
Implementing pragmatism and John Dewey's educational philosophy in Emirati elementary schools: case of mathematics and science teachers

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Abstract: The purpose of this study is to determine the extent to which John Dewey's philosophical pragmatic thoughts are implemented in Emirati elementary schools from the perspectives of mathematics and science teachers. Data were collected from 87 teachers using a descriptive analytical approach. The study findings indicate a general agreement among teachers who believed that pragmatism is implemented in the United Arab Emirates elementary schools from moderate to strong degree. The findings also reveal that there was no statistical significant difference between public and private school teachers' perspectives, and no statistical difference between teachers' teaching experience in terms of their views on the implementation of John Dewey's educational pragmatic principles. The recommendations arising from the study emphasise the importance of conducting workshops about educational philosophy to ensure that school teachers believe that the teaching profession must stem from an educational belief, which would help in an improved job performance.

Keywords: elementary teachers; pragmatism; John Dewey; educational philosophy; Emirati schools; mathematics and science teachers.

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1 Introduction

Throughout the Emirati schools, the pedagogical or educational system has had several educational theories for the past three decades. Some educational aspects such as the curriculum, the teacher's role, student's role, teaching methods, and school function are the domains or aspects of schooling which the Emirati governing bodies seek to recommend (Warner and Burton, 2017). Presently, the time is ripe and it is appropriate to test the continuing validity of not only Dewey's pragmatic educational thoughts, but also other philosophical educational thoughts as they may complement one another.

The pragmatic educational philosophy of John Dewey (1859–1952) has been implemented and so influential throughout private and public schools in the USA. He generated a new philosophy of education that requires reasoning and justification. Dewey stressed that wisdom, understanding, and intelligence are profoundly ethical. He was a writer, a thinker, and a philosopher whose ideology had a great influence on his society and contemporary schooling during the 20th century and beyond. Frequently known as the pragmatist educationalist thinker of modern education, Dewey observed learning as an activity arises from personal experiences (Field, 2007).

Dewey argued that the schools do not provide genuine learning experiences but an infinite build-up of details and facts nourished to the students and believed that schools and classrooms must demonstrate real life situations (Williams, 2017). Consequently, students furnished the exact facts back as rote knowledge and shortly fail to recall such details because they were looked upon as passive learners since they were only provided with the materials and information by their teachers and course books that had been prepared and pre-assimilated. Dewey established a theory of education that entails '*Learning by Doing*' (Campbell, 1995; Sleeper, 1986).

However, would his theory '*Learning by Doing*' be applicable to all school subject matters, and how about mathematics and sciences? This study examines such a question by referring to the previous literature of Dewey and his educational philosophy. We will begin with Dewey's notion of pragmatism and then discuss whether contemporary thinking habits about mathematics provide mathematics education with acceptable educational foundations. Additional clarifications would be found in the following subsections.

2 The study purpose and problem

The purpose of this study is to examine the extent to which John Dewey's philosophical pragmatic thoughts are implemented in the Emirati Elementary private and public schools from the perspectives of mathematics and science teachers. The problem of this study has been developed as a result of a number of drives (e.g., casual observations, deductions from theory, related literature, practical situations, and some personal insights of the researchers).

An educational/teaching philosophy implies educators' beliefs about the teaching/learning profession because not all principles of each philosophy are harmonious with the values of pedagogy (the science of teaching children). Consequently, it is the teacher's responsibility as a professional specialist in education to realise his/her own teaching philosophy in order to establish a theoretical base. Yet there is no true or false educational philosophy since each philosophy stands for a particular national or regional educational system regarding the teaching/learning process in different societies. Dewey (1944) argued that what works for a society may not work for another from a pragmatic philosophical view.

The researchers' desires are to determine how pragmatic the participant elementary teachers are. Additionally, this research study revisits Khasawneh, Miqdadi, and Hijazi's 2014 study, which indicated that Jordanian teachers lack the pragmatic thoughts and a clear principled pedagogy based on philosophical foundations that would help them put it into practice.

3 The study questions

Our study is driven by the following questions:

- 1 What are the beliefs and attitudes of the Emirati Mathematics and Science teachers regarding the implementation of John Dewey's philosophy 'pragmatism' in Emirati Elementary schools?
- 2 Is there any statistical significant difference ($\alpha = 0.05$) between teachers' responses due to their major, teaching experience, and whether they teach in public or private school?

The dependent variable of the study is embodied in the first question, while the independent variable is embodied in the second question.

