

The Effect of Content Knowledge Workshop on the Written Test Performance of Physical Education Students

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Abstract

In this paper, the workshop teaching method and standardized teaching method (two teaching methods) are used to intervene in a teaching experiment conducted among the students of the same level. The teaching experiment is divided into the workshop method and standard teaching groups with the aim of analysing the influence of these teaching methods on students' achievement. Two kinds of teaching methods were used to intervene in the six-week teaching experiment, and the students were given three written tests in the form of test papers. The total score of the test paper was 100. The test paper includes six groups of knowledge modules: sports training design (STD), competition venue planning (CVP), movement energy metabolism (MEM), and the teaching design (TD) as well as knowledge of movement techniques (KMT) and movement rules (KMR). The main purpose of the written tests were to determine whether the workshop teaching method improved the students' written test performance compared to the standard teaching method. Data was used to test the effectiveness of the research. The experiment found that the scores of students in the workshop teaching group to be significantly higher than those in the standardized teaching group.

Keywords: Content knowledge, Workshop, Physical education, Student performance, China.

Tob Regul Sci.TM 2022; 8(1): 1209-1217

DOI: doi.org/10.18001/TRS.8.1.98

INTRODUCTION

Shulman (1986) had the view that the knowledge of subject matter was required to be deemed to have in depth knowledge of the facts and concepts presented in a field and to have the ability to organize them through a variety of method of representation. A teacher who has content knowledge must understand that something is so and further understand why it is as such under a specific learning circumstance (Insook Kim, 2011). Ball et al. (2008) had the view that content knowledge was essential to accomplish effective teaching by teachers, but it is insufficient in helping students who are struggling with tasks. They argued that special content knowledge is vital

and represents the core knowledge for teaching (Insook Kim, 2011). Siedentop (2002) considered that the core subject matter of physical education is sports and physical activities that teachers teach to students in schools (Insook Kim, 2011). Ward (2009) considered that physical education teachers should possess more sophisticated knowledge for teaching beyond merely knowing the rules, techniques, and tactics for performing the activities (Insook Kim, 2011).

Content knowledge is described into two domains (Ward, 2009; He, 2017): Common content knowledge (CCK) and specialized content knowledge (SCK). The six knowledge points of this study are STD, CVP, MEM, TD, KMT, and KMR belong to the rules, techniques, and tactics of physical education.

To test which teaching method can improve the achievement of students majoring in physical education, the experiment adopts workshop and standard teaching to intervene the same students. The workshop was a violent, high creative experience, which spurred lots of discussions about the students thinking, both in lessons and in lessons/curriculum planning (Emma K, 2018). On the other hand, standard teaching does not use any treatment or standard education. The workshop includes STD, CVP, MEM, TD, KMT, KMR, and standard teaching therapy.

METHODS

The overall summary

A total of 54 data samples were collected for this study, including 27 cases in the experimental group and 27 cases in the control group. Due to the fact that the two groups of samples were measured twice before and after the intervention on different indicators, the variance analysis of repeated measurement was used to analyse the main effect of each indicator changed at the time point and the interaction effect at the time point group. The least significant difference (LSD) method was chosen to compare them in pairs within and between groups. The statistical software used was SPSS 26, and the drawing software chosen was GraphPad 7.0. The significance level recorded was 0.05.

Experimental grouping

This experiment includes two distinct groups i.e., the experimental group and the control group. The experimental group and the control group were taught in two different ways. The experimental group underwent the intervention with the new teaching method, while the control group did not undergo the intervention and were subjected to conventional teaching methods.

Location and time

The experimental group and the control group were located in different schools, and the time of the specific class varied. However, the total time taken by the each group was fixed and the same.

Participants

The subjects of the experimental group and control groups were made up of different individual students who had the same level of education. They were in the same grade, had not participated in the training, and were randomly assigned before the experiment. However, the teachers of both the groups were the same people that deployed different teaching methods for the varied groups.

Research hypothesis

General hypothesis (Ho1): After six weeks of intervention, there is a significant difference between the students' overall scores in the experimental group and the control group.

Six specific hypotheses (Ho2): There are six categories of knowledge, and each category has its own hypothesis. It is assumed that after six weeks of intervention, there is a significant difference between the experimental group and the control group.

