

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(13), 2014 [7349-7354]

The application and study of the physical education evaluation model

Yinrui Liu¹, Changqing You²

1 FuJian Normal University Minnan Science and Technology Institute, Fujian Nanan, 362332, (CHINA)

2Guoguang NO.2 Middle School, Fujian Nanan, 362321, (CHINA)

ABSTRACT

The efficient use of the teaching evaluation model is helpful to promote the development of the physical education in colleges and universities. In terms of the teaching efficiency, the evaluation model clearly shows us the close connection between the factors of students, teachers, the teaching quality and the teaching efficiency. The scientific study of the teaching level through several means such as fuzzy comprehensive evaluation, questionnaire survey, Delphi Method and analytic hierarchy process has a positive influence on the improvement of student's study initiative and the teaching efficiency, making the physical education in colleges and universities break through the traditional way to reach the instructive objective. By using the teaching evaluation model, our physical education in colleges and universities not only can meet the requirement posed by the new century but also can reach the goal of sustainable development.

KEYWORDS

Physical education in colleges and universities; Teaching level; Evaluation model; Construction and application.



INTRODUCTION

To build the physical education evaluation model, we have collected the references about physical education efficiency. By making a deep study of these references and combining with practical teaching experience we have got the way of building the evaluation model, which can be divided into three steps : making a student evaluation scale; setting the standard of evaluating physical test and means in colleges and universities; and applying fuzzy comprehensive evaluation model to improve the teaching efficiency in colleges and universities. Besides, we also use such methods as searching relative references, questionnaire survey, Delphi Method, analytic hierarchy method, expert judgment, fuzzy comprehensive evaluation and method of characteristic to build and study the physical education evaluation model. The comprehensive evaluation model used to measure physical education quality is shown in Figure 1 below.

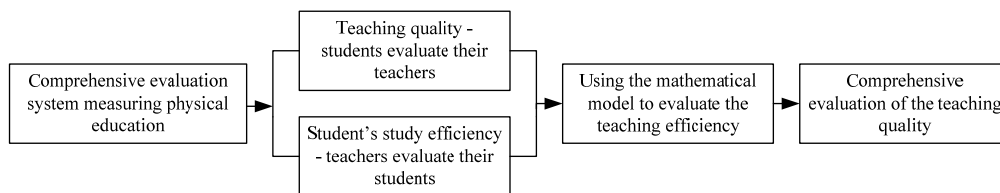


Figure 1 : The comprehensive evaluation system used to measure physical education

THE SCALE OF STUDENT’S EVALUATION OF THE PHYSICAL EDUCATION

In now days the evaluation of the physical education in colleges and universities has become an important part of the physical teacher’s work. The teaching evaluation system, as the guarantee of physical teaching quality, should be given more attention. The system includes two parts: the physical teacher’s professional skill and the quantitative tool used to evaluate the physical teaching, which are crucial for physical teachers to strengthen their teaching management and to improve their teaching efficiency, making the teaching quality improving continuously. By researching the teaching quality and the student’s study quality, the Representative values shown in this paper are more accurate and more standard (the values are shown in TABLE 1).

TABLE 1 : The student’s evaluation of the physical education (n=60)

