

The Impact of the (4-MAT) Strategy on the Academic Achievement of University Social Studies Students in Jordan

Omar Bataineh^{1,*}, Salah Hailat², Samer Khasawneh², Mohammad Jawarneh²

¹Department of Educational Foundations and Administration, Faculty of Educational Sciences, the Hashemite University, Zarqa, 13115, Jordan

²Department of Curriculum and Instruction, Faculty of Educational Sciences, the Hashemite University, Zarqa, 13115, Jordan

Received October 20, 2020; Revised November 16, 2020; Accepted December 11, 2020

Cite This Paper in the following Citation Styles

(a): [1] Omar Bataineh, Salah Hailat, Samer Khasawneh, Mohammad Jawarneh , "The Impact of the (4-MAT) Strategy on the Academic Achievement of University Social Studies Students in Jordan," *Universal Journal of Educational Research*, Vol. 8, No. 12A, pp. 7702 - 7709, 2020. DOI: 10.13189/ujer.2020.082557.

(b): Omar Bataineh, Salah Hailat, Samer Khasawneh, Mohammad Jawarneh (2020). *The Impact of the (4-MAT) Strategy on the Academic Achievement of University Social Studies Students in Jordan*. *Universal Journal of Educational Research*, 8(12A), 7702 - 7709. DOI: 10.13189/ujer.2020.082557.

Copyright©2020 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

Abstract The 4-MAT strategy is an effective teaching method for all educational levels (high school and university settings) and academic disciplines in many parts of the world. However, a shortage of research still exists in higher education related to social studies disciplines. This study was carried out to fill this gap and provide further research evidence to the suitability of the 4-MAT strategy. The primary purpose of this study was to determine the impact of the 4-MAT strategy on the direct and deferred academic achievement of social studies students in Jordan. The population of the study consisted of all classroom teachers who are required to take social studies course as part of their curriculum plan during their study in the Department of Curriculum and instruction. The sample of the study composed of (86) students was divided into two groups: the experimental group with (45) students and the control group with (41) students. The equivalence of the two groups was established through a pre-test. The academic achievement test used in this study was composed of 25 items and has proven to be valid and reliable. Results of the study indicated significant differences between the experimental and control groups in both the direct and deferred academic achievement in favor of the experimental group. The present study provided valuable insights as to the effectiveness of the 4-MAT teaching strategy to prove academic achievement and

deferred retention of information for social studies students at higher education institutions in Jordan.

Keywords The (4-MAT) Strategy, Academic Achievement, University Students, Social Studies, Jordan

1. Introduction

Students encounter many challenges in the 21st century related to suitable teaching environments and effective teaching and learning strategies. These challenges require major reforms in the educational system with special attention to modern instructional strategies rather than relying on traditional methods of instruction [1]. These modern strategies can motivate students to practice pivotal roles in the learning process [2].

It is well documented in the literature that each student possesses a unique learning style and pattern of learning, which impact his/her learning method of multiple knowledge and skills [3]. This can lead to learner's maximum stimuli, avail suitable chances for the occurrence of the best learning, and increase the teaching process efficiency [4].

To this end, an integrated teaching cycle was developed,

taking into account the four major individual learning patterns (imaginary, analytical, logical and dynamic). Based on that, a particular stage for every learning pattern is developed to fits its properties and characteristics. Moreover, it was integrated with the learning theory according to the two brain hemispheres (preference for either the right or left side of the brain). Thereby, this strategy was formed consisting of four stages, each fits a particular learning pattern, and eight sections, with two sections in every stage. The first one fits those learners who prefer the right hemisphere and the second fits those prefer the left, which was termed the 4-MAT strategy [5].

The first stage of this strategy is called "reflective observation", which is related to the first pattern (the imaginary), which is concerned with meanings related to them as individuals. Under this, individuals ask: why this learning is of value for me? In this stage, the importance of the new knowledge in terms of the learner is verified, and the teaching experience is linked to what the learner has of pertinent previous knowledge. That is, previous knowledge plays an axial role in learning new experience.

