



Research on the Constraints and Improving Strategies of Science and Engineering College Teachers' Scientific and Technological Innovation Intention

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Abstract. At present, China has entered a brand new stage of building a modern socialist country, but some scientific research fields still have the dilemma of being “strangled”. Enhancing science and engineering college teachers’ scientific and technological innovation intention is the key to strengthening China’s independent research strength and achieving scientific and technological progress. This paper analyzes the factors restricting the intention of science and technology innovation of teachers in science and technology universities in China from three aspects, including performance assessment and evaluation system, collective value orientation and administrative intervention, and proposes countermeasures to reform the performance assessment and evaluation system, strengthen the construction of teachers’ team, enhance teachers’ sense of self-worth and sense of belonging and identity to universities.

Keywords: science and engineering college teachers · science and technology innovation · intention · constraints · improving strategies

1 Introduction

The report of the 20th CPC National Congress pointed out that education, science and technology, and talents play a fundamental and strategic supporting role in the journey of building a modern socialist country in all aspects. Both national development and national revitalization need to rely on talents, and colleges and universities are the aggregation place of intellectuals and the strategic town of science and technology innovation. The goal of the development of science and engineering colleges and universities is to become the highland of talents and innovation, and science and engineering teachers are the backbone of science and technology innovation in China’s colleges and universities.

Over the past 40 years of reform and opening up, China has always adhered to the economic construction as the central task, and the social productivity has been greatly developed. Although China has made great achievements in the field of science and technology, and many technologies and industries have finished catching up and surpassing

the developed countries, some high-tech industries are still subject to the western developed countries. Overall, China is still a technology catching-up country and is in the stage of transformation from a technology catching-up country to a technology leading country [1]. In some key core technology areas of industry, China has obvious shortcomings and the problem of being “strangled”. This problem not only limits the sustainable development of related industries, but also affects the security and stability of China’s economic and social development.

Science and technology is the first productive force, is the decisive factor to solve the “neck” problem. All major breakthroughs in history have been achieved by human beings, and in today’s society, science and engineering teachers play an important role in it. Science and engineering teachers have an important responsibility in China’s socialist modernization construction, and their scientific and technological innovation behavior is the key to China’s scientific and technological progress [2].

Whether the science and engineering college teachers can play a role in the cause of science and technology innovation in China depends on their scientific and technological innovation ability on the one hand and their intention to innovate on the other. Intention as a subjective factor is easy to be underestimated or ignored, but actually plays an irreplaceable and important role. Intention is the inner driving force, the root and starting point of all practical human actions. The intention to innovate in science and technology directly affects the degree of teachers’ commitment to science and technology innovation and has an important impact on innovation behavior [3].

The improvement of the intention of science and technology innovation can not only promote the improvement of the individual teachers and the overall science and technology innovation performance of the universities, but also has a self-evident significance to the improvement of China’s scientific research career and even the comprehensive national power. In the critical stage of transformation, we should pay more attention to innovation construction, start from basic science and technology innovation, and strive to grasp the initiative in important science and technology fields. Therefore, it is an important task for China’s scientific research career to enhance the intention of science and technology innovation among teachers in science and technology universities.

2 Analysis of Constraints

In recent years, universities in China have taken measures in many aspects to promote the output of teachers’ scientific research, such as introducing high-end talents, adopting the employment system, and reforming the performance pay system. However, although the universities have made obvious progress in the quantity of scientific and technological innovation achievements, the influential high-level scientific and technological innovation achievements are still insufficient, and in general, the repetition is high and the quality is not satisfactory [4].

Scientific and technological innovation intention is one of the important factors influencing the science and technology innovation behavior of science and engineering college teachers, and the main constraints on the scientific and technological innovation intention of science and engineering college teachers in China are as follows.

2.1 Performance Assessment and Evaluation System Brings Pressure to College Teachers

There has always been a problem of emphasizing scientific research and neglecting teaching in China's higher education system, and nowadays, scientific research has become the primary task and approach for the development of colleges and universities and teachers' promotion. The number of topics and papers directly affects the evaluation and promotion of teachers' titles, which makes college teachers suffer from huge pressure of topics and the burden of papers [5]. Under the quantitative management mode, the work of college teachers is largely measured by quantitative rigid indicators only, but considering the characteristics of college teachers' labor, this assessment and evaluation system is not comprehensive, and the quality of scientific research achievements and breakthrough contributions made by science and engineering teachers in scientific and technological innovation are difficult to be measured by simple numerical indicators. Moreover, scientific and technological innovations are often generated based on internal motivations, such as the researcher's hobbies, curiosity, and the need for self-actualization. Passive research cannot generate sustained and stable motivation, and even if it can increase the number of science and innovation results, it is difficult to produce high-quality science and technology innovation results [2]. Faced with the pressure of their own career development, teachers in science and technology universities are forced to succumb to the performance evaluation system and unilaterally chase quantitative indicators, which are prone to burnout, and some of them even produce bad behaviors such as academic fraud and academic corruption under the heavy pressure of indicator assessment. In a word, for science and engineering teachers in colleges and universities, one-sided performance assessment and evaluation through rigid indicators will obscure their own enthusiasm and initiative, resulting in their subjective initiative of scientific and technological innovation being suppressed and their internal will and motivation playing a smaller and smaller role.