The first grade indicator	The second grade’s content and standard	The synthetic weight W_i	The rating V_j				
			A	B	C	D	E
			2	1	0	-1	-2
Teaching program	1. The teaching goal is clear and practical.	0.05	0.35	0.65	0.00	0.00	0.00
	2. Teaching full time and having a serious attitude.	0.05	0.35	0.65	0.00	0.00	0.00
Teaching content	3. The teaching key points are put forward and the teaching difficulties can be resolved efficiently.	0.10	0.10	0.80	0.10	0.00	0.00
	4. Teaching students physical methods and paying more attention on improving student’s skill.	0.09	0.20	0.40	0.40	0.00	0.00
	5. Avoiding overload and making physical exercise moderate, in quantity and in strength.	0.09	0.00	0.50	0.50	0.00	0.00
Teaching method	6. The teaching step is ordered and the organization is flexible.	0.09	0.20	0.60	0.20	0.00	0.00
	7. Inspire students to combine studying with practice.	0.11	0.10	0.80	0.10	0.00	0.00
	8. Using teaching tools to help students accelerate the formation of skill.	0.04	0.00	0.60	0.30	0.10	0.00
Teaching skill	9. Language is vivid and effective.	0.05	0.30	0.60	0.10	0.00	0.00
	10. The demonstration action is skillful and the key technique points is highlighted.	0.05	0.40	0.60	0.00	0.00	0.00
Guide outside the class	11. Teaching both in and outside the class and the teaching attitude is serious.	0.04	0.00	0.20	0.60	0.20	0.00
	12. Measuring student’s physique and making a correct evaluation.	0.04	0.00	0.20	0.60	0.20	0.00
Teaching results	13. Students get technical skills and make a distinct progress.	0.10	0.10	0.20	0.60	0.10	0.00
	14. by studying physical methods students can do exercise by themselves.	0.10	0.10	0.20	0.60	0.10	0.00

The building and confirming of the evaluation index system

We use three methods of expert judgment, questionnaire survey and principal component analysis to make the teaching quality list, the student study quality list by surveying teachers, students and experts and systemically the existing problems and their resolves, achieving three grades: the first evaluation index, which include six factors; the second index weight and the component weight, which is the product of two second index weights, both of which are presented by W_i . By this way the evaluation index system can be more accurate and scientific, and the further study of the factors influencing the teaching quality can enable the process of building the three list referred above be more persuasive.

The scientific classification of the evaluation index grade

The evaluation index grade means the level of reaching the evaluation content and standard, which is an important standard to make the systemic classification from low to high and also provide a reference in the process of judging the evaluation value. In the building of both the teaching quality list and the student study quality list, the evaluation index grade is divided into five parts, each of which is respectively represented by A,B,C,D,E. E totally conforms to what it represents; C generally conforms to what it should represent; B is the second grade, lower than A but much higher than others and shares a close relationship with A and C, so dose E. Applying the analysis of the evaluation index to the classification of the index can make indexes more persuasive and play a positive role in building the teaching quality list and the student study quality list.

The application of the fuzzy comprehensive evaluation

In order to build the physical teaching evaluation model, we should firstly use the fuzzy comprehensive method, which can make a detail analysis of the main teaching activities and a nature study of the teaching activity’s efficiency. By this way this method can not only make a reasonable judgment about teaching results but also play its “comprehensive” role.

In the application of the teaching evaluation model, through $M(\cdot \mp)$, we can get $B_j = \sum W_i * R_{ij}$, in which M has some comprehensive meaning [3]. However when we get $\sum W_i = 1$, R_{ij} represents the membership, the equivalence of the proportion of people who gets a certain grade of the total informants.

Every ultimate judgment result shown in the fuzzy evaluation formulation has a certain grade, whose membership is embodied in V_j , and V_j^T is called the transposed matrix of the evaluation grade.

$$G_T = \sum B_j \bullet V_j^T$$

In the process of evaluating the statistics (shown in list 1), we can get the proportion of people who get a certain grade of total informants through the fuzzy comprehensive evaluation. The proportion is shown as bellow:

$$B_j = (0.147 \ 0.508 \ 0.305 \ 0.04 \ 0.00), \quad G_T = 0.762 \text{ (Can be used to calculate the teaching efficiency).}$$

TRANSFORMING THE SCORES TO RANKING SCORES

The colleges and universities sports teaching outline points out that the sports test should be designed to conform to student’s comprehensive skill. Student’s study attitude should account to 10 percent of the total score; the theoretical score, as an important part of the high education test, accounts to 20%; the proportion of physical fitness test should be increased to 20%-30%; the sports skill test should take a certain proportion of the total score. In the teaching practice, the results of “the sports skill test” and “the physical fitness test” can influence each other. Student’s study attitude and student’s progress will be taken into account the test standard.