The first part of this stage concerns students with right hemisphere preference, which is termed "connect". In this section, learning is done by connecting the content with the learner's concrete and personal experience, so that he/she becomes able to provide subjective meanings to the new learning. The second part of this stage is related to students with left hemisphere preference, which is called "attend". In this part, learning is made by contemplating the gained knowledge from the previous step through analysis, evaluation, judging, and showing its accuracy or consistency with the previous experience, and finally, concluding a new meaning.

The second stage, "concept formulation", concerns the second pattern (the analytic), which answers the question: what shall I learn? or the content to be learnt in terms of its nature, essence, and objectives. In this stage, the teacher attempts to shift the learner from the concrete experience to the abstract concept in a clear and organized manner. The first section of this stage is related to students with right hemisphere preference, which is called "image". Learning in this section is made by enhancing the meanings to accommodate and comprehend the new concept, through representation and accommodation; In other words, achieving the content to be learnt and achieving its objectives. The second section of this stage is pertinent to the students with left hemisphere preference, which is termed "inform". Learning in this section is carried out through an active, sequent and logical manner, by active listening and good hearing of what the teacher (or colleague) performs.

The third stage, "active experimentation" is related to the third pattern (the logical), which is concerned with how things are done. Its pivot is answering the question: how can we benefit from this learning in reality? In this stage, what was learnt is experimented and applied. Also,

the learner becomes able to represent the new knowledge, which becomes part of his theoretical framework. The first section of this stage is pertinent to the students with left hemisphere preference, which is called "practice", in which the learning is done by applying the new concepts and learnt experiences. In this stage, the teacher returns to the second stage that included providing new information and concepts. The second section of this stage is related to the students with right hemisphere preference, which is termed "extend". Learning in this part is done by availing a chance to the learner to innovate his/her own system, to find out new applications (innovative) for what had been learnt.

The fourth stage, "concrete experience" is related to the fourth pattern (the dynamic), which is highly concerned with self-discoveries. It is answering the question: what new things can be added to this new experience and learning? In this stage, the new knowledge is integrated with self-experiences to produce new knowledge in a different shape and apply it into new situations. The first part of this stage is pertinent to left hemisphere preference, which is termed "refine". Learning in this part is carried out by the learners' project presentation in small groups and providing each other with feedback to utilize before presenting the project in its final shape. On the other hand, the second part of this stage concerns students with right hemisphere preference, which is termed "perform". The pivot of this part is integration and closure where projects, presentations, stories and advertisements (all whatever the learners produced during the learning process) are presented in a special ceremony. In this event, certain guests could be invited, and all the learners participate in it [6-8].

According to previous research, the 4-MAT strategy showed positive results about its use in high school and higher education levels, representing various disciplines including mathematics, history, biology, science, and physics. Further, previous research indicated improvements in the academic level of learners, increasing their abilities to retain new learning, and a noticeable improvement in their trends toward learning the material [9-15].

Furthermore, a study by [16] stressed that the use of the 4-MAT strategy increased the achievement of the belonging values and social responsibility. It further contributed to the employment of history learning and utilizing it, which further assisted in realizing the educational objectives smoothly and easily. Another study by [17] indicated that the 4-MAT strategy contributed to the decline in the learners' acquisition of wrong concepts. Finally, a study by [18] asserted that the 4-MAT strategy helped the learners' integration in the learning process and stimulated them to initiate creative activities and took care of them during the learning process.

Noticeably, the above studies agreed on the suitability of 4-MAT strategy for use in all educational topics and for

all educational stages. Still, there is a shortage of studies related to social studies. In addition, there is a shortage of research studies in the university setting. Therefore, this study was made to fill this gap and identify the effect of the 4-MAT strategy on the academic achievement of university students in one social studies course. In addition, this research aimed at determining its effect on helping students retain the studied subject for longer periods.

