREAM on enhancing teaching, learning and professionalism? To have answers to the first research question, the researcher first used a one-sample t-test as a referential statistic and then used the data from the interview questions as well. The study firstly uses one sample to test the hypothesis that there are no statistically significant differences between a hypothesized population mean and the sample's mean (as 3 represents 'neutral' and the means above three would indicate a tendency towards agreeing with the statements of the survey).

Secondly, the following interview questions and their reply were used to support the answers to the survey questions about the teachers' perceptions: Q1- What does STREAM look like at your school? Q2- Do you think STREAM is integral to learning and teaching in the United Arab Emirates? Q3- So, do you think that STREAM instills innovative skills in students? Moreover, how? Q4- Do you think incorporating STREAM into the existing curricula supports teaching and learning in our school and how? Q5- Do you think that using different STREAM activities in class would enhance students' motivations to learn and how? Q6- Has your professional development in STREAM supported your ability to implement classroom practices. Give an example.

3.5.1.1 One-Sample t-Test Results

Testing the hypotheses to decide that there are no statistically significant differences between the mean of the hypothesis of the study's population and the mean of the sample (as three represents 'neutral' and means above three would indicate a tendency towards agreeing with the statements of the survey), a one-sample t-test was performed. The t-test indicated statistically significant differences between the sample's mean and the hypothesized population mean. The sample means of the six domains of the survey elements were statistically significantly higher than three, "which represents neutral". The two-sample t-test (also known as the independent samples t-test) and the paired t-test are likely the two statistical tests most frequently used to compare the mean values of two samples (Wang et al., 2017). Table 11 shows the One-sample t. test results of the six domains (N = 462), where equal variances are assumed.

Table 12: One-Sample t.Test Results of the Six Domains

	Test Value = 3			
	t	**df**	**Sig. (2-tailed)**	**Mean Difference**
Domain 01	38.223	461	.000	1.28355
Domain 02	36.892	461	.000	1.22908
Domain 03	37.875	461	.000	1.24639
Domain 04	33.416	461	.000	1.17576
Domain 05	36.716	461	.000	1.25271
Domain 06	33.568	461	.000	1.15931

3.5.1.1.1 Professional Knowledge

Table 11 shows the mean of the responses of the study sample (N = 462) regarding the first domain of the survey element, "Professional Knowledge" was M = (4.28) (SD = .742). The sample distributions were sufficiently normal for the purposes of conducting a t-test where the skewness = -1.414 (Std. Error = .114), < |2.0| and the kurtosis = 3.395 (Std. Error = .227), < |9.0|) (Schmider et al., 2010). Additionally, the assumption of homogeneity of variances was tested and satisfied via Leven's F test, F (1,460) = .404, p = .526. The one sample *t*-test was associated with a statistically significant effect, t (461) = 38.223, p < .001, d = 3.56. The effect sizes associated with the statistically significant effects are considered huge based on Cohen's (1992) guidelines.

3.5.1.1.2 Instructional Planning

The mean responses of the study sample (N = 426) regarding the second category of the survey elements, “Instructional Planning”, was M = (4.29) (SD = .716). The sample distributions were sufficiently normal for the purposes of conducting a t-test where the skewness = -1.288 (Std. Error = .114), < |2.0| and the kurtosis = 2.981 (Std. Error = .227), < |9.0|) (Schmider et al., 2010). Additionally, the assumption of homogeneity of variances is tested and satisfied via Leven's F test, F (1,460) = .114, p = .736. The one sample t-test was associated with a statistically significant effect, t (461) = 37.875, p < .001, d = 3.53. The effect sizes associated with the statistically significant effects are considered huge based on Cohen's (1992) guidelines.

3.5.1.1.3 Instructional Delivery

The mean of the responses of the study sample (N = 462) regarding the third category of the survey elements, “Instructional Delivery”, was M = 4.24 (SD = .707). The sample distributions were sufficiently normal for conducting a t-test where the skewness = -1.288 (Std. Error = .114), < |2.0| and the kurtosis = 3.064 (Std. Error = .227), < |9.0|) (Schmider et al., 2010). Additionally, the assumption of homogeneity of variances is tested and satisfied via Leven's F test, F (1,460) = .114, p = .736. The one sample t-test was associated with a statistically significant effect, t (461) = 37.875, p < .001, d = 3.53. The effect sizes associated with the statistically significant effects are considered huge based on Cohen's (1992) guidelines.

3.5.1.1.4 Student Learning Assessment

The mean of the responses of the study sample (N = 462) regarding the third category of the survey elements, “Student Learning Assessment”, was M = (4.1758) (SD = .75). The sample distributions were sufficiently normal for conducting a t-test where the skewness = -1.287 (Std. Error = .114), < |2.0| and the kurtosis = 3.022 (Std. Error = .227), < |9.0|) (Schmider et al., 2010). Additionally, the assumption of homogeneity of variances was tested and satisfied via Leven's F test, F (1,460) = .966, p = .326. The one sample t-test was associated with a statistically significant effect, t (461) = 33.716, p < .001, d = 3.14. The effect sizes associated with the statistically significant effects are considered huge based on Cohen's (1992) guidelines.

3.5.1.1.5 Learning Environment

The mean of the responses of the study sample (N = 462) regarding the third category of the survey elements, “Learning Environment”, was M = (4.2527) (SD = .7333). The sample distributions were sufficiently normal for the purposes of conducting a t-test where the skewness = -1.413 (Std. Error = .114), < |2.0| and the kurtosis = 3.55 (Std. Error = .227), < |9.0|) (Schmider et al., 2010). Additionally, the assumption of homogeneity of variances is tested and satisfied via Leven's F test, F (1,460) = .531, p =. 467. The one sample t-test was associated with a statistically significant effect, t (461) = 36.716, p < .001, d = 3.42. The effect sizes associated with the statistically significant effects are considered huge based on Cohen's (1992) guidelines.

3.5.1.1.6 Professionalism

The mean of the responses of the study sample (N = 462) regarding the third category of the survey element, “Professionalism”, was M = (4.1593) (SD = .742). The sample distributions were sufficiently normal for conducting a t-test where the skewness = -1.261 (Std. Error = .114), < |2.0| and the kurtosis = 3.145 (Std. Error = .227), < |9.0|) (Schmider et al., 2010). Additionally, the assumption of homogeneity of variances is tested and satisfied via Leven's F test, F (1,460) = 1.782, p = .183. The one sample t-test was associated with a statistically significant effect, t (461) = 33.568, p < .001, d = 3.13. The effect sizes associated with the statistically significant effects are considered huge based on Cohen's (1992) guidelines in general; there were statistically significant differences between means (p < .05). Therefore, we can reject the null hypothesis and accept the alternative hypothesis.

Table 13: One-Sample t.Test Results of all Items

	t	Mean Difference	95% Confidence Interval	
			Lower	Upper
STREAM instills innovative skills in students.	35.996	1.279	1.21	1.35
STREAM equips students with knowledge for the future	36.330	1.284	1.21	1.35
STREAM provides a meaningful learning experience for students.	35.959	1.294	1.22	1.37
STREAM emphasizes acquiring problem-solving skills.	34.406	1.281	1.21	1.35
STREAM provides interdisciplinary knowledge through the integration of subject matter.	34.728	1.279	1.21	1.35
Integrating STREAM with the current curriculums supports participatory teaching and learning	30.066	1.165	1.09	1.24
Integrating Project-Based Lessons makes students more innovative and creative.	34.814	1.268	1.20	1.34
Using different STREAM activities enhances students' motivation to learn.	33.787	1.271	1.20	1.34
Teaching real-life, tangible activities enrich students' learning experience	38.450	1.344	1.28	1.41
STREAM planning will help teachers execute meaningful STREAM activities.	34.030	1.247	1.17	1.32
As a teacher, I am able to do STREAM planning and implement it in my classes	26.270	1.080	1.00	1.16
Instructional resources such as videos, PowerPoint Presentations and the use of technology in STREAM encourages students to be engaged.	36.356	1.294	1.22	1.36
STREAM promotes a variety of instructional strategies that fit what is being taught, such as collaboration, project-based lessons and teamwork.	35.371	1.253	1.18	1.32
The use of instructional strategies in STREAM classrooms promotes innovation skills.	35.260	1.245	1.18	1.31
The use of instructional strategies in STREAM classrooms promotes entrepreneurial skills.	33.091	1.199	1.13	1.27
Teaching STREAM inside classrooms promotes problem-solving in different subjects.	34.281	1.238	1.17	1.31
In STREAM classes, students learn life skills and critical thinking.	33.593	1.249	1.18	1.32
STREAM helps teachers gauge learner development over time	31.831	1.177	1.10	1.25
In STREAM, collaborative learning assessments enrich students' learning	32.695	1.214	1.14	1.29
Formative evaluation supports STREAM teaching practices.	29.192	1.152	1.07	1.23
STREAM helps teachers make responsive instructional decisions to the students' needs based on the student learning data to enhance learning.	31.100	1.169	1.09	1.24
The usage of self-assessments in STREAM makes students cognizant of their learning progress.	30.091	1.167	1.09	1.24
STREAM supports the usage of rich resources to provide different learning experiences.	36.008	1.271	1.20	1.34
STREAM creates a supportive environment for innovation, a 21st Century Collaborative Learning Environment.	33.738	1.251	1.18	1.32
STREAM promotes a productive learning environment.	34.952	1.251	1.18	1.32
STREAM teaches students the skill of growth mindset.	33.798	1.238	1.17	1.31
There is a commitment to ethical practices in STREAM	31.091	1.158	1.08	1.23
STREAM creates a culture of collaboration among staff.	29.671	1.136	1.06	1.21
STREAM promotes leadership skills.	31.770	1.182	1.11	1.25
STREAM provides effective professional development programs for teachers.	28.072	1.119	1.04	1.20
STREAM develops the pedagogical creativity of teachers.	31.273	1.201	1.13	1.28

Table 12 shows the detailed One-Sample t-Test results for all the elements which includes One-Sample t-Test Value = 3, d f = 461, Sig. (2-tailed) = 000, Mean Difference, 95% Confidence Interval of Mean Difference. The independent samples t-test lowest value that was associated with a statistically significant effect was in the element "As a teacher, I can do STREAM planning and Implement it in my classes" $t(461) = (26.270)$, $p < .001$, $d = 2.45$. Where the highest one sample t-test value that was associated with a statistically significant effect was in the survey element "Teaching real-life, tangible activities enriches students' learning experience" $t(461) = 38.450$, $p < .001$, $d = 3.58$.

