Construction of Teaching Effectiveness Evaluation System for Command Information System Major Based on Kirkpatrick Model

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Abstract. In view of the current situation of teaching effectiveness evaluation for Command Information System Major, imitating the application of Kirkpatrick Model in training effectiveness evaluation, constructing the teaching effectiveness evaluation system for Command Information System Major based on Kirkpatrick Model, and putting forward corresponding multilevel evaluation index. At the same time, Markov Chain is applied to the analysis and implementation of teaching effectiveness evaluation, and the whole process of reflecting teaching effectiveness is emphasized. The teaching effectiveness evaluation system fully reflects the multi-level and dynamic process of the formation of teaching effectiveness, it provides an effective evaluation mechanism for the transformation of the training mode of Command Information System Major under the joint combat system, and has a good prospect of popularization and application.

1. Introduction

Command information system is the nerve center of modern high-tech war army [1, 2], the comprehensive construction of high efficiency and reliable command information system has become an important task of military modernization, as a result of the command information system construction of talent gap is big, the relative shortage of professional personnel training, thus cultivate high-quality comprehensive multi-level qualified personnel command information system has become a very urgent and challenging work. And command information system as a professional education is mainly engaged in military command in military, information system management, and other frontline jobs multiple lighter one officer, how the existing command information system for teaching effect and reasonable assessment is further command information system in the new period for the important link of the teaching reform and innovation [3].

This article will be to Command Information System Major for teaching effectiveness evaluation system were discussed, and imitate Kirkpatrick Model application in training effectiveness evaluation of the effect [4-6], construct Command Information System Major, based on Kirkpatrick Model for teaching effectiveness evaluation system, and puts forward corresponding multi-level evaluation index, thus for the Command Information System Major under the joint operations require professional combat training mode change to provide effective evaluation mechanism.

2. Status Quo of Teaching Effectiveness Evaluation System for Command Information System Major

2.1. Insufficient Understanding of Teaching Effectiveness Evaluation

At present, in the process of teaching implementation and reform, there is a widespread problem that the evaluation of teaching effectiveness is not paid enough attention to. Most of the teachers do not know enough about teaching effectiveness evaluation and think it can be done or not. Therefore, the teaching effectiveness evaluation system of Command Information System Major is not perfect, and there is little investment in the later teaching effectiveness evaluation, which leads to the failure to correctly and scientifically evaluate the teaching effectiveness.
2.2. The Evaluation Level of the Teaching Effect Based on Professional Characteristics is Not Comprehensive

When in the professional training effectiveness evaluation at present are mostly remains at the end of the training for the trainees training satisfaction survey and evaluation of knowledge ascend, but often ignored the trainees return to work after the training effectiveness of tracking and evaluation work is not thorough to the trainees work behavior change in the future professional post, ability of ascension, shift in attitude, job performance gain, professional recognition, etc. At a deeper level assessment of the area. Therefore, such an assessment ultimately makes the evaluation indexes such as training satisfaction and knowledge and skill improvement mere formality.

2.3. Evaluation Indicators are Difficult to Quantify

Command information system is an integrated information system that integrates the functions of battlefield intelligence, communication, command, control, combat and logistics support [7]. Its professional knowledge covers many fields such as information science, computing science and social science. At present, the evaluation of in-service teaching in command information system has not given specific and comprehensive evaluation indicators, and most of the indicators are not easy to be quantified and cannot be made quantitative analysis, which causes certain difficulties in the evaluation of teaching and training effectiveness. When teaching units conduct teaching effectiveness evaluation, they can only summarize and summarize their own experience over the years, and some of their indicators are difficult to quantify, which directly leads to the difficulty for teaching implementation institutions to establish their own teaching evaluation data system.

3. The Teaching Effect Evaluation System Based on Kirkpatrick Model

Kirkpatrick Model is currently the most widely used and most operable evaluation model. From the perspective of the depth and difficulty of personnel training, the model divides the training effect into four time-progressive levels, response level, learning level, behavior level and result level, that is, the trainee’s response (satisfaction), learning (knowledge), Changes in skills, attitudes), behavior (changes in behavioral performance during the work process), results (changes in unit entity performance due to trainees) [8]. This model fully reflects the change process of the trainee's behavior and status, and the degree of contribution to the post. It is especially suitable for the evaluation of the teaching effectiveness of the position that requires high practical skills training and can meet the actual needs of the employer as soon as possible.

3.1. Evaluation of the Reaction Layer

Reaction layer evaluation is a first-layer evaluation, which is mainly used to evaluate whether trainees like the training program, whether the training content meets the needs of trainees, whether the training method is properly used, and whether trainees are satisfied with the training site, facilities and environment.

3.2. Evaluation of Learning Layer

Learning layer evaluation is the second-layer evaluation, which is conducted before the end of the training and mainly focuses on trainees' understanding and mastery of the training contents such as knowledge, skill operation, attitude and ability.

3.3. Evaluation of Behavior Layer

Behavioral layer evaluation is the third-layer evaluation, which is usually measured within three months to half a year after the end of the training. It mainly examines whether the trainees can apply the knowledge they have learned to specific work in their future work positions, and whether there are significant changes in their behavior and performance after the training.
3.4. Evaluation of Result Layer

Results layer evaluation is the fourth-layer evaluation, the main content of this layer evaluation is: the training project brought unit and post which changes, such as cost savings, reduce accident rate, the ascension of the improvement of quality excellence, task completion rate, improve staff work attitude, satisfaction of unit or increase the sense of belonging, and so on. This layer evaluation is the ultimate goal of the trainees' on-the-job training, and it is also the most difficult level to obtain relevant data and carry out the evaluation in the training effectiveness evaluation.