2.2 The Generalization of Utilitarian Thought into Collective Value Orientation

With the development of socialist market economy system, there is a tendency of "generalization of utilitarianism" in China's society in recent years, and the direct benefit is the criterion for judging the value of things. At this stage, many colleges and universities unilaterally pursue the quantity of scientific and creative achievements, but pay less attention to the really important academic quality. This utilitarian thought is contrary to the value orientation of colleges and universities themselves and distorts the value orientation of teaching and educating people in colleges and universities [6]. The generalization of utilitarian thought in colleges and universities, coupled with the influence of social utilitarianism trend, many science and engineering college teachers' enthusiasm for scientific and technological innovation has been affected, and they even no longer get down to scientific research, but turn to the career development path of ganging up and forming exclusive cliques to obtain resources unethically [5]. Facing the interests in real life, the subtle utilitarian ideological orientation discourages the motivation of science and engineering college teachers to engage in scientific and technological innovation, which is not conducive to the enhancement of their intention to scientific and technological innovation.

2.3 Excessive Administrative Intervention Leads to Teachers' Insufficient Sense of Belonging and Identity to Colleges and Universities

The innovation behavior of science and engineering college teachers is influenced by the organizational environment including the fairness of reward and promotion, team atmosphere and other factors [3]. Under the framework of today's Chinese university management system, managers and administrations of universities hold the power to deploy resources, which may breed bureaucratism questions if there is a lack of supervision and restriction. In the process of reward and promotion, higher-level administrators may give priority to teachers who have a closer relationship with them [7]. For excellent teachers who focus on teaching and research, this phenomenon will weaken their sense of belonging and identity to their universities. At the same time, the administrative power squeezes the space of academic power within the university, which is not conducive to the establishment of close relationships among teachers and destroys the unity of teachers. This will discourage the research enthusiasm and creativity of university teachers and negatively affect the scientific and technological innovation intention of science and technology university teachers.

3 Countermeasure Research

3.1 Reform the Performance Assessment and Evaluation System

Firstly, it is necessary to reform the current performance appraisal and evaluation system of our colleges and universities, and change the previous path and pattern of benefit distribution in colleges and universities. It is necessary to promote the deepening of the reform of performance salary incentive mechanism by combining the opinions of the majority of college teachers' groups, and promote the scientific and rationalization of the salary distribution system of science and engineering college teachers, so that it can adapt to the new requirements in the field of science and innovation in today's colleges and universities [8].

The criteria of the performance assessment and evaluation system of our universities should be more flexible and more comprehensive in terms of performance evaluation. In terms of the content of assessment and evaluation, universities should consider various aspects such as teachers' working status, degree of commitment, and third-party performance evaluation, and should not be limited to the quantitative indicators of teachers' scientific research achievements. As for the methods of assessment and evaluation, qualitative and quantitative methods should be combined. Qualitative assessment and evaluation include science and engineering teachers' intention to innovate and their working attitude, while quantitative assessment and evaluation focus more on the quantity and quality of science and technology innovation results of science and engineering teachers. Combining qualitative and quantitative assessment and evaluation, the comprehensive evaluation of science and engineering teachers is used as the basis for evaluating teachers' titles, teachers' promotion and allocating performance salary, so as to strengthen the incentive effect on the scientific and technological innovation intention of science and engineering college teachers.

As far as the basic performance salary is concerned, colleges and universities should adjust and optimize the structure of basic performance salary according to the value created by teachers in their positions and in their doing in science and technology innovation. Science and engineering college teachers should get the opportunity to adjust their salaries every year, and provide teachers with strong scientific and creative ability and intention to create science and technology with the opportunity to get more performance salary.

3.2 Promote the Construction of Faculty Teams and Build High-Quality Faculty Teams

A faculty team is a collection of innovative and specialized talents in a university. In a science and engineering faculty team, each team member may come from different research directions and different levels, but the team members can exchange information and ideas among themselves, helping each other to cooperate as well as competing actively to promote the progress of the team's overall science and technology innovation quality and ability [9]. Science and engineering faculty teams are conducive to mobilizing the enthusiasm and initiative of team members in science and technology innovation and promoting the intention of teachers in the group to innovate in science and technology.

In view of this, colleges and universities should strive to build high-quality, high-efficiency and well-communicated science and technology faculty teams. Firstly, universities should optimize the construction of teachers' team, improve the structure of the team, introduce and select high-quality and capable members from multiple channels, gather innovative talents, continuously inject "intellectual water" into the teachers' team, and enhance the innovation vitality of the team.