Overall, most of the survey items mentioned in Table 12 namely STREAM instills innovative skills in students. STREAM equips students with knowledge for the future. STREAM provides a meaningful learning experience for students. STREAM emphasizes acquiring problem-solving skills. STREAM provides interdisciplinary knowledge through the integration of subject matter. Integrating STREAM with the current curriculums supports participatory teaching and learning. Integrating Project-Based Lessons makes students more innovative and creative. Using different STREAM activities enhances students' motivation to learn. Teaching real-life, tangible activities enrich students' learning experience. STREAM planning will help teachers execute meaningful STREAM activities. As a teacher, I am able to do STREAM planning and implement it in my classes. Instructional resources such as videos, PowerPoint Presentations and the use of technology in STREAM encourages students to be engaged. STREAM promotes a variety of instructional strategies that fit what is being taught, such as collaboration, project-based lessons, and teamwork. The use of instructional strategies in STREAM classrooms promotes innovation skills. They were all highly perceived by most of the participants in the survey. This was reflected in the findings and results of the survey's all elements and domains.

3.5.1.2 The Data from the Interview Questions

The researcher used thematic analysis to write about the themes that emerged from the interview replies. Thematic Analysis (TA) is a simple, adjustable and widely used technique for analyzing qualitative data. The ability to perform it gives the qualitative researcher a foundation in the fundamental abilities required to interact with various techniques for qualitative data processing (Braun & Clarke, 2012). The teachers' and lead teachers who attended the interviews showed that most of them understand and realize the importance of applying STREAM at their schools as a successful system that fosters the use of technology, 21st century skills, project-based learning and problem-solving as well. When posing questions to the teachers and the lead teachers and comparing their answers, this reflects high awareness of the importance of STREAM, as for teachers and lead teachers both at the same level.

3.5.1.2.1 Theme One: STREAM Status at Schools Now

The emerging subthemes, participants in the interview agree that STREAM education in their classes advocates the following themes, grouping students, integrating many subjects, learning everyday experiences, motivation to work collaboratively, innovation and sustainability as follows:

Subtheme one, grouping students, two of the five participants, almost 40 percent of the interview participants, perceive STREAM at their schools as an area where students can work collaboratively. Ansha mentioned that ‘‘STREAM is grouping students with the same abilities to perform a task”. This agrees with the opinion of Kiram, who thinks that STREAM encourages students to work collaboratively:

> *STREAM is one of the projects adopted in our school that is very important to support different integrated subjects. It is important because it advocates sustainability and aligns with the nation's vision of an innovative and creative generation. It is a wonderful project where students are motivated to work collaboratively.*

Subtheme two: Integration of subjects, three of the interview five participants, almost 60 percent of the interview participants, perceive STREAM at their schools as an integration process between different subjects. Rishdi considers integrating many subjects and Fahmi responded that at his school, STREAM involves all subjects taught inside the classroom. Kiram reported that STREAM is one of the projects adopted in their school, which is very important in supporting different subjects' integration. He added that it is a wonderful project that integrates learning into everyday experiences, and that integrating subjects motivated students to work collaboratively and get involved in all subjects teaching and learning. Rishdi reported the following:

> *We have already integrated many subjects to create this type of STREAM environment, namely Science, Math, Technology, Art, Music and English. When we created our (STREAM) project, we got all these subjects to be integrated into one task, so STREAM in our school is important when we try to integrate subjects with one another within the topic we are teaching in the chapter students and teachers will try to perform one task.*

Subtheme three, sustainability innovative and creative generation. One out of the five participants, almost 20 percent of the interview participants, mentioned that STREAM in his school advocates sustainability and goes along with the nation's vision to have an innovative and creative generation. Kiram thinks that ‘‘STREAM advocates sustainability and goes along with the nation's vision to have an innovative and creative generations’’.

Subtheme four, learning everyday experiences. One participant, almost 20 percent of the interview participants, mentioned that he sees STREAM at his school as an excellent tool to teach students every day and life skills.

Ihsan reported, “STREAM education is relating learning to everyday experiences. Learners are more involved in the learning process; thus, their learning experiences become more meaningful”.

3.5.1.2.2 Theme Two: STREAM as an Important Part of Teaching and Learning

The main themes that arose from the responses to question two were mainly stressing STREAM education's importance as it teaches students new skills, provides learning of everyday experiences and instills vital skills such as problem-solving, critical thinking, collaboration, innovation and essential technological skills as well. Both teachers lead teachers agreed that it makes students enjoy learning different subjects in an integrated way, learning skills in a better way to make them ready for the future and promoting collaboration, offering new ideas to teach them creativity. They find it very beneficial for the students to learn future life skills and prepare for future workforce development.

Subtheme one, new skills and learning of everyday experiences. Four out of the five participants, almost 80 percent of the interview participants, agreed that STREAM is an essential program that teaches students new skills and everyday experiences, as perceived by Ansha. At the same time, Rishdi believes that STREAM plays a crucial role in enhancing schooling and developing student skills and abilities. He thought it allows students to acquire vital skills such as problem-solving, critical thinking, collaboration, innovation and essential technological skills. In the meantime, Kiram agrees that STREAM is an important project where he sees students learn skills in a better way to enable them to be ready for the future, with an agreement with Fahmi, who thinks STREAM supports students in learning future life skills as follows:

> *STREAM education is vital because it teaches students new skills and supports their learning of everyday experiences. As I mentioned, learners are more involved and even motivated in the learning process; thus, their learning experiences become more meaningful. Therefore, it is helpful for UAE classes.*

Subtheme two integration. Only one participant of the five interview participants, Ihsan, reported that STREAM is significant because students will see the link between subjects, which means they will enjoy other subjects as much as they enjoy the specific subject if they are taught together in an integrated way via STREAM approach, he mentioned that:

> *STREAM is significant because, in most cases, some students enjoy one subject, let us say, because of the teacher. Nevertheless, let us say that STREAM is the topic taught in the classes and then students will start to see the link between subjects, which means they will enjoy other subjects as much as they enjoy the specific subject if they are taught together in an integrated way.*

3.5.1.2.3 Theme Three: STREAM Instills Innovative Skills in Students

The emerging subthemes for theme three, the main subthemes from the responses to question three stressed that STREAM instills innovative skills in students. The subthemes included encouraging questioning, supporting students to be creative, curious, and risk-taking, creating a project, thinking outside the box, acquiring innovative skills finding new ways to solve problems and working collaboratively.

Subtheme one, questioning and curiosity. Both participants, Ansha and Rishdi, making up almost 40 percent of the respondents, agreed that STREAM encourages asking questions and curiosity by students. They both believe that innovation and creativity come from curiosity and asking questions. Ansha noted that:

> *STREAM encourages questioning. It requires hands-on learning, and it advocates more creativity. It supports collaboration and communication, so it is an excellent method to instill innovative skills in students and support them in being creative.*

Rishdi stated that “STREAM fosters curiosity, risk-taking, creativity, innovation and collaboration”. He added that ‘‘These skills are being delivered to students when applying STREAM inside our classes”.

Subtheme two, thinking outside the box, creativity and problem solving. Three of the five participants making up 60 % of the responses, believe that STREAM supports innovation. Ihsan believes that STREAM supports students' ability to think outside the box to know how they will solve a given problem in a specific situation. He claimed that students must use different subjects to create a type of innovative ideas so they can find a solution to the problem. And added that they would need STREAM. Kiram believes that students can find new ways to solve any problem and create their projects when they learn using the STREAM approach. Fahmi thinks that when students perform a project, teachers do not give students exactly what they need to do. They only give them the problem and then ask them to find the solution, so naturally, this involves innovative skills. When they work together to find the solution, this, in turn, promotes collaboration and new ideas to teach them creativity as well. Ihsan believes that:

> *When the students are creating a project to solve a problem, they must think outside the box to know how they will solve a given problem in a particular situation. They must use different subjects to create a type of innovative ideas so they can find a solution to the problem, so yes, they would need STREAM.*

3.5.1.2.4 Theme Four: STREAM in Curricula Supports Teaching Learning and Teachers' Professionalism

The emerging subthemes for theme four, the main subthemes from the responses to question four stressed that incorporating STREAM into the existing curricula supports teaching and learning in schools, except for one participant who thinks that the curriculum still needs to be more aligned with the STREAM practices. The main subthemes were model teaching practices, best teaching attitude, integration into different subjects, exchange of knowledge, development professionally, planning together and using technological tools.

Subtheme one, Integration of Subjects, four out of five of the participants representing almost 80 percent of the interview's responses to two questions, agreed that STREAM enhances teaching and learning by promoting model teaching practices bringing in the best teaching towards learning the content in an integrated way. This was as for Ansha, while Rishdi believes that STREAM skills can be best taught in an integrated manner with different subject utilizing technological tools for this purpose. Meanwhile, Kiram thinks that STREAM practices foster both teachings and learning at his school. He believes that teachers exchange knowledge and develop professionally together when teaching STREAM to the learners to develop their learning of new skills and enhance their learning opportunities in a comprehensive view. Ansha stated:

> *Students learn the content in an integrated way adding to their skills and enhancing their innovation and creativity. As for teaching, STREAM incorporates model-teaching practices because teachers plan and perform classes together. It serves the purpose of bringing the best teaching attitude toward learning. In some cases, it promotes high ethics and professionalism among teachers regarding collaborating, planning, and performing STREAM model classes.*

Subtheme two, aligned curriculum, only Ihsan expressed his opinion about the need for a more aligned curriculum with STREAM. He stresses the need to be aligned with all the subjects within all curriculums. He added that there is a need to find a link between Arabic, readings, writing and different subjects besides the present links to Math and Science reporting that:

I think that the curriculums in different subjects need first to be aligned so that more STREAM can be implemented. Now, it is about Math and Science. We still need to find a link between Arabic, readings, writing and different subjects, but now, I see many links. For example, English has much reading taking place, yet the students' reading levels are not what they should be, so they should be aligned with all the subjects first with all curriculums.

3.5.1.2.5 Theme Five: STREAM Activities Enhance Students' Motivations to Learn

The emerging subthemes for theme five, the main subthemes from the answers to question five are teamwork, collaboration, enhancing the low achievers, the project-based class, learning different skills enhances motivations, proper planning the correct timeline and explaining to the students problem-solving.

Subtheme one, collaboration and teamwork, three of the five interview participants representing 60 percent, agreed that teamwork and collaboration are two STREAM skills that enhance students' motivation to learn. This happens when teachers give them tasks that require working as teams. They added that students solve a problem and become more motivated to learn new skills innovatively. They all think STREAM enhances students' motivation to learn. Ansha believes that students are more involved when working together; meanwhile, Rishdi believes that STREAM classes encourage students to work together and be motivated and more involved in the lesson rather than traditional classes. While Ihsan believes that different STREAM activities would touch upon different skills if these skills taught by teachers target higher order of learning and foster collaboration among students, enhancing students' motivation to learn.