Statement of the Problem

In spite of the enormous efforts to develop social studies teaching methods, yet, most of the methods applied in this area are still traditional, which focus on inculcation by the teacher, and retrieval of the information by the learner. Traditional methods of instruction do not take into account different learning patterns [19]. This will negatively reflect on the learners' academic achievement and their attitudes toward the taught topic. It also negatively reflects on their abilities to retain what they learnt even for short periods.

Many studies emphasized the importance of utilizing the educational research results, and adopting modern teaching methods, which treat the deficit aspects in the traditional methods. They further stress on the positive role of the learners, considering their learning patterns, how they process the educational material, their preferences of the right or left hemisphere, and availing them a chance to deal in and analyze the material directly [3].

Accordingly, this study explored the effect of the use of the 4-MAT strategy on direct and deferred (retention) achievement among classroom teacher students in one university, in one of the social studies courses, through answering the following questions:

1. Are there any statistically significant differences at ($\alpha=0.05$) level between the means of both the experimental and control groups of students, ascribed to the teaching methods strategy (4-MAT vs. traditional)?
2. Are there any statistically significant differences at ($\alpha=0.05$) level between the means of the deferred achievement (retention) of both the experimental and control groups of students, ascribed to the teaching methods strategy (4-MAT vs. traditional)?

Significance of the Study

It is anticipated that the results of this study will benefit the learner through providing a new teaching pattern, taking into account his/her learning styles, to be the first and basic axil for him. The learner will be integrated through these methods and engage in active and effective learning, which keeps him/her away from boredom in learning social studies and increases his/her academic achievement and retention of the information in his/her

mind for longer periods. The teacher is also expected to benefit the results of this study by providing modern teaching methods that are in line with the educational developments, based on the results of the scientific research works, which help in the improvement of students' achievement, and sustaining the information they learn. These results will also enable the teacher to prepare lessons using the 4-MAT strategy. In addition, the study is of particular importance to the educational curricula developers, who can integrate such effective strategy during the preparation and development of the curricula.

2. Methodology

Procedures

The researchers chose a unit from the social studies course titled "treaties". This unit is related to the historical events that took place in the Arab World between 1910-1918, namely events concerning the Sykes-Picot Agreement, its historical events and results.

Objectives of the Module

The students should:

- Conclude the reasons that enabled the Ottoman State to keep hold of its lands until the First World War, in spite of its weakness and the increasing greed of the European countries in it.
- Identify the reasons of the policy changes of some European countries toward the Ottoman State after the end of the First World War.
- Compare between the European treaties about dividing the Arab area.
- Mention the terms and conditions of Sykes-Picot Agreement.

Teaching Steps and Procedures as per 4-MAT Strategy

The 4-MAT system is established by McCarty (1987) which integrates four learning cycles with the two brain hemispheres (right vs. left), resulting in four stages and eight sections. In the first Stage "reflective observation": concerning the students with right hemisphere preference (Link): they are asked to look at the world map and focus on the territories controlled by the Ottoman State, and the neighboring countries. The learners are assigned a number of stimulating activities to attend learning, such as creating a list of the countries surrounding the Ottoman State, as per area and population. Then they are asked a number of questions related to the previous activities, such as: which country do you believe is more interested in the Ottoman issue? Why?

As for the students with left hemisphere preference: the learners analyze what they concluded in the previous stage,

and share their information and perceptions, and discuss the similarities and differences among what they concluded through discussion groups. The aim is to approach the reasons that made the Ottoman State reserve its territories in spite of its weakness and the greed of the European countries in it.

