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Effectiveness of Using the Six-Dimensional Strategy on Skill Performance of Selected Handball Skills and Development of Decision-Making Among Students

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ABSTRACT

The purposes of this study are to examine the difference between pre-test and post-test results of students' skill performance in the selected handball skills after applying the 6 dimensional strategy, and to examine the contribution of the 6 dimensional strategy to improve the decision making skill of students. In addition, the study aims to find out whether there are differences between the six-dimensional strategy and the traditional teaching method in the development of the performance of the handball skills in the post-test. It also compares the results of these two methods of teaching on enhancing students decision making after the educational program. The researcher used the experimental method because of its appropriateness that has been considered in light of the nature and objective of the study. The research sample consisted of two physical education second year student sections at the College of Physical Education and Sports Sciences, University of Mosul and selected randomly. The experimental group was Section (C) and Control group was Section (Y). Prior to education program implementation, homogeneity and equivalence of the two groups was achieved. The researcher examined the approved handball curriculum of the second-year students in the first semester of the academic year and then developed an educational program based on the strategy of six dimensions. The program was consisted of 12 educational units which were implemented in the experimental group while the control group received conventional teaching method. Appropriate educational resources and instructional technologies were also used by the researcher that was needed for the experiment. The researcher used several research instruments, such as the preliminary information form, the skill acquisition assessment and decision-making scale, to gather the necessary data. The results showed that the experimental group had a significantly higher level of skill acquisition and performance than the control group. The findings also showed that the 6D strategy is effective in the promotion of skill achievement than the conventional teaching method. Furthermore, the results of the students in the experimental program showed that the six-dimensional strategy had a positive effect in enhancing the students' decision making ability, as evidenced by the better results obtained in the decision making assessment. On the findings, the researcher suggested

using the educational materials that have been designed according to the six dimensional strategy in teaching handball in the second year students of Colleges of Physical Education and Sports Sciences. This method could play a role in enhancing the practical skills outcomes and boosting the students' decision-making competencies in educational contexts.

Keywords: Six-Dimensional Strategy; Skill Performance; Handball Skills; Decision-Making.

ABSTRAK

Tujuan dari penelitian ini adalah untuk menguji perbedaan hasil pre-test dan post-test performa keterampilan mahasiswa pada keterampilan bola tangan terpilih setelah penerapan strategi enam dimensi, serta menguji kontribusi strategi enam dimensi dalam meningkatkan keterampilan pengambilan keputusan mahasiswa. Selain itu, penelitian ini bertujuan untuk mengetahui perbedaan antara strategi enam dimensi dan metode pengajaran tradisional dalam pengembangan performa keterampilan bola tangan pada post-test, serta membandingkan hasil kedua metode pengajaran tersebut terhadap peningkatan pengambilan keputusan mahasiswa setelah program pembelajaran. Peneliti menggunakan metode eksperimen dengan desain kelompok ekuivalen pre-test–post-test. Sampel penelitian terdiri atas mahasiswa tahun kedua pada Fakultas Ilmu Pendidikan Jasmani dan Olahraga, Universitas Mosul, yang dipilih secara acak: Kelas (C) sebagai kelompok eksperimen dan Kelas (Y) sebagai kelompok kontrol. Sebelum pelaksanaan program pembelajaran, homogenitas dan ekuivalensi kedua kelompok telah dicapai. Peneliti mengembangkan program pendidikan berdasarkan strategi enam dimensi yang terdiri atas 12 unit pendidikan, diterapkan pada kelompok eksperimen sementara kelompok kontrol menerima metode pengajaran konvensional. Hasil penelitian menunjukkan bahwa kelompok eksperimen memiliki tingkat penguasaan dan performa keterampilan yang jauh lebih tinggi dibandingkan kelompok kontrol. Temuan juga membuktikan bahwa strategi 6D efektif dalam meningkatkan pencapaian keterampilan motorik serta memberikan pengaruh positif yang signifikan dalam meningkatkan kemampuan pengambilan keputusan mahasiswa. Peneliti menyarankan penggunaan materi pendidikan berbasis strategi enam dimensi dalam pengajaran bola tangan untuk meningkatkan hasil keterampilan praktis dan kompetensi pengambilan keputusan mahasiswa.

Kata Kunci: Strategi Enam Dimensi; Performa Keterampilan; Keterampilan Bola Tangan; Pengambilan Keputusan.

INTRODUCTION

Education is a reflection of a society and its aspirations and goals, values and philosophy. It is also deemed as one of the important tools to orient and develop societies and realize significant targets. As a result, developed countries are constantly striving to enhance their education practice, strategies, and systems to stay current with the rapid developments that occur in different science domains (Gustafson & Mahaffy, 2012; Hu, 2021; Nurharini et al., 2019) . This is because, they believe that education is one of the

most valuable investments in the future generations who are the backbone of the society's progress. Moreover, it shows that they have the consciousness that scientific knowledge is not only theoretical knowledge, but it is also the method of doing something that can have a positive impact on the lives of people and contribute to the development of society (Cerovac & Keane, 2025; Stevens & Dascombe, 2015; Trabelsi et al., 2025) .