4 Study significance

This research study would fill a gap in literature on the implementation of Dewey's educational philosophy in Emirati elementary schools since there is no such study found upon reviewing the related literature. The study findings, on the other hand, may benefit some stakeholders, particularly those who deal with elementary teachers of mathematics and science throughout the Emirati private and public schools in addition to teachers as well as other educators in general. The value of this study lies not only in its potential contribution to curriculum theory and implementation, but also in bridging any gaps between the thoughts of pragmatism and Emirati elementary teachers as it would enhance their own educational philosophical understandings. Extended elaboration, regarding the principles of pragmatic educational philosophical foundations, and principles of other major educational philosophical fundamentals, could be found in the following section of literature review.

5 Literature review

This section provides a thoughtful review of pertinent literature and related previous research. Writings and authentic works about Dewey in general and his influence on the field of education in particular are available worldwide. However, to the best of our knowledge, there is no exclusive research study reported in literature which determines the pragmatic educational implementations in Emirati private or public schools from the perspectives of elementary teachers. This section is divided into four subsections related to Dewey's philosophical and educational thought, the intimate relationship between philosophy and education, Dewey's views on mathematics and science education, and the education system in the United Arab Emirates.

5.1 Dewey's philosophical and educational thought

Dewey believed that children must be prepared to become problem-solvers and lifelong learners, in addition to good citizens in a democratic society. Dewey's philosophy of education entails that education must be pragmatic preparing learners for their real-world, and education has to be experiential and practical. Active learners must be involved in experiences while 'learning by doing', not just by reading and listening (Dewey, 1938). The learning process is important and education ought to prepare students for a productive place in a civil and democratic society (Dewey, 1916).

Dewey's philosophical thought entails that each person with an open mind is a philosophical disposition and is a thinker (Kaminsky, 1992). Through focusing on experience and practical involvements, Dewey made connection between the living beings and their environments to highlight their interface (Eldridge, 1998). As he denied the dualistic notion of the physical and metaphysical (body and mind) viewpoint, he claimed that the mind functions as a reformation tool, while the human body must not be isolated from the world. Individuals are purposeful citizens and major parts of their society, culture, and social order (Ryan, 1995).

Dewey rejected the dualistic assessment of mind versus body, arguing that the mind is a product of progression or growth, not amalgamated from a superior being. For him; nature is always rolling using philosophy as an instrument to surpass from situations. It is filled with ambiguity and differences, but provided that it keeps rolling and changing,

individuals will experience better conditions (Ryan, 1995; Welchman, 1995; White, 1943). Dewey contributed two parts to pragmatism: the psychological, and the biological. Both parts significantly influenced pragmatism as he declared that reasoning contains generating perfect instruments which helps handling situations and maintaining that the mind is a mechanism for understanding, reasoning, and changeable ideas (Diggins, 1991).

For Dewey, ideas are changeable, artificial, flexible, and adjustable, which owe their determination to the vigorous responsibilities they work for. Philosophy's duty is to be envisioned as a movement within which thoughts and ideas are examined for their inspiring rational history which must be reflected upon to be aware of how values and beliefs come to be realistic (Dewey, 1944). Pragmatism, Dewey's contribution to the world of philosophy (Diggins, 1991), pledge to help societies deliberately recognise what actions must be taken when challenging situations are encountered. As an instrumental method to knowledge, pragmatism is expected to deliver perceptive intelligence to endure on society. His major works such that are: 'How We Think', 'The School and Society', 'Democracy and Education', and 'Reconstruction in Philosophy' present his convictions that shaped his philosophy (Hickman, 1990).

Philosophy could be defined as the generalised theory of education; a form of thinking, which finds its origins in the uncertain of the subject matters of experience. The purpose of philosophy would be to trace the nature of the confusion, misunderstanding, and to provide theories to be experienced in action (Johnson, 1995; Rorty, 1979; Dewey, 1944). '*Doing of philosophy*' is representative of combined analysis because culture is a way of life. Individuals do not need to live as philosophers to promote the self-corrective strength of investigation; rather this must be endorsed in every member of the learning community and/or advanced society (Johnson, 1995; Rorty, 1979).

Dewey outlined his views on how education could advance society. As a progressive educator, he argued that through education, individuals would be inspired to develop to their fullest potentials. He argued that children should learn by experience not only attainment of knowledge, which would help them develop skills and attitudes necessary to solve problems. Progressive education was therefore necessary for individuals to think for themselves. Students must be engaged in meaningful and relevant activities which allow them to apply the concepts they are endeavouring to learn. Hands-on-experience projects are the key to creating authentic learning experiences rather than rote learning (Devendorf, 2013).