Subtheme two problem-solving. Ansha and Rishdi, who represent almost 40 percent of the respondents, agreed that students are more involved when asked to solve a problem and become more motivated to learn new skills innovatively. STREAM enhances students' motivation to learn, as for Ansha, while Rishdi believes that students are more involved in the lesson when teachers teach STREAM, even the low achievers. According to Rishdi, one of the lessons was a project-based class in which students were asked to build a house in Minecraft to solve a housing problem. Students were more motivated to find a solution to this problem, Rishdi mentioned that:

If you accurately implement STREAM, using the correct planning and the proper timeline and explain to the students what STREAM is, this can be successful in measuring the success you would have to find a task for the student to complete or create they will reach innovative ideas successfully, especially if teachers offer different activities contributing to motivating students more to be innovative and creative to do a project.

3.5.1.2.6 Theme Six: Professional Development in STREAM

The emerging subthemes for theme six professional development in STREAM, the emerging subthemes were learning new teaching strategies, enhancing the teachers' careers and enabling them to learn and pass this knowledge to their students, accurately implementing STREAM using the proper planning. Supporting teachers' abilities to implement new innovative classroom practices. Still, there is a need for some teachers to learn more about it. All the participants believe that the professional development in STREAM supported their ability to implement new creative classroom practices, except for Kiram, who believes he still wants to learn more about STREAM. While Fahami reported saying that:

I agree that the professional training I received at my school and from MOE supported my teaching practices in my classes. As for my school, in a specific topic, when we did the project of building a sustainable house, we had to use different subjects to make the task, so in a lesson; I think all start from your lesson plan. Which topic it is relating to in another subject you have to plan that you know what the other subjects are doing you will have to speak to the so other subject teachers, like I am a math teacher so I will have to speak to the science teacher and find out what topics are they teaching and how can I use that topic in my lesson.

3.5.2 The Results of the Second Research Question

RQ2 what impact do different demographic variables have on teachers' perceptions related to the STREAM themes? To answer research question two, several referential statistics tests were conducted to test the impact of the demographics on the teachers’ perceptions. To test the impact of gender, an Independent Samples t-test was conducted to test ESE male and female teachers’ perceptions of STREAM's impact on teaching, learning and professionalism. One-Way-ANOVA several tests were conducted to test the rest of the demographics (Degree - Emirates - Subject – STREAM - Experience) impact on teachers’ perceptions.

3.5.2.1 Gender

All domains and items have no statistically significant differences due to the gender of the participants in the survey. This means that there are no statistically significant differences in the ESE teachers' and the lead teachers’ perceptions of the impact of STREAM influence on teaching, learning and professionalism due to gender. A p-value less than 0.05 is typically considered to be statistically significant, in which case the null hypothesis should be rejected. A p - value greater than 0.05 means that deviation from the null hypothesis is not statistically significant and the null hypothesis is not rejected. Despite being different on digital numbers of both genders as female N = 292 and male participant N = 170 still the difference in the rate is not significant. Several ANOVA one-way tests were done to test the impact of the other demographics, such as, emirates, subjects and years of experience, as well as STREAM experience and training as follows:

3.5.2.2 Degree

Test of Homogeneity of Variances: showed there were no significant differences due to the degree that the participants have or the degree they hold. Not all domains and items are significant, which means there are no statistically significant differences due to the qualification of the teachers and lead teachers’ perceptions of STREAM impact on teaching, learning and professionalism due to the degree that staff hold.

3.5.2.3 Emirates

Test of Homogeneity of Variances of domains 03 and 04 are significant. The ANOVA test results showed that all standards are not significant. This means that there are no statistically significant differences due to the emirates where teachers and lead teachers live in their perceptions of STREAM impact on teaching, learning and professionalism due to the place where they live. If p - value less than 0.05 is typically considered to be statistically significant, in which case the null hypothesis should be rejected. While if p-value greater than 0.05 means that deviation from the null hypothesis is not statistically significant and the null hypothesis is not rejected.

However, the significant items were: (1) Integrating Project-Based Lessons makes students more innovative and creative. (2) Teaching real-life, tangible activities enriches students' learning experience and (3) STREAM planning will help teachers execute meaningful STREAM activities.

3.5.2.4 Subject

All domains and items are not significant. This means that there are no statistically significant differences in the ESE teachers' and lead teachers' perceptions of the impact of STREAM on teaching, learning and professionalism due to the subject they teach.

3.5.2.5 Experience in Conducting STREAM

The results of the Test of Homogeneity of Variance are not significant. There are no statistically significant differences in the ESE teachers' and lead teachers' perception of the impact of STREAM on domains one, ‘‘Professional Knowledge’’ and six, ‘‘Professionalism’’ due to years of teaching STREAM.

There are statistically significant differences in the ESE teachers' and lead teachers' perception of the impact of STREAM on domains two, three, four and five due to years of experience in teaching STREAM as follows:

3.5.2.5.1 Domain Two, Instructional Planning

The descriptive statistics associated with domain two “Instructional Planning” across the number of years of experience in conducting STREAM.) (1-5 years, 6-10 years and 10-15 years) revealed that the teachers' group who had (6 to 10) years of experience in conducting STREAM was associated with the numerically highest mean level of (Domain 2, instructional planning) (M = 4.40, SD =.614) and the teachers' group who had 11 to 15 years of experience in conducting STREAM was associated with the numerically smallest mean level of domain 2, instructional planning *(*M = 4.17, SD =.733*).*

To investigate if domain two instructional planning differs across different levels within the number of years of experience conducting STREAM (1-5 years, 6-10 years and 10-15 years).

H0: There are no significant differences in domain two, instructional planning across the different number of years of experience in conducting STREAM (1-5 years, 6-10 years and 10-15 years).

To test the hypothesis level of the number of years of experience in conducting STREAM (1-5 years, 6-10 years and 10-15 years) influenced domain 2, instructional planning.

Before conducting the ANOVA, the assumption of normality was evaluated and determined to be satisfied as the three groups' distributions were associated with skewness = -1.291 (Std. Error = .114), < |2.0| and kurtosis = -.152 (Std. Error = .227), < |9.0| (Schmider et al., 2010). Furthermore, the assumption of homogeneity of variances was tested and satisfied based on Levene's F *test*, F (2, 459) = .376, p = .687.

The Independent Samples t-test between-groups and ANOVA yielded a statistically significant effect, F (2, 459) = 3.986, p = .019, η2 = .017. Thus, the null hypothesis of no differences between the means was rejected and 1.7% of the variance in domain two instructional planning was accounted for by the number of years of experience in conducting STREAM (1-5 years, 6-10 years and 11-15 years).

To further evaluate the nature of the differences between the three statistically significant means ANOVA was followed-up with three Fisher's LSD post hoc tests.

The test indicated that the mean score for the teachers' group who have five or less than five years of experience in conducting STREAM (M = 4.8750, SD = 1.37723) was significantly higher than the teachers' group who have 11 to 15 years of experience in conducting STREAM (M = 5.8472, SD = .86393). The mean differences were significant at the 0.05 level.

The difference between the teacher's group who have five or less than five years and the teachers who have 11 to 15 years of experience in conducting STREAM was statistically significant, t (459) = -2.45, p = .018, d = 0.29 (small to medium effect).

Finally, the difference between the teacher's group who have five or less than five years and the teachers who have 6 to 10 years of experience in conducting STREAM was not statistically significant, t (459) = -2.45, p = .856, d = 0.0399 (very small effect).

The effect sizes associated with the statistically significant effects are considered small to medium effects based on Cohen's (1992) guidelines.

3.5.2.5.2 Domain Three, Instructional Delivery

The descriptive statistics associated with domain three “Instructional Delivery” across the years of experience in conducting STREAM (1-5 years, 6-10 years and 11-15 years) revealed that the teachers' group who have five or less than five years of experience in conducting STREAM was associated with the numerically highest mean level of (Domain 3, instructional delivery) (M = 4.42, SD =.591) and the teachers' group who have (11 to 15 years) of experience in conducting STREAM was associated with the numerically smallest mean level of (Domain 3, instructional delivery) (M = 4.19, SD = .735).

To investigate if the domain three instructional delivery differs across different numbers of years of experience in conducting STREAM (0-5 years, 6-10 years and 11-15 years).

H0: There are no significant differences in domain 3, instructional delivery across the different numbers of years of experience in conducting STREAM (0-5 years, 6-10 years and 10-15 years).

To test the hypothesis that the number of years of experience in conducting STREAM (0-5 years, 6-10 years and 11-15 years) influenced domain 3, instructional delivery.

Before conducting the ANOVA, the assumption of normality was evaluated and determined to be satisfied as the three groups' distributions were associated with skewness = -1.291(Std. Error = .114), < |2.0| and kurtosis = -.152 (Std. Error = .227), < |9.0| (Schmider et al., 2010). Furthermore, the assumption of homogeneity of variances was tested and satisfied based on Levene's F test, F (2, 459) = .601, p = .549.

The Independent Samples t-test between-groups and ANOVA yielded a statistically significant effect, F (2, 459) M = 4.131, p = .017, η2 = .018. Thus, the null hypothesis of no differences between the means was rejected and 1.8% of the variance in domain 3, instructional delivery was accounted for by the number of years of experience in conducting STREAM (0-5 years, 6-10 years and 11-15 years).

To evaluate the nature of the differences between the three statistically significant means further, the ANOVA was followed-up with three Fisher's LSD post-hoc tests.

The test indicated that the mean score for the teachers' group who have five or less than five years of experience in conducting STREAM (M = 4.42, SD = .591) was significantly higher than the teachers' group who have 11 to 15 years of experience in conducting STREAM (M = 4.19, SD = .86393). The mean differences were significant at the 0.05 level.

The difference between the teachers' group who have five or less than five years and the teachers who have 11 to 15 years of experience conducting STREAM was statistically significant, t (423*)* = 2.694, p = .007, d = 0.344 (small to medium effect). Finally, the difference between the teachers who have five or less than five years and those who have 6 to 10 years of experience conducting STREAM was not statistically significant, t (122) = .574, p = .621, d = 0.11 (very small effect). The effect sizes associated with the statistically significant effects are considered small to medium effects based on Cohen's (1992) guidelines.

3.5.2.5.3 Domain Four, Student Learning Assessment

The descriptive statistics associated with domain four “Student Learning Assessment” across the numbers of years of experience in conducting STREAM. (1-5 years, 6-10 years and 10-15 years) revealed that the teachers’ group who have five or less than five years of experience in conducting STREAM was associated with the numerically highest mean level of (Domain four student learning assessment) (M =

4.402, SD = .699) and the teachers' group who have (11 to 15) years of experience in conducting STREAM was associated with the numerically smallest mean level of (Domain four student learning assessment) (M = 4.106, SD = .783).

To investigate how the level of teachers' perceptions regarding domain 4, student learning assessment differs across different numbers of years of experience in conducting STREAM "H0: There are no significant differences in domain four student learning assessment across the different numbers of years of experience in conducting STREAM)", to test the hypothesis a One-Way ANOVA test was conducted.

Before conducting the ANOVA, the assumption of normality was evaluated and determined to be satisfied as the three groups' distributions were associated with skewness =-1.291(Std. Error = .114), < |2.0| and kurtosis = -.152 (Std. Error = .227), < |9.0| (Schmider et al., 2010). Furthermore, the assumption of homogeneity of variances was tested and satisfied based on Levene's F test, F (2, 459) = .833, p = .435.