The researcher mentioned that several foundations are needed to be considered before and during learning process, as well as the fundamental principles that have a significant role in acquiring motor skill. Practice and training are more than just repeating movements, they involve repetition that is continuous, with reinforcement, feedback and appropriate modification. These involve making corrections to errors, reinforcing successful responses and reinforcing correct movement patterns, which can lead to progressive motor improvements over time. Educational specialists also discuss the importance of the six-dimensional approach in helping students to master a range of skills including when introducing new skills to students and early learning stages. This approach helps to enhance cognitive learning activities and deepen students' understandings while maintaining and effectively utilizing what has been learned and motor skills (Ihsan et al., 2023; Riadi et al., 2024; Sarin et al., 2021) .

Handball is a sport that demands much more than learning the fundamentals of the sport and being able to play it. It also has a number of physical, psychological, cognitive and educational needs (Jabbar et al., 2026; Masada & Nakano, 2013) . These requests could pose problems to the beginners and make handball less popular than it is, especially among the students. However, the use of modern teaching methods, in combination with a well-qualified educational coach, can be a tool to tackle such issues, foster involvement and promote increased use of this sport (Jassem, 2014, p. 64).

This study is significant because it aims to investigate the effectiveness of 6-dimensional strategy in teaching selected handball skills and improving decision making skills in students. The need of the problem is the need to upgrade the instruction techniques and teaching strategies that are used in teaching handball in physical education and sports sciences field and this need has been increasing. The researcher's personal experiences in the early learning stages for handball skills, coupled with the observation of the lack of students' willingness to participate in handball, highlighted the need for a development of a more effective instructional strategy for handball. This approach may help students to learn the required skills, enhance their practical and intellectual performance, build confidence and self-esteem.

Handball is a game with a lot of educational and athletic value; it is not a popular game among students, which can be a problem for students to acquire and master the technical skills of the game. Thus, the research problem came about because of the need to know more about an instructional strategy that would meet these challenges and thus develop better opportunities for learning. In view of this, the researcher tries to investigate experimentally the effectiveness of using the six-dimensional strategy in teaching the handball skills to the second-year students in the College of Physical Education and Sports Sciences (Al-Khannaq et al., 2026; Faisal et al., 2026; Majead et al., n.d.) .

In order to clearly state the research problem, the present study aims to answer the following question: What is the effect of applying the six-dimensional strategy on technical performance of some selected handball skills and how is the development of

the ability of decision making among second-year students at the College of Physical Education and Sports Sciences?

The purpose of the present study is to compare the effectiveness of the six-dimensional strategy and the conventional teaching method on the handball performance on selected skills and ability of decision-making by using pre-test and post-test. It also aims to determine the differences between these two methods of teaching in terms of the students' performance of selected handball skills post-test results. Moreover, the study is to find out how different between the six dimensional strategy and the conventional teaching method in improving decision making skills in students' post test measurement.

This research is conducted based on several null hypotheses that assume that the mean pre-test and post-test scores of experimental and control groups are not statistically different in terms of: improvement of the performance of some handball skills, improvement of decision making skills. Besides, it is hypothesized that there are no statistically significant difference between the mean of post test scores from the experiment and control groups for the development of skill performance in selected handball skills. Lastly, the study assumes that the mean score of post test for the experimental group and the mean score of post test for the control group in respect to the development of students' decision making skills are not statistically different.

METHODS

Research Methodology

The researcher used experimental method because it was appropriate for the study and the purpose of the study. The students in the second year at the College of Physical Education and Sports Sciences at University of Mosul for the academic year (2025/2026) were selected as the research population. The population consisted of 424 male and female students divided into 14 academic sections A, B, C, D, E, F, G, H, I, J, K, L, M, N. This population was purposively selected because the basic handball skills covered in the study are part of the curriculum provided in this stage of education. To minimize the impact of gender differences on the research results, sections (A) and (B) were excluded; (71) female students. Therefore, the total research sample was (353) students.

The researcher randomly selected the two samples of the study, assigning the independent variable, to be certain that the research sample was the most appropriate. So sections (C) and (Y) were chosen with (54) students both in the two sections, with (27) students in each section. Then the researcher dropped a number of students from both experimental and control groups on the basis of certain criteria. Excluding students: the numberings excluded (5) and (4) for sections (C) and (Y), respectively, did not take part in research assessments. Also, students with absences of more than two instructional sessions were excluded and (4) students were taken from each section. One student from section (Y) was also excluded due to the previous participation and experience of handball in practicing, which might affect the accuracy of the experimental result.