Second stage "concept formulation": here the student shifts from the concrete experience to the abstract concepts. It is divided into two sections. The first section concerns the students with right hemisphere preference (image), in which the teacher provides learners with information to enhance the meaning and comprehend the new concepts. He/she also presents maps and pictures that show and illustrate the borders of the new Ottoman State, to underline the greediness of the European countries in it. Then, he specifically underlines the greed of France, Britain and Russia, for instance, to cut off large areas of the Ottoman State and annex these areas to them. The second section concerns the students with left hemisphere preference (inform), where information is presented in an effective, sequent and logical manner. The learners are asked to read the text from the book in a silent reading method, and then listen to the text reading by one of their colleagues. They are directed to the importance of the active listening and good hearing, then answering the related questions. For instance, define the territories of the Ottoman State, which France, Britain and Russia were greedy to get, explain your answer.

The third stage (active experimentation): this stage aims at applying what was learnt and practically experienced, so that the new learning becomes an integrated part of the learner and his personal knowledge. It is also divided into two parts. The first concerns the students with left hemisphere preference (practice), which aims at the learner's presentation of the information he learnt and the content practice, alternatively with the new information, which was presented in the second stage, and apply their content in this stage. The learner is asked to write an article or short story, or perform a play, in which he shows the reasons that enabled the Ottoman State to retain its territories during the First World War, in spite of its weakness and the greediness of the European countries in it.

The second section is related to the students with right hemisphere preference (extend), in which the learning processes are extended. The learner acts as a scientist by assigning his own point of view, based, necessarily, on the scientific evidence. He will be asked to answer the question: what are the reasons that enabled the Ottoman State to retain its territories till the First World War in spite of its weakness and the greediness of the European countries in it? (In his own point of view). This stage represents the first step in achieving the learning project.

The fourth stage (concrete experience): in which the new knowledge is integrated to the learner's self-experience and his personal experiences. The

previous concepts are deepened and developed in a totally different manner than before, so that the learner becomes able and qualified to judge and assess the projects. It is divided into two sections. The first concerns students with left hemisphere preference (refine), where the learner is asked to review additional resources about the topic, to rewrite the students' final project. Any other specialized person may be contacted or approached to benefit his/her opinion in this issue. The students are also asked to evaluate each other's projects and use appropriate feedback to present the project in its final shape. After all these steps, the learners are asked to rewrite the reasons that enabled the Ottoman State to retain its territories till the First World War in spite of its weakness and the greediness of the European countries in it. The second section is related to students with right hemisphere preference (perform), where the learner presents the final project in a workshop, which could be in the form of a simple celebration. They discuss together the results every one approached, with the possibility of the emergence of new results not written before. The learners' final projects may also include reports, stories or Power Point presentations.

Teaching Steps and Procedures as per Traditional Method

The control group was taught via the traditional method of instruction. Under this method, the instructor is the sole provider of information to students in form lectures, questions, and answers format. Students are expected to memorize the subjects under study and respond to any questions provided by the instructor through recitation. Students are also expected to study and memorize assigned contents by the instructor to respond to various assignments and tests. The instructor also exercises strict control over students' behaviors in the classroom based on established rules and regulations. Moreover, it is worth noting that traditional methods of instruction are used moderately in Jordan by some teachers.

Population and Sample

The population of the study consisted of all classroom teachers who are required to take social studies course as part of their curriculum plan during their study in the Department of Curriculums and instruction. The sample of the study is purposive in nature and consisted of (86) male and female students from one public university located in the middle part of Jordan for the academic years of 2016-2017.

Instrumentation

A test was prepared to measure the students' achievement in the topic titled "The Arab World under the

Ottoman Rule", within a special schedule of two dimensions. The first is the content, which includes the following topics: Covenants and Their Antheses, Avowals of the Alliances to Sharif Hussein Bin Ali, Sykes-Picot Agreement, the Ottoman Peace Offer, Balfour Declaration, Attitude of the Arabs toward Balfour Declaration, and Alliances' Promises to the Arabs. These topics were suitably distributed over the second dimension, i.e. the learning objectives of these topics. These objectives were classified into the following levels: knowledge, comprehension, application, and higher mental processes.

