An Initial Exploration of an Intercollegiate Collaborative Innovation Path for Aviation Equipment Primary Training Based on ANT

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Abstract. Talent cultivation for primary training of aviation equipment majors has many modules, many categories, long class hours and cross-fields, and there are realistic difficulties in improving the teaching effect. After a number of training practices and explorations, it is found that collaborative training based on inter-college innovation has obvious advantages. In view of the real problems of aviation equipment professional primary training personnel training, based on the perspective of the advanced theory widely recognized in the education sector - actor network theory (ANT), we have explored the intercollegiate synergistic path with military colleges as the main body, which is of certain practical significance for further improving the comprehensive quality and efficiency of aviation security primary training personnel training.

1. Introduction

Primary training of aviation equipment professionals, according to the requirements of the syllabus, under the diversification of courses, cross-specialization, and high intensity of credit hour requirements, relying on intercollegiate collaborative training has obvious resource advantages. Intercollegiate collaborative innovation is a key link in the reform of education modernization and an important way to promote collaborative innovation and talent training. Colleges and universities communicate and coordinate with each other, link docking, and collaborative innovation helps to carry out three-dimensional innovation cooperation of multidisciplinary fusion, multi-team cooperation, and multi-technology integration, and to obtain long-term and comprehensive benefits of teaching and research.

In the field of education, the actor network theory, as a new perspective of thinking, changes the basis of educational research, expands the existing educational research problem domain, and innovates the educational research methodology, which helps to re-examine the original face of the educational phenomenon and the educational problem, and helps to reconstruct the existing concept of pedagogy, and develops a new research field. The theory provides a new perspective for exploring the synergistic path of colleges and universities, and for solving the real problem demand for piloting the primary training mode of aviation equipment specialization.

2. Aviation equipment primary training personnel training problem analysis

In view of the changes and expansion of the training task, Qingdao Campus, as the main body of training, there are still some obvious deficiencies and problems in the training of aviation equipment primary training personnel, mainly reflected in the following three aspects:

2.1. Curriculum materials

At present, the main body of the training of more courses teaching content still exists "old, false, shallow" problem, lagging behind the development of aviation equipment, and trainees job posting is not close enough, it is difficult to achieve a close combination of theory and practice, it is necessary to optimize the "teaching" strategies This makes it necessary to optimize the "teaching" strategy to better reflect the practicality, research and dynamic updating of teaching content. It is necessary to improve and upgrade the curriculum and teaching materials system.

2.2. Teaching staff

The primary training, adhering to the idea of "coming with problems, learning around problems, and solving problems", has constructed a teaching content system with 4 major topics and dozens of sub-topics. This requires teachers with deep research in related fields and experts from related organizations to serve as instructors to help trainees collect research materials and answer
questions. This puts higher requirements on instructors and team construction.

2.3. Condition construction aspect

The primary training of aviation equipment is centered on the cultivation of aviation equipment protection ability, exploring and practicing the theory and practice teaching mode of "thematic study" and "comprehensive exercise"; therefore, it is necessary to vigorously carry out the construction of related teaching conditions, forming the organization and implementation entity of the vocational education and training system. Therefore, there is a need to vigorously develop the construction of relevant teaching conditions and to form the organizational and implementation entities of the vocational education and training system. To a certain extent, the above problems have affected the comprehensive quality and efficiency of primary training personnel training.

3. Actor Network Theory (ANT)

3.1. Meaning of ANT

Actor network theory (ANT), also known as translational sociology and heterogeneous constructivism, is a method of analyzing science, knowledge, and social construction, and was proposed in the mid-1980s by Bruno • Latour, the founder of the Paris School in France [1,2]. ANT emphasizes that the relationship between actors in an actor network is indeterminate, and that each actor is a node, which is linked by pathways to form a seamless network. In this network, there is no center, and the actors are in a relationship of mutual identification, interdependence and mutual influence. ANT is framed by three core concepts: actors, heterogeneity and translation, in which the concept of actors includes both living actors (individuals or organizations) and inanimate actors (e.g., technologies, concepts), and the two types of subjects are in an equally important position.