After these exclusion criteria, both research groups resulted in a sample of (36) students of which (18) students were present in each group. The researcher used a random assignment procedure to assign the instructional treatment to each group to make sure that the experimental arrangement was proper and the selection bias

minimized. Section (C) was then taken as the experimental group and taught using the six-dimensional strategy while section (Y) was assigned as the control group and was shown the instructional method used by the instructor in implementing the research experiment.

Experimental Design

Choosing the right experimental design is among the key requirements that researchers need to take into account before starting a scientific investigation because it plays an important role in ensuring that research methods and results are accurate and reliable. Based on the nature of the study, the methodological requirements, and the aim of the study, the researcher used an equivalent-groups experimental design (pre-test and post-test) that is considered appropriate for the study. Additionally, the differences between the experimental group and the control group can be analyzed, and the effectiveness of the proposed instruction strategy can be compared to the instruction strategy used in the control group (Van Dalen, 1985, p. 366).

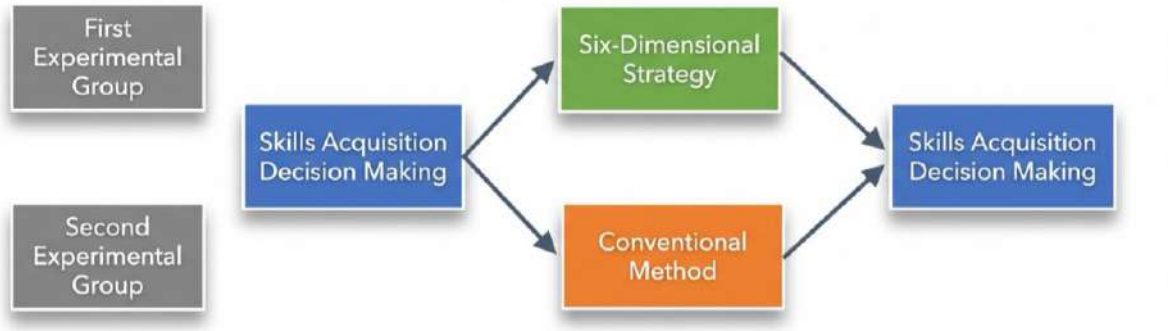


Figure 1. The experimental design illustrates

Equivalence of research groups

The researcher analysed some variables related to the anthropological characteristics and chronological age of the participants to compare the groups. The variables were body height (cm), body weight (kg) and chronological age (yrs). These variables were evaluated to achieve comparability of the two groups and to keep the individual differences to a minimum so as to minimize the influence on the experimental findings. The measurements and statistical results are given in Table (1).

Table 1. Provides the arithmetic means and standard deviations for the experimental and control groups for selected variables: chronological age, body height, body mass. It also presents t-values calculated for determining the statistical significance of the differences between the two groups and their equivalence in these variables

Variable	Experimental group		Control group		Calculated (t) value
	Mean	Standard deviation	Mean	Standard deviation	
Age/ mon.	225.82	13.45	227.42	25.13	1.486
Height/ cm.	175.67	2.48	173.52	3.46	1.24
Mass/ kg.	68.26	7.67	69.64	8.57	1.055

Tabular value of (t) in relation to degrees of freedom (34) and a margin of error of (0.05) = 2.032

Table (2) The results showed that none of the variables studied showed statistically significant differences between the experimental and control groups. The t-values calculated were lower than the tabulated values at the specified level of significance, as shown in this. The results indicate that the two groups in the selected variables were statistically equivalent, hence, both groups had similar characteristics prior to the experimental procedures.

Equivalence in Physical Fitness Tests

The researcher engaged in a thorough examination and analysis of the scientific literature and previous research regarding the most important physical characteristics that affect the acquisition and development of handball skills (Hassanin, 1995; Othman, 2005; Al-Janabi, 2019). Based on this review, a special questionnaire was designed, which is shown in Appendix (2) and sent to a panel of experts in handball, physical measurement and evaluation as detailed in Appendix (1). This questionnaire was designed to identify the most important physical properties and fitness factors related to good learning and performance of handball skills. Table (2) shows the percentage of agreement for the physical attributes selected by the experts, and with specific focus on physical attributes that were agreed upon by at least 75% of the experts. This criterion was chosen based on recommendations from Bloom et al., (1983, p. 126) that at least 75% agreement between expert judges was needed when identifying and prioritizing the appropriate attributes. Therefore the physical features that had met this criterion were deemed suitable for the subsequent research methods.