With the changing times, hundred-mark system, used in the traditional test, has been replaced by the credit system. That means when we calculate the teaching efficiency, we should transform the score into G_S [4]. This can be finished through two steps, which are respectively shown in 3.1 and 3.2.

The process of calculating the percentage

In the process of calculating student’s academic grade, their hundred-mark score should be classified into different grades, totally thirteen grades. V_j representing in ratio and R_j representing in percentage are clearly shown in TABLE 2 bellow.

TABLE 2 : The computation sheet of scores transforming to G_S (n=60)

Percentage	≥ 96	≥ 90	≥ 84	≥ 78	≥ 72	≥ 66	≥ 60
V_j	2.00	1.66	1.33	1.00	0.66	0.33	0.00
R_j	0.03	0.05	0.10	0.20	0.22	0.25	0.10
Percentage	≥ 54	≥ 48	≥ 42	≥ 36	≥ 30	≥ 29	
V_j	-0.33	-0.66	-1.00	-1.33	-1.66	-2.00	
R_j	0.03	0.02	0.00	0.00	0.00	0.00	

The calculation of the index grade value

Through $G_s = \sum R_j * V_j^T$, we can efficiently get the relative G_s . In the study shown in this paper we have got $G_s = 0.681$, which also can be used in the calculation of the teaching efficiency.

THE APPLICATION OF THE MATHEMATICAL MODEL TO THE CALCULATION OF THE TEACHING EFFICIENCY

In the 1980s the idea of applying the information theory to the teaching was put forward, but only an assumption at that time because of its complex calculation program that could not be met by that time’s teaching situation. Till now, this idea has plied an important role in promoting the physical teaching’s development and in guaranteeing the communication between teachers and students. Its great influence on the teaching transform and the relative suggestion make physical education in universities have a two-sides characteristic. And each link has a certain relationship and dynamic variation rule. Information quantity represents the physical teaching efficiency, which is the measurement of the study quality and the teaching study. However in the teaching mathematical method introduced by Zhang Tieming, the information quantity is got through the formulation of $S = FmTl_{og_2}(1 + P / N)$. The experiments have shown us that not on in the process of applying the teaching method but also setting a evaluation index, the physical teaching enjoys some teaching characteristics and rules for practical application.

The mathematical model for calculating the teaching efficiency

The teaching efficiency, as the teaching information quantity, is the measurement used to evaluate the study quality and the teaching quality. because it’s the result of the teaching information power dividing the wrong information power, the model reveals the functional relationship between the teaching quality and the study quality. “ The teaching efficiency mathematical model” is comprised of the teaching model [a] and the model [b]. The quantitative data characteristics are shown in list 3. The teaching efficiency $H_{(T)}$, is shown in the model [a] ($2 > G_T > -2; 2 > G_s \geq 0$). When $G_s < 0$, the calculation can be referred to the model [b].

$$H_{(T)} = \ln \left[1 + G_s \sqrt{(2 - G_T)(2 - G_s)} / (2 - G_T)^2 \right] \tag{a}$$

$$H_{(T)} = \ln \left[1 + G_s \sqrt{(2 - G_T)(2 - G_s)} / (2 - G_s)^2 \right] \tag{b}$$

When the fuzzy comprehensive score $G_T = 2$;or $G_T = -2$, the teaching evaluation scores are all full marks or zero marks. Such an evaluation is an unpractical test. We should find out the problems in the operation of evaluation subject and the testing mistakes and then move them out of the calculation of the teaching efficiency.