3.2. Basic Composition of Actor Network

The construction of the actor network is based on the combination, connection and expansion of these heterogeneous actors [3]. Firstly, to determine the main body of the network and its mandatory access points; secondly, to analyze the translation process of the actors; and finally, to test the results of the operation of the network of actors. Among them, "translation" is the most central stage, and the process of translation is also a key point in the construction of actor network. Since heterogeneity is the most basic characteristic of actors, which represents the demands of different actors in terms of interest orientation and behavioral mode, the theory of actor network believes that each heterogeneous actor has the ability to act and interests, and it is necessary to coordinate the interests of many actors through the translation to reach a consensus and establish a network.

The process of translation is generally a process of alliance among actors, which consists of four main stages: problematization, interest empowerment, recruitment and mobilization. In the problematization stage, the core actors first identify their own target problems, and then transform them into "must-pass points" for other actors to achieve their own goals, i.e., to gain the support of other actors by constructing a win-win action plan. In the stage of benefit empowerment, the core actor will strengthen the positioning and roles of other actors in the program to deepen their sense of shared benefits and attract more participants. Through the above two steps, other actors become enlisted members and the goal of recruiting members is realized. Finally, in the operation of the coalition, the core actors also need to mobilize continuously to play the role of all kinds of resources to maintain the stable operation of the network.

The four stages of translation are not in chronological order, but can also be carried out with overlap. After these links, a heterogeneous network is constructed based on the main goals of the core actors. From the perspective of ANT, the intercollegiate collaborative platform for primary training can be regarded as a process in which different core actors, such as different colleges and universities, build a collaborative network with other human or non-human actors based on the demand for heterogeneous interests and through cooperation.

4. The construction of inter-college collaborative power operation mechanism based on ANT

4.1. Inter-college collaborative action body based on ANT

Collaborative innovation is in order to break the barriers of disciplines, regions, sectors and technologies, share resources in terms of talents, information, capital, technology, etc., and form a collaborative platform of interdisciplinary, cross-regional and cross-organizational units to overcome educational and scientific research problems, so as to realize the synergistic benefits of 1+1>2.[4] According to the development stage of collaborative innovation platform construction, each heterogeneous actor can be categorized into three types: core actors, main actors and co-actors.

4.1.1. Clarify the core actor status of the subject of training

ANT contains three core elements: actors, translation and network. The actor is the main body of the actor network, which is a collective term for many heterogeneous elements, including both human actors and non-human actors. Translation is the basic way of constructing an actor network, forming an actor network through four steps of problematization, benefit conferment, recruitment and mobilization, i.e.,
determining who is the main part in the operation of the network, how to recruit heterogeneous actors, and how to maximize the benefits among different actors through the optimal way and form.

4.1.2. Identify the common interest demands of the actors' subjects

In the inter-collegiate collaborative actor network centered on military colleges and universities, their demands are clearer, that is, in order to better fulfill the primary training tasks of aviation equipment, they need to make up for their own shortcomings with the advantages of the synergistic platform of inter-collegiate collaboration. In the problem presentation stage of the synergistic network construction process, it is not only necessary to specifically consider their own interests, but also to specifically consider the motivations and interests of other actors.

(1) The subject of training. The main body of training is an important coordinator, service provider and self-manager in the inter-college collaborative platform, the main task is based on their own needs, inter-college collaborative innovation, the work covers their own top-level design, policy development, curriculum materials, team building and so on. On the one hand, efforts to promote the creation of collaborative platforms, policy and mechanism innovation, to promote the pace of synergy; on the other hand, according to their own needs, the integration of synergistic resources, to build a training alliance for primary training in the direction of aviation equipment.

