REVIEW ARTICLE

The effect of an educational program using artificial intelligence applications on learning backstroke skills among people with motor disabilities

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ABSTRACT

Purpose, this study aimed to identify the impact of an educational program using artificial intelligence applications on learning backstroke skills among people with motor disabilities, Methods, the study sample consisted of (22) students with motor disabilities at Hashemite University and registered for the second semester of the academic year 2024/2025 (who are not fluent in swimming skills). They were divided into two groups, an experimental group (12) students and a control group (10) student. The researcher used the experimental method by designing the experimental and control group for its suitability and objectives of the study. An educational program in swimming using artificial intelligence applications was applied to the experimental group for 8 weeks three times a week and 45 minutes each unit, while the control group was taught in the traditional way, Results, the results of the study indicated that there are statistically significant differences between the pre- and post-measurements and in favour of the post-measurement in the skill level of the two groups. Conclusion, the researcher recommends adopting the proposed educational swimming program for basic skills in swimming using artificial intelligence applications.
Keywords: Artificial intelligence, People with mobility disabilities, Swimming, Educational program.

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INTRODUCTION

Scientific innovations and modern technologies are considered one of the hallmarks of the twenty-first century and it is difficult to abandon them because of their prominent role in achieving the best results in the world, which all countries seek to own and apply to reach the podiums in sports forums, where technology has become a reality that we cannot ignore (Hussein, 2021).

Since ancient times, man has contributed to the creation of machines and devices that facilitate the requirements of his diverse life, and employed them in the fields of health, agricultural, industrial, educational, and other fields, and the machine has become an integral part of the life of modern man (Melaw et al, 2020).

Howard (2019) believes that artificial intelligence is one of the modern technological applications that can be used in multiple academic aspects such as worksheets, performance evaluation, assignments, correction of errors, various tests, and others, which facilitates and simplifies education by presenting educational content and explaining it in a fun way and an interesting presentation that accompanies sound, image and simulates reality. Where the educational sector has been significantly affected by the changes and transformations of society, which requires workers in the university sector to keep pace with this development to survive and reach the highest levels, whether at the local, regional, or international levels.

Among the uses of artificial intelligence in the educational field is that it contributes to identifying the capabilities of students and designing study programs that suit the individual abilities and different needs of students, as well as contributing to the creation of digital learning interfaces and simplifying concepts, in addition to helping the trainee to keep pace with educational lessons at multiple times and outside official working hours, which contributed to improving the academic level of students (Chen et al, 2020).

Abu Arida (2021) indicates that the use of artificial intelligence applications in teaching motivates students, improves the learning process, and increases the efficiency of the teaching process by deviating from the routine pattern adopted in teaching, which may sometimes boring students.

Artificial intelligence as seen by (Zhuo, 2021) are programmed computer applications that have certain characteristics that simulate human mental abilities and work patterns, and among these characteristics they help to learn and deduce.

Ismail (2021), Taweel and Noureddine (2023) stated that the use of artificial intelligence has become an imperative necessity to develop the sports field, whether in sports facilities or training camps, correct common errors of skills, audit arbitration cases, or process various data to develop sports performance. It also contributes to the creation of a virtual reality database that is used to improve and improve the skill performance of various sports.

This is confirmed by (Robert et al, 2016) and Essam and Ayyad (2021), as many artificial intelligence applications that are used in the sports field simulate the reality of sports, and audio-visual videos related to artificial intelligence help the coach by storing and analysing the data that is recorded during play to know the performance of the players and their efficiency during matches and predict the results, in addition to the possibility of watching the ideal performance of certain skills in sports for the player to apply and learn them to the point of mastery.

Abu Arida (2021) also believes that the use of various artificial intelligence applications in the education and training process is commensurate with different swimming skills, considers the individual differences between learners, responds to their interests, and contributes to the development of their physical abilities to reach the highest levels.

Swimming is among the areas that have been directly affected in keeping pace with modern scientific and technological development with artificial intelligence applications in the practical and theoretical aspect, whether in the processes of teaching skills for different types of swimming or through training and development mechanisms to improve the time and performance of swimmers. As swimming is a complete sport that is not equivalent to a sport for the growth of the ideal physical composition of swimmers, it is also a humanitarian sport that enables the individual to save himself and preserve his life and keep the danger away from him and others, and it is a way to save people who are about to drown (Abu Eid, 2008).