The Independent Sample t-test between-groups and ANOVA yielded a statistically significant effect, F (2, 459) = 5.930, p = .003, η2 = .018. Thus, the null hypothesis of no differences between the means was rejected and 1.8% of the variance in domain four student learning assessment was accounted for by the number of years of experience in conducting STREAM.

To evaluate the nature of the differences between the three statistically significant means further, ANOVA was followed-up with three Fisher's LSD, Tukey HSD and Scheffe post-hoc tests.

The tests indicated that the mean score for the teachers' group who have five or less than five years of experience in conducting STREAM (M = 4.402, SD = .591) was significantly higher than the teachers' group who have 11 to 15 years of experience in conducting STREAM (M = 4.106, SD = .86393). The mean differences were significant at the 0.05 level.

The difference between the teachers' group who have five or less than five years and the teachers who have 11 to 15 years of experience conducting STREAM was statistically significant, t (423) = 2.694, p = .001, d = 0.344 (small to medium effect).

The effect sizes associated with the statistically significant effects are considered small to medium effects based on Cohen's (1992) guidelines.

3.5.2.5.4 Domain Five Learning Environment

The descriptive statistics associated with domain five “Learning Environment” across the numbers of years of experience in conducting STREAM, the teachers’ group who has five or less than five years of experience in conducting STREAM was associated with the numerically highest mean level of the teachers' perceptions regarding domain 5, the Learning Environment (M = 4.431, SD = .665) and the teachers’ group who have 11 to 15 years of experience in conducting STREAM was associated with the numerically smallest mean level of domain five Student Learning Environment (M = 4.202, SD = .751).

To test whether the Learning Environment domain differs across different years of experience in conducting STREAM “H0: There are no significant differences in domain 5 Learning Environment across the different numbers of years of experience in conducting STREAM” to test the hypothesis, a One Way ANOVA was conducted.

Prior to conducting the ANOVA, the assumption of normality was evaluated and determined to be satisfied as the three groups' distributions were associated with skewness = -1.291(Std. Error = .114), < |2.0| and kurtosis = -.152 (Std. Error = .227), < |9.0| (Schmider et al., 2010).

Furthermore, the assumption of homogeneity of variances was tested and satisfied based on Levene’s F test, F (2, 459) = .232, p = .793.

The Independent Samples t-test between-groups and ANOVA yielded a statistically significant effect, F (2, 459) = 3.488, p = .031, $\eta 2$ = .018. Thus, the null hypothesis of no differences between the means was rejected and 1.8% of the variance in domain 5, the “Learning Environment”, was accounted for by the number of years of experience in conducting STREAM.

To evaluate further the nature of the differences between the three statistically significant means, the ANOVA was followed-up with three Fisher's LSD Tukey HSD and Scheffe post-hoc tests.

The tests indicated that the mean score for the teachers' group who have five or less than five years of experience in conducting STREAM (M = 4.431, SD = .591) was significantly higher than the teachers' group who have 11 to 15 years of experience in conducting STREAM (M = 4.202, SD = .864). The mean differences were significant at the 0.05 level.

The difference between the teachers' group who have five or less than five years and the teachers who have 11 to 15 years of experience in conducting STREAM was statistically significant, t (423) = 2.694, p = .025, d = 0.344 (small to medium effect).

The effect sizes associated with the statistically significant effects are considered small to medium effects based on Cohen's (1992) guidelines.

3.5.3 The Results of the Third Research Question

RQ 3. What confronts teachers as obstacles while applying STREAM in the classroom? First, the researcher developed two open and close-ended questions at the end of the survey asking the respondents about any challenges that they face while applying STREAM in their classes. Then, asked them about their suggestions if they find any challenges. Secondly, the researcher included interview question number 6 Do you have any challenges in adopting STREAM practices in your classes? To answer the study's third question, what confronts teachers as obstacles while applying STREAM in the classroom?

The rationale was to consolidate the survey answers with interviews with teachers and lead teachers at the school where the researcher works to establish a complete understanding of the real perceptions of the teachers and the kind of challenges they faced in case there were any. Research interviews are a domain method for practitioner and student research since they effectively obtain unique data and learning viewpoints (Hannabuss, 1996).

Another rationale of the study was that the researcher acted as a STREAM coordinator at two different schools. He has had the passion and knowledge to learn more about the topic and the other teachers' perception of its impact on teaching, learning and professionalism. That is why he was interested in running the study using both methods, the survey and the interviews to have unique data about a topic he likes to investigate in order to spread the knowledge about it in the UAE context and globally as well.

3.5.3.1 Answers from the Survey

The researcher added close-end and open-end two-part questions at the end of the survey to consolidate the opinions of teachers about the interview results concerning the challenges that teachers might face when implanting STREAM, as follows: Do you have any challenges when it comes to applying STREAM in your classes, if so, what are they and what do you suggest overcoming them? This part was added at the end of the survey to allow the participant to express if they have challenges facing them when applying STREAM practices inside their classes. They are asked to forward their suggestions for the mentioned challenges in case there are any.

Almost 135 responses were collected from the two open-ended survey questions and 80 percent of the participants mentioned that there were no challenges. Meanwhile, 20 percent of the participants mentioned some challenges such as time, resources, class management, administrative support, teachers' loads, integrated planning, assessment and curriculum, language barriers, reading and writing abilities, low achievers, the needed training and workshops, support by parents, knowledge of STREAM from early ages as well as the needed knowledge by some teachers about STREAM practices.

The researcher finds it the most exciting part of the study because it gave him a clearer vision of the teachers’ perception and the actual situation. Despite mentioning different challenges, both the survey and interview participants still perceive STREAM as an important topic that should be taken seriously and supported more by school administrators and the educational authorities.

3.5.3.1.1 Theme One: The Absence of Integration

Eleven participants (13%) in the survey reported a lack of integration between STREAM and other subjects at their schools. One participant mentioned that he finds a mismatch of topics with other subjects for STREAM to be applied. Another participant reported that it is difficult for students to understand scientific subjects such as

Mathematics, Science, Engineering and Technology if they are not integrated in the right way. A third participant believed that STREAM is not given a place in the curriculum. Some suggest that the STREAM application needs to be integrated from an early age. Therefore, if there were a way to combine curriculum and STREAM, this would be beneficial for both teachers and students. Sample answers and suggestions for the survey results of the two open-end questions are introduced here. One participant reported that:

> *The challenge that I find is the lack of integration between subjects. I suggest that there should be coordination between STREAM and the curriculum. Assigning special sessions to STREAM would be great. Modifying the curriculum and clarifying the STREAM practices to be implemented during each class period. Reducing the size of the books. We find it difficult to apply the program due to lack of space and time I suggest having an illustration program for the STREAM system and circulating the STREAM program with the needed materials to benefit from it.*

3.5.3.1.2 Theme Two: Resources Availability

Almost nine participants mentioned that access to resources is a significant challenge to the implementation of the STREAM initiative. Some teachers reported that resources are very important for students to perform STREAM lessons. Others claimed that the lack of resources could sometimes contribute to the inability to perform STREAM or cause the necessary change. One participant believes that providing learning resources for the subjects and motivating students for this method of learning is very important, whereas another participant thinks that having various resources available for teachers and students supports the teaching and learning process. Other participants reported that lack of resources, technical problems, internet connection problems and the current lengthy curriculum are too much that could be a clear challenge for adopting STREAM.

Sample answers and suggestions for the survey results of the two open-ended questions: one participant claimed that:

The important key point here is to provide learning resources for the subjects and motivate students for this learning and language acquisition method. Students who were adept at speaking, listening and communicating still need to learn using different resources, which will teach them STREAM skills.

3.5.3.1.3 Theme Three: The Needed Time and Class Management

Another point of the challenge was reported by other nine participants who believe that more time is needed to apply STREAM and prepare its lessons. Other participants claimed that they are already using STREAM in a strategy that varies with levels or grades, learning styles and level of achievers. Still, teachers need to dedicate time to meet and plan with other teachers. A third participant reported that teachers, specifically C2 and C3, need a dedicated classroom space and enough time rather than moving to student classes to save time to apply STREAM inside their rooms. A fourth participant thinks that a specially allocated time for STREAM would minimize the loss of ordinary teaching and learning time. Sample answers and suggestions for the survey results of the two open-ended questions are shown below, a fourth participant claimed that:

More awareness is to be raised about STREAM and the easy way to follow the steps of the whole process. Instead of having a lengthy, tedious presentation or workshop for repeated topics, there should be clear and consistent training sessions on how STREAM is expected to operate and a practical guide or demonstration of STREAM could be helpful. Then allocating some lessons from each unit to apply STREAM practices to ensure the training sessions we understood and practically applied inside the classrooms to save time and energy.

While another participant reported that, STREAM is a great approach that needs support at schools now. He suggested decreasing the amount of the curriculum in each term. Another participant reported that:

STREAM takes time, as learning is based on student participation. STREAM lessons cannot be rushed for effective learning to take place. The current curriculum leaves no time for this opportunity. The amount of the curriculum in *each term has too many outcomes. A genuine and practical suggestion was about having activities on the ministry of education platforms like LMS, Alef, etc., which need to be more STREAM centric to save time.*

3.5.3.1.4 Theme Four: Teaching loads

Four participants mentioned that teaching loads could be considered another challenge in implementing STREAM classes. One participant mentioned that being overloaded with many classes does not allow collaborative planning and preparation time. He suggested that teachers need time allocated specifically for collaboration, planning and preparation for STREAM classes to ensure high-quality teaching, learning and professionalism. Another participant suggested that reducing the teacher's load and assigning him a stage of study or one level only would contribute to achieving STREAM. A third participant claimed that, as the teacher does not have enough time to think of suitable STREAM activities for his lessons due to many burdens and assignments, he or she would not be able to apply STREAM. Sample answers and suggestions for the survey results of the two open-ended questions: a third participant claimed that:

Providing ready-made plans and lessons for the teacher, adding some ideas or adjusts the ideas to suit the personalities and needs of students, as the teacher does not have enough time to think of suitable STREAM activities for his lessons due to many burdens and assignments.

3.5.3.1.5 Theme Five: Integrated Planning, Assessment and Curriculum, Language Barriers, Reading and Writing Abilities, Low Achievers

In this part, teachers expressed that the process of integration could be faced by some challenges like planning, assessment and the aligned areas inside the given curriculum as well as the language barriers, reading and writing abilities and the low achievers a participant reported:

For me no challenges were faced inside my school to adopt STREAM in my classes, yet I suggest improving skills in English, reducing the teacher's quorum. Reducing the amount of the curricula, allocating a unit of study in each subject in *which the STREAM project is applied and it is included in the semester plan, provided that several classes are allocated to it in the time plan.*

Some teachers reported that there is a need to have alignment in curriculums and that model peer classes should be there to overcome the challenge of being a new project claiming that STREAM is a very important approach that requires more training to know how to apply it inside the class as one participant suggested that:

Modeling is needed by giving examples and training at our school. We started this as a pilot project on specific classes and students. STREAM is the best vehicle for authentically encompassing and implementing the 21st Century skills, yet we still have to adhere to end-of-term exams that ask us to teach specific learning outcomes that cannot be covered as thoroughly. The second solution reduces the number of learning outcomes in the Math curriculum so that viable teaching vehicles such as STREAM are under-utilized and only given a cursory glance because we are under the pressure of time to ensure that our students are prepared for the exam. We were training the students to complete their activities on time. Mixing up the routine can help.