Through his teachings and educational philosophy, Dewey affirmed that education requires different standards and directions to be applicable to students and educators as well (Dewey, 1916). In his book 'Experience and Education', he argued that the need of a theory for the 'Progressive Education' must be accredited (Mendonça et al., 2014). He believed in recognised principles for significant educational achievements. Developing mathematics education focusing on mathematical literacy may require that mathematics teachers ought to consider as to how to provide their learners with ample learning experiences. Such lived-experiences must be associated with their daily routines, making possible pedagogical practices that permit them to construct their own progress (Stemhagen, 2016a). Dewey emphasised practical teaching and learning, and he was so concerned with an education that permits a total growth of the person who must be taught by hands-on experiences.

As an educator, Dewey is well-known and celebrated for his construction of teaching through experimental reflection, known as a progressive system in education. As a

philosopher, he is well-known for the new development of pragmatism. For him, education diffuses culture to create and form standards, morals, beliefs, and offers values to things (Ryan, 1995). Education is a good way of life through which the transition of culture follows (Dewey, 1916). Individuals pursue different conducts and methods to articulate about themselves in natural development. Education is essential for people who require learning and changing and who need knowledge, meanings, and good will to turn such adjustment to their benefit. Progressive or liberal education needed in democratic states would involve change in thoughts, beliefs, and feelings (Eldridge, 1998; Rockefeller, 1991). As a philosopher of education, Dewey cherished both fields within an intimate relationship between philosophy and education.

5.2 The intimate relationship between philosophy and education

Philosophy would be an evident invention of visions and ideas through which a better constancy of happiness may be generated while education would be the process through which the desirable change could be achieved. Thus, philosophy could be defined as the 'theory of education' as an intentionally accomplished performance (Dewey, 1916). Educators and learners are involved in a curriculum concerned with the nature of the subject matters. Psychologically speaking, the educator's mission is to adjust stimuli so that the response will end in the development of anticipated intellectual characters. The educator's attitude to subject matter is so different from the learner's (Dewey, 1944). While the teacher previously knows what is to be taught, learners are in the process of obtaining the same knowledge through schooling and pedagogy (Dewey, 1944; Kaminsky, 1992; Devendorf, 2013). The significance of Pedagogy as the science of teaching children is a theory of education, according to Dewey.

According to Dewey, the significance of Pedagogy as a theory of education could shape a mental condition which is practical to some substance resulting in knowledge. This means that exercising the mind is offering a situation that motivates actions (Dewey, 1944). Helping students learn their natural mechanisms and use them effectively may well be the primary aim of education (Dewey, 1944). "Dewey agreed that the primary aim of education is to help the individual discover her natural equipment, foster and develop it, and use it in effective ways" [Stemhagen and Smith, (2008), p.28]. Dewey (1944) contended that experience comprises an inert element unusually joint, which follows a sense of organised and clear experiment. This inert element endures a sense that demonstrates experiencing skills that are acted upon. Experience, then is an 'active-passive issue not cognitive'. That is; the value of an experience would be in the awareness of relations or connections to an educative experience leading to knowledge. Ultimately, this value of knowledge is inferior to its application in thinking. In some of his works, Dewey described his philosophical views on mathematics and science education.

5.3 Dewey's views on mathematics and science education

Dewey states:

"It is a cardinal precept of the newer school of education that the beginning of instruction shall be made with the experience learners already have; that this experience and the capacities already developed during its course provide the starting point for all further learning." [Dewey, (1938), p.74]

Dewey proposed that students could independently formulate questions in addition to constructing clarifications for natural phenomena, seeking to clarify, evaluate critically, and may be able to resolve issues depending on their own thinking. They could perform that once the ideas and concepts are presented by their teachers, peers, and scientists. He argued: “The final problem of instruction is the reconstruction of (the student’s) experience” [Dewey, (1898), p.74].

Stemhagen and Smith (2008) argued that Dewey described philosophically and psychologically grounded method to mathematics education in his co-authored work: *‘The Psychology of Number and its Applications to Methods of Teaching Arithmetic’*. His assessment of the psychological processes involved in a person who is about “to learn mathematics offers a point of entry for human elements into a discipline ‘philosophy of mathematics’ that has frequently worked to explain mathematics in non-human, anti-psychological terms” [Stemhagen and Smith, (2008), p.31]. Consequently, what would Dewey’s philosophy of mathematics be? Stemhagen and Smith wrote:

