Application of Weighted Average Method in Evaluation System for Rural Cadre Distance Education

DAI Li-na[1]* , **ZHENG Bo-wei**[1], **DONG Hai-ge**[2]

1. Institute of Agricultural Scientech Information，Beijing Academy of Agriculture and Forestry Sciences，Beijing 100097，China；2. Food Quality Supervision and Management Section，Chaoyang Branch of Beijing Administration for Industry and Commerce，Beijing 100125，China

Abstract   We elaborate the application method，process and effect of weighted average method in the examination and evaluation system for modern distance education of rural party members and cadres. The study shows that this method reflects the evaluation results objectively and comprehensively and plays a remarkable role in establishing and improving the examination and evaluation system，thus will have an important reference value for the development of modern distance education of rural party members and cadres in the future.

Key words   Rural modern distance education，Weighted average method，Weight distribution，Calculation model

The examination and evaluation system for modern distance education of rural party members and cadres（hereinafter referred to as " rural party distance education"）is a system to carry out networking evaluation for the teaching platform of rural party distance education-auxiliary teaching website. It adopts the networking examination and evaluation means to conduct a comprehensive and in-depth analysis for the teaching conditions on the platform and the learning conditions of users on the platform，through which we can quickly find the problems in the operation and maintenance work and teaching activities on the platform，and promptly know the learning needs and application effects of users on the platform so as to point out the direction for the smooth development of teaching work. In 2007，the General Office of the Central Committee of the Communist Party of China issued the *Opinions on Implementing the Work of Modern Distance Education of Party Members and Cadres in Rural Areas of the Whole Country*[1]. This document proposed definite requirements for strengthening the examination and evaluation work of rural party distance education. With high attention of the Central Committee of the Communist Party of China，led by Shandong，Hunan and Guizhou，many provinces having started the work of rural party distance education utilize the methods and means of network informatization to establish the examination and evaluation system successively and implement the work of networking evaluation for rural party distance education work. However，in the process of examination and evaluation，what method shall be used to summarize and calculate the evaluation results has always been the subject that is studied by the experts and scholars in various fields，because different summary methods can make the evaluation results far from each other and then further influence the application values. In view of this，with the insight of effective application and remarkable effects of weighted average method in the examina-

tion and evaluation system for distance education of experimental universities and colleges in recent eight years[2]，we strive to explore more reasonable application method that can be suitable for the examination and evaluation system for rural party distance education based on the weighted average method so as to establish and improve the examination and evaluation system for rural party distance education，thus making it achieve the purpose of examination and evaluation really，playing the role of examination and evaluation and ensuring the sustainable development of rural party distance education work.

1   General description of weighted average method

1.1   Basis principle   The weighted average method is a method for weighted calculation of average on the basis of the calculation principle of weighted arithmetic average. As an average index，the weighted arithmetic average is the average value of certain quantitative indicant in each unit of the whole that is calculated comprehensively on the basis of considering different weights of the statuses，functions，*etc*. in each unit of the whole or different weight numbers of occurrence times，proportions，*etc*. of its quantitative indicant so as to reflect the representation level or the general level in one aspect of certain quantitative indicant in the whole[3].

1.2   Calculation method   The calculation method is to summarize the products of quantitative indicants and weights in each unit of the whole，and the calculation formula is：

$$\bar{x} = \Sigma x \cdot \frac{f}{\Sigma f} \tag{1}$$

where x represents the quantitative indicant in each unit；f represents the weight number；$\frac{f}{\Sigma f}$ stands for the weight[3]. It can be seen from this formula that the weight directly influences the calculation result，which is one of the factor that must be considered emphatically when the weighted average method is used.

1.3 Application field The application of weighted average method is extremely wide, including but not limited to calculating the market share price index, inventory cost, average daily production of worker in the workshop of enterprise, completion condition of gross annual value of subordinate enterprise in the company, total score of student in a semester. As long as there is a factor that weights the average result, this method will be suitable for application, and this method is based on easy basis principle and simple calculation method, thus being suitable for application in various fields.

2 Application of weighted average method in the examination and evaluation system for rural party distance education

2.1 Application method

2.1.1 Weight distribution. In the process of examination and evaluation, the key point of using the weighted average method is to determine the factors that influence the evaluation results and make their weight distribution so as to carry out the weighted calculation and get the score of each index and final result of examination and evaluation in the examination and evaluation index system (as an organic whole and set, which is composed of indices reflecting various characteristic states of the object examined).