4. Teaching Effectiveness Evaluation System for Command Information System Major

Command Information System Major for teaching should be on national defense and army building theme, focus on the training officer position command information system technology, make the students grasp the command information system basic theory, demonstration, design, maintenance, security, organization to use professional knowledge and skills, understand the battle command, weapon system, early warning detection, communication of related knowledge, strengthen students' innovation ability, coordinating ability and other aspects of quality.

The teaching of the major content in technology and auxiliary decision-making intelligence information processing technology, equipment use and security as the core, build command information system professional theoretical basis, organization skills, jobs skills training system of multi-level teaching, meet the requirement of equipment development of informatization talents, gradually from equipment safeguard personnel training mode to equipment command, management, engineering and technical comprehensive training mode. At the same time, it emphasizes the basic training of post skills, and forms the integrated characteristics of comprehensive ability and post holding ability, application ability and innovation ability, organization and application and comprehensive guarantee.

4.1. Construction of Evaluation Index System

Combined with the four layer evaluation system of Kirkpatrick Model, and based on the characteristics and teaching content of the professional job training of Command Information System Major, an evaluation system of the professional job teaching effectiveness of Command Information System Major based on Kirkpatrick Model is constructed. The basic level and content framework of the indicator system are shown in Figure 1.

In order to evaluate the teaching effectiveness fairly and objectively, it is the key to establish a standardized and reasonable evaluation index system. Therefore, in the construction of teaching effectiveness evaluation index system, on the one hand, Kirkpatrick Model is adopted to reflect the evaluation content and level; On the other hand, we must adhere to the principles of objectivity, independence, operability and integrity in the teaching process of command information system. According to the process of response evaluation, learning evaluation, behavior evaluation and result evaluation of the offset model, a multi-layer evaluation index system is established, which can fully reflect the different stages, angles and levels of teaching implementation.
4.2. Teaching Effectiveness Evaluation Method Based on Markov Chain

As the teaching objects are often uneven, its teaching effectiveness should be closely related to the current teaching implementation. Therefore, the impact of students' basic differences should be excluded when evaluating the teaching effectiveness, so as to make the evaluation result more objective and accurate. Markov Chain is a typical discrete event stochastic process with Markov property. The application of Markov Chain in evaluation can focus on the analysis of the complete process of things and focus on examining the degree of development and progress of things, so as to make the evaluation results more objective and reasonable. It has been applied to the investment in stock index futures, weather forecast, performance estimation and other fields [9,10].

This paper proposes a teaching effectiveness evaluation method based on Markov Chain, which can be applied to in-service teaching not relying too much on the "past" or the original foundation, but looking at the teaching quality in a period of time from the perspective of development, paying attention to the actual teaching effectiveness, so as to meet the practical needs of in-service training. The specific steps to implement the teaching effectiveness evaluation method based on Markov Chain are as follows:

1. the indicators at the end of the evaluation can be divided into several levels: outstanding (90-100), good (80-89), medium (70-79), qualified (60-69), unqualified (60), take each level intermediate values are respectively 95, 85, 75, 65, 55, the teaching effectiveness can be obtained percentage set \( N = (95, 85, 75, 65, 55) \), five levels of the parameters set for \( N^T = (95, 85, 75, 65, 55)^T \). The proportion of the first time participants in the evaluation survey in the total number of participants is taken as the state vector, and the state vector is denoted as \( M = \left( \frac{n_1}{n}, \frac{n_2}{n}, \frac{n_3}{n}, \frac{n_4}{n}, \frac{n_5}{n} \right) \), where \( n_i \) is the number of people who give the evaluation grade \( i \), and \( n \) is the total number of the evaluation.
2. After the second evaluation survey, \( n_{ij} \) represent the number of people who were given the evaluation grade from \( i \) to \( j \), and establish the transition probability matrix \( P \).

\[
P = (p_{ij})_{5\times5} = \begin{bmatrix}
p_{11} & \cdots & p_{15} \\
\vdots & \ddots & \vdots \\
p_{51} & \cdots & p_{55}
\end{bmatrix}
\]

Among \( p_{ij} = \frac{n_{ij}}{n_i} (i, j = 1, 2, 3, 4, 5) \)

3. The change of in-service teaching and post-teaching is often a long-term process. The change of students' performance, the formation of relevant skills and the students' overall perception of the teaching course and the professional occupation will be smaller and smaller, and the ultimate state probability will be stable. According to ergodicity, \( \sum_{j=1}^{5} \pi_j = 1 \) equations can be established to obtain the limit distribution \( \pi = (\pi_1, \pi_2, \pi_3, \pi_4, \pi_5) \), which represents the second investigator's evaluation grade transfer.

4. Assign scores to each level, conduct normalized quantitative processing, and finally obtain the evaluation value of teaching effect \( S = \pi \times N^T \).

5. Conclusion

The evaluation of the teaching effectiveness of the Command Information System Major is a comprehensive problem which reflects the teaching process of the major and the training results of the personnel. The establishment of the evaluation index system based on Kirkpatrick Model can fully reflect the teaching characteristics and content essence of Command Information System Major specialty, and can reflect the whole dynamic process of teaching and training, making the evaluation more specific and more practical. The evaluation method based on Markov Chain can pay more attention to the improvement of students' level after teaching, which fully reflects the actual effectiveness of teaching. Therefore, in the process of teaching implementation and management in the future, the evaluation system of the professional teaching effectiveness of the command information system based on the balance model will have a good application prospect, which can further promote the improvement and promotion of the professional teaching mode of the command information system.

References