“Dewey saw the development of mathematics as arising from the need to solve genuine human problems. Hence, Dewey’s philosophy of mathematics provides both stability in the form of pragmatic constraint....and contingency (our mathematics could be different if our lives demanded it). In this way, Dewey’s conceptualization of mathematics as inescapably psychological in nature can be used to lessen the tension between the oppositional forces in contemporary math wars.” [Stemhagen and Smith, (2008), p.33]

A majority of school students have trouble understanding mathematics in their traditional classrooms. In the subject of algebra, for example, the majority of students fail (Gates, 2008). There is a correlation between student mathematical failure and a failure to solve problems flexibly as a result of using traditional methods of teaching mathematics, which concentrates on one solving technique (Newton et al., 2010). Additionally, there is no relation between mathematics and application of real life knowledge resulting from the lack of validity in traditional mathematics (Palm, 2008). However, non-traditional or modern teaching styles could enhance students’ understanding of mathematics in abstract higher mathematics level courses such as algebra (Sanders, 2013). Such modern styles of teaching may well supplement schools with a meaningful curriculum.

In addition to a meaningful curriculum, an active student learning would be an essential factor of Dewey’s educational philosophy. Dewey believed that learners may not actually learn as classrooms involve them in inactively captivate subject matter materials in learning environments from which the engagement and involvement that naturally comes with living is removed (Dewey, 1916). Dewey’s educational theory declared that it is hard for learners to fully engage if they are challenged with unfamiliar information and occupying an exclusively external linking to their internal interests (Platz and Arellano, 2011; Voparil, 2008). Mathematics as a subject matter may not be of a great interest to a majority of students, but implementing a pragmatic attitude and understanding of mathematical problems as live issues could represent a primary benefit (Stemhagen and Smith, 2008). Stemhagen and Smith wrote:

“A primary benefit of adopting a pragmatic, human-oriented understanding of mathematics is that mathematics class no longer bears the burden of being the place where students attempt to gain access to certain Truths. Instead, the starting points for mathematical inquiry are the multiple live issues that

students possess; mathematics becomes the set of tools from which they can choose to help carry out their inquiries. In this type of mathematics class, the teacher becomes a skilled guide who can help shape student inquiries, aiding in the construction of mathematical models and the selection of appropriate mathematical tools of inquiry and in supervising the evaluation of such activities.” [Stemhagen and Smith, (2008), p.34]

Since such types of mathematics classes require teachers to become skilled guides who can help shape students' inquiries, the Ministry of Education in the United Arab Emirates embraced teaching methods that concentrate on 'the self-learning abilities of students' through the education system in the United Arab Emirates (Ismail and Jarrah, 2019).

5.4 The education system in the United Arab Emirates

Preparing competent and enthusiastic school teachers including elementary provided with necessary pedagogical in addition to content knowledge has recently become a priority in several countries, including the United Arab Emirates (Ismail and Jarrah, 2019). As a nation, the United Arab Emirates was established in 1971; education was recognised and became free for all Emirati students, and primary education was compulsory for all male and females (Alhebsi et al., 2015). Delivery of education began upon the establishment of the federation with the inception of the United Arab Emirates University (UAEU) in the city of Al Ain. The United Arab Emirates as a nation has proceeded with determinations to have guaranteed high literacy rates of 91%, contemporary educational programs in addition to including females in the education process (Kamal, 2018; Godwin, 2006).

The Ministry of Education has embraced 'Education 2020', in order to advance innovative skills, and put emphasis on students, and self-learning abilities. An improved mathematics and integrated science program of study had been announced for first-graders throughout all public schools as a major part of this program. Recognising a constant need for progress, the United Arab Emirates pursued to implement respected standards in its education system through pursuing new policies and school programs (Kamal, 2018; Godwin, 2006).

Moreover, ever since the inception of the federation, the United Arab Emirates has encouraged private education under the governance of the Ministry of Education. Globalisation as well as the growth of education has added to the development of private and/or international educational institutions in the country. Then, the government organised a program to associate education with employment (Forstenlechner et al., 2012; Godwin, 2006).

The authors reviewed some literature focusing only on the four subsections mentioned above. The second part of this section will address some related previous studies.

5.5 Previous studies

Here, we provide some previous research studies pertinent to this study starting from the most recent. To begin with, a study conducted in 2016 at Georgia State University by Stinson who provided a working definition of philosophy from a cultural point of view, and argued that the need for mathematics educators would be developing their philosophy

of mathematics teaching and learning, in addition to speaking more broadly about their philosophy of education. Stinson's study results indicated that the language alone thematically and the hypothetically could demonstrate the need for those who are and will be engaged in the grand challenges debates to develop and formulate their philosophies of mathematics education.