Table 2. Shows percentage of agreement among experts regarding the identification of the most important physical characteristics

Physical attributes	Specialists No.	Agree	Percentage
Explosive power of arm muscles	9	9	100%
Explosive power of leg muscles	9	9	100%
Agility	9	9	100%
Power of arm muscles	9	9	100%
Speed endurance	9	5	55.55%
Speed of response	9	5	55.55%
Flexibility of lower limbs	9	4	44.44%
Flexibility of upper limbs	7	3	33.33%
Strengthening leg muscles	7	3	33.33%
Strengthening power	7	3	33.33%

Identifying tests for physical fitness components

After careful consideration of the scientific literature and literature review, the researcher chose and decided on the tests to be used in evaluating the targeted physical attributes. The following tests were then assembled into a questionnaire and given to a panel of experts in physical measurement, evaluation and handball as shown in Appendix (1). This procedure aimed to identify the best physical tests for the chosen attributes, based on the goals and methodological needs of the study. The level of agreement between the specialists consulted and the percentage of agreement for each proposed physical test is shown in Table (3). Based on this, those tests that had an expert agreement rate of 75% or above were deemed acceptable and chosen for the next phase of the research for implementation.

Table 3. Percentage of expert agreement on definition of physical attribute tests

Measured physical attributes	Physical tests	Number of specialists	Number of those who agree	Percentage
Explosive power of arm muscles	Test of pushing a medicine ball forward weighing (3) kg from a seated position on a chair.	9	9	100%
Explosive power of leg muscles	Standing broad jump test.	9	9	100%
Agility	Barrow test (3 * 4.5 meters).	9	9	100%
Power of arm muscles	10-second arm flexion and extension test.	9	9	100%

The researcher then selected and approved the proper tests for the evaluative components of physical fitness and performed an equivalence test between the experimental group and the control group with regard to the physical fitness variables selected. The procedure was performed to make sure both groups had similar physical characteristics prior to the experimental program to reduce possible pre-existing differences having an effect on the results of the research. The results of this evaluation and statistical indicators used to establish the equivalence of two groups are shown in Table (4).

Table 4. Shows means and standard deviations of the two groups are shown for some variables

Variable	Experimental group		Control group		Calculated t value
	Mean	St.d	Mean	St.d	
Explosive power of arm muscles / m.	3.86	0.47	3.126	0.76	1.24
Explosive power of leg muscles / m.	2.11	0.37	2.21	0.26	1.24
Agility / Sec.	10.86	1.47	11.01	1.19	1.33
Power of arm muscles / Sec.	11.86	1.69	11.12	1.69	1.16

Table (4) Data obtained from the above table show that there were no statistically significant differences between the experimental and control group with regard to the physical fitness variables measured. The t-values calculated from the Physical fitness tests were all found to be below the Tabulated t-value and this supports this finding. As such, the observed differences in the two groups were not regarded as statistically significant, suggesting that they had similar physical fitness before the application of the experimental procedures. These results confirm the similarity of the groups studied on the physical fitness components evaluated and give them a basis for examining the effectiveness of the educational program used in this study, while keeping physical differences at the outset of the study to a minimum and thus controlling the possible influence they might have on the results obtained.

Identifying the educational material

The first step in conducting experiments was to determine the basic handball skills that were used in the required handball program for second year students at the College of Physical Education and Sports Sciences, University of Mosul. The identification of these skills was done according to the recommendations issued by the

relevant sectoral committee in consultation with the instructors who teach handball in this academic level. Therefore, the skills scheduled for the first academic semester were chosen based on the officially approved syllabus approved by the sectoral committee, keeping in mind the educational curriculum adopted by the college. The researcher then held a number of consultations and interviews with a group of specialists and academic staff members with experience in handball teaching as outlined in Appendix (1). The purpose of these consultations was to gain experts' opinions on the suitability and validity of the proposed skill assessment tests to measure the technical performance of each skill in handball within the study that could be observed. The purpose of this procedure was to ensure that the tests selected were suitable to the research aims and were able to provide systematic reflection on students' performance of skills in the experimental investigation.

Determining grades of apparent construction sections for some handball skills

Skill performance test is the execution of the fundamental technical stages of each of the selected handball skills, including the preparatory and final phases of the movements, and the main steps of their execution. The researcher designed a technical performance evaluation form to measure level of skill execution of the participants in both experimental and control group that is designed specifically for technical performance evaluation in order to gain assessment systematically and objectively. The proposed evaluation form was then presented to a panel of experts in handball, measurement, and evaluation, as shown in Appendix (1), for their opinion on the appropriate allocation of marks for the three technical phases of each of the skills. As part of this assessment structure a value was given to each stage based on the technical demands and how important each stage was in the correct execution of the skill. The overall technical performance score was based on the total of points awarded to the preparatory, main and final phases, and a maximum of ten (10) points was given for each assessed skill. This process was used as a framework for assessing and comparing the technical levels of the research groups.

Scientific basis for a questionnaire to determine scores of apparent structure sections of some handball skills

To obtain the face validity of the technical performance evaluation instrument, the researcher presented the preliminary version of the questionnaire to a panel of experts in measurement and evaluation and handball instruction as shown in Appendix (1). The aim of this process was to gain expert opinions about the validity of the evaluation criteria, the distribution of scores for each of the technical phases of the skill performance, and the suitability of the instrument for the characteristics and abilities of the research sample chosen. Additionally, the experts were asked to evaluate the extent to which the planned evaluation tool captured the technical aspects that it was developed to evaluate. This process was used as a foundation to consider the face validity and the instrument's appropriateness for use in the experimental procedures.