Meanwhile, other suggestions were received from the survey's open questions, such as raising the students' awareness about the importance of the project and using the different MOE platforms to foster using STREAM approaches in different subjects in an integrated method. One participant thinks that:

Students should be aware of the importance of STREAM and its future applications. Providing online courses to show different ways to apply STREAM with different subjects using (MOE) books and the current curriculum to show a real example- if we are going to use STREAM from A to Z.

An English teacher reported that ‘‘One of the most complex challenges he faces as an English teacher in applying STREAM practices in teaching is the weakness and meager achievements of many students in the English language’’. He suggested that low achievers should be encouraged and motivated to speak and communicate in English and to do more hand-based activities, saying that:

I suggest encouraging those students who are weak in speaking or reading to practice English language more and do more activities in the classroom or at home. More time should be allotted to these practices. Extra clubs should be for these activities, like the STREAM club on evenings or weekends. Interdisciplinary planning is required among the subjects that teachers teach.

3.6 Summary of Chapter Three

This chapter revealed the study's findings about the teachers' perceptions of STREAM's impact on teaching, learning and professionalism based on different demographic factors and variables. The chapter presented the main results of the study. This study used quantitative and qualitative data analysis methods to address the different domains and the different emerging themes. Specifically, the quantitative data analysis was utilized to address the six different domains (professional knowledge, instructional planning, instructional delivery, learning environment, assessment and professionalism) and how teachers perceive them based on their gender, qualifications, emirates and years of experience in teaching, years of experience in conducting STREAM, training received in STREAM and teaching subjects.

All the domains were found to be positively perceived about the impact of STREAM on teaching, learning and professionalism. The sample means of the six domains of the survey elements were statistically significantly higher than three. The highest mean was (4.28) for professional knowledge domain no one, while the lowest mean was 4.15 for professionalism domain No 6. The value of the Cronbach's Alpha of the survey's six domains in the survey was $\alpha = .978$. The internal consistency of the survey is very high, with reliability between questionnaire variables. The t-test indicated statistically significant differences between the sample's mean and the hypothesized population mean. The size effect for the six domains ranges from large to massive. It shows a tendency towards agreeing with the statements of the survey. This indicated that the participants perceived the STREAM approach as having a positive impact on the six domains according to the descriptive statistics of the survey domains and items as well as the interviews' emergent themes.

Chapter 4: Discussion

The primary purpose of this study is to investigate the ESE teachers' and lead teachers' perceptions about the impact of STREAM on enhancing teaching, learning and professionalism at ESE schools in the UAE. In order achieve this goal, the researcher has studied the results of the replies to the research questions as follows:

RQ 1. What perceptions do teachers and lead teachers have about the impact of STREAM on enhancing teaching, learning and professionalism?

RQ 2. What impact do different demographic variables have on teachers' perceptions of the STREAM domains?

RQ 3. What obstacles do teachers face while applying STREAM in the classroom?

The study was conducted through a concurrent research method that concurrently mixed surveys and interviews results to reach a final conclusion about the topic of the study. While doing the survey and collecting its data, the researcher conducted the interviews simultaneously. The survey replies and results came from 462 teachers on the ESE, almost all public schools in the UAE from the seven emirates. At the same time, the interview data were collected from five teachers and lead teachers.

4.1 Discussion of the Result of Research Question One

RQ1: What perceptions do teachers and lead teachers have about the impact of STREAM on enhancing teaching, learning and professionalism? The first study question investigates the ESE teachers' perceptions about the impact of STREAM on enhancing teaching, learning and professionalism in ESE schools. To get replies to this research question, quantitative data was collected via the distributed survey to the ESE public school teachers.

The one sample t-test statistics showed that all the six domains and their items were statistically significantly higher than a hypothesized population mean equal to three, "which is Neutral as per the likert scale points". That indicated that the teachers agreed with the survey statements. The measurement of the effect sizes of all the domains and the items showed a huge d value as per Cohen's (1992) guidelines, reflecting the teachers' great awareness of the STREAM project domains and items. This would show a tendency towards agreeing with the statements of the survey. It indicated that the participants perceive the STREAM approach as positively affecting the six domains (Professional Knowledge, Instructional Planning, Instructional delivery, Student learning assessment, learning environment and Professionalism). It agrees with the results that were reached by Nuangchalerm et al. (2020). When they claimed that although few teachers are specialists in Science or Math, they all share a positive outlook about STREAM education; they added that every teacher might implement STREAM education with a change in mindset and approach and design-based learning and creative classrooms should also be encouraged. Nevertheless, a comprehensive viewpoint will be more useful in the classroom; thus, it is crucial to set up the technology and other learning spaces. The research findings are very close to the findings of the current study.

This in turn agrees with the study conclusion by Wannapiroon and Pimdee (2022) that claimed, according to research conducted in the United States by Morrison (2006), STEM was found to improve student creativity, their capacity for creative design and their ability to produce solutions based on current needs. This is congruent with Bakar and Mahmud (2020), who described the significance of STEM and TVET education in Malaysia as declared by the national government as cited by (Wannapiroon & Pimdee, 2022). This gives the study more reliability and credibility.

The data from the interview questions. The emergent themes from the replies to the interview questions were as follows, STREAM status now at your schoolteachers reported that STREAM is already adopted at their schools. One subtheme was grouping students and making them work in teams, which means that STREAM advocates collaboration and teamwork inside classes and with teachers. This agreed with the study by Mpofu (2019) claiming that the interactions between the teacher and students are of immense importance here so that their collaboration can lead to efficient knowledge delivery. Mpofu (2019) added that in this approach, the teaching is in the way subjects intersect, for example, Mathematics in Science areas and scientific theories in Mathematics. It agrees again with the study by Anabousy and Daher (2022) that explains how the prospects of teachers' demonstrating the design of STEAM bring details on the collaboration of STEM activity by students. This can create experiences that will inspire elementary school teachers and students. It can happen here as well in the Emirati context as well.

In subtheme two, teachers reported that the integration of subjects is there when we use the STREAM approach in our classes; this, in turn, agrees with the study by Badmus and Omosewo, (2020) that suggested an investigation into the knowledge, skill and resource gaps needed to address these new trends for meaningful classroom integration in Africa that led to the conclusion that the transition from STEM to STEAM had enormously favorable effects on the linked fields and disciplines. It was mentioned by Nadelson et al. (2013), who stated that in primary schools, students develop their core understanding of major basic subjects, so it is better to integrate STEM in that phase. Students' enthusiasm for STREAM in the classroom is just another factor in their determined gaze for a better future optimistically and excitement about the potential for learning the latest things (Badmus & Omosewo, 2020). This can be applied to STREAM program here in the UAE context as well.

Subtheme three, sustainability, innovation and creative generation, are three topics that the interviewee reported that the STREAM approach enhances. This in turn agrees with Di et al. (2021), who reported that STEM education seeks to foster innovative talents by improving students' ability to apply interdisciplinary knowledge robustly in solving practical problems by building upon experiences and newly acquired skills. The relationship between the innovation event model and STEM education is established from the perspectives of subject integration and constructivism in STEM education. In subtheme four, learning everyday experiences. There is an agreement with the study results when relating to STEAM approach as well. This is the last STEM approach. It was done to promote the affability of STEM. The main art areas include music, acting, theater, dancing and the visual arts (Mpofu, 2019). It was done, as arts cannot be separated from the reality of life that was stressed in our study when the study results showed responses from the interview participants that STREAM teaches students life skills. This can be applied to STREAM program here in the UAE as well.

The findings from the interview’s replies showed that teachers and lead teachers consider STREAM an essential part of learning and teaching in the United Arab

Emirates. Teachers and lead teachers reported that students learn new skills, including life experiences and survival skills in the 21st century. The findings revealed their awareness of the importance of integration in STREAM classes, as it enhances teaching and learning. Teachers reported that STREAM instills innovative skills as well as questioning and curiosity since the results showed the majority of them agreed to the survey item stating that as well. Others reported that it encourages students to think outside the box and enhances their creativity and problem-solving skills. STREAM in curricula supports teaching and learning in our school. It was reported by the findings that integration of subjects fosters both teaching and learning at schools. It supports the exchange of knowledge and professional development. Teachers claimed that STREAM activities enhance students' motivation to learn. They are aware that it teaches students problem solving skills, especially in the project-based class and problem based lessons, supporting acquiring different new skills and enhancing their motivations to learn as well as the needed life skills for future job market.

4.2 Discussion of the Result of Research Question Two

4.2.1 The Impact of Gender on Teachers' and Lead Teachers' Perception

RQ 2 What impact do different demographic variables (gender, emirate, subject, experience, qualifications, STREAM experience and training) have on teachers' perceptions of the STREAM domains? The independent samples t-test revealed that there is no statistically significant difference in all six domains and the items due to the participants' gender. That could reflect a consistency between male and female school communities. That consistency tends to lean toward positive attitudes as both the gender means are significantly higher than the hypothesized population mean, as reported in the One-Sample t-test results. It was opposite to a study done in Japan about the public perception of gender in STEM when they investigated the possibility of gender bias in the public perception of various academic fields in Japan (Ikkatai et al., 2020).

First, they discovered that mechanical engineering and nursing had the highest gender-bias disparity in public perceptions. Furthermore, those with low levels of egalitarianism in their attitudes regarding gender roles said that nursing was a profession best suited to women. Third, those with low levels of egalitarian attitudes believed that men should generally pursue STEM disciplines (Ikkatai et al., 2020). This opposes the current study's findings that there is no statistically significant difference that exist between male and female perceptions of STEM importance. It implies that there are still gendered conceptions about academic fields in Japan. This is not applicable in the Emirati context as support is given for both genders in STEM market and education as mentioned by (Geronimo, 2019), that the UAE leadership supports Emirati women to excel in STEM fields according to Sarah Yousif Al Amiri, Minister of State for Advanced Sciences, Emirati women have made significant achievements in the fields of Science, Technology, Engineering and Mathematics (STEM) thanks to the UAE's leadership's strong support and encouragement, as well as the equal opportunities.