Mendonça, Costa and Megid conducted a study in 2014 at the Pontifical Catholic University of Campinas on mathematics education through the perspective of John Dewey's. They discussed the relations and contributions of Dewey's theoretical and philosophical thinking on mathematics education. The results showed that 'experience based education' would develop a mathematics learning free of procedures that are anchored in abstractions, permitting students to comprehend mathematics in a concrete manner attached to the routine inside and outside school. Additionally, making mistakes is important in order to build solid knowledge, meanings, new experiences acquisition, and values by students.

Khasawneh, Miqdadi, and Hijazi conducted a study in 2014 throughout Jordanian public schools whose purpose was to determine the degree to which Pragmatism and the philosophical thought of John Dewey are implemented throughout Jordanian schools. The findings revealed that Jordanian teachers believe Pragmatic principled educational thoughts are implemented in Jordan to a moderate degree. The study participants expressed that Dewey's educational thoughts are somewhat implemented within Jordanian public schools. Several teachers articulated that pragmatic views are employed to some extent. Yet, most of them voiced that more is needed in order to shift from traditional to progressive teaching methods. For example, a shift from rote memorisation to experimentation, a shift from a passive role of the students to an active one through which learners could explore, experiment, justify and express their views freely.

In 2013, Sanders conducted a study at Grand Valley State University titled 'Breaking Tradition in the Mathematics Classroom: Making Mathematics Real, Relevant, and Personal' through which he analysed educational theory and research. The study results revealed that the key for combating student difficulty in mathematics, especially abstract courses such as algebra, is to focus on non-traditional teaching modes and enriched presentation of curriculum. As a result, a supplementary algebra curriculum was developed to implement non-traditional components of teaching and learning into the mathematics classroom. This non-traditional curriculum features authentic real world connections, differentiation to meet student needs, and an emphasis on conceptual understanding and flexible problem solving.

In 2011, Radu conducted a study focusing on 'progressivism', as a reaction to the American traditional school in order to accomplish the purpose of connecting education to the realities imposed by the rapid changes of the American society. The results indicated that 'deconstructionism' established the basis of 'social meliorism'; a progress is a real concept leading to an improvement life. Social efficient education would use modern techniques of mathematical statistics in experimental research as well as in teaching.

Upon completion of reviewing several previous studies in which quantitative approaches were used, we were confident to employ a quantitative approach as our methodology to fulfil the objectives of this study.

6 Research methodology

Research study reports in general, should provide readers with inferences to some degree of affirmation. Based on the findings, the researchers' responsibility would be to make obtainable for readers revenues for attaining these affirmations through a creation of assumptions (Tashakkori and Teddlie, 1998). The researchers employed the quantitative method for several reasons. First, quantitative technique is incorporated to support the study by collecting data from a large number of elementary school teachers who responded to several questionnaire items within a relatively short period of time. This method was useful since it enabled us to collect comprehensive evidence from the participant teachers in addition to make connections to variables related to elementary school teachers who expressed a moderate degree to the extent of their beliefs that pragmatic educational principles are implemented in the United Arab Emirates. While taking a full advantage of such a style, the researchers were interested in asking several teachers about implementing the educational thought of John Dewey in the Emirati schools in order to appreciate the experience, skills, knowledge, understanding, practice plus the meanings and values they make of these educational principles (Tashakkori and Teddlie, 1998). This section is divided into three subsections: data collection, the study instrument, and the participants.

6.1 Participants

A total of 87 elementary mathematics and science teachers participated in this study to respond to the study questionnaire statements which represent the pragmatic educational principles. Participants were selected randomly taking into account they represent private and public school teachers in the United Arab Emirates.

6.2 The study instrument

The researchers constructed an instrument for the purpose of collecting data. The instrument consisted of 21 items that addressed John Dewey's ideas on education (Pragmatic Educational Principles). Respondents rated the 21 items according to whether they agreed with each statement using a 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree). The validity of the instrument was examined by a group of faculty members in the UAEU. These experts checked the items of the questionnaire for clarity and relevance.

Upon the review completion by the evaluators, the questionnaire was reviewed, refined and redeveloped by the researchers based on the comments and suggestions of the evaluators. The internal consistency of the instrument was estimated using 'Cronbach alpha formula' which was found to be 0.89. The criterion for assessing what the beliefs and attitudes of Emirati mathematics and science teachers regarding the philosophy of John Dewey 'pragmatism' is implemented in Emirati elementary schools are, was based on the following scale: 1 to 2.50 was categorised as weak, 2.51 to 3.99 was categorised as moderate, and 4.00 to 5.00 was categorised as strong. Based on this scale, the researchers were able to execute the study data collection.