2.1.1.1 Determination of influence factors. In the examination and evaluation system for rural party distance education, there are two factors that influence the evaluation results:

One is index contents, that is, the contents of all indices listed in the examination and evaluation system; the other is all members in the examination and evaluation group, which is composed of relevant personnel transferred from the rural party distance education centers in relevant provinces.

2.1.1.2 Selection of distribution methods. The methods for determining weight are weight factor judgment table method, expert intuitive judgment method, hierarchy analysis method, ranking method, Delphi method, *etc*[4]. Among them, the ranking method stresses sequence difference and can avoid the dispute over the number of weight resulted from direct valuation[5]. When using the ranking method, we first determine a ranking standard so as to provide descending or ascending ranking for the factors that influence the evaluation results; then, determine different scores for the factors in different orders; finally, conduct summary and calculation and get the weight. In the examination and evaluation system for rural party distance education, when ranking the index contents, it is allowed to start from the teaching guidance intention based on the standards such as teaching target, task, strategy, *etc*.; when ranking the evaluation group members, it is allowed to be based on the standards such as the working experience, professional knowledge grasp conditions of evaluation group members.

2.1.1.3 Calculation formula for weight. In the process of actual examination and evaluation, the weight of evaluated index is the proportion of the score of each evaluated index to total score, and the calculation formula is:

$$Q = Px \Big/ \sum_{x=1}^{n} Px \qquad (2)$$

where Px represents the score of index content of item x, x stands for the number of indices, x is equal to 1, 2, $\cdots$, n. As shown in Table 1 (the index contents and index scores are selected from the examination and evaluation index system for rural party distance education of Shandong province, and the number, score and weight of evaluation group members are assumption data), the scores of index contents of 6 items for video watching conditions of users on the examination and evaluation platform are respectively 20, 30, 20, 20, 20, 20 points, use the formula (2) and get the values of weight, which are respectively 15.4%, 23.1%, 15.4%, 15.4%, 15.4% and 15.4%.

2.1.2 Weighted calculation. For application of the weighted average method into on-line examination and evaluation system, it needs conducting model analysis and handling for calculation method and process, to replace human brain with computer and get evaluation result rapidly. The evaluation index system established in the examination and evaluation system for rural party distance education is made up of several levels of indicators, which can be subdivided from top to bottom. Since the evaluation group carries out evaluation from the lowest indicators of evaluation standard, principle and basis, the calculation model must be established from bottom to top. On the basis of calculation principle and formula of the weighted average method, it is proposed to establish following calculation models in sequence:

Firstly, calculate the score of each indicator from the lowest one according to weight of evaluation group, and the calculation model is

$$Q_j = \sum_{i=1}^{n} P_{ij} \cdot Q_{ij} \qquad (3)$$

where P_{ij} is the score of each evaluation person for indicator at level of j (the lowest level); Q_{ij} refers to the weight of evaluation person for the content of each indicator at level of j; and i stands for number of evaluation group, i = 1, 2, $\cdots$, n. For example, using data in Table 1 and the above calculation model, adding the product of scores of two evaluation persons and the weight of evaluation person, we get the results of 6 indicators for conditions of watching video for platform users, which are 13, 22, 12, 12, 13 and 13 points respectively.

Secondly, calculate the weighted average score of each indicator from bottom to top according to weight of indicator content, and the calculation model is:

$$S_w = \sum_{c=1}^{n} P_{cw} \cdot Q_{cw} \qquad (4)$$

where P_{cw} represents the score of each indicator at level w; Q_{cw} refers to the weight of each indicator content at the level of w; and c stands for number of indicators, c = 1, 2, $\cdots$, n. Using data in Table 1 and the above calculation model and adding the product of scores of 6 indicator contents of watching video for computer platform users and the weight of indicator, the result of weighted average score will be 14.78 points. The rest may be reduced by analogy, through analogy of the calculation model, it is able to rapidly calculate the weighted average score of each level indicator and get the final evaluation results.

2.2 Application process As stated above, the application

of weighted average method in the examination and evaluation system for rural party distance education includes four steps. Firstly, determine factors influencing evaluation results on the basis of actual conditions of the examination and evaluation system and evaluation group. Secondly, distribute the weight for factors influencing evaluation results using sequencing method. Thirdly, design the calculation model according to calculation principle and formula of weighted average principle. Fourthly, dispatch the model and calculate the final evaluation results.