Measurement

Three tests were conducted before, during and after the experiment. The data processing method chosen was a double repetition of the analysis of variance (ANOVA) where both the experimental and control groups were provided written test papers to ascertain whether the students' grades improved. The test papers consist of six different knowledge blocks.

RESEARCH METHODOLOGY

Statistical analysis was performed using the SPSS 22.0 software. Measurement data was subjected to normal distribution after a normality test and was described as $x \pm s$. The repeated measures design using data index analysis adopted the two-factor repeated measures design analysis of variance (ANOVA) whilst the multi-group mean comparison adopted a one-way analysis of variance (ANOVA), and the between-group utilised a two-way analysis of variance. Two comparisons were performed using the Student–Newman–Keuls (SNK) test. If the measurement data did not obey the normal distribution after the normality test, the median and the 25th and 75th percentiles [M(P25, P75)] were described with the test level being $\alpha=0.05$ (two-sided).

RESULTS AND INTERPRETATION

ANOVA with a repeated measures design for two groups

The repeated measures design ANOVA was used in the two groups. The results showed that the STD index F between the groups, F time and F interaction were 0.428, 11.357 and 0.503, respectively; p was 0.516, 0.001 and 0.522, respectively, indicating that the STD score improved with time. However, there was no statistical difference between the two groups. The TD index F between the groups, F time and F interaction were 16.734, 39.080 and 4.497 respectively; p was 0.000, 0.000 and 0.026 respectively, indicating that the TD score improved over time, and the improvement of the TD score of the experimental group was significantly better than that of the control group. The KMT index F between the groups, F time and F interaction were 12.388, 20.147 and 12.367 respectively; p was 0.000, 0.000 and 0.000 respectively, indicating that the KMT score improved over time, and the improvement of the KMT score of the experimental group was significantly better than the control group. The MEM index F between the groups, F time and F interaction were 1.873, 9.018 and 1.348 respectively; p was 0.177, 0.000 and 0.251 respectively, indicating that the MEM score improved with time, but there was no statistical difference between the two groups. The CVP index F between the groups, F time and F interaction were 12.606, 65.926 and 14.765 respectively; p was 0.000, 0.000 and 0.000 respectively, indicating that the CVP score improved over time, and the improvement of the CVP score of the experimental group was significantly better than that of the control group. The KMR index F between groups, F time and F interaction were 3.198, 46.499 and 2.808 respectively; p was 0.080, 0.000 and 0.097 respectively, indicating that the KMR score improved with time, but there was no statistical difference between

the two groups. Score F between groups, F time and F interaction were 19.629, 93.047 and 13.130 respectively; p was 0.000, 0.000 and 0.001 respectively, indicating that the score improved with the change of time, and the improvement of the score of the experimental group was significantly better than that of the control group.

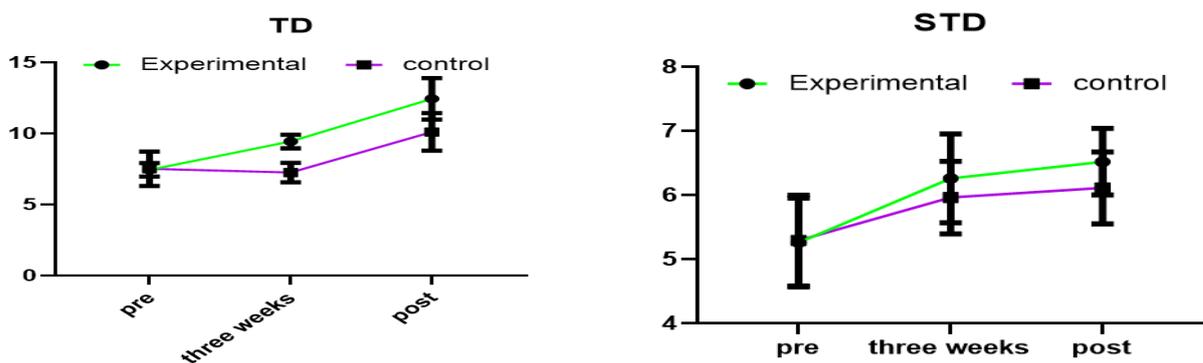
Concrete analysis

Table 1 A comparison of groups with different time indicators ($\bar{x}\pm s$).