6.3 Data collection

Research assistants from the College of Education in the UAEU helped in distributing the questionnaires and collecting the data. Meetings and workshops were conducted to those research assistants to explain the nature of the study. The researchers took all measures to ensure that the research assistants had understood their roles and they could perform their tasks. The data were collected during the fall semester of 2016 academic year. And upon collecting the data (SPSS) was used in order to avail the study findings.

7 The study findings

In this section we present the findings of our research study based on the analysis and interpretations of the data obtained from the study questionnaires completed by Emirati public and private school teachers (87 respondents) chosen randomly from the United Arab Emirates. The sample of the study consisted of public and private school teachers with varying levels of experience, areas of Education levels (post graduate and undergraduate, and school types), which represented the independent variables. The dependent variable, on the other hand, is the questionnaire of this study, which consisted of 21 statements, representing the principles of Pragmatism as an educational philosophy to which the participant teachers responded.

The section is divided into two parts. The first part presents the findings of the study that answer the first research question, which: *“What are the beliefs and attitudes of the Emirati Mathematics and Science teachers regarding the implementation of John Dewey’s philosophy ‘Pragmatism’ in Emirati Elementary schools?”* The second part presents the findings regarding the second research question: *“Is there any statistical significant difference ($\alpha = 0.05$) between teachers’ responses due to their major, teaching experience, and whether they teach in public or private school?”*

Addressing the first study question, the researchers designed a table that shows the mean scores and standard deviation results of the degree to which mathematics and science teachers believe that pragmatism is implemented in private and public elementary schools in the United Arab Emirates. The 21 items represent the pragmatic educational principles or implementations. Overall, the respondents expressed high to moderate degrees of agreement regarding all questionnaire statements. They strongly agreed to 13 principles and moderately agreed to eight pragmatic educational principles. The study findings are presented in more details in Table 1.

Table 1 Mean scores and standard deviation results of the degree to which mathematics and science teachers believe pragmatism is implemented in elementary schools in UAE

<i>Item #</i>	<i>Item</i>	<i>Mean</i>	<i>S.D.</i>	<i>Degree</i>
1	Teaching mathematics and science provides students with ample opportunities to learn through hands-on activities.	4.19	.909	Strong
2	The teaching methods utilised to teach mathematics and sciences are based on dialogue, problem-solving, and self-learning.	4.00	.868	Strong
3	Teaching mathematics and science provides various opportunities for students to acquire intellectual skills.	4.33	.869	Strong

Table 1 Mean scores and standard deviation results of the degree to which mathematics and science teachers believe pragmatism is implemented in elementary schools in UAE (continued)

<i>Item #</i>	<i>Item</i>	<i>Mean</i>	<i>S.D.</i>	<i>Degree</i>
4	Teaching mathematics and science provides various opportunities for students to acquire social skills	4.11	.840	Strong
5	Teaching mathematics and science serves realistic goals that benefit free individuals and democratic society.	4.03	.908	Strong
6	Teaching mathematics and science provides students with activities to practice learning through projects.	4.19	.842	Strong
7	Teaching mathematics and science helps students express their opinions and make decisions.	4.11	.826	Strong
8	Teaching mathematics and science refines students and helps them become disciplined and good citizens.	3.99	.874	Moderate
9	Teaching mathematics and science is concerned with opening up to the youth so they could live in a model-environment full of harmony and solidarity.	3.94	.854	Moderate
10	Teaching mathematics and science provides students with an atmosphere that helps create democratic citizens.	3.93	.886	Moderate
11	Teaching mathematics and science is concerned with raising individuals that continue to contribute to their communities and take into consideration individual differences.	4.05	.776	Strong
12	Teaching mathematics and science provides each learner with different opportunities to become an active person who has certain roles and is not a passive learner.	4.00	.807	Strong
13	Teaching mathematics and science is concerned with viewing the teacher as a guide to students' learning rather than the source of knowledge.	4.15	.909	Strong
14	The primary goal of mathematics and science teacher is to help students discover knowledge through experimenting.	4.15	.875	Strong
15	Teaching mathematics and science views teaching as laboratories based rather than lecture rooms.	4.15	.740	Strong
16	Teaching mathematics and science task is to prepare students to conceptualise social life.	3.90	.928	Moderate
17	Teaching mathematics and science helps students to not fully become obedient or to perform imposed duties.	3.50	1.128	Moderate
18	Teaching mathematics and science does not neglect the interest or the needs of the students.	3.99	.869	Moderate
19	Teaching mathematics and science is concerned with guiding the student's expertise in order to achieve his/her growth.	4.07	.846	Strong
20	Teaching mathematics and science is concerned with making the educational process a reflection of reality outside.	3.90	.849	Moderate
21	Teaching mathematics and science is concerned with making sure that education addresses realistic needs and does not indulge in the past.	3.81	1.017	Moderate