The importance of practicing sports activity in general and swimming in particular increases among people with disabilities, as Goodman (2002) pointed out that the importance of practicing sports activity for people with disabilities is doubled, as it is not only preventive, but it also amounts to rehabilitation due to their lack of movement resulting from their disability directly or indirectly. Abu Eid (2004) also pointed out that the practice of swimming activity works to develop the skill level in swimming among individuals with motor disabilities.

The importance

1- It is one of the few studies in the Jordanian environment (within the limits of the researcher's knowledge) Which examines the possibility of using artificial intelligence applications in teaching basic skills in swimming to people with motor disabilities.
2- This study contributes to identifying the importance of using artificial intelligence applications in education and training, especially with people with disabilities.
3- The researcher believes that this study will save effort, energy, and time in teaching basic skills in swimming among people with motor disabilities.

The problem

There are many challenges facing workers in the field of training and teaching swimming to people with disabilities at the present time, so it was necessary to consider the efficiency of the trainers and work to be up to the desired goals. To reach this stage, we must search for factors that contribute to the good productivity and efficiency of trainers in some circumstances through which to influence the educational process in order to interact with training programs and their artificial applications with high efficiency and guide students towards achieving goals. Swimming is one of the water sports that contribute to the growth of the ideal physical composition of its practitioners, and mastering its various skills enables the individual to save himself and maintain his life and ensure his safety and the safety of others, and through the researcher's experience in teaching and training swimming and given that some classrooms may be interspersed with certain circumstances that hinder the entry of participants to the swimming pool, such as the blessed month of Ramadan or during emergency circumstances, as happened during the Corona pandemic (2019) Which constituted a major obstacle at the beginning to the continuity of education, and since technology began a while ago to invade various health, industrial, agricultural, educational and other vital fields, the problem of the study appeared to the researcher, through which he believes in the need to use artificial intelligence techniques in teaching and training swimming among people with motor disabilities, where Haider (1991) mentioned That hearing some sound effects such as guidance, applause, speech and guidance all lead to accelerate learning and economy with the effort expended, by answering the following study questions.

Questions

1- Is there a statistically significant effect at the level of significance (α ≤ .05) between the pre- and post-measurements of the use of the proposed program to learn backstroke skills among people with motor disabilities using artificial intelligence applications for the experimental group?
2- Is there a statistically significant effect at the level of significance (α ≤ .05) between the pre- and post-measurements of using the traditional method on learning backstroke skills among people with motor disabilities of the control group.
3- Is there a statistically significant effect at the level of significance (α ≤ .05) on learning backstroke skills in the two-dimensional measurements between the experimental and control groups.

Objectives

1- Identify the impact of the proposed educational program using artificial intelligence applications on learning basic skills in backstroke among people with motor disabilities.
2- The significance of the differences between the experimental and control groups in the level of learning backstroke skills among people with motor disabilities.

METHODOLOGY

The researcher used the experimental method to suit the nature of the study using the experimental design of two groups, one experimental and the other control.

Participants

The study participant consisted of students with motor disabilities at Hashemite University who were registered for the first semester of the academic year 2023/2024, amounting to (45) students.

Sample

The members of the study sample, numbering (22) students, were deliberately selected from the total community to study according to the conditions (disability in one of the upper or lower limbs, and to adhere until the end of the educational program, and not to be fluent in swimming skills) to equalize the two groups, especially in tribal measurements. They were divided into two groups randomly, so that the experimental group consisted of (12) students, and the control group consisted of (10) students. Table 1 shows the equivalence of the two groups in growth variables.

Table 1. Arithmetic averages, standard deviations, range, and torsion among the sample members in the experimental and control groups.

Growth variables/ unit of measure	Control Group (10)				Experimental Group (12)			
	Average	Deviation	Range	Torsion	Average	Deviation	Range	Torsion
Length/Meter	172.9	6.48	20	0.19	173	6.68	20	0.42
Weight/kg	76.6	4.11	23	1.19	76.2	3.93	15	1.11
Age/Year	19.2	1.54	4	-0.41	19.4	1.34	4	0.77

By reviewing Table 1, we note that the sample is homogeneous in terms of torsion, where the torsion values of the length variable for the control and experimental sample were (0.19 and 0.42), for the weight variable, the value was (1.19 and 1.11), and for the age variable, the torsion for the two samples was (-0.41 and 0.77), and these values all range between (± 3), which indicates that the two samples are homogeneous.

Tools

After reviewing the specialized references and previous studies such as the study (Al-Shorman et al, 2023), the study of Abu Eid (2008), the study of (Abu Eid et al, 2023) and the study of (Abu Eid, 2021), where the researcher benefited from it in building and designing the proposed educational program for basic skills in backstroke, and he designed the program in proportion to the members of the study sample in terms of the nature of the exercises and skills that suit the nature of motor disability based on the use of artificial intelligence applications in education.