The researcher analyzed the objectivity of the technical performance assessment by comparing the consistency of the scores given by the independent judges, who were responsible for the participants' technical performance evaluation. The direct assessment of the post-test technical performance of second year students of the experimental and control groups was conducted at the College of Physical Education and Sports Sciences with three qualified judges whose information are presented in

Appendix (1). The students' technical performance was independently assessed by each judge who used the assessment form prepared beforehand and assessed it according to his own opinion to ensure the degree of agreement among the judges as well as to reduce the subjective judgment factor in the assessment result. In order to explore the inter-rater reliability, the researcher computed the correlation coefficient between the scores given by the three judges. The results showed that the correlation value between the first and the second judges was (0.86), first and third judges (0.88), and second and third judges (0.89). The relatively high correlation coefficients suggest a high consistency among the evaluators in rating the technical performance of the selected handball skills. Therefore, results have been used to support the objective nature of the evaluation procedures and the appropriateness of the assessment tool with the current research sample.

Conducting equivalence tests (pre-tests) for the two groups

The researcher performed a preliminary test on the level of technical performance of the participants, according to the scores of the evaluators who perform the test, in order to get equivalence between the experimental group and the control group in the selected handball skills. These scores were then compared statistically in order to see if there was any significant difference between the two groups before the experimental program was put in place. This procedure was designed to ensure that the research groups were comparable and that any differences in their skill performance at the start of the study would not have a significant impact on the results. The handball skills being assessed for equivalence are listed in Table (5).

Table 5. The summary of the t-test for the two research groups shows equivalence in skill tests

Variable	Experimental group		Control group		Calculated (t) value	Sig.
	Mean	St.d	Mean	St.d		
Over-the-shoulder passing	2.82	1.276	3.21	1.579	0.81	Insig.
Bounce pass	2.03	1.087	2.250	1.064	0.61	Insig.
Push pass to side	2.51	1.558	2.25	1.56	0.72	Insig.
Dribbling	2.54	1.258	2.50	1.316	0.10	Insig.
Overhead passing	2.37	1.436	2.625	1.360	0.52	Insig.
Scoring from a jump	2.50	1.85	1.875	0.619	1.24	Insig.

Tabular value of (t) for degrees of freedom (36) and a margin of error of (0.05) = 2.032

Table (5) shows that there were no statistically significant differences between the two research groups in the variables used in the skills tests and all the t-values calculated were less than the tabulated t-value of (2.032). The results obtained show the equality of the research groups in the variables examined.

Decision-Making Scale

The experimental and control groups were checked for equivalence by comparing the pre-test scores of both groups on the decision making scale as shown in Table (6).

Table 6. The summary of the pre-test for the two research groups shows equivalence in decision-making

Variable	Experimental group		Control group		Calculated (t) value
	Mean	St.d	Mean	St.d	

Decision-making	35.42	8.98	36.82	17.52	0.52

Table (6) The results showed that there was no statistically significant difference between the two research groups in the decision making pre-test because the calculated t value was less than the tabulated t value and thus the groups were equivalent in this variable.

The researcher used the scale of decision making developed by Junjun (2017) that consists of 22 items with three answer alternatives in a three-point Likert scale. The highest possible score on the scale is 66 points and the lowest possible score is 22 points with the hypothetical mean score being 44 points.

Identifying and adjusting search variables

The independent variables of this study are the six-dimensional strategy and conventional teaching method, and the dependent variables are the handball skill-acquisition and decision-making skills.

Non-experimental (extraneous) variables

The first is the internal validity of the experimental design. To make sure that the researcher designates the factors that are likely to affect the dependent variables, he/she establishes the internal validity. These involve experimental conditions, equipment and instruments and experimental losses. As far as experimental conditions go, no unusual or unforeseen events came up that would have a negative impact on the experiment. For the equipment and instruments, the same instruments and equipment were used for both research groups to ensure consistency. Regarding experimental attrition, the students who missed two lectures in the educational program were excluded, and the students who missed and the results of the two are shown in Table (1).

The second chapter examines the external validity of the experimental design. Random sampling to select the independent variable and the creation of equivalence of experimental and control groups controlled the interaction between the two. As far as experimental procedures are concerned, the education programme was carried out without informing the subjects to the research objectives, in coordination with the subject teacher. With both research groups, the handball instructor at the College of Physical Education and Sports at the university was tasked with implementing the educational program, after reaching an agreement on the methods of instruction. This was being done to reduce any variations that might be due to the instructor and his/her effect on the acquisition of skill.