(2) Other military colleges and universities. Other military colleges and universities mainly refer to other military colleges and universities that are different from the main body of the primary training in the direction of aviation equipment, and have related or the same teaching and research tasks. This type of actor body, its synergistic motive is mainly educational and scientific research cooperation, to improve the teaching and scientific research level of related specialties, and to realize the synergistic benefits.

(3) Local colleges and universities. The local universities here mainly refer to the local universities whose teaching and research tasks are related to the training tasks of the training subjects. Generally speaking, it is the local colleges and universities that are allied with the training subject, i.e., the core actors, on their own initiative. In the field of teaching, local colleges and universities have strong advantages in the mode of teaching methods, online MOOC, SPOC teaching, online and offline blended teaching, and course ideology and politics. Meanwhile, in the field of research, local universities also have their unique advantages. The motivation of local colleges and universities stems from their duty to improve their scientific research ability and human education level. Therefore, local colleges and universities also have the intrinsic motivation and demand for collaborative innovation.

(4) Troops. Troops are the key link in the trinity new military personnel training system. Troops are the primary training of aviation equipment to send the main body, but also the follow-up of the main body of employers, visible troops themselves and training military colleges and universities there is a synergistic relationship, the interests of the two are basically the same. But the troops and the main body of the synergy of the training is also subject to constraints in various types of regulations.

(5) Research institutions. Scientific research institutions is an important part of the aviation equipment primary training intercollegiate synergy, which focuses on the development of special technology and core innovation capabilities, can fully utilize their own talents and facilities resources to provide theoretical and technical support for the main body of the training, and the results of the research results obtained will also become an important asset of the unit.

Although the actors have different interests, the common problem they face is how to maximize their interests in cooperation. By finding the Obligatory Passage Point (OPP) in the network of actors, i.e., forming a multi-integrated nurturing collaborative cultivation mechanism, the quality of cultivation will be improved, and their respective goals and interests will be realized in the process. As shown in Figure 1 to form a collaborative innovation platform actor network.
4.2. Inter-College collaborative power mechanism based on actor network

Collaborative innovation platform involves the interests of many actors, and each actor has different interests, which will inevitably lead to differences, thus affecting the construction of collaborative innovation platform and the effect of collaboration. Therefore, it is the primary issue to study the power mechanism of collaborative innovation platform, so as to promote the heterogeneous actors to form a coalition of interests with roughly the same demands. Translation, as the core concept of ANT, is the process of alliance between core actors and other actors’ interests [6]. The construction of a collaborative innovation platform depends on the translation of key points such as the core actors' presentation of key issues and empowerment of interests to other actors, the ability of other actors to be recruited, and the ability of the core actors to become the platform's advocates and deal with dissent through mobilization. In addition, there is a need for common points of forced passage between the various heterogeneous actors.

4.2.1. Problem Presentation - Synergy Goals

Problem presentation is the first stage in the process of constructing the network of actors of the collaborative innovation platform, which involves establishing core actors and their tasks, identifying common goals, defining the interests and demands of actors that may be included in the network, resolving the contradictions of heterogeneous actors, and proposing solutions that can be endorsed by the different actors, and so on [7]. At this stage, the core actors, as the main body of primary training, set up synergistic goals consistent with their own interests and make them clear according to the policies and concepts of collaborative innovation, prompting other actors, such as other military colleges and universities, troops, and scientific research institutes, to form a network of actors around the key issues and their own interests; and, in the network of actors of collaborative innovation platforms, promote the establishment and sound operation of the collaborative innovation platforms, so that each of the actors can get their own benefits. This is the key to whether the translation can be successfully carried out. At this stage, it is clear that the military academy that is the main body of the training has common interests with other military academies and local universities in terms of course materials, such as excellent MOOC resources, etc.; in terms of the teaching staff and other members of the network, there is a synergistic demand for the resources of technical experts; in terms of the conditions for the construction of the main body of the training has a synergistic interest in internship bases, laboratories, etc., with other military academies and other actors. Demand. The realization of these needs and interests is the synergistic goal interests of the whole synergistic network. In the stage of problem presentation, as a training subject, we should first sort out the target demand of collaborative education, and then seek the realization of inter-college synergy as a benchmark, and the synergy target is shown in Figure 2 below:
4.2.2. Benefit Empowerment - Mutual Benefits