The quantitative analysis of the physical teaching efficiency

TABLE 3 : The quantitative data characteristics of the teaching efficiency $H_{(T)}$

G_s G_T	-1.0	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.5	1.6	1.8	1.9
-1.0	-0.405	0.000	0.050	0.092	0.128	0.155	0.176	0.187	0.189	0.185	0.177	0.144	0.109
0.0	-0.317	0.000	0.090	0.164	0.223	0.269	0.302	0.321	0.324	0.318	0.305	0.250	0.192
0.2	-0.298	0.000	0.105	0.190	0.257	0.309	0.346	0.367	0.449	0.364	0.349	0.287	0.222
0.4	-0.278	0.000	0.124	0.223	0.300	0.359	0.401	0.425	0.429	0.421	0.405	0.334	0.296
0.6	-0.258	0.000	0.150	0.266	0.356	0.424	0.472	0.499	0.503	0.494	0.476	0.396	0.309
0.8	-0.236	0.000	0.185	0.325	0.431	0.510	0.565	0.596	0.601	0.591	0.570	0.477	0.376
1.0	-0.213	0.000	0.237	0.409	0.536	0.629	0.693	0.729	0.734	0.723	0.699	0.590	0.470
1.2	-0.188	0.000	0.318	0.534	0.689	0.799	0.874	0.916	0.922	0.909	0.881	0.753	0.609
1.4	-0.161	0.000	0.455	0.736	0.927	1.059	1.147	1.196	1.203	1.188	1.156	1.005	0.829
1.5	-0.146	0.000	0.564	0.888	1.101	1.246	1.342	1.395	1.402	1.386	1.351	1.186	0.993
1.6	-0.129	0.000	0.723	1.098	1.336	1.496	1.599	1.656	1.665	1.647	1.609	1.430	1.216
1.8	-0.089	0.000	1.386	1.895	2.190	2.379	2.499	2.564	2.574	2.554	2.510	2.302	2.049
1.9	-0.062	0.000	2.249	2.833	3.154	3.357	3.485	3.533	3.563	3.542	3.496	3.275	2.995

Through the teaching efficiency model we can easily calculate the physical teaching efficiency in universities, $H_{(T)}$ (shown in list 3) . In the model the student study quality usually is represented by G_T , but the teaching efficiency can be represented by $H_{(T)}$. These three values share a complex linear relation, which is independent and interactive. In teaching practice teaching and study has formed a functional relationship, which can be clearly in TABLE 3. Two parts below will introduce the two relationships.

In the same teaching grade the teaching efficiency $H_{(T)}$ would increase with the continuous growth of the teaching quality; however, when the teaching quality > 1.4 the physical teaching efficiency will decrease, reflected by the datum in TABLE 3. All these characters referred above all reflect the limitation of the physical teaching. So the student's initiative will play a crucial role.

When the teaching qualities are in the same grade, the curve T_i can represent the teaching efficiency and show that the teaching quality increases with the increasing of the student's study quality. However, when the teaching quality is respectively 0.6, 1.2, 1.6, on based which the three functional curves of T_1 , T_2 , T_3 , are made, further reflecting these changes (shown in Figure 2).

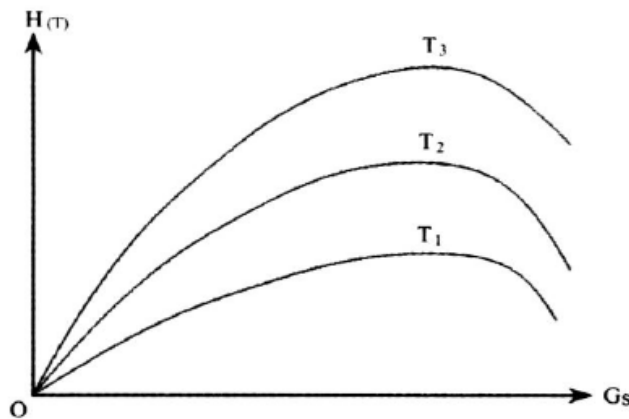


Figure 2 : The T_i curve graph

When the teaching qualities are in the same grade, the teaching efficiency $H_{(T)}$, the teaching efficiency will increase with the continuous increase of the teaching quality, and this rule has been reflected by datum in Figure 3. In this paper when the student's study quality is equal with the teaching quality, their relationship can be represented by $G_{(T, S)}$, which can be used to calculate the teaching efficiency. Just like what is shown in list 3 link the black letter in the 0.405~2.995 diagonal line and you will get a curve, which is the relation function reflecting the relations between $H(T)$ and $G(T, S)$, just like what is shown in Figure 3.