The experiment period was the same for both research groups, which started on 4 November 2025 and ended on 9 December 2025, lasting two and a half weeks. 6 educational units were given to each group, each unit was 90 minutes in duration. The weekly lecture programme was set up so that both groups were given the same time to provide the instruction. It was ensured that there will be an equal number of instructional sessions for both groups of students in case of holidays or unexpected interruption; replacement lectures were arranged.

Research Requirements

The educational program was structured and the lesson plans created after a detailed analysis of scientific literature, previous research, and related academic research as well as employing personal interviews with teaching method and handball experts. With the basis of these procedures, the researcher developed the questionnaire

on the proposed educational program and presented it to a group of experts in the fields of handball and teaching methods and asked their opinions and recommendations on the content, validity and suitability of the handball curricula for the selected research sample. The educational units were organized in the following way and each one had three parts: preparatory part, which contained introduction, general preparation, and specific preparation; main part – educational and practical activities; final part. The twelve (12) educational units were divided equally between the experimental and control groups, with six (6) units given to each group. The duration of each educational unit was ninety (90) minutes and the programme was conducted at a weekly rate of one educational unit.

Pilot study

The pilot study was given to a sample of twenty (20) second year students, not from the experimental group nor from control group, of the same research population, on October 28, 2025. The aim of this preliminary study was to determine possible problems and comments that could occur as the educational program is implemented. The second objective of the pilot study was to evaluate the teacher's capacity to successfully carry out the intended educational units, the availability of the handball court, and the availability of the facilities, and finally, the feasibility of using the proposed teaching methods for the selected research sample. In addition, it aimed to assess the length of the time devoted to each part of the educational unit, and to test the students' capacity to stay focused and engaged throughout without becoming over tired or bored. The results of the pilot study showed that the educational units could be effectively implemented by the teacher and the handball court, equipment and teaching aids were appropriate to carry out the lessons. It also showed that the methods proposed to teach the students could be implemented with these students and that they were able to perform the necessary activities without fatigue or boredom.

Applying the main experiment

Once the mandatory conditions for carrying out the research experiment have been met, in which the research groups were organized by their academic sections, they were made equivalent and the educational content mentioned above was determined, the experiment was put into practice on November 4, 2023. Both research groups were taught by the same subject teacher, but the teacher was asked not to have any influence on the results of the experiments. The six dimensional strategy was used for the experimental group and the conventional method used by the subject teacher was used for the control group.

The experimental group (Section (C)) put the educational program into practice in line with the six-dimensional strategy. Students were assigned to cooperative groups and in as much as possible the groups were kept the same during the experiment. Excitement and motivation was the first stage, where the students' attention was captured by presenting them with a situation or question that was of relevance to handball skills that required them to think about appropriate skills to perform. The second phase was the exploration where the students were given the opportunity to practise the skills independently and in collaboration, to experiment with ways of performing the skills and to ask questions of the teacher rather than have the teacher give them answers.

The third stage, interpretation, was a discussion about what individuals experienced and learned in stage 1: Exploration. The teacher's technical performance was appropriate and misconceptions and errors were corrected. In extension, which was the fourth phase, students had to use the developed skills in different and more complex scenarios, starting from basic exercises up to scenarios that were closer to real game situations.

In the final stage, evaluation, students' performances were observed and lesson objectives evaluated by using performance evaluation forms or practical skill tests. Students' knowledge of skills and skill performance were part of the assessment. In the sixth stage, reflection, students were reminded to look at their performance, pick out examples of what they did well and where they made mistakes and think about what they could do to improve. The teacher aided this process by asking questions regarding skills' execution issues and how those issues were corrected.

The second group which was composed of control group (Y) followed the traditional teaching style of the subject teacher in implementing the educational program.

Post-tests

Post tests were conducted for both research groups at the handball hall of the College of Physical Education and Sports Sciences, University of Mosul on Tuesday, December 16, 2025, after finishing the educational program. On December 16, 2025, a panel of experts conducted a technical assessment of the handball skills that were selected. A technical performance evaluation form prepared prior to the assessment was used to evaluate the students' performances in a scientific way by each of the experts. Each participant received a technical score based on the technical performances of three experts and the mean of these three scores was used to determine the technical performance score for each participant.

Conducting a decision-making test:

After coordinating the researcher with the department coordinator to set a date for carrying out assessment for both the research groups, the post test was conducted on December 16, 2025.

Statistical methods

The statistical tools used in this study were simple correlation coefficient, t-test, Spearman correlation coefficient, multiple correlation coefficient and computation of percentages.

RESEARCH RESULTS

Show and discuss results for the first research hypothesis

The researcher used t-test to test for the existence of a statistical significant difference between the mean pre-test and post-test scores of students in the experimental group on handball skill acquisition as shown in Table (7), to test the first research hypothesis.