Secondly, colleges and universities should provide science and engineering teachers' teams with sufficient investment in scientific research funds and scientific research resources. The conditions of scientific research hardware and facilities in colleges and universities directly affect the scope and ability of science and innovation of science and engineering teachers' teams, so the investment in scientific research equipment and infrastructure is essential. In terms of scientific research resources, on the one hand, universities should regularly guide science and engineering teachers to participate in cutting-edge research activities in academic fields, and on the other hand, they should strengthen the joint cooperation with enterprises and institutions in related fields to promote the organic combination of "industry-university-research" and create necessary platforms for teachers' scientific research activities. In this process, the team of science and engineering teachers should give full play to the effect of stimulating innovation and promoting teachers to improve scientific research.

At the same time, we should create a good environment for team communication and cooperation. Universities should improve the information exchange mechanism of teachers' teams, build information platforms, construct resource sharing networks, provide more communication opportunities for teachers, and guarantee the smooth communication among team members. In the team cooperation, multi-dimensional and deep information exchange is realized to give full play to the team clustering effect, tap the innovative development potential of college teachers and deepen the development of innovative thinking of team teachers.

Finally, the assessment and incentive mechanism of the teacher team should be established and improved. It is necessary to integrate teachers' personal professional growth into the development and progress of the teachers' team, comprehensively examine the diversified roles played by teachers in the team's scientific and technological innovation achievements, and motivate teachers at different levels such as material and spiritual, so as to mobilize the enthusiasm of science and engineering teachers to participate in team scientific and technological innovation from various aspects.

3.3 Enhance the Sense of Self-worth of Science and Engineering Teachers in Their Career

The self-worth of university teachers is positively correlated with their intention to engage in scientific and technological innovation and teaching innovation, while it is significantly negatively correlated with their burnout [10]. Therefore, colleges and universities should first encourage science and engineering teachers to carry out scientific and technological innovation, such as encouraging teachers to publish their innovation results and giving material rewards or spiritual commendations to teachers who have achieved important scientific and technological innovation results, so as to promote teachers' professional self-confidence and thus enhance their sense of identity and satisfaction from their own profession.

Meanwhile, universities should create an innovative atmosphere to avoid burnout of science and engineering teachers. The environmental factors will affect the ideological perception of the individuals in it, thus affecting their inner motivation and eventually their realistic behavior. Under the influence of the innovation atmosphere, teachers will have a stronger motivation and higher sense of self-worth, and they will be more willing and motivated to carry out science and technology innovation.

Colleges and universities should also pay attention to the humanistic care for science and engineering teachers. Universities should pay enough attention to the physical and mental health of science and engineering teachers. For teachers with high work and life pressure, colleges and universities should adopt psychological guidance and other means to help them relieve the pressure, and give material care and spiritual comfort at the same time. We should respect the individual differences of different teachers, and help them solve their worries and troubles in work and life in a gentle manner, so as to help them resolve their self-contradictions and enhance their sense of self-worth, and finally promote the improvement of scientific and technological innovation intention of science and engineering teachers.

3.4 Enhance the Sense of Belonging and Identity of Science and Engineering Teachers to Their Colleges and Universities

The sense of belonging and identity of college teachers to their colleges and universities will directly affect their motivation to participate in science and technology innovation activities [11]. Science and engineering teachers who have a high sense of belonging and identification with the university are more willing to participate in the activities of the university and take more responsibilities in research and teaching. Colleges and universities can promote science and engineering teachers to understand the development

history, current planning layout of disciplines and development prospect of the university by means of school history education, so that teachers can understand, identify with and love their universities more and help them integrate into the collective actively. At the same time, the publicity of advanced figures and deeds of colleges and universities can help promote science and engineering teachers to improve their ideological and moral cultivation and strengthen their awareness of scientific research responsibility.

College administrators should change their concepts and turn management into service. Science and engineering teachers should be encouraged to participate in the management of the university, and when formulating various comprehensive management systems, full discussions should be held on the basis of active participation of teachers, and the design and formulation of the system should be combined with the opinions of teachers' groups from different levels. It is necessary to make teachers feel that they are valued and trusted in the public affairs of the school, deepen their understanding of the university management system, generate a sense of identification with the system as well as a sense of responsibility to comply with and maintain the system, and maximize the incentive effect of the system on the creative wishes of science and technology university teachers.

4 Conclusions

Scientific and technological innovation intention is the subjective condition for science and engineering college teachers to realize themselves and achieve the unity of personal value and social value. As the main force to cultivate high-level scientific and technological talents in the country, colleges and universities should play the role of incentive, accumulate and summarize experience, fully mobilize scientific and technological innovation intention of science and engineering college teachers, and strive to cultivate innovative talents who can take up the great responsibility of national rejuvenation.

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