4.2.2 The Impact of Other Demographics on Teachers' and Lead Teachers' Perceptions

The One-Way ANOVA revealed several results regarding the impact of the other demographics on the teacher's perceptions of the domains and items:

4.2.2.1 Qualifications

There were no significant statistical differences in the teachers' perceptions that could be due to the teachers' qualifications or academic degrees. This could reflect that all the teaching-related qualifications should include practical components and courses focusing on STREAM teaching, learning, assessment, professionalism and applications. That would affect their ability to plan and deliver successful and effective STREAM learning experiences.

4.2.2.2 The Emirate

The results showed that the Emirates the teachers are resident in did not have any significant statistical differences in the teachers' perceptions regarding all the domains and most of the items. That could be a positive indicator of consistency among the different schools and educational regions, which needs more investigation to prove it or not. However, three items showed statistically significant differences among the teachers from different Emirates. Namely, "Integrating Project-Based Lessons makes students more innovative and creative", "Teaching real-life, tangible activities enriches students' learning experience" and "STREAM planning will help teachers execute meaningful

STREAM activities”. That could reflect individual differences among the schools’ environments that influenced their perceptions regarding the three items and resulted in these significant differences. Still, the other domains and items had no significant statistical differences in the teachers’ perceptions regarding all the domains and most items.

4.2.2.3 Number of Years in Conducting STREAM

Investigating the impact of the number of years the teachers spent in conducting the STREAM program from different phases on the teachers' perceptions of the six domains and their elements showed:

4.2.2.3.1 Domains One and Six

Teachers’ perception of domains (1) professional knowledge and (6) professionalism and their items showed no statistically significant differences that could be due to the number of years the ESE teachers conducted STREAM programs. That could have negative and positive interpretations. However, the positive ones seem far-fetched. The negative ones could be concluded in the idea that the STREAM experience should logically have an enhancing impact on both the domains, which means the more experience the teachers have, the more their knowledge and professionalism should increase, which should result in statistically significant differences between the experience groups; however, the results showed the opposite.

The positive reasoning could be that there are great induction programs that leave the teacher with no need for years of experience, which seems illogical and opposes the results for the significance of the training years in another ANOVA test. This agrees with Dickson et al. (2019) point of view that STEM education brought new disciplines, knowledge and educational pedagogies. It presents excellent practices of modern-day sciences and necessities. It explains how STEM might be able to support future development (Dickson et al., 2019). This in turn could agree with the reported literature review that has been reported about the challenges that some teachers face while incorporating STEM activities in the classroom. These occur when they have to integrate different subjects to teach them in relevance with another, for example, by combining

Science and Mathematics (Margot & Kettler, 2019). Attempting to eradicate these challenges, teachers joined training programs and professional development programs so that their resistance to the STEM activities decreases and they become accustomed to them (Lee et al., 2019). Training is very crucial to make STREAM a success in the UAE.

It again agrees with the study by Anabousy and Daher (2022) that explains how the prospects of teachers' demonstrating design of STEAM brings details on the collaboration of STEM activity which demonstrates that can lead to the creation of experiences that will inspire elementary school teachers and students. They claimed that the introduction to STEM's professional development program was the setting for these designing experiences. Their study's results demonstrate several potentials for STEM education (Anabousy & Daher, 2022). It is in turn, similar to what was mentioned by Bybee (2010), that the knowledge of STEM strives to improve the working team connected to this profession and it nurtures literacy to handle the fundamental issues confronting the twentieth-century generation (Bybee, 2010) as cited by (Yata et al., 2020, p. 01).

As for professionalism, this agrees with the study by Dare et al. (2019), which reported that the success rate of STEM programs is directly proportional to the concepts of teachers and that if teachers have positive perceptions and strong attitudes, their response toward the STEM programs will lead to the children excelling in this area. They added that STEM education had seen significant modifications in recent years (Dare et al., 2019). The researcher finds that could be logical as experience now is not the only source of knowledge, but professional development and different attitudes could contribute to a better understanding of any new sciences. More training makes a difference in teachers' attitudes about applying STREAM.

El Nagdi et al. (2018) mentioned that new roles for teachers are emerging due to STEM schools' growth worldwide and in the United States since these jobs are accompanied by changes in attitudes. While in another study, Margot and Kettler (2019) concluded that teachers believed that peer collaboration, high-quality curricula, district support, prior experiences and efficient, professional development would support their efforts to adopt STEM education (Margot & Kettler, 2019).

4.2.2.3.2 Domains Two, Three, Four and Five

Teachers' perception of the other four domains, (2) instructional planning, (3) instructional delivery, (4) student learning assessment and (5) learning environment, showed statistically significant differences due to the STREAM experience. That could be because these four domains are more closely attached to the practical aspect of the day-to-day experiences of the teachers and administrators involved in the STREAM program. These results seem logical and could be supported by anecdotal data and are experienced among teachers.

As for instructional planning, this goes along with what Chalk (2020) prosed that creating an instructional plan is a process that is not just creative but critical too, as teachers must use a varied range of strategies to make sure that the students remain engaged, their performance is being assessed and they are better learners and able to understand the concepts (Chalk, 2020). This was perceived and agreed to by Burton et al. (2022) that the affective dispositions exhibited and the instructional action of planning STEM did not always align. In their study, they explained that the statistics indicated that while learning, witnessing and designing STEM classes can be valuable experiences for professional development, more work has to be done to link instructional behaviors with emotional dispositions connected to STEM education.

As for assessment, in agreement with the results, an essay by Gao et al. (2020) explains that assessment refers to a conscious attempt to monitor student learning through various techniques to assess where each student concerns with one or more particular learning outcomes, Nevertheless, creating accurate and rigorous assessments of transdisciplinary learning in STEM has proven difficult (Gao et al., 2020). STEM education is one of the most effective strategies for enabling children to be self-regulated learners. Students are given several opportunities to refine their thinking in STEM education classes (Anwari et al., 2015). STREAM would support students' innovative skills. This agrees with the results of the study and the last findings as well.

4.2.2.4 The Subject

The subject the teachers taught seemed to have no statistically significant influence on the teachers' perceptions of all domains and items. That could seem unusual as the logic implies that the subjects closer to STREAM (Science, Math, IT, Arts) should stand out among other no - STREAM - related subjects with higher means that result in a statistically significant difference. That could be due to similar reasons to the qualification's demographics. It agrees with a study by Lin et al. (2022) in which they investigated the modeling of Chinese teachers' efficacies for the teaching of integrated STEM with interdisciplinary communication and epistemic fluency; their study's outcomes supported the notion that their measuring model looked to be comparable for both genders and the investigated topic areas. The measured variables did not significantly differ by gender or subject matter (Lin et al., 2022).

4.2.2.5 STREAM Training

The results of the Test of Homogeneity of Variance are not significant. The one-way ANOVA test indicated that not all domains and items are significant. It means that there are no statistically significant differences in the ESE teachers' and the lead teachers' perceptions of the impact of STREAM on teaching, learning and professionalism due to the number of years in STREAM training. It could have two reasoning, whether training has no efficacy and or is of high quality; triangulating the data with the results from the one sample t-test, which indicates a larger effect size, would emphasize the second reasoning. Using triangulation and looking for the data in many resources like the survey, interviews and references or measuring tools like the One-Way-ANOVA and using one sample t-test shows high perceptions and effect size as they have an awareness of STREAM, which could result from high-quality training. The third source comes from the interviews; most participants reported that they received high training and still needed more training. This agrees with what was mentioned in the study by (Margot & Kettler, 2019) which concluded to the results to eradicate the challenges, teachers joined training programs and professional development programs so that their resistance to STEM activities decreased and they became accustomed to different STEM practices (Lee et al., 2019).

It in turn goes in accordance with the STREAM training in the UAE context, which reached the third stage of the Emirates STREAM program that has begun at the Ajman Teachers Training Institute, according to MOE. To make a generation of children who have the understanding, fundamental concepts and experience, as well as capabilities to study Science, Math, language skills, Engineering and Technology, this program will help to make them ready to handle an active part in the knowledge economy societal structure (Ministry of Education, 2018).

4.3 Discussion of the Result of Research Question Three

RQ3. What confronts teachers as obstacles while applying STREAM in the classroom? To answer this question, the research developed the survey with two open and close-ended questions asking the teachers about the challenges they face when applying STREAM inside their classes. To answer the third question, the researcher used data from both the survey and interviews results as follows:

4.3.1 From the Survey Results

The researcher added a part at the end of the survey to seek the participants' suggestions to figure out how deeply they realize and understand STREAM challenges, if there is any. Their replies reflect that teachers consider STREAM an effective teaching approach for advocating professionalism and a genuine learning technique for students and teachers. It in turn could agree with a reported literature review that has been reported about teachers who encounter some challenges while incorporating STEM activities in the classroom. These occur when they have to integrate different subjects to teach them in relevance with another, for example, by combining Science and Mathematics (Margot & Kettler, 2019); trying to eradicate these challenges, teachers joined training programs and professional development programs so that their resistance to the STEM activities decreases and they become accustomed to them (Lee et al., 2019). These results agree with the current study. Training can solve the problem of challenges.

The results are close to what Al Murshidi (2019) concluded that the UAE has advanced more than other countries, but this progress has been hampered by issues such as the UAE citizens' lack of interest in STEM subjects and the inaccessibility of STEM education to all age groups and socioeconomic groups. In her study, she suggests that STEM teachers still need to put more effort into their professional and personal growth, which will influence students' enthusiasm for STEM subjects. Additionally, STEM education should be available to all and all age groups (Al Murshidi, 2019). The current study aimed to fill that gap and find suggestions to resolve these challenges. As the main reported challenges were classroom management, integrated planning, assessment and curriculum, language barriers, reading and writing abilities and low achievers, more training to acquire the needed knowledge to master more STREAM practices and integrate them into classes, time, resources and the required curriculums compared to a load of teaching. Other challenges were related to the students from many different backgrounds and that it is a new, pioneering project; new things take time to deal with them.

4.3.2 The Interview Results

First, the researcher developed two open and close-ended questions at the end of the survey asking the respondents about any challenges they face while applying STREAM in their classes. Then, ask them about their suggestions if they find any challenges. Secondly, the researcher included an interview question; do you have any challenges in adopting STREAM practices in your classes? Most of the interviewed teachers' answers were no. Moreover, fewer interviewees answered that sometimes they face particular challenges. To answer the study's third question, what confronts teachers as obstacles while applying STREAM in the classroom?

The reported emerged themes are time and pacing, assessing the final product and the need to incorporate the cultural aspects of STREAM. It agrees with the study by Margot and Kettler (2019), in which they suggested that some teachers think that STEM is essential for students to learn and should be integrated into the curriculums. Teachers believe that STEM should be added to the K12 education of the students. They believed that STEM leads to an increase in the scientific literacy of the students after they graduate from high school and they become more able to do critical thinking about different issues and implications in their personal lives as well as in other areas (Margot & Kettler, 2019), despite facing different challenges. Still, teachers perceive it as an essential educational approach. This agrees with the study results as well.