Table 1 Evaluation results of platform users watching video

No.	Indicator contents	Indicator score	Indicator weight	Evaluation person 1		Evaluation person 2	
				Evaluation score∥points	Weight %	Evaluation score∥points	Weight %
1	Organize Party members and cadres and masses to take centralized study not less than three times	20	15.4	15	60	10	40
2	Party members and cadres play backbone and leading role, the rate of attendance of distance education up to 80, and not less than 80 hours for a whole year.	30	23.1	20	60	25	40
3	The masses have great enthusiasm for getting to know the distance education work and participating in the study.	20	15.4	10	60	15	40
4	Both the study contents and time accord with local situations.	20	15.4	10	60	15	40
5	Adopt different learning methods in line with varied learning groups and contents, to receive better learning results.	20	15.4	15	60	10	40
6	Learning contents include discussion, coaching and practice, and mutual help and mutual learning.	20	15.4	15	60	10	40

2.3 Application effect   Using the calculation model (3), we calculate scores of 6 indicator contents of watching video for platform users. The calculation results are 13, 22, 12, 12, 13 and 13 points respectively. Using the simple arithmetic mean method, the scores will be 12.5, 22.5, 12.5, 12.5, 12.5 and 12.5 points. From comparison of these two groups of calculation results and scores of evaluation persons, it can be seen that the first group data is inclined towards evaluation results of the evaluation person 1 who has higher weight, indicating that there is certain gap between two evaluation persons in knowledge level and work experience and the results of first evaluation person are more reasonable. Similarly, using the calculation model (4), we calculate scores of 6 indicator contents of watching video for platform users. The calculation result of weighted average is 14.78 points. Using the simple arithmetic mean method, the score will be 14.17 points. From comparison of these scores and the scores of 6 indicator contents, it shows that the score of weighted average is inclined towards the second indicator content which has a higher weight, so this indicator has higher contribution to evaluation of watching video conditions and will play an important role in improving the rate of attendance of party members and cadres in the rural distance education. "The evaluation without key points is not an objective evaluation." Through weight distribution and weighted average calculation of indicator contents and factors influencing evaluation results, it is able to obtain more scientific, objective and fair evaluation results, and make the evaluation have higher reference value and strategic directive significance.

3   Conclusions

In conclusion, application of the weighted average method in examination and evaluation system for rural party distance education and comprehensively considering weight of each indicator and weight of each evaluation person provide preconditions for obtaining scientific, objective and fair evaluation results. Besides, through effective operation of the calculation models established on the basis of weighted average method, it is able to raise evaluation efficiency, rapidly obtain evaluation results and reduce many complex calculation works. In addition, calculation models established on the basis of the weighted average method can be combined with other models, such as pie charts, block diagrams, and table, *etc*., to have a visual demonstration of the evaluation results and facilitate analysis and practical application of rural party distance education workers. Therefore, application of the weighted average method in examination and evaluation system for rural party distance education can help those workers to make more scientific and reasonable decisions, and promote stable and orderly development of rural party distance education project.

References

[1] China modern distance education for party cadres in the countryside leadership concilliation panel office. Service manual of modern distance education for party cadres in the countryside[M]. Beijing: Party Building Readings Publishing House, 2008: 1 –8. (in Chinese).

[2] YU JF. Research on technology of decision support in distance education evaluation system[D]. Xi'an: Xi'an University of Electronic Science and Technology, 2006: 35 –43. (in Chinese).

[3] XIE JW, WU XP. Statistics theory[M]. Beijing: Beijing Institute of Technology Press, 2010: 91 –96. (in Chinese).

[4] LI YH. University performance appraisal index weight determination method under balanced scorecard[J]. Economic Research Guide, 2011(3):107. (in Chinese).

[5] WEI J. Performance assessment index[M]. Beijing: Peking University Press, 2010: 57 –59. (in Chinese).

[6] Modern distance education for party cadres in the countryside leadership concilliation panel office of Shandong Province. Notice of Evaluation on modern distance education for party cadres in the countryside job rating of Shandong Province and modern distance education for party cadres in the countryside evaluation index system of Shandong Province (for Trial Implementation)[EB/OL]. (2005 –04 –25) http://www.hydj.com.cn/content.aspx? contentid =3606. (in Chinese).