To determine the reliability of the test, it was pilot tested with a group of (35) students whom were excluded from the main sample of the study. The reliability coefficient (KR-20) was calculated, with a (0.77) value. The test items were also analyzed by difficulty and distinction coefficients for each item. Items with less than 0.25 coefficient, or less than 0.20 difficulty coefficient, or more than 0.80 were deleted (N=3). Therefore, the test in its final shape included 25 items. The test was proven reliable in this study. The test was also evaluated by a group of three faculty of members to determine its content validity. The results of the evaluation indicated that the test is also valid.

Data Collection and Analysis

The achievement test was applied to the study sample as a pretest before teaching the subject and adopting its results as a degree of the learners' pre-achievement. The experimental group was taught by one of the researchers using the 4-MAT strategy for six weeks at the rate of 3 lectures, 50 minutes each, per week. The control group was taught by the same researcher through the traditional method. The students in both groups were not informed that a study is taken place to eliminate any Hawthorne effect. The achievement test was applied to both study groups after completing the study to measure the learners' direct achievement. The achievement test was also applied on the study groups three weeks after completing the study application to measure the learners' deferred achievement (retention). The test sheets were corrected manually according to the adopted correction standards, i.e. one grade for every correct answer and (0) for the wrong; the total was (25) grades.

Table 2. Results of ANCOVA for testing the differences between the mean values for the experimental and control groups achievement in the direct achievement test

Source	Total Squares	Degrees of Freedom	Average Squares	F Value	Significance Level
Corrected Model	201.30	2	100.65	6.02	0.004
Intercept	1172.05	1	1172.05	70.11	0.000
pretest	61.48	1	61.48	3.67	0.059
Method	138.56	1	138.56	8.28	0.05
Error	1387.53	83	16.71		
Total	21240.00	86			
Adjusted Total	1588.83	85			

To compare the learners' performance in both the control and experimental groups, means and standard deviations were calculated on the pre-posttests. Furthermore, analysis of covariance (ANCOVA) was also utilized to compare between the post-means after the removal of the pre-grades of both the direct and deferred achievement.

3. Results and Discussion

Results Concerning the First Question

The first question was: are there statistically significant differences at ($\alpha=0.05$) level between the means of both the experimental and control groups of students, ascribed to the teaching methods strategy (4-MAT vs. traditional)? For answering this question, the researchers employed the ANCOVA to compare between the post means after the removal of pre-grades effect of the direct achievement. Means and standard deviations of the students' grades of both the experimental group, who studied using the 4-MAT strategy, and the control group, who studied through the traditional method, were calculated on the pre and direct achievement test, as illustrated in Table (1).

Table 1. Descriptive statistics of students' degrees for both the control and experimental groups in the pre and direct achievement test

Group	No.	Pre-Test		Direct Test		Deferred Test	
		M	SD	M	SD	M	SD
4-MAT Strategy	45	6.71	2.18	16.33	3.86	13.93	3.66
Traditional Method	41	6.69	2.02	15.11	4.44	10.85	4.21

Table (1) shows that the mean of the experimental group utilizing 4-MAT strategy was (16.33), which is higher than those who studied the material through the traditional method (control group), which was (15.11). The researchers used the ANCOVA statistic to investigate whether this difference between the two mean values was statistically significant, taking the pre-achievement as an associated variable, to remove any effect of the research results and control the differences between the two groups on the pre-achievement, as shown in Table (2).

The above table shows that the F-value in terms of the teaching method was (8.28), which is statistically significant at ($\alpha=0.05$) level, which means that there are statistically significant differences between the means of the two groups' performance in the direct achievement test. To determine in whose favor these differences were, we calculated the adjusted means of the two study groups, as shown in Table (3).

Table 3. Amended means for both study groups in the direct achievement test

SD	Adjusted Mean	No.	Group
0.61	16.32	45	4-MAT Strategy
0.63	13.78	41	Traditional Method

Table (3) shows that the adjusted mean of the experimental group who studied through the 4-MAT strategy was higher (16.32) than the control group who studied through the traditional method (13.78). This indicates that the 4-MAT strategy has a positive effect on the learners' achievement as compared with the traditional method. These results are consistent with previous research [3, 16].