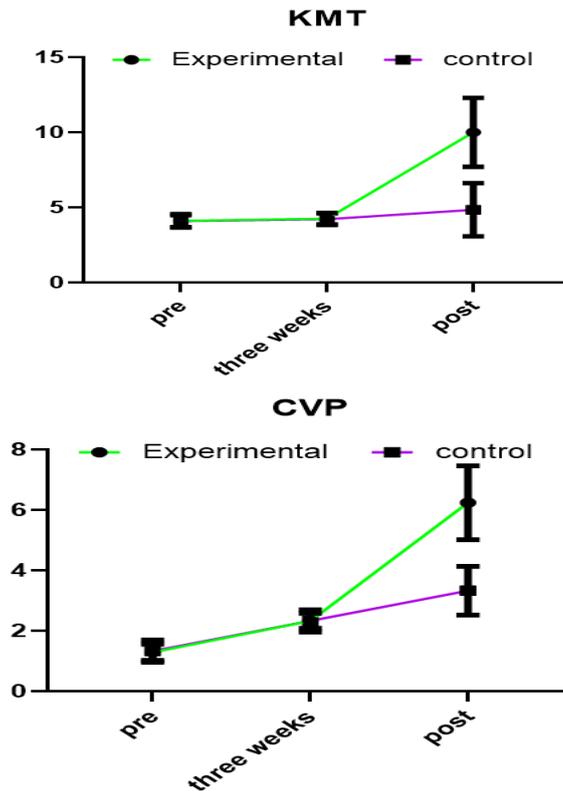
INDEX	GROUP	N	PRE	THREE WEEKS	POST
STD	EXPERIMENTAL	27	5.26±1.75	6.26±1.75 ^{AC}	6.52±1.31 ^{ABD}
	CONTROL	27	5.29±1.79	5.96±1.43 ^A	6.11±1.42 ^{AB}
TD	EXPERIMENTAL	27	7.44±1.20	9.44±1.22 ^{AC}	12.44±3.68 ^{ABD}
	CONTROL	27	7.52±1.31	7.25±1.72 ^C	10.11±3.33 ^{AB}
KMT	EXPERIMENTAL	27	4.11±1.12	4.26±0.98	10.00±5.81 ^{ABD}
	CONTROL	27	4.09±0.99	4.22±0.97	4.85±4.46 ^{AB}
MEM	EXPERIMENTAL	27	4.11±0.99	5.19±1.17 ^A	5.81±2.37 ^{ABD}
	CONTROL	27	4.07±1.12	5.07±0.99 ^A	4.85±2.50 ^A
CVP	EXPERIMENTAL	27	1.29±0.67	2.33±0.62 ^A	6.24±3.10 ^{ABD}
	CONTROL	27	1.33±0.92	2.33±0.92 ^A	3.33±2.04 ^{AB}
KMR	EXPERIMENTAL	27	5.89±1.60	6.89±1.60 ^{AC}	10.87±3.49 ^{ABD}
	CONTROL	27	5.89±1.50	5.56±1.37	8.93±3.74 ^{AB}
SCORES	EXPERIMENTAL	27	27.11±2.72	34.37±2.83 ^{AC}	51.48±13.12 ^{ABD}
	CONTROL	27	27.33±3.13	31.41±4.17 ^A	38.59±9.45 ^{AB}

Note: ^ap<0.05 is compared with pre-intervention; ^bp<0.05 is compared with three weeks; ^cp<0.05 is compared with three-week control group whilst ^dp<0.05 is compared with post-intervention control group.