Table 7. Means and standard deviations of the pre-test and post-test, and the calculated t-value for the experimental group in the skills achievement test

Skills	Pre-test		Post-test		Calculated
	Mean	St.d	Mean	St.d	(t) value

Over-the-shoulder passing	2.82	1.276	7.35	1.65	6.45
Bounce pass	2.03	1.087	7.66	1.54	7.02
Push pass to side	2.51	1.558	6.93	1.71	7.79
Dribbling	2.54	1.258	7.25	1.61	7.65
Overhead passing	2.37	1.436	7.63	1.22	7.27
Scoring from a jump	2.50	1.85	5.50	1.52	4.64

Tabular value of (t) in relation to degrees of freedom (34) and a margin of error of (0.05) = 2.032

Table (7) There were statistically significant differences between pre test and post test results of selected handball skills in the experimental group as identified in Table (7). Thus, the null hypothesis is rejected and the alternative is accepted. The results of this study show that the six-dimensional strategy is able to improve the skill performance of the research subjects.

Presentation and discussion of results for the second research hypothesis

In order to evaluate the statistical significance of the differences in the mean pre-test and post-test scores for the students of the control group in the handball skill achievement test for the second research hypothesis, the paired-samples t-test was used as shown in Table (8).

Table 8. Means and standard deviations of pre-test and post-test, and the calculated t-value for the control group in the skills achievement test

Skills	Pre-test		Post-test		Calculated
	Mean	St.d	Mean	St.d	value (t)
Over-the-shoulder passing	3.21	1.579	5.50	0.26	3.54
Bounce pass	2.250	1.064	5.04	0.83	3.25
Push pass to side	2.25	1.56	5.28	1.45	3.61
Dribbling	2.50	1.316	5.62	0.96	4.27
Overhead passing	2.625	1.360	4.92	1.37	2.98
Scoring from a jump	1.875	0.619	4.86	0.82	3.63

Tabular value of (t) in relation to degrees of freedom (34) and a margin of error of (0.05) = 2.032

Table (8) shows that there was a statistically significant difference between the pre-test and post-test scores of the control group in some handball skills. Thus, the null hypothesis is rejected and the alternative hypothesis is accepted. The results showed that this traditional teaching method is effective in enhancing the skill performance of the research participants.

Presentation and discussion of results for the third research hypothesis

The researcher used independent-samples t-test to test the statistical significance of the differences between the experimental and control groups mean post-test scores of handball skill achievement test as presented in Table (9) for the examination of the third research hypothesis.

Table 9. Means and standard deviations of post-test and calculated t-value for the first and second experimental groups in post-test of skill achievement

Skills	Experimental		Control		Calculated
	Mean	St.d	Mean	St.d	(t) value

Over-the-shoulder passing	7.28	1.76	5.50	0.26	4.24
Bounce pass	7.66	1.36	5.04	0.83	4.58
Push pass to side	6.93	1.71	5.28	1.45	3.76
Dribbling	7.03	1.61	5.62	0.96	3.19
Overhead passing	6.02	1.22	4.92	1.37	2.35
Scoring from a jump	6.75	1.52	4.86	0.82	4.64

Tabular value of (t) in relation to degrees of freedom (34) and a margin of error of (0.05) = 2.032

Table (9) The results showed that t-values calculated for the post-test handball skill assessment for selected handball skills for the experimental and the control groups were statistically significant, showing statistical significance between these two groups. Thus, the third null hypothesis is rejected and the alternative hypothesis is accepted.

Presentation and discussion of the fourth research hypothesis

The researcher used suitable statistical techniques to analyse the test result of the students' decision making. The data obtained were presented, analysed and discussed in order to evaluate the statistical significance of differences between the two research groups in terms of the research aims and hypotheses. The test scores were averaged to measure the means and standard deviations were calculated for both groups. The paired-samples t-test was used to determine significant differences in the pre-test and post-test scores for skill performance between the two groups. The same statistical test was also used to analyze pretest and post-test data of experimental and control groups on critical thinking.

Table 10. Means and standard deviations of pre-test and post-test for the experimental and control groups in the decision-making test

Groups	Pre-test		Post-test		Calculated
	Mean	St.d	Mean	St.d	(t) value
Experimental group	35.42	8.98	55.28	11.54	7.65
Control group	36.82	7.52	43.97	9.27	3.35

Table (10) The results showed that there were statistically significant differences between the experimental group's pre-test and post-test scores in favour of the post-test. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted.

Presentation and discussion of the results of the fourth hypothesis

To verify this hypothesis, the (T) test was used.

Table 11. Means and standard deviations of the post-test for the experimental and control groups in the decision-making test

Groups	Experimental group		Control group		Calculated
	Mean	St.d	Mean	St.d	(t) value
Decision making	55.28	11.54	43.97	9.27	5.78*

Significant at error > 0.05 and degrees of freedom (34). Tabulated t-value = 2.032

Table (11) shows that the t value calculated is greater than the tabulated t value, which shows that there are statistically significant differences between the experimental group and the control group in the Post-test data, favoring the

experimental group. Thus, we accept the alternative hypothesis and reject the null hypothesis.