These results can be ascribed to the nature of the 4-MAT strategy based on the use of modern techniques that take into consideration learners' styles. In this regard, this strategy offered every learner an enjoyable and attractive learning opportunity, which is quite suitable to his learning style, at least for one fourth of the lecture time, if not more. At the same time, it availed him/her thrilling chances to learn using new teaching techniques applied for the first time, which may not suit his learning pattern in the other time of the lecture. In general, it availed to the learner an opportunity to be the pivot of the educational process, and its center, by shifting learning from the normal method, based on the lecture by the teacher, and merely receiving the information by the learner, to a strategy in which he is engaged into learning activities, and the major element and main axil in it.

In addition, learning in this style, which is in line with learner's learning style, offers him/her opportunity to integrate in learning, and stimulate his/her motivation to approach the maximum level of his/her mental abilities. As a result, it will facilitate the understanding and comprehension processes; concept, thoughts and lesson topics become easier and closer to access [20]. It is also emphasized by [21] that learning through the learner's suitable style is reflected on the way he receives and processes the information, and the way to access and

utilize from the new knowledge. Furthermore, it will arouse his motivation to learn, which, in turn, leads to an internal interest and broad eagerness to continue learning, enjoy the new learning experiences, and instigate the pleasant feelings during the learning process, which are positively reflected on his/her academic achievement.

The reason that made the students who were taught by the 4-MAT strategy over perform the other group of students, may be attributed to the varied activities and learning techniques included in this strategy, which fit the brain control pattern. This strategy provided various activities that fitted all the students who prefer the right or left hemisphere. The use of different activities during the learning process that fits both sides of the brain (as per their preference) activates acquiring new experiences, and ease in integrating them into the previous knowledge structure with the learners, which incites comprehension, understanding and increases the achievement because it increases the learner's positive participation in the different activities of the lesson [3].

Results Concerning the Second Question

The second question was: are there statistically significant differences at ($\alpha=0.05$) level between the means of the deferred achievement (retention) of both the experimental and control groups of students, ascribed to the teaching methods strategy (4-MAT vs. traditional)? To answer this question, the analysis of covariance (ANCOVA) was employed to compare between the post-M's, taking the pre-achievement as an associated variable, to remove any effect of the deferred achievement (retention) and relate it only to the effect of the teaching method. The researcher calculated the means and standard deviations of experimental groups students' grades, who received teaching using 4-MAT strategy, and those of the control group, who received teaching through the traditional way, on the deferred achievement test (retention).

Table (1) showed that the mean of the experimental group of students using 4-MAT strategy on the deferred achievement test was (13.93), which is higher than the mean value for the control group (10.85). To determine whether this difference is statistically significant, the researchers applied the analysis of covariance (ANCOVA) bearing in mind that the pre-achievement is the associated variable, to remove any effect on the research results and control the differences between the two groups on the deferred (retention) achievement, as shown in Table (4).

Table 4. Results of ANCOVA for testing the differences between the M's of the experimental and control groups achievement in the deferred achievement test

Source	Sum of Squares	Degrees of freedom	Average Squares	F Value	Significance Level
Corrected Model	346.10	2	173.05	12.39	0.00
Intercept	526.34	1	526.34	37.68	0.00
pretest	142.63	1	142.63	10.21	0.02
Method	201.18	1	201.18	14.40	0.00
Error	1159.29	83	13.96		
Total	14868.00	86			
Adjusted Total	1505.39	85			

Table (4) shows that the F-value in terms of the teaching method was (12.39), which is statistically significant at ($\alpha=0.05$) level, which means that there are statistically significant differences between the means of the two groups' performance in the deferred achievement test. To determine in whose favor these differences were, the researchers calculated the amended M's of the two study groups, as shown in Table (5).