After the problem is presented, the core actor needs to promote the role's work and benefits to other actors to attract them to join the coalition and break through the "mandatory access point" together. Introducing roles is benefit giving. In the operation of inter-college collaborative innovation platform network, it refers to the role of the training body as attracting other actors through channel opening, policy reciprocity, resource sharing and other forms, so as to guide them to enter the network. Benefit conferment is a means of attracting and stabilizing other actors, and is the second stage of the formation of the network of collaborative innovation platform actors. In this stage, the subject of training as a core actor, under the existing regulatory and institutional framework, formulates favourable policies, decision-making, and allocation of resources in collaborative innovation activities and other means, defines roles for each heterogeneous actor, and ultimately causes each actor to be recruited and become a member of the inter-university collaborative innovation platform actor network, and confers benefits to all actors to stimulate other military universities, research institutes, and other military universities and research institutes, troops and other actors to play a role in the collaborative innovation platform.

4.2.3. Recruitment stage - active collaboration

Enlistment is to realize a more solid connection through multi-party negotiation, according to the interest of actors, and to convert a problem into a series of more accurate expressions. Driven by interests, more actors are recruited and mobilized to participate in the "network operation", a process that helps to achieve the relative stability of the network and maximize the mobilization of actors to participate in the initiative. Although ANT emphasizes the role of core actors, it focuses more on the participation of other actors. Enlistment means that each actor in this network must be given a task that is relatively acceptable. In this phase, the training participant, as the core actor, has to play a proactive role so that the other key actors, such as military academies, local universities, troops, etc., accept the role set by the core actor's primary training participant and accept the benefits of a concerted and synergistic approach. In addition, the main body of training may also enlist research institutions and other institutions to provide technology and other services for the establishment of the collaborative innovation platform.

4.2.4. Mobilization Stage - Full Protection

Mobilization is to emphasize the utilization and conversion of relevant resources, so that the resources are effectively integrated in the network organization. This stage means that it is the core actors who rise to be the spokesperson of the whole network and integrate the other actors of the network. In the collaborative innovation network, actors such as the main body of training, other military colleges and universities, local colleges and universities, and scientific research institutions are not chosen two by two from each other, and they may or may not be directly related to each other. Other actors are mobilized to participate in the network through the core actor of the training body. Each actor obtains corresponding synergistic benefits through synergy.

In the process of building the collaborative innovation platform, the actors other than the core actors have no direct interests although they are different in nature, that is, the possibility of conflicts among other actors is not large, and they will not become obstacles to the development and operation of the collaborative innovation platform [8]. After forming a stable network, the core actor pulls other actors to stabilize their roles and develop in an orderly and coordinated manner for the common goal, which is called mobilization.
5. Conclusion

As the main body of training, aviation equipment primary training, on the basis of the experience of previous training, has initially practiced a new type of military personnel training mode in training mode, training objectives and training methods, realizing the trinity of training objectives of personnel training, development of military theories, and service of preparation for war and fighting, and realizing the trinity of training methods of classroom teaching, theoretical research, and training practice. In order to better fulfill the task of primary command education for naval aviation equipment, it is a feasible theoretical path to establish an inter-college collaborative innovation platform through actor network theory. After analyzing and arguing, the ANT can make the core actors and main actors in the intercollegiate synergy gain synergistic benefits, which is conducive to maximizing the interests of all parties. It can form a strong support and supplement to the new military personnel training model of "three-in-one".

References

2. Q. Liu. Actor Network Theory F.L 6,64 (2021)