DISCUSSION

The researcher considers that it is because the six dimensional strategy is systematically and well organized, where students' needs in learning the skill are met using the appropriate instructional procedures. The majority of students responded well to these stages, it helped to make lessons more engaging and enjoyable and helped to enhance their acquisition of skills and knowledge. In this regard, Ausubel stresses that memory and learning may be improved by presenting information in an organized, logical, and meaningful fashion. Linking of new knowledge with the existing knowledge and skill structures helps to avoid the rapid forgetting of information, since the organized information is acquired easily and retained in the memory (Al-Zayyat, 2004, p. 294–295).

The researcher believes such an improvement is due to the adopted teaching method in developing students' skills, which is encouraged by the subject teacher. This way, students are able to actively respond and participate, speak candidly, and overcome the fear of failure with constant support and encouragement. It also helps them to build confidence in the ability to generate new ideas and in their selection of alternatives that are suitable. Moreover, this is one of the methods that makes students more motivated to use their skills to get better understanding and develops their visual thinking capability which results in positive outcomes in accordance with their individual abilities and capability.

The researcher believes that the results of this research are due to the effectiveness of the 6-dimensional strategy in creating a positive and interactive learning environment, which stimulated student participation and helped students' skill performance and academic achievement. The practice of this strategy allowed students to transcend from a passive role to an active one in the learning process, as well as collaborate with each other to be the focus of learning. Moreover, the six-dimensional approach was effective in meeting individual students' needs and in increasing their self-confidence, which had a positive effect on the skill achievement of the students.

The results are in line with Novak's student-centered learning approach, which suggests that student learning builds from prior knowledge. Thus, students should be encouraged to build their knowledge themselves, and teachers should help them clarify their thoughts and offer chances for meaningful learning by having them actively participate in the learning process (Ayesh, 2008).

The researcher also considers these improvements to be the result of cooperative learning model established in the process of group activity which provided cooperation and interaction among students. The allocation of specific roles, responsibilities and duties within the classroom during a particular lesson enhanced students' sense of responsibility towards their group members and aided in improving students' performance, especially for those who took leadership roles. Furthermore, learning to play various roles led to the students' reduction of the fear of making mistakes in front of others, which was reflected as elimination of embarrassment, hesitation and reluctance to participate and improvement of self-confidence. Moreover, students' progress was positively reinforced by the group members, which encouraged students to continue making improvements to their performances. In this context, Mu'ayyad Fawzi

translated James' book (2005) Evaluating the Teaching Process: What Teachers Need to Know, pointed out that giving praise from time to time to the students' achievements will add motivation for them to persist and strive to achieve more.

The researcher believes these results are a result of the successful implementation of the six-dimensional approach in establishing a positive and interactive learning environment in school. This approach enabled students to engage with the subject matter in a reflective manner, to critically analyse the information presented, and to develop their decision making skills and motivation for learning. In addition, the 6D strategy helped to build students' self-confidence because they were able to determine the logical point of the lesson, as well as to make evaluations on various situations, so that they could make a right decision.

In the group that showed statistically significant difference, the researcher believes that the method used by the teacher that facilitated interaction, cooperation, and active participation of the students is responsible for this improvement. Cooperative Learning activities enabled students to share their thoughts, have conversations, define issues and offer possible solutions. Such practices helped cultivate students' decision making skills, but the teacher could still be said to be the main player in the learning process and students' roles in the classroom were still very active.

The researcher takes this improvement as the result of the findings reported by Al-Ayasrah (2011) who stated that in the process, the six-dimensional strategy helps students to express positive or negative opinion in various situations and backs up their opinion with strong arguments. Decision making is thinking, which is reflective and aims at making judgement and stating opinions based on the use of logic and adequate evidence. They acquire decision-making skills by analysing information and data in a logical and rational manner to reach sound conclusions. The six-dimensional strategy helped students develop their decision-making skills by asking questions when they come across new information, separating emotional and logical thinking, considering different options, and determining when they need more information. Moreover, it fostered learning environments in which students were encouraged to be open to new ideas and were provided with opportunities to make decisions and explain with relevant evidence. As a result, students were more independent in their thoughts and had a wider understanding of the matters and problems that they faced (Al-Ayasrah, 2011, p. 199–200).

CONCLUSIONS AND RECOMMENDATIONS

Experimental group, taught with six-dimensional strategy showed higher achievement and technical performance in selected handball skills. Moreover, the Six dimensional strategy was more successful than the traditional teaching method in improving the decision making skills of handball skills among students.

The use of the six-dimensional strategy to teach handball skills and the use of the modern teaching methods in physical education are recommended because they have positive and effective effects on the acquisition of handball skills and the achievement level of students.

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