Table 5. Amended M's of both study groups in the deferred achievement test

SD	Adjusted Mean	No.	Group
0.55	13.92	45	4-MAT Strategy
0.58	10.86	41	Traditional Method

Table (5) shows that the amended mean of the experimental group who studied through the 4-MAT strategy was higher (13.92) than that of the control group who studied through the traditional method (10.86). This indicates that the 4-MAT strategy has a positive effect on the learners' retention of the learnt information as compared with the normal method.

In this concern, results of this study are in line with [3, 9]. These results are imputed to the nature of the 4-MAT strategy, which consists of successive, organized steps, beginning with the reflective observation, and then concept formulation, active experimentation, and finally ending with the concrete experiences; in addition to the continuous feedback. Each stage consists of two types of the various activities that fit the pattern of the brain control (left and right hemisphere) [5]. Such successive and organized steps enable the learner to learn the concepts and the related terms of the educational materials accurately. They further help the learner build new knowledge by himself during concept formulation stage. The feedback also enables the learner to make many inquiries and extend the concept, which helps in mastering the educational subject, and ability to retain it for the longest possible period [6].

In addition, this strategy contributes in developing the learner's intellectual abilities to the highest possible limit and enables him to access knowledge through additional ways using more than one sense in learning. Furthermore,

it offers a complete chance to process the information in the right way, which helps in understanding and analyzing the thoughts, and making attempts to link and use them in more than one situation.

In general, learning becomes meaningful leading to the stability of the new knowledge and settling down into the learner, which enables him to keep in the long-term memory, and facilitates its retrieval [21-24]. This is contrary to the traditional method that includes surficial processing of the information as they are based on instant recitation and recollection, which renders the information subject to forgetting. As a result, the experimental group students over performed their control group counterparts in the deferred achievement test (retention).

In conclusion, the present study provided valuable insights as to the effectiveness of the 4-MAT teaching strategy to improve academic achievement and deferred retention of information for social studies students at higher education institutions in Jordan. This study also provides valuable insights and recommendations for the field of social studies as to the importance of using modern techniques such as the 4-MAT strategy in teaching social studies disciplines. Based on this method, the content and method of instruction can be adjusted to fit the learning styles of students, which requires students to participate in the learning process as active learners. Future research should compare sample of students from different cultural backgrounds on the regional and international levels. Further, a path-analytic model should be developed that includes more outcome variables and antecedents.

REFERENCES

- [1] W. Al-Ansari. Level of the constructive learning practices of the social studies and civics teachers in the secondary stage in the Kingdom of Saudi Arabia. *Islamic University Journal for educational and psychological studies*, Vol. 25, No. 1. pp. 32-15, 2016.
- [2] A. Julban. Information and communication technology and their reflections on the teaching methods and styles in the