Procedures for the authenticity of tests

Arbitrators were consulted from professors in Jordanian universities and specialists in the field of physical education and special education, numbering (4) arbitrators, to ensure the sincerity and appropriateness of these tests through apparent honesty, to express their opinions and observations about the tests, and after retrieving the tests from the arbitrators, the data on the arbitrators' responses was unloaded, as the percentage of arbitrators' approval of the tests reached 80%, where they made some suggestions and amendments to the method of performing or measuring some tests. The tests under study were nominated for their suitability for the members of the study sample, and the researcher took these suggestions into consideration.

Procedures for the stability of tests

To ensure the stability of the tests, the researcher applied the selected tests to a sample of five students other than the study sample on 8/10/2023 in the Hashemite University swimming pool, and the results were unloaded into special tables in order to conduct the necessary statistical treatment to ensure the stability of the tests, as the tests were repeated on the selected sample a week after the first tests. Then the researcher calculated the Pearson correlation coefficient to find the degree of stability of the tests through the method of testing and re-testing and the degree of stability was as in Table 2.

Table 2. Correlation coefficient (Pearson) and Cronbach alpha for study tests.

Test	Pearson correlation coefficient	Cronbach alpha coefficient
Leg stroke tests	0.78	0.80
Tests for arm movements	0.77	0.82
Total Backstroke Compatibility Tests	0.89	0.91

Table 2 indicates that all correlation coefficients are statistically significant at the significance level ($\alpha \leq .05$) and that the Cronbach alpha coefficient as an indicator of internal consistency of the test indicates a high degree of stability of the tests used in the study.

The proposed educational program using artificial intelligence applications was also presented to a group of arbitrators in the field of swimming and special education, numbering (5) to express their opinions and observations and to ensure the sincerity of the program and its suitability to the objectives of the study and the nature of the sample members through virtual honesty, and after retrieving the program from the arbitrators, the data on the arbitrators' responses was unloaded, as the percentage of arbitrators' approval of the program reached 87%. Where they presented some proposals and amendments to the method of performing some skills commensurate with the nature of motor disability, The researcher took these suggestions into account, and the program under study was nominated for its suitability for the members of the study sample, where the program in its final form consisted of (24) educational units and the time of one unit (45) minutes by three days a week, and the program included teaching some backstroke skills for people with motor disabilities using artificial intelligence applications, whether by presenting them in the form of

PowerPoint slides or displaying YouTube videos and simulation programs for swimming skills. The program was implemented during the period from 15/10 – 7/12/2023.

Statistical analysis

The researcher used statistical treatments that suit the nature of the study, where he used percentages, arithmetic averages, standard deviations, range, torsion, t-test, Pearson's stability coefficient, Cronbach alpha, and analysis of single variance.

RESULTS

The first question, which states "*Are there statistically significant differences at the significance level (α ≤ .05) between the pre- and post-measurement of the experimental group in the skill level in swimming among people with motor disabilities*"?

To verify this question, the researcher calculated the arithmetic mean and standard deviation between the pre- and post-tests of the experimental group, and Table 3 shows the results.

Table 3. Arithmetic averages and standard deviations between the pre- and post-measurements of the experimental group members at the skill level, (n = 12).

Variable	Unit of measurement	Pre-measurement		Post-measurement	
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation
Leg blows	meter	1.80	0.49	9.50	1.35
Arm movements	meter	2.40	0.39	10.10	0.99
Backstroke performance	meter	1.50	0.10	12.80	0.94

It is clear from the presentation of Table 3 that there are apparent differences in the arithmetic averages between the pre- and post-measurements among the members of the experimental group in the skill level. To determine the sources of these differences, a single variance analysis was used, and Table 4 illustrates the results.

Table 4. The source of variance, the sum of squares, the mean of squares, the value of "*F*" and the level of significance between the pre- and post-measurements of the experimental group members. (n = 12).

Variable	Unit of measurement	Source of variance	Sum of squares	Degree of freedom	Mean of squares	Value of "*F*"	Level of significance
Leg blows	meter	Between groups	85.73	1	98.73	79.13	.00*
		Inside groups	17.84	10	1.44		
		Total	114.45	11			
Arm movements	meter	Between groups	98.92	1	87.92	77.52	.00*
		Inside groups	45.33	10	1.33		
		Total	657.45	11			
Backstroke performance	meter	Between groups	125.12	1	111.00	89.65	.00*
		Inside groups	9.10	10	0.33		
		Total	145.10	11			

*Note. * There is a positive effect at the significance level ($\alpha \leq .05$).*

It is clear from the previous table that the *p*-value ranged between (77.52 and 89.65) and these values are considered a function at the level of significance (α ≤ .05).