Table 1 demonstrates the highest mean score of 4.33 with a standard deviation of 0.869 regarding item 3, which states “*Teaching Mathematics and Science provides various opportunities for students to acquire intellectual skills*”. The researchers believe this result could be related to the fact that within the Emirati culture, as is the case in many similar regional cultures mathematics and science are subject matters that promote mental and intellectual skills of students. This interpretation could be obvious as the respondents reacted to the item related to social studies ‘*Teaching Mathematics and Science task is to prepare students to conceptualize social life*’ with a mean of 3.90 and standard deviation of 0.928.

On the other hand, Item 17 “*Teaching Mathematics and Science helps students to not fully become obedient or to perform imposed duties*” displays the lowest mean score of 3.50 with a standard deviation of 1.122. The researchers believe that this result is related to the fact that the Emirati teachers throughout the public and private schools are not able to implement the pragmatic philosophical views of John Dewey in an appropriate manner. The reason for this would be a lack of an appropriate school environment because of a shortage in necessary facilities, which are needed to implement such principles. Mean and standard deviation scores were also used to reveal the study findings regarding the three independent variables in terms of responding to the second research question.

Addressing the second research question (Is there any statistical significant difference ($\alpha = 0.05$) between teachers’ responses according to their school type, education level, and teaching experience), Table 2 shows the mean scores and the standard deviation results for the variable of School type.

Table 2 School type: independent sample t-test

<i>School</i>	<i>N</i>	<i>Mean</i>	<i>t</i>	<i>df</i>	<i>P</i>
Government	70	83.3286	-1.552	84	0.093
Private	16	89.4375	-2.038	34.128	

Table 2 demonstrates that there was no statistical significant difference between public and private schools due to their perspective on implementation of John Dewey’s educational pragmatic principles.

Table 3 Academic degree: independent sample t-test

<i>Education level</i>	<i>N</i>	<i>Mean</i>	<i>t</i>	<i>df</i>	<i>P</i>
Undergraduate	61	86.3279	1.914	84	0.036
Postgraduate	25	79.9200	1.685	35.122	

Table 3 shows that there was a statistical significant difference between teachers’ perspectives on the implementation of Dewey’s educational pragmatic principles due to their academic backgrounds (i.e., undergraduate or postgraduate). The results indicated statistically significant difference according to teachers’ background in terms of their views on the implementations of Dewey’s ideas in the United Arab Emirates.

Table 4 Teaching experience: analysis of variance

<i>Variable</i>	<i>Sum of square</i>	<i>DF</i>	<i>F</i>	<i>P</i>
Between	559.747	2	1.337	0.285
Within	16871.649	83		

Table 4 indicates that there is no statistical difference between teachers' teaching experience in terms of their views on the implementation of John Dewey's educational pragmatic principles. A one-way ANOVA was used to test for differences among Emirati teachers due to their teaching experiences. The findings indicate that there was no significant difference across the three teaching experience levels, $F(2, 83) = 0.1337$, $P = 0.285$.

To conclude, the findings related to the study primary question indicated that teachers expressed a moderate to strong degree in all items about the level of implementation of the philosophy of John Dewey in Emirati elementary schools. The mean scores of participants ranged from 3.50 to 4.33 on a 5-point scale ranging from strongly agree '5' to strongly disagree '1'. This means that mathematics and science teachers believe that pragmatism is implemented in elementary schools. Additionally, the findings related to the second question, which represent the independent variables, indicated that

- 1 there was no statistical significant difference between public and private school teachers' perspective on implementation of John Dewey's educational pragmatic principles
- 2 there was statistically significant differences between teachers' perspectives on the implementation of Dewey's educational pragmatic principles due to their academic backgrounds
- 3 there was no statistical differences between teachers' perspectives on the implementation of Dewey's educational pragmatic principles due to their teaching experience.

8 Discussion and recommendations

The findings of our research study may or may not be consistent with the findings of previous research studies. Most of our discussion is based on the question "would our research outcomes be correlated to previous studies' conclusions and outcomes?" Here, we discuss the correlation between the findings of the current study and the findings of the previous studies mentioned in the second section of this study.