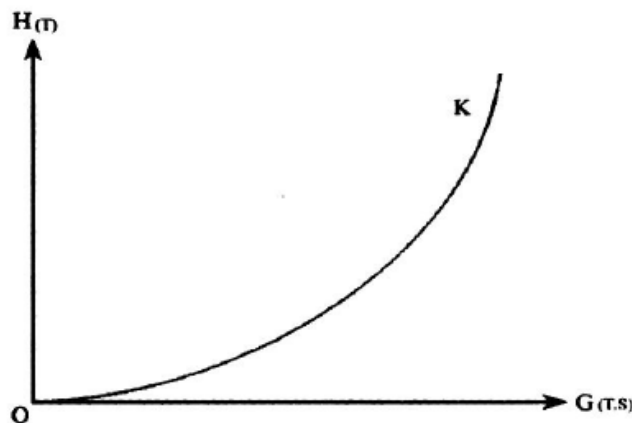


Figure 3 : The curve K graph

In the process of analyzing the curve K we can find the magnitude change of the physical teaching efficiency : the teaching efficiency has a positive relationship with the student's initiative, and that higher the teaching efficiency is higher the student's study quality. However, when the teaching efficiency value increases to 0.693~2.995, the physical teaching efficiency is multiplied.

Setting the standard of evaluating the teaching efficiency

We collected the colleges and universities physical teaching efficiency datum between 2001 and 2005 and proven them through teaching practice. After making a detail analysis of five different working conditions we made a teaching efficiency evaluation standard.

- (1) Teaching disorderly status : $H_{(T)} < 0$ (negative value).
- (2) Teaching invalidly status : $H_{(T)} = 0$.
- (3) Teaching validly status : $0 \leq H_{(T)} < 0.5$.
- (4) Teaching improvement status : $0.5 \leq H_{(T)} < 1.0$.
- (5) Teaching effectiveness status : $H_{(T)} > 1.0$.

Through the evaluation datum in TABLE 1 we can get the teaching quality, which is 0.762, and the student's initiation, which is 0.681. Through the mathematical model we can get the physical teaching efficiency in colleges and universities, which is 0.449. Based on the teaching efficiency standard above, we can make a comprehensive evaluation of the teaching quality and the student's initiation, thus evaluating efficiently the teaching efficiency and the teaching status.

CONCLUSION

The content above introduces our deep study of the physical teaching evaluation model in colleges and universities, which is based on the information provided by teachers, students and some experts and to which many mathematical models are applied. So the way of researching is rational and practical, providing the relative theories and datum for building the physical teaching evaluation model.

REFERENCES

- [1] Zeng Bosi; The study of the relationship between the physical teaching evaluation system and the student's health, The journal of Guangzhou Sport University, **31(3)**, 121-124 (2011).
- [2] Xu Yan, Guo Dingwen, Tang Shaomin; The building of the physical teaching evaluation system in colleges and universities, Journal of Physical Education, **17(12)**, 66-68 (2010).
- [3] Wei Chaogui; The building of the physical teaching evaluation under the new curriculum, Chinese adult education, **15**, 122-123 (2010).
- [4] Yang Hua; The physical education evaluation standard based on the physical lifestyle, Journal of Shanghai University of Sport 2014, **38(2)**, 74-77.
- [5] Liujian; The study of regional competitive sport's competitive evaluation model, The Sports Culture Guide, **11**, 12-15 (2012).
- [6] Yangjun; The history and future of China's physical evaluation study. Journal of Wuhan Institute of Physical Education, **46(9)**, 64-67 (2012).
- [7] Zhongze; The building of the competitive sports evaluation index system, Journal of Shenyang Institute of Physical Education, **1**, 41-43 (2010).