The second question, which states that "*Are there statistically significant differences at the significance level (α ≤ .05) between the pre- and post-measurement of the control group in the skill level in backstroke among people with motor disabilities*"?

To verify this question, the researcher calculated the arithmetic mean and standard deviation between the pre- and post-tests of the control group, and Table 5 shows the results.

Table 5. Arithmetic averages and standard deviations between the pre- and post-measurements of the members of the control group in the skill level. (n = 10).

Variable	Unit of measurement	Pre-measurement		Post-measurement	
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation
Leg blows	meter	1.75	0.33	8.25	1.35
Arm movements	meter	2.33	0.37	6.25	0.99
Backstroke performance	meter	1.40	0.10	8.20	0.94

It is clear from the presentation of Table 5 that there are apparent differences in the arithmetic averages between the pre- and post-measurements among the members of the control group in the skill level. To determine the sources of these differences, a single variance analysis was used, and Table 6 illustrates the results.

Table 6. The source of variance, the sum of squares, the mean of squares, the value of "*F*" and the level of significance between the pre- and post-measurements of the control group members. (n = 10).

Variable	Unit of measurement	Source of variance	Sum of squares	Degree of freedom	Mean of squares	Value of "*F*"	Level of significance
Leg blows	meter	Between groups	85.73	1	98.73	79.13	.00*
		Inside groups	17.84	8	1.44		
		Total	114.45	9			
Arm movements	meter	Between groups	98.92	1	87.92	77.52	.00*
		Inside groups	45.33	8	1.33		
		Total	657.45	9			
Backstroke performance	meter	Between groups	125.12	1	111.00	89.65	.00*
		Inside groups	9.10	8	0.33		
		Total	145.10	9			

*Note. * There is a positive effect at the significance level ($\alpha \leq .05$).*

It is clear from the previous table that the *p*-value ranged between (77.52 and 89.65) and these values are considered a function at the level of significance (α ≤ .05).

The third question, which reads: "*Are there statistically significant differences at the level of significance (α ≤ .05) in the dimensional measurements of the experimental and control groups in the level of backstroke skills using artificial intelligence applications*"?

To verify this question, the researcher calculated the arithmetic mean and standard deviation between the two-dimensional tests of the experimental and control groups, and Table 7 shows the results.

It is clear from the presentation of Table 7 that there are apparent differences in the arithmetic averages between the two-dimensional measurements in the experimental and control groups. To determine the sources of these differences, a single variance analysis was used, and Table 8 shows the results.

Table 7. Arithmetic averages and standard deviations of the two-dimensional measurements for the members of the experimental and control groups.

Variable	Unit of measurement	Control group		Experimental group	
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation
Leg blows	Meter	8.25	1.35	9.50	1.35
Arm movements	Meter	6.25	0.99	10.10	0.99
Backstroke performance	Meter	8.20	0.94	12.80	0.94

Table 8. The source of variance, the sum of squares, the average of squares, the value of "*F*" and the level of significance between the two-dimensional measurements of the members of the experimental and control groups.

Variable	Unit of measurement	Source of variance	Sum of squares	Degree of freedom	Mean of squares	Value of "*F*"	Level of significance
Leg blows	Meter	Between groups	8.12	1	8.12	20.26	.00*
		Inside groups	7.28	8	0.40		
		Total	15.36	9			
Arm movements	Meter	Between groups	14.21	1	14.21	8.90	.00*
		Inside groups	28.88	8	1.60		
		Total	43.16	9			
Backstroke performance	Meter	Between groups	125.00	1	125.0	4.77	.00*
		Inside groups	470.00	8	26.11		
		Total	595.00	9			

*Note. * There is a positive effect at the significance level ($\alpha \leq .05$).*

It is clear from the previous table that there are statistically significant differences in all variables (arm movements, leg strokes, backstroke performance).

DISCUSSION

Table 3 indicates that there are statistical differences and a clear development in the skill level of some backstroke skills among people with motor disabilities (members of the experimental group) who underwent a proposed educational program using some artificial intelligence applications. Table 4 also indicates that all values were a function at the level of significance (α ≤ .05), which indicates the positive impact of the proposed program on the speed of learning the selected swimming skills, and the researcher believes that the use of artificial intelligence applications in teaching swimming skills to people with motor disabilities was very useful in the process of motor memory and mental perception of the skill before and during the application of the skill, which enhanced the ideal performance of the skill when the members of the study sample in the experimental group by following up on intelligence applications artificial and at different times when the study sample, Saeed et al. (2020) also stated that the use of technology in education facilitates the learning process of motor skills by analysing the skill and presenting it in an easy and attractive way, which helps to speed up its learning and comprehension. This is what Abu Arida (2021) pointed out, and I agree with the study of (Wei et al, 2021).