In the meantime, the teachers and lead teachers who attended the interviews showed that most teachers understand and realize the importance of applying STREAM at their schools as a successful system that fosters Technology, 21st century skills, project-based learning and problem solving. The survey and interview findings show the teachers' and the lead teachers' awareness of the six domains of the study that the researcher based the investigation on, professional knowledge, instructional planning instructional delivery, student learning assessment, learning environment and professionalism.

The findings of the concurrent study respond to the literature on STEM. It reflects and matches two constructivism theories. According to Piaget, biological maturation and environmental experience led to a progressive restructuring of mental processes during cognitive development (McLeod, 2007). As cognitive constructivist Piaget (1896-1980) suggested, students could acquire innovative knowledge related to their experiences. This knowledge can be acquired by shifting their mental process utilizing assimilation, accommodation and schema. They can do this to fit the new learning situation. The STREAM approach is related to cognitive constructivism when students receive learning based on innovation and creativity in a student-centered learning process and collaborate in teamwork experiences, they develop and acquire new experiences based on their past experiences, which goes along with the learning of STREAM pedagogies (Inquiry-problem based lessons-project-based lessons, creative thinking). This, in turn, develops their cognitive side.

While many theories describe the phenomenon of learning, Vygotsky's social constructivism is one of the oldest and most accepted approaches (Deulen, 2013). Theory two Vygotsky's (1896 -1934) Social Constructivism, as for Vygotsky's theory on Social Constructivism, children develop in a social world. The child's environment, age, culture and life experiences, social relationships and interactions with other adults and children must be considered when reaching conclusions about children's learning and development. As for Social Constructivism and STREAM, students socialize in various ways in constructivist classrooms because learning occurs in groups rather than individually. They actively collaborate to solve problems, test hypotheses, investigate, discuss, debate, and even create unique learning experiences. Education is the result of situational information, tactics and interactions. STEM employment is in the growing market and expansion in STEM output and research across the economy has significant societal advantages (Green & Sanderson, 2018; Dalton, 2019). It was evident in the study when the survey sample and interview participants reported that STREAM education instills innovative skills building on students' previous experience and knowledge, which is an authentic and practical way to teach life and survival skills and social skills as well.

The results again agree with and reflect the integrated approach. In this approach, there is integration and the teachers must deliver knowledge, skills and information by combining everything as one function (Mpofu, 2019) who added; that in this approach, the teaching is in a way where subjects intersect one another, for example, Mathematics in Science areas and the use of scientific theories in Mathematics. It in turn agrees with the continuum approach, which is a combination of both the pathed and the integrated approach, which has four levels of integration, as mentioned in the literature review, in its first level, as mentioned in the pathed approach, all subjects are taught separately along with traditional Science subjects, but Engineering and Technology are included. In level 4, everything is taught in an integrated manner, as cited in the article Top 6 Advantages of Traditional Education, the University of the Potomac and the continuum approach level four, which is the highest level and most integrated (Mpofu, 2019). STEAM is the last STEM approach to STEAM before STREAM. There is an agreement with the study results when relating to the STEAM approach. The main art areas include music, acting, theater, dancing and the visual arts (Mpofu, 2019). Arts cannot be separated from the reality of life, which was stressed in our study when the study results showed responses from the interviewed participants that STREAM teaches students life skills and survival skills.

4.4 Summary of Chapter Four

The objectives of the research study are attained. The research findings could disclose teachers' perceptions of implementing STREAM in public schools in the UAE. The primary goal was achieved by ascertaining that teachers realize the importance of preparing students to be ready and well-equipped to join a technology-dominated workforce and build entrepreneurial skills. The STREAM framework was used and could determine how well teachers perceive it and the results disclose that there is a high perception by the ESE teachers of the importance of the STREAM approach. The results and the emerging themes from the survey and the interview responses agree that the STREAM practices promote 21st century skills and survival skills authentically, especially regarding real communication, creativity, collaboration, critical thinking, innovation and entrepreneurship. The results respond to the ESE's aspiration to promote public education with innovation as well.

Chapter 5: Conclusion

5.1 Managerial Implications

To sum up, STREAM is clearly seen as an important topic and essential for enhancing teaching, learning and professionalism as perceived by the ESE teachers and the lead teachers who showed high awareness of its importance and impact on the students learning teachers' instruction and professionalism. Still, more awareness needs to be raised to adopt STREAM practices daily and effective use of it would contribute more to the better acquisition of 21st century survival skills. Every teacher can implement STREAM education with a shift in their approach and attitude and design-based learning and creative classrooms should be encouraged. Nevertheless, a comprehensive viewpoint will be incredibly beneficial in the classroom; thus, it is crucial to set up the technology and other learning environments (Nuangchalerm et al., 2020).

The perceptions of STREAM's importance are highly perceived as the findings explain that there is already a well-established awareness among the ESE teachers and lead teachers about STREAM to instill innovative skills in students, equip them with knowledge for the future and provide them with meaningful learning experiences as well. The study findings derived from the main domains and emergent themes mentioned would raise the teachers' awareness more. The study concluded that the ESE teachers are aware that STREAM emphasizes acquiring problem-solving skills by students and that it provides meaningful knowledge through the integration of subject matter. Teachers and lead teachers are aware that through the STREAM approach, students are exposed to multiple content areas within a single lesson. This matches the Emirates STREAM initiative that aspires to prepare students who desire to learn Science, Math, Engineering and Technology and possess the professional skills that enable them to compete in the global market (Ministry of Education, 2018).

The ESE teachers and lead teachers showed a deep understanding that integrating STREAM with the current curriculums supports teaching and learning and that using different STREAM activities enhances students' motivation to learn. They realize that teaching real-life tangible activities enrich students' learning experience. They understand that STREAM planning will help teachers perform meaningful STREAM activities and that applying instructional techniques such as videos, PowerPoint Presentations and the use of technology in STREAM encourages students to be engaged and more motivated to learn in STREAM classes.

It was clear from the study's findings that ESE teachers and lead teachers realize that STREAM promotes various instructional strategies that fit what is being taught and that using instructional strategies in STREAM classrooms promotes innovation and entrepreneurship skills for students. It matches the MOE's ambition to promote innovative education for leading, knowledgeable and global recognition, with the mission of developing an inventive school reform for a competent and worldwide community. It matches the ESE's published mission to improve the school system and the intellectual community by using cutting-edge teaching strategies, developing strong faculty and staff leadership and promoting expertise to foster the growth of vibrant cultures. The advocated ESE vision is promoting public education with innovation and serving as a global role model (Emirates Schools Establishment, 2021).

As for the assessment of and for learning, the results show that teachers and lead teachers realize that STREAM guides them to gauge the learners' development over time; moreover, in STREAM, collaborative learning assessments enrich students' learning. In other words, formative and summative evaluation support STREAM teaching practices and assessments. ESE teachers and lead teachers showed their perception that STREAM encourages teachers to make responsive instructional decisions based on the student learning data to enhance learning. ESE teachers and lead teachers realize the usage of self-assessments in STREAM makes students cognizant of their learning progress as well.

As for the learning environment that STREAM promotes, teachers are aware that STREAM supports the usage of rich resources to provide different learning experiences, creates a supportive environment for innovation, a 21st century collaborative learning environment and promotes a growth mindset as well as a productive learning environment for students. It agrees with the MOE and ESE notions that Emirati schools strive to offer students a unique, innovative and revolutionary educational climate based on the mission and vision statement of the United Arab Emirates Ministry of Education (MOE) and the Emirates Schools Establishment (ESE).

Out of being aware of the professional side, teachers and lead teachers realize that there is a commitment to ethical practices in STREAM and that it creates a culture of collaboration among staff, promotes leadership skills and provides effective professional development programs for teachers. Most teachers agreed that STREAM is a successful method for enhancing teaching, learning and professionalism in the Emirates Schools Establishment. They showed their understanding that STREAM is an approach not only to study comprehensive and intellectual subjects in an integrated way, but it is a way of teaching and learning that also supports both teachers and students to communicate, collaborate and innovate regarding their increased abilities to teach and improve different strategies for learning new skills. The students and teachers could learn from STREAM skills such as leadership, critical thinking, design thinking, entrepreneurship, and other life skills required in the 21st century for survival.

The findings reveal that teachers are aware that when teaching STREAM, students are also supported to grow and have flexible mindsets. It reveals that teachers know that students can learn advanced learning skills, promote their teamwork skills and enhance their motivation to learn. The teachers were also aware of the need to use the resources properly. The teachers' ethical and teaching practices were able to advance as per the 21st educational practices. As Nguyen et al. (2020) studies showed previously, the STEAM system helps change the kids' perspectives towards a better and more positive perspective. Their ecological preferences can evolve if given the right resources and spaces.

5.2 Research Implications

The given conclusions of the study showed a tangible awareness of the teachers and lead teachers of the impact that STREAM has in enhancing teaching, learning and professionalism on the ESE schools in the UAE at most levels of the study. These results were not affected by the place where teachers work, their subject of teaching, their teaching experience, gender, or any other demographic variables except for the number of years in conducting STREAM in four domains.

The current research stands in favor of supporting the enhancement programs of STREAM and training teachers accordingly. The research implied that the teachers and students could learn new practices using STEM/STEAM/STREAM. These three progressed into the educational lives of people quite smoothly. The schools can pre-plan their events and studies so that the students have space to grow. They can learn to lead, become better learners and increase their innovative skills. It can be claimed that STREAM is a program that benefits everyone who practices it, both the lead teachers, teachers and students. The teachers also gain immeasurable skills when they plan STREAM lessons collaboratively for teaching and sharing the best teaching practices that promote innovation and creativity.

Studies with more extensive qualitative samples of correspondents on the Emirates STREAM initiative should be applied. These studies can include private schools. The current study sample included the ESE schools to cover the vast majority of teachers all over the United Arab Emirates public schools. It also attempted to have an overall view of the initiative seeking a holistic reform in the education system. It would match the MOE and ESE mission and vision in the Emirati context to have innovative education for a leading, knowledgeable and global recognition and to satisfy upcoming future employment market requirements.

5.3 Recommendations

As for any future studies about STREAM's impact on teaching, learning and professionalism in the United Arab Emirates, these recommendations could guide any future researchers aspiring to investigate the topic and dig deeper into the STREAM initiative and its impact on education in the UAE.

- To raise more awareness among the ESE teachers and lead teachers in the UAE about the importance of adopting STREAM practices inside classrooms daily to enhance and improve students' innovative skills by providing more resources, curriculum and training related more to the STREAM teaching approach.
- Schools should be encouraged to apply the STREAM teaching approach on a broader scale. They should encourage and train teachers to have a better attitude

in using the STREAM approach to motivate students to work in teams and collaborate more to be more creative and motivate them to learn to be innovators and entrepreneurs.

- The study suggests developing the project and utilizing it nationwide to have consistent results, as the program would contribute more to the enhancement of teaching, learning and professionalism for all teachers and schools in the UAE.
- The students and teachers should be given complete and transparent ideas about STREAM to acquire new skills and become better learners to have a generation of entrepreneurs through encouraging leaders and policymakers to make the STREAM initiative a nationwide project.
- The students are the world's future and this future can be made better if offered a better educational opportunities. There should be attempts to adopt STREAM in a practical and approachable way to prepare students for the future.
- STREAM should be taught from an early age, concentrating on the younger offspring to be aware of STREAM's importance of skills and this can be delivered at KG and cycle one as well. This early introduction will facilitate their acquisition of 21^{st} century skills, innovation and entrepreneurship.
- Training sessions, workshops and conferences should be held to encourage the decision-making process towards stressing more STREAM applications inside the UAE schools. The skills, expertise and training that educators need to educate in inclusive STREAM education successfully need more investigation and discussion.
- The UAE is an aspiring country to be one of the most pioneering countries in the world in the field of technology advancement and spreading the STREAM culture would contribute to the national target.
- The study fosters the concept of STREAM for teachers, leaders and policymakers to bring in curriculum and plan effective pedagogy at all education levels in the United Arab Emirates. It contributes to the existing literature on the development of teaching practices within the educational process in (ESE) schools.

- Supporting teachers' professionalism in STREAM so that they have all the required skills, knowledge, practice and experience to become better educators of STREAM education.

5.4 Recommendations for Future Research

Based on this study's findings, recommendations for future studies on the same development field from STEM to STEAM reaching the developed version of STREAM, adding the R for reading and writing and the A for Arts. The researcher would make suggestions for the STREAM field as a novel educational approach that is gaining fame worldwide. The recommendations would be related to the policymakers and educational experts in the UAE, school leaders, lead teachers and STREAM teachers, as well as students, parents and stakeholders. These recommendations could be applied globally and in the UAE context as well.

- A similar study and action research should be done in private schools in comparison with the study on the ESE schools to figure out the challenges and suggestions to adopt the STREAM approach on both schools' levels nationwide.
- Investigating students' perceptions of the impact of studying STREAM compared to the teachers' perceptions to determine if students know its importance to guide them more.
- Future research should be done to investigate the perceptions of students, parents and stakeholders about the importance of STREAM in education.
- Future research on spreading the STREAM cultures in the schools and providing more space for teaching innovation, 21^{st} survival skills and entrepreneurship skills.
- Future research on how to support the Emirates STREAM initiative and how to provide the needed curriculum, resources and training to teach it to kids at an early age.

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List of Publications

Alkaabi, A. M., Abdallah, A. K., Badwy, H. R., Badawy, H. R., & Almammari, S. A. (2022). Rethinking school principals' leadership practices for an effective and inclusive education. Advances in Early Childhood and K-12 Education, 53-70. https://doi.org/10.4018/978-1-6684-4680-5.ch004

Appendix

The Survey and the Interview Questions

Dear respected colleagues, peace and mercy be upon you. The researcher is conducting a study entitled "Investigating the Teachers' Perspective About the Impact of STREAM in Enhancing Teaching and Learning in the Emirates Schools Establishment" from the point of view of teachers as they perceive STREAM concepts and the Ministry of Education's vision and mission. This study is part of the requirements for obtaining a Master of Education degree with a specialty in Educational Leadership. To achieve the goals of the study, a questionnaire was prepared that includes six (6) components of STREAM education and its statements were determined following the academic and school environment regulations of The Emirates Schools Establishment. The survey will be administrated to targeted public schools implementing STREAM in the UAE. The answers to the questions and statements within the questionnaire will follow the likert scale of five points, including *Strongly Agree*, *Agree*, *Neutral*, *Disagree* and *Strongly Disagree*.

STREAM Component	Targeted	Number of Items
Professional Knowledge	Teachers	5
Instructional Planning	Teachers	6
Instructional Delivery	Teachers	6
Student Learning Assessment	Teachers	5
Learning Environment	Teachers	4
Professionalism	Teachers	5

All information will be confidential, and pseudonyms will be used in the transcript. In addition, we will not release any identifying information to anyone other than the individuals working on the project. Participation in this study is voluntary. Your decision to participate will not influence your employee evaluations or other performance assessments related to your employment or your working relationship with the researchers conducting this study.

Demographic Information.

Please answer the following questions by choosing the appropriate answer:

Gender

- Male
- Female

Qualification or Degree:

- Diploma
- Bachelor’s degree
- Higher diploma after bachelor’s degree
- Master’s degree
- PhD / Doctorate

Teaching subject:

- Islamic Studies
- Arabic Languages
- English Language
- Social Studies
- Sciences
- Design and Technology
- Arts
- Mathematics
- Other: ________________________________

Years of experience in teaching.

- 0-5 years
- 6-10 years
- 10-15 years
- 15-20 years
- More than 20 years

Years of experience in conducting STREAM.

- 0-5 years
- 5-10 years
- 10-15 years

Training Received in STREAM.

- 0-5 years
- 5-10 years
- 10-15 years
- 15 + years

Emirate.

- Abu Dhabi
- Dubai
- Sharjah
- Ajman
- Ras Al-Khaimah
- Umm Al-Quwain
- Fujairah

<u>Questionnaire for STREAM Teachers.</u>

<u>Domain 1: Professional Knowledge</u>

In this part, the researcher investigates the teachers' knowledge and disposition of STREAM practices and curriculum integration to provide meaningful learning experiences and promote learners' development inside the classrooms.

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	STREAM instills innovative skills in students.					
2	STREAM equips students with knowledge for the future.					
3	STREAM provides meaningful learning experience for students.					
4	STREAM emphasizes acquiring problem-solving skills.					
5	STREAM provides interdisciplinary knowledge through integration of subject matter.					

<u>Domain 2-Instructional Planning</u>

In this part, the researcher investigates the teachers' awareness of the importance of effective plans to use the approved curriculum, instructional strategies, resources, and data to guide learner development.

	Domain 2-Instructional Planning	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Integrating STREAM with the current curriculums supports participatory teaching and learning					
2	Integrating Project-Based Lessons makes students more innovative and creative.					
3	Using different STREAM activities enhances students' motivation to learn.					
4	Teaching real-life, tangible activities enriches students' learning experience.					
5	STREAM planning will help teachers execute meaningful STREAM activities.					
6	As a teacher, I am able do STREAM planning and implement it in my classes.					

Domain 3: Instructional Delivery

In this part, the researcher investigates the teacher promotion of the learner's development by effectively engaging students in STREAM learning and using a variety of instructional strategies.

	Domain 3: Instructional Delivery	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Instructional resources such as videos, PowerPoint Presentations and the use of technology in STREAM encourages students to be engaged.					
2	STREAM promotes a variety of instructional strategies that fit what is being taught such as collaboration, project-based lessons and teamwork.					
3	The use of instructional strategies in STREAM classrooms promotes innovation skills.					
4	The use of instructional strategies in STREAM classrooms promotes entrepreneurial skills.					
5	Teaching STREAM inside classrooms promotes problem solving in different subjects.					
6	In STREAM classes, students learn life skills and critical thinking.					

Domain 4: Assessment of and for Student Learning.

In this part, the researcher investigates the teachers' use of learning data to measure learner development, guide instructional content and STREAM delivery methods, providing feedback that is timely and requires real-time student action by the student.

	Domain 4: Assessment of and for Student Learning.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	STREAM helps teachers gauge learner development over time					
2	In STREAM, collaborative learning assessments enrich students' learning.					
3	Formative evaluation supports STREAM teaching practices.					
4	STREAM helps teachers make responsive instructional decisions to the students need based on the student learning data to enhance learning.					
5	The usage of self-assessments in STREAM makes students cognizant of their learning progress.					

Domain 5: Learning Environment

In this part, the researcher investigates the teacher's uses of different educational resources, class routines, and procedures that promotes teamwork among students to create a 21st Century Collaborative Learning Environment.

	Domain 5: Learning Environment	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1	STREAM supports the usage of rich resource to provide different learning experiences.					
2	STREAM creates a supportive environment for innovation a 21st Century Collaborative Learning Environment.					
3	STREAM promotes productive learning environment.					
4	STREAM teaches students the skill of growth mindset.					

Domain 6: Professionalism

In this part, the researcher investigates the teacher demonstration of leadership and ethical practice, collaboration and a commitment to lifelong learning, as well as promoting leadership skills.

	Domain 6: Professionalism.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	There is a commitment to ethical practices in STREAM					
2	STREAM creates a culture of collaboration among staff.					
3	STREAM promotes leadership skills.					
4	STREAM provides effective professional development programs for teachers.					
5	STREAM develops pedagogical creativity of teachers.					

Do you face any challenges related to apply STREAM practices inside your classroom?

If so, what are they? Do you have any suggestions to overcome these challenges?

Thank you for your efforts and support to the researcher. My greetings and appreciation to you, may God protect you.

Interviews questions

- What is STRAEM education like in your school?
- Is the understanding of STREAM education reflected in the content and instructions in your classes?
- How far do you think STREAM education is important in the United Arab Emirates? Why?
- Do you think STREAM instills innovative skills in students? How?
- How would you describe STREAM classes in your school?
- Do you think integrating STREAM with current curriculums supports teaching and learning? How?
- The use of instructional strategies in STREAM classrooms promotes innovation and entrepreneurship. What do you think of this statement?
- Do you think that STREAM provides meaningful knowledge through integration of subject matter? How?
- How far do you think STREAM practices are successful? Can you explain with example?
- Integrating project-based lessons makes students more innovative and creative. What do think of this statement?
- What challenges do teachers face when implementing STREAM education? What do you suggest?
- Do think using different STREAM activities enhances students' motivations to learn. How?
- Do you receive effective professional development support in STREAM education in your school? Mention any example?

Ethical Approval Letter

UAEU النائب المشارك للبحث العلمي Associate Provost for Research | جامعة الإمارات العربية المتحدة United Arab Emirates University

Date: 20/04/2022

ERS No. ERS_2022_ 8505

Social Sciences Ethics Sub-Committee

Approval Letter

This is to certify that research proposal No: ERS_2022_ 8505, titled: "Investigating the Teachers' Perspective About the Impact of STREAM in Enhancing Teaching and Learning in the Emirates Schools Establishments", submitted by Ahmed Alkaabi has been reviewed and approved by the UAEU subcommittee for research ethics in social sciences.

Sincerely

Hala Elhoweris

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STREAM education is the latest development of STEM and STEAM educational approaches. According to the study the STREAM approach enhances teachers' professionalism, students' creative skills and the learning of 21st century survival skills such as communication, collaboration, creativity, critical thinking, digital competency, innovation and entrepreneurship skills the study offers managerial and research implications for future study and for policymakers and educationalists to enhance the application of the STREAM approach in schools in the United Arab Emirates.

Hosam Rashad received his Bachelor of Arts degree in English literature from the Sohag University Faculty of Arts in Egypt. He received his Master of Education degree in the year 2022 from the UAEU, United Arab Emirates.