- Libyan education. *University Journal*, Vol. 22, pp. 287-302, 2015.
- [3] S. Cengizhan, S. Özer. The effect of the 4MAT learning style model on academic achievement and learning retention teaching "ratio and proportions". *Journal of Theory and Practice in Education*, Vol. 12. No. 3. pp. 568-589, 2013.
- [4] N. Joan, S. Seider. Assessing the impact of the 4MAT teaching model across multiple disciplines in higher education. *College Teaching*, Vol. 58, No. 1, pp. 19-27, 2009.
- [5] B. McCarty. *The 4MAT system, teaching to learning*, Excel, Inc., Oak Brook, Illinois, 1987.
- [6] N. Felemban. Effectiveness of (4MAT) system in the academic achievement and creative thinking among the second secondary female students in Mecca in English language subject. Unpublished Ph.D. Dissertation, Umm Al-Qura University, KSA, 2006.
- [7] B. McCarty. A tale of four learners: 4MAT'S learning styles. *Educational Leadership*, Vol. 54, No. 6, pp. 46 -51, 1997.
- [8] J. Thomas. *Philosophy of teaching*, Westminster Choir College, 2015.
- [9] A. Abbas, A. Mogheer, J. Jawad, Ibtisam. Effect of the use of McCarty and Merrill –Tennyson models in acquiring and retention of the biology concepts among the first intermediate female students. *Basic Education College Journal*, Babylon University, Vol. 11, pp. 179-225, 2013.
- [10] M. Abjal. Effect of the use of McCarty Model in acquiring the historical concepts among the second intermediate female students. *Diala Journal*, Vol. 43, pp. 634-664, 2010.
- [11] E. Al-Hadaibeh, A. Ambosaeedi. Effect of the use of McCarty model in developing the reflective thinking and science achievement among the female sixth graders. *The Jordanian Journal of Educational Sciences*, Vol. 22, No. 1, pp. 1-15, 2010.
- [12] H. Al-Nu'aيمي. Effect of McCarty model on the elementary stage female graders and their attitudes toward mathematics. *Educational studies*, Vol. 27, pp. 55-80, 2014.
- [13] A. Ayyash, Amal. Effect of the use of (4MAT) model on the sixth basic female students in science and the attitudes toward it. *Al-Quds Open University Journal for research and psychoeducational studies*, Vol. 1, No. 4, pp. 159-182, 2013.
- [14] R. Ghazal. Effect of (4MAT) system in developing the concepts and the scientific thinking skills in the general science subject among the female seventh graders in Gaza. Unpublished MA thesis, Islamic University, Gaza, 2016.
- [15] F. Ovez, F. The effect of the 4MAT model on student's algebra achievement and level of reaching attainments. *International Journal of Contemporary Mathematical Sciences*, Vol. 7, No. 45, pp. 2197-2205, 2012.
- [16] M. Al-Dasouqi. Effect of teaching a developed module in history according to the (4MAT) pattern on developing the values of the national belonging and societal responsibility among the elementary stage graders. *Journal of the Educational Association for Social Studies*, Vol. 80, pp. 1-50, 2016.
- [17] S. Ergin, S. Atasoy, S. Comparative analysis of the effectiveness of 4MAT teaching method in reaming pupil's physics misconception of electricity. *Journal of Baltic Science Education*, Vol. 12, No. 6, pp. 730- 746, 2013.
- [18] O. Irfan, F. Almufadi, A. Brisha. Effect of using 4MAT method on academic achievement and attitude toward engineering economy for undergraduate students. *International Journal of Vocational and Teaching Education*, Vol. 8, No. 1, pp. 1-10, 2016.
- [19] I. Younes. Effectiveness of the social media use in teaching the course of geography teaching methods on the development of academic achievement and self-efficiency of the faculty of education students. *Psychoeducational Journal*, Vol. 9, No 1, pp. 197-210, 2015.
- [20] M. Adam, R. Shatat. Effectiveness of a proposed strategy in the light of the learning theory based on both brain sides (hemispheres) on the achievement, visual thinking skills and compound self-efficiency among the preparatory stage students. *Arabic studies in education and psychology*, Vol. 57, pp. 17-70, 2015.
- [21] L. Jdeed. Relationship between learning methods as a style for information processing and exam anxiety, and their effect on the academic achievement. *Damascus University Journal*, Vol. 26, pp. 93-123, 2010.
- [22] Y. Aal-Salem. Effectiveness of a developed module in the social studies and civics built on the brain-based learning theory in developing the visual thinking skills among the third intermediate graders. *Education and Psychology Message*, Vol. 56, pp. 51-69, 2017.
- [23] F. Al-Dosari. Effectiveness of a teaching strategy based on cartoons in developing concepts that threat the intellectual security in the social studies and civics subject among the third intermediate female graders. *Islamic University Journal for educational and psychological studies*, Vol. 25, No. 1, pp. 1-14, 2017.
- [24] A. Al-Kassab. Effectiveness of the use of the learning cycle in developing creative thinking skills and academic achievement in the social studies and civics subject among the third secondary female graders in Al-Qunfudah Governorate (KSA). *Islamic University Journal for educational and psychological studies*, Vol. 25, No. 2, pp. 272-291, 2017.