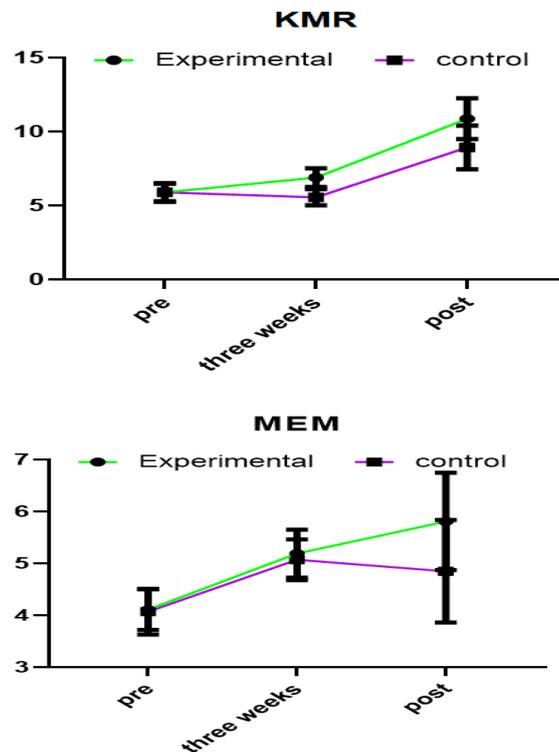
Fig. 1 STD, TD, KMT, MEM, CVP, KMR and total score for the groups pre, during and post intervention results.



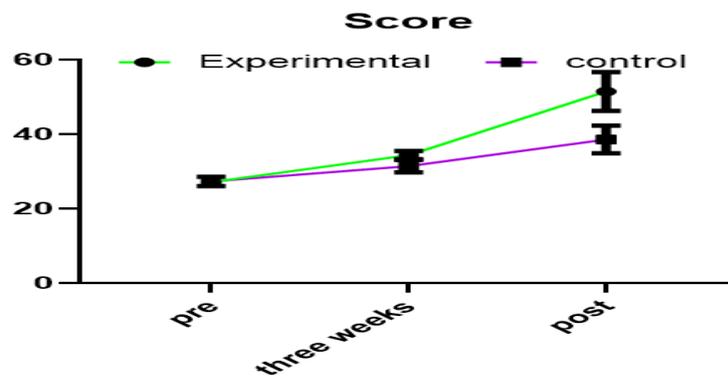
As shown in the figure: with the increase in intervention time in TD and STD groups, students' achievements are in the time points of the pre-test, three weeks test, and post-test all changed, and the scores of the experimental group were significantly higher than those of the control group. The reason why the scores of the experimental group are higher than those of the control group is because we have adopted different teaching methods.



With the increase of intervention time in the KMT and CVP groups, students' scores changed at the time points of pre-test, three weeks test, and post-test, and the scores of the experimental group were significantly higher than those of the control group. The reason why the scores of the experimental group are higher than those of the control group is because we have adopted different teaching methods.



With the increase of intervention time in KMR and MEM groups, students' scores changed at the time points of pre-test, three weeks test, and post-test, and the scores of the experimental group were significantly higher than those of the control group. Group MEM students' scores showed a downward trend from Three weeks to Post-test. However, the results of the experimental group still keep an upward trend. Generally speaking, the result of the experimental group is higher than that of the control group because we have adopted different teaching methods.



The score is the total score of six fields: STD, CVP, MEM, TD, KMT, and KMR. With the increase in intervention time, the scores of the students in the Score group changed at the time points of pre-test, three weeks test, and post-test, and the scores of the experimental group were significantly higher than those of the control group. The reason why the scores of the experimental group are higher than those of the control group is because we have adopted different teaching methods.

Table 2 Control skewness and kurtosis

TIME	INDEX	N	SKEWNESS		KURTOSIS	
			STATISTIC	STD. ERROR	STATISTIC	STD. ERROR
PRE						
	STD	27	0.641	0.448	0.144	0.872
	TD	27	0.895	0.448	1.284	0.872
	MEM	27	0.597	0.448	-0.589	0.872
	KMT	27	-0.483	0.448	0.721	0.872
	CVP	27	-0.427	0.448	-1.169	0.872
	KMR	27	0.424	0.448	-1.000	0.872
	SCORE	27	-0.563	0.488	0.832	0.872
THREE WEEKS						
	STD	27	0.241	0.448	-1.055	0.872
	TD	27	-0.24	0.448	-1.761	0.872