Table 5 also indicates that there are statistical differences in the skill level of some of the backstroke skills of the members of the control group who have undergone a traditional educational program to teach backstroke skills to people with motor disabilities, and Table 6 indicates that all values were a function at the level of significance (α ≤ .05), which indicates the skill improvement among the members of the control group and

the researcher attributes this to the natural result of performing the exercise, skill and gaining practical experience in addition to the skill of sensation and habituation. On the water in the pool Which leads to a clear improvement in the skill level. Saeed et al. (2020) stated that the teaching methods used for swimming, whether through verbal explanation or the performance of a model in front of students, give a clear idea of how to properly perform the various swimming skills, and through exercise, repetition and correction of mistakes, learning is done well and mastering the required skills. Where El-Khouly (2001) pointed out that the practice of physical activity may reflect on the life of the individual and develop his vital organs and give activity and vitality to his health and contribute to the process of motor learning. This delegation agreed with the study of Abu Eid (2004), which indicated a positive and noticeable improvement in the skill level of the members of the study sample.

Table 7 also indicates that there are statistical differences in the skill level in the post-tests of some backstroke skills among members of the experimental and control groups and in favour of the experimental group who used artificial intelligence applications to learn swimming skills among people with motor disabilities during the proposed program.

Table 8 also indicates that all values were a function at the level of significance ($\alpha \leq .05$), which indicates the positive impact of the proposed program on the speed of learning the selected swimming skills, and the researcher believes that the use of artificial intelligence applications in teaching swimming skills was very useful in the process of motor memory and mental perception of the skill among people with motor disabilities members of the experimental group, and this is what Abu Arida (2021) pointed out. As the use of artificial intelligence applications in teaching motivates students, improves the learning process and increases the efficiency of the teaching process by deviating from the routine pattern adopted in teaching, which may sometimes boring students, which enhanced the ideal performance of the skill among the members of the study sample in the experimental group by following up on artificial intelligence applications at different times when the study sample, Where Essam and Ayyad mentioned (2021) Many artificial intelligence applications that are used in the sports field simulate the reality of sports, where audio-visual videos related to artificial intelligence help the trainee by storing and analysing the data that is recorded during the performance of the skill to know the performance of the players and their efficiency and predict the results in addition to the possibility of watching the ideal performance of certain skills in swimming for the player to apply and learn them to the point of mastery, Hussain (2000) and (Kozub, 2002) that the use of auditory aids with the learner and activate his ability to think contributes to the formation of a better form of movement so that the skill is analysed accurately, in addition to that the word and music during training accelerate the learning process and banish boredom and the result of the current study agreed with the study of Abu Arida (2021), and (Wei et al, 2021)

CONCLUSIONS

- The proposed program to teach basic skills in backstroke among people with motor disabilities has a positive effect on the development of the skill level in swimming among (people with motor disabilities) members of the study sample of the experimental group.
- The proposed program for teaching basic skills in swimming has a positive impact on the development of the skill level in swimming among people (with motor disabilities) members of the study sample of the control group.
- The proposed program for teaching basic skills in swimming using artificial intelligence applications has a positive impact on the development of the skill level in swimming among the members of the experimental and control groups and for the benefit of the experimental group.

Recommendations

- Applying the proposed educational swimming program for basic skills in backstroke for people with motor disabilities using artificial intelligence applications, as it greatly affected the speed of learning basic skills in backstroke among the sample members.
- Providing Jordanian libraries with references and specialized sources using artificial intelligence applications in training and education.
- Diversity in the use of teaching methods for motor skills for people with motor disabilities.
- Graduating trained and specialized cadres to deal with people with motor disabilities in modern educational ways using artificial intelligence applications.

AUTHOR CONTRIBUTIONS

Study design: Faleh Sultan Abu Eid and Amal Mohammad Hasan Alhamad. Data collection: Suliman Mohammad Alghodran, Salwa Adnan Alshorman and Khaleel Taha Al Qawasmeh. Statistical analysis: Faleh Sultan Abu Eid. Manuscript preparation: all authors. Discussion: all authors.

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No potential conflict of interest was reported by the authors.

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