To begin with, the nature of some of the previous studies differs from this current study in regards to their methodological approaches, purposes, and cultures since each study aimed at a specific drive. For example, providing a working definition of philosophy from a cultural point of view, and the relations and contributions of Dewey's theoretical and philosophical thinking on mathematics education were the focus of two of the previous studies. Additionally, determining the effects of certain reform constructs on students' mathematical comprehension and proposed a supplementary algebra curriculum based on research to improve the achievement of mathematics students who were experiencing difficulties understanding mathematics was a scope of one of the previous studies.

Focusing on 'progressivism', as a reaction to the American traditional school in order to accomplish the purpose of connecting education to the realities imposed by the rapid changes of the American society was another scope that a study undertook. Determining the degree to which the implementation of pragmatism and the philosophical thought of

John Dewey had been employed by a previous study with which its findings and results could be discussed in light of the current study findings.

The findings of the current study indicated that the majority of mathematics and science teachers expressed a moderate to a strong degree on the questionnaire statements regarding the level of implementation of the philosophy of John Dewey in Emirati elementary schools. These findings are consistent with Khasawneh et al.'s (2014) results, which revealed that Jordanian teachers believed pragmatic educational thoughts were implemented in Jordanian schools to a moderate degree. However, the majority of teachers in the United Arab Emirates strongly believed in pragmatic views while the participants of the previous study expressed that Dewey's educational thought is somewhat implemented within Jordanian public schools. Several teachers articulated that pragmatic views were employed to some extent, and the mainstream expressed that more is needed in order to shift from traditional to progressive teaching methods.

The findings of the current study are also consistent with Sanders's (2013) results, which revealed that the key for combating student difficulty in mathematics, especially abstract courses such as algebra, is to focus on non-traditional teaching modes and enriched presentation of curriculum. All participants of our study believed that their students must be provided with ample opportunities to learn through hands-on activities, rather than concentrating on rote learning. Teaching mathematics and science practically and pragmatically, may well provide learners with various opportunities to attain intellectual skills and knowledge instead of memorisation. Both research findings showed that non-traditional curricula and teaching methods ought to be connected to the real world experiences, diversified in order to meet students' needs, and focused on conceptual understanding and flexible problem solving.

The results of Radu's (2011) study indicated that social efficient education would use modern techniques of mathematical statistics in experimental research as well as in teaching. Such effective education would apply principles of programmed instructions with dynamic learning objectives, a clear teaching design, liability and accountability, consistency, and standardised testing. The findings of our study are consistent with the results of Radu's study as the perspectives of private and public school teachers pointed out that teaching mathematics and science should provide students with various opportunities to acquire social skills in addition to preparing students to conceptualise social life.

Moreover, Stinson' (2016) study results revealed that the language alone thematically and hypothetically could demonstrate the need for those who are and will be engaged in the grand challenges debates to develop and formulate their philosophies of mathematics education.

Inconsistent with such result, one finding of the current study indicated that teaching mathematics and science would help students express their opinions and make decisions. Even though expressing students' abilities to articulate their thoughts could be language ability, there was no indication to such capacities throughout this current study.

In Brazilian culture, the findings of Mendonça et al. (2104) showed that 'experience based education' would develop a mathematics learning free of procedures that are anchored in abstractions, permitting students to comprehend mathematics in a concrete manner attached to the routine inside and outside school. Likewise, making mistakes would be important for students to be able to build solid knowledge, meanings, new experiences acquisition, and values. Again, those findings are consistent with the findings of our study in terms of providing students with activities to practice learning through

projects as well as a primary goal of mathematics and science teachers would be to help students discover knowledge through experimenting. Based on the study findings, we suggest some recommendations.

8.1 Recommendations

- Conduct similar research studies to examine the implementation of pragmatic philosophical educational thoughts in addition to other philosophical thoughts such as the idealistic, realistic, naturalistic educational principles throughout the Emirati public and private schools. Such studies may help in determining the exact educational philosophical principles that are implemented in the United Arab Emirates Schools.
- Conduct workshops by experts in educational philosophy to ensure that school teachers throughout the Emirati schools believe that the teaching profession must stem from an educational belief, which would help in an improved job performance.
- We believe that some elementary teachers did not comprehend the questionnaire statements accurately. Therefore, we suggest conducting other studies using qualitative methods (for example, interviewing several teachers in order to deeply understand their attitudes and beliefs about educational philosophy in general and the pragmatic educational thought in particular). Qualitative methods were not used in this study since the researchers argued that this would be a starting point for future research.

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