	MEM	27	0.597	0.448	-0.589	0.872
	KMT	27	-0.483	0.448	0.721	0.872
	CVP	27	-0.427	0.448	-1.169	0.872
	KMR	27	0.507	0.448	-1.017	0.872
	SCORE	27	0.005	0.488	-0.820	0.872
POST						
	STD	27	-0.124	0.448	-0.913	0.872
	TD	27	0.185	0.448	-0.978	0.872
	MEM	27	0.498	0.448	-0.330	0.872
	KMT	27	1.793	0.448	2.167	0.872
	CVP	27	1.099	0.448	0.339	0.872
	KMR	27	-0.413	0.448	-0.326	0.872
	SCORE	27	0.745	0.488	0.252	0.872

Table 3 Experimental skewness and kurtosis

TIME	INDEX	N	SKEWNESS		KURTOSIS	
			STATISTIC	STD. ERROR	STATISTIC	STD. ERROR
PRE						
	STD	27	0.461	0.448	1.885	0.872
	TD	27	0.277	0.448	3.712	0.872
	MEM	27	-0.234	0.448	-0.123	0.872
	KMT	27	-0.541	0.448	0.575	0.872
	CVP	27	0.411	0.448	0.534	0.872
	KMR	27	0.073	0.448	-0.953	0.872
	SCORE	27	0.331	0.488	0.072	0.872
THREE WEEKS						
	STD	27	0.461	0.448	1.885	0.872
	TD	27	0.277	0.448	3.712	0.872
	MEM	27	-0.234	0.448	-0.350	0.872
	KMT	27	0.477	0.448	1.856	0.872
	CVP	27	0.697	0.448	0.770	0.872
	KMR	27	0.073	0.448	-0.953	0.872
	SCORE	27	0.779	0.488	0.324	0.872
POST						
	STD	27	-0.319	0.448	-0.600	0.872
	TD	27	-0.361	0.448	0.561	0.872
	MEM	27	0.725	0.448	0.343	0.872
	KMT	27	-0.496	0.448	-1.486	0.872
	CVP	27	0.481	0.448	-0.697	0.872
	KMR	27	-0.302	0.448	-0.709	0.872
	SCORE	27	-0.186	0.488	-0.834	0.872

CONCLUSION

This research aims to study the effect of content knowledge workshops on the performance in written tests among students of physical education. In this study, 54 data samples were collected consisting of 27 cases in the experimental group and 27 cases in the control group. The two

groups of samples were measured with different indicators three times before, during, and after the intervention. Before measurements were taken, the square deviation test and the normal distribution test showed that the variance of STD, TD, MEM, KMT, CVP, and KMR in each group were equal to the Levene's test value. In accordance with the research objective and the results recorded, the following conclusions are drawn:

The STD, TD, MEM, KMT, CVP, and KMR Levene's test results were significant (> 0.05). Therefore, the hypothesis of homogeneity of variance among STD, TD, MEM, KMT, CVP, and KMR groups has not been violated.

Evaluating normality, skewness, and kurtosis is considered to be widely used statistical methods. For example, Byrne (2013) mentioned that skewness was between +3 and -3, and kurtosis was between +7 and -7, which indicates that the data collected was normal, and the P-value was < 0.05 . Using the values of (+3 and 3) skewness and kurtosis (+7 and 7), table 4.7 showed the range between skewness and kurtosis. All groups skewness and peak states of STD, TD, MEM, KMT, CVP, and KMR indicated that the data were normally distributed.

- Total score: There was no significant difference between the experimental group and the control group before the intervention when it came to the total scores of the tests. After the intervention, the experimental group was significantly higher than the control group.
- STD: There was no significant difference between the experimental group and the control group before the intervention. After the intervention, the experimental group was significantly higher than the control group.
- TD: There was no significant difference between the experimental group and the control group before the intervention. After the intervention, the experimental group was significantly higher than the control group.
- MEM: There was no significant difference between the experimental group and the control group before the intervention. After the intervention, there was no significant difference between the two groups.
- KMT: Before the intervention, the experimental group was significantly higher than the control group, and after the intervention, the experimental group was still significantly higher than the control group.
- CVP: Before the intervention, the experimental group was significantly higher than the control group, and after the intervention, the experimental group was still significantly higher than the control group.
- KMR: There was no significant difference between the experimental group and the control group before the intervention. After the intervention, the experimental group was significantly higher than the control group.

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