

Policy on Developing Human Resources in Science and Technology in Hai Phong City, Vietnam

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Abstract: Developing human resources for science and technology in Hai Phong City has contributed to making Hai Phong an economic bright spot in Vietnam. The Hai Phong city government has made efforts to issue many policies such as improving the education system, implementing a project to attract high-quality human resources, and increasing budget investment for research and application of science and technology. People in the city have actively and voluntarily studied to improve their qualifications. However, the quantity and quality of human resources for science and technology in Hai Phong City are still modest, not meeting the city's development potential. The city government needs to continue to build a comprehensive strategy for developing and planning human resources for science and technology; have policies to attract human resources for science and technology to live and work in Hai Phong city; need to encourage people to study, lifelong learning to increase the city's human resources for science and technology.

Keywords: Human resources, science and technology, policy, Vietnam, development

1. INTRODUCTION

Human resources in science and technology are an essential factor in each country's economic and social growth and development. Human resources in science and technology are not only the resources used and control other resources throughout the social production process, but now, facing the great achievements of the fourth industrial revolution, human resources in science and technology are also the foundation for countries to innovate, create, and transform digitally (Dung, 2021).

Asian countries with outstanding investment in developing human resources in science and technology include China. China not only invests in education (funds for human resources account for up to 15% of GDP) but also issues many policies to attract, nurture, and promote human resources in science and technology (China has issued more than 220 policies on human resources in science and technology from 2013 to 2021). Other countries in the world also invest in developing human resources in science and technology, such as Singapore.

Vietnam is gradually asserting its position on the world economic map with many remarkable achievements. According to CEBR's ranking, in 2023, Vietnam will become the 34th largest economy in the world, and it is expected that in 2039, Vietnam's economy will rank 25th. Identifying breakthroughs in science and technology development, innovation, and national digital transformation as the golden key to help Vietnam escape the middle-income trap, towards a strong and prosperous Vietnam, localities have been making great efforts to carry out tasks and solutions to effectively use resources, including science and technology human resources (Chi & Tien, 2024). Science and technology human resources include individuals who meet one of the following requirements: (i) have graduated from university and college and work in a science and technology field; (ii) have graduated from university and college, but do not work in any science and technology field; (iii) have not

graduated from university or college, but work in a field of science and technology requiring equivalent qualifications.

According to Decision No. 2395/QĐ-TTg, dated December 25, 2015, of the Prime Minister approving the Project on training and fostering human resources for science and technology domestically and internationally using the state budget. The subjects of the Project include individuals engaged in science and technology activities and human resources for science and technology management of ministries, branches, localities, science and technology organizations, and enterprises in Vietnam.

According to the Law on Science and Technology, scientific and technological activities are defined as scientific research, experimental research and development, technology development, technology application, scientific and technological services, promotion of initiatives, and other creative activities aimed at developing science and technology. Individuals engaged in science and technology activities are those who carry out scientific and technological activities.

Thus, science and technology human resources are those who carry out scientific research and management activities, experimental research and development, technology development, technology application, science and technology services, and promote initiatives and other creative activities to develop science and technology. Science and technology human resources include university and college graduates and non-university graduates working in the field of science and technology. Developing science and technology human resources is an increase in both the quantity and quality of this human resource (Ha & Thuan, 2024).

In recent times, Hai Phong has become a bright spot in the Vietnamese economy. It remains in the group of localities with the fastest growth and development rates in the country; it is one of the cities attracting the largest foreign direct investment in the country. Hai Phong, with its advantages in natural conditions and outstanding achievements in economic and social development, has affirmed its position as the economic locomotive of the Northern Coast region as well as the whole country. Identifying opportunities and challenges in the new era, Hai Phong City has actively implemented central regulations on the development of science and technology human resources while creating an environment to attract and facilitate the development and innovation of science and technology human resources. The development of science and technology human resources in Hai Phong city in recent times has achieved many remarkable achievements (Hoang, 2025). Hai Phong city government has issued many policies to encourage education, select investment projects associated with science and technology, and attract and reward science and technology human resources.

Hai Phong is a locality with the highest rate of trained labor in the country. However, the development of science and technology human resources in Hai Phong currently still has some shortcomings, such as the number of leading experts in science and technology fields is still modest; some research and inventions carried out by science and technology human resources have not demonstrated wide applicability. Researching and developing science and technology human resources in Hai Phong city, thereby proposing solutions to increase the quantity and quality of this human resource in the context of national digital transformation and the fourth industrial revolution, is meaningful in both theoretical and practical aspects.

2. RESEARCH METHODOLOGY

The study starts from the content of developing human resources for science and technology in Hai Phong city to analyzing the current status of human resource development. Based on the current status and factors affecting the development of human resources for science and technology in Hai Phong City, the article proposes solutions to continue developing the city's human resources for science and technology. The research logic is shown in Diagram 1.

To carry out the research tasks, the article uses qualitative research methods with a specific approach. Primary data is collected through in-depth interviews with experts who are scientists researching human resources for science and technology, and managers of human resources for science and technology in Hai Phong city. Secondary data is collected from official sources including documents of the Communist Party of Vietnam; Government, Hai Phong City Government; documents and reports from science and technology organizations in Hai Phong city.

From the collected data, the article uses the methodology of dialectical materialism and historical materialism, combining the use of many other methods such as: synthesis, analysis, statistics, and comparison.

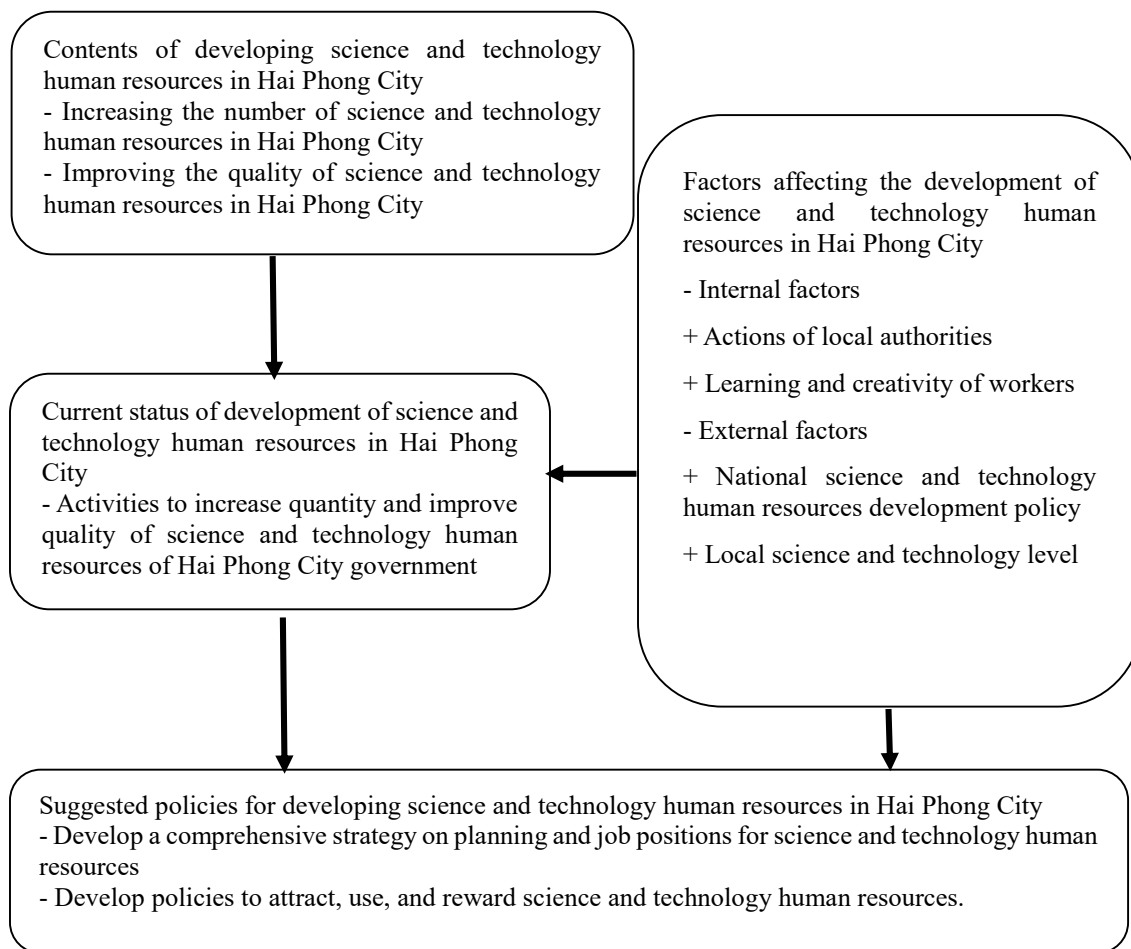


Figure 1. Sequence of research steps

3. RESULTS AND DISCUSSION

3.1. Current Status of Science and Technology Human Resource Development in Hai Phong City

3.1.1. Structure and scale of science and technology human resources in Hai Phong

HaiPhong is a national-level type I urban area with a population of over 2.1 million people. The labor force aged 15 and over in Hai Phong City is currently 1,020,200 people. With many creative policies and actions, from 2015 to the present, Hai Phong has been one of the localities with the highest rate of trained workers in the country, and the rate is continuously increasing. In the period 2019 - 2023, the rate of trained workers in Hai Phong City increased from 31.44% to 38%, while in 2023, the rate of trained workers nationwide only accounted for 27%. The high proportion of trained labor force in Hai Phong is one of the advantages for the city to develop and attract science and technology human resources, because science and technology human resources who want to research, develop, and apply ideas and innovations need an environment and a common ground of qualified labor force to quickly grasp, absorb, and even develop those ideas and innovations.

Currently, in terms of scale, the number of science and technology workers in Hai Phong City is 9,676 people, accounting for 0.9% of the total number of workers aged 15 and over. The scale of science and technology human resources in the city has increased significantly from 2018 to the present. In 2018, the total number of professional, scientific, and technological personnel in Hai Phong was only 6,617 people; in 2022, it increased to 8,804 (an increase of 33.05%); in 2023, it increased by nearly 10% compared to 2022. Although this result has shown the efforts of the Hai Phong city government in increasing the city's scientific and technological workforce, this rate is still relatively modest compared

to other centrally-run cities such as Hanoi, Ho Chi Minh City, and Da Nang. The rate of professional, scientific, and technological personnel in Da Nang City is relatively high, and the growth rate is also faster than that of Hai Phong City. Specifically, in 2018, Da Nang city had 1.14% of workers in the field of professional, scientific and technological activities, in 2022, this rate was 1.28%, while the highest rate of workers in professional, scientific and technological activities in Hai Phong city was only 0.9% of the total number of workers in the city.

3.1.2. Activities to increase the number of science and technology human resources in Hai Phong city today

Increase the number of science and technology human resources with college degrees or higher

The number of science and technology human resources with college and university degrees or higher working at science and technology organizations in Hai Phong City has increased continuously from 2008 to the present. Compared to 2008, in 2023, the number of science and technology human resources in Hai Phong increased by 23.7%, the number of people with PhD and science doctoral degrees increased the fastest, up 200%, the number of people with master's degrees increased by 160.14%, the number of people with university and college degrees decreased by 34.8%. The increase in the number of human resources with PhD, science doctoral degrees, and master's degrees is a positive result in the implementation of support policies and attracting highly qualified science and technology human resources in Hai Phong city.

The Hai Phong City Government has had many policies to support and encourage the increase of the number of science and technology human resources. With the current number of science and technology organizations and standard laboratories, science and technology human resources with high professional qualifications, PhD degrees, Associate Professor and Professor titles in the city are relatively high. The number of PhDs, Associate Professors, and Professors in Hai Phong City is mainly concentrated in several universities and local research institutes, central agencies operating in Hai Phong City. Specifically, Vietnam Maritime University currently has 891 staff, including 225 PhDs, 47 professors and associate professors, and 495 masters. Every year, the Maritime University has about 3,000 students from various training systems graduating. Vietnam Maritime University is also a training institution for human resources with professions suitable for the city's socio-economic development characteristics, such as logistics, marine economy, ship control and exploitation, and maritime management.

Hai Phong University is one of the training and research institutions providing Hai Phong city with a relatively high number of scientific and technological human resources. This is a relatively large workforce, which can participate in the city's scientific and technological human resources. Currently, the school has 09 associate professors and 103 PhDs. Hai Phong Medical University has 92 PhDs and specialist doctors II. In addition, research institutes such as the Institute of Marine Research and the Institute of Marine Resources and Environment are also units contributing to the scientific and technological human resources.

The Hai Phong city government always pays attention to and creates conditions to promote the development of scientific and technological organizations, especially at major universities in the city. The City People's Council issued Resolution No. 20/2024/NQ-HDND, dated December 6, 2024, on policies to support training and attract highly qualified lecturers for Hai Phong University from 2025 to 2030. Accordingly, to attract and increase the number of highly qualified lecturers who are also science and technology human resources for Hai Phong city, the city budget will support cadres and lecturers who meet the standards of Professor, Associate Professor, and have a doctorate.

Increase the number of science and technology human resources in the non-public sector

The science and technology human resources who have not graduated from university and work in the field of science and technology in Hai Phong city have a relatively high rate. These workers work scattered in enterprises in economic zones and industrial parks in Hai Phong city and are mainly workers in the engineering and manufacturing sectors. The decrease in the number of university-educated workers in Hai Phong City can be explained by the increased demand for skilled workers in industrial zones in the city. At the same time, the Hai Phong city government has had career guidance activities and policies to support vocational and intermediate training for workers in the city.

In 2021, vocational training institutions in the city have applied the tuition fee management regulations in Decree No. 81/2021/ND-CP dated August 27, 2021 of the Government on the mechanism of

collecting and managing tuition fees for educational institutions in the national education system and policies on tuition exemption and reduction, support for learning costs, and service prices in the field of education and training. Currently, the total number of workers in science and technology in the city is 9,676 people, accounting for 0.9% of the total number of workers aged 15 and over. The number of workers with college degrees or higher is 4,083 people, and the number of workers in science and technology without university or college degrees in Hai Phong accounts for more than 50% of the city's science and technology workers. Issuing policies to support vocational training and increase the number of skilled workers in Hai Phong is necessary in the new context.

3.1.3. Activities to improve the quality of science and technology human resources of Hai Phong City Government

From 2015 to present, Hai Phong City Government has had many policies and activities to improve the quality of science and technology human resources such as investing in improving the education system, investing in scientific research activities, and implementing the application of science and technology research.

Investing in improving the education system

To prepare and increase the number of science and technology human resources in the future, Hai Phong City Government has invested relatively large amounts in the national education system in the area. Hai Phong City is one of the pioneering localities to support tuition fees for 100% of students in public schools at all levels, building the foundations and lessons learned for the central government to research and implement this activity nationwide. Since 2019, the Hai Phong City People's Council has issued Resolution No. 54/2019/HĐND dated December 9, 2019, on tuition support policy for students from preschool to high school in Hai Phong City. Since the 2020 school year, the City People's Council has issued Resolutions every year to continue supporting public school students, with the city budget spending over 300 billion VND each year. Currently, in Hai Phong, the rate of 5-year-old children going to school is 99.9%, the rate of 5-year-old children completing preschool education is 99.81%, the rate of 6-year-old children entering grade 1 is 99.98%, the rate of 11-year-old children completing primary school is 98.46%; The rate of adolescents aged 15-18 who are studying high school education or continuing education or vocational education is 97.51%. These are positive results showing the efforts of the Hai Phong City government in improving the city's education system.

By 2024, the Standing Committee of the City Party Committee issued Resolution No. 14-NQ/TU dated May 13, 2024 on innovation and improvement of the quality of vocational education in Hai Phong City by 2030, with a vision to 2045, in which it directed the review and development of specific policies of the city to create breakthrough changes in vocational education, attract enrollment for college and intermediate training, create highly skilled human resources, meet the needs of the labor market and industrial parks. The City People's Council continued to issue Resolution No. 03/2024/NQ-HĐND, dated July 19, 2024, stipulating policies to support training in several occupations in Hai Phong City for the period 2024 - 2030.

Hai Phong is a locality that pays bonuses to students with excellent academic achievements among the highest in the country. The City People's Committee pays attention to and implements student reward activities every year. Implementing Resolution No. 06/2018/NQ-HĐND dated July 12, 2018 of the Hai Phong City People's Council on regulations on policies and mechanisms in detecting, training and fostering excellent students; To select, employ and reward excellent teachers in the field of training and fostering excellent national and international students in Hai Phong city, the People's Committee of the city has applied the maximum spending levels according to the provisions of Joint Circular No. 66/2012/TTLT-BTC-BGDDT dated April 26, 2012 of the Ministry of Finance - Ministry of Education and Training guiding on the content, spending levels, financial management work to build a test bank, organize general exams, prepare to participate in international and regional Olympic competitions.

Each year, Hai Phong City spends about more than 2 billion VND to reward students with high achievements in international and regional Olympic competitions. In the 2024 school year, the spending on rewards for students with high achievements in international, regional, and national Olympic competitions in Hai Phong City is up to 7.8 billion VND; the total spending on activities to foster excellent students and hire teaching experts is more than 28 billion VND.

Investment in research and application of science and technology

From 2013 to 2022, Hai Phong City promoted projects, programs, and research and application of science and technology to find directions and solutions for the city's development, and at the same time, it was an opportunity for the city's science and technology human resources to improve their research and application capacity. During this period, the city approved and implemented 205 city-level science and technology tasks in areas such as social sciences and humanities, environmental resources, agriculture, and application projects. The budget for implementing the project was VND 257,473,016,000, of which the science and technology career budget supported VND 156,502,394,000 (accounting for 60.8%). The mobilized budget of the organization, the unit in charge of implementing the task, and other funding sources is 100,970,622,000 VND (accounting for 39.2%).

In addition, science and technology organizations in the city have also actively implemented research topics and projects at the ministerial and national levels. For example, in 5 years (2020 - 2024), Vietnam Maritime University has implemented 02 state-level topics, 65 ministerial and city-level topics, 410 articles published in international journals, and 117 articles published in international conference and seminar proceedings. Science and technology organizations have also proactively implemented grassroots scientific research tasks (3,500 tasks). The research, topics, and projects implemented have been applied to production and life, developing production and business, creating jobs for workers, increasing productivity and product quality, and meeting market demands.

Currently, in Hai Phong City, there are 52 science and technology organizations, including organizations in the public and non-public sectors. The number of laboratories and testing facilities operating with the national standard VILAS (ISO/IEC17025) in Hai Phong is 38 (nearly 3 times higher than in 2013). Investing in developing laboratories and testing facilities with national standards is an important condition for the city's science and technology human resources to continue researching and developing ideas and projects for widespread application in production, business, and daily life.

3.2. General Assessment

Achievements in developing science and technology human resources in Hai Phong

In recent times, the Hai Phong city government has made great efforts to increase the quantity and improve the quality of science and technology human resources in the city. Hai Phong is one of the leading localities in investing in education and implementing policies to support the development of science and technology human resources. Currently, the quantity and quality of science and technology human resources have improved significantly, contributing to promoting the socio-economic development of the city and the country.

The income of workers working in science and technology has increased rapidly and is higher than that of many workers in other economic sectors, contributing to increasing the GRDP of Hai Phong city and also demonstrating the efficiency of this group's labor. The high rate of trained workers and the increase in quantity and quality of science and technology human resources are some of the key driving forces helping Hai Phong City improve its competitiveness in many aspects, such as the provincial competitiveness index and capacity to attract foreign direct investment (FDI). On the other hand, the city's total factor productivity (TFP) has also been significantly improved, and many projects and initiatives have been widely applied in production and business, contributing to creating added value for production facilities, enterprises, and the city's economy in general.

Along with the efforts of the city government, it is also necessary to mention the favorable conditions for the science and technology human resources of Hai Phong city to achieve the above achievements: central policies and the creative and self-reliant capacity of science and technology human resources in the city. In addition to the general regulations on the policy of developing science and technology human resources nationwide, the Central Government also issued specific policies for Hai Phong city, especially Resolution No. 45-NQ/TW dated January 24, 2019 of the Politburo on building and developing Hai Phong city to 2030, with a vision to 2045. This is both an opportunity and a challenge, but also a pressure for the government and people of Hai Phong city to make a breakthrough, actively develop science and technology human resources, and digitally transform the city in all fields. The high rate of trained workers and the increase in the number of science and technology human resources in Hai Phong must also take into account the creativity and eagerness to learn of the workforce in the city. The achievements in the rate of universal education, the rate of trained workers, and the workforce with

university degrees demonstrate the spirit of learning and meeting the requirements of the people in Hai Phong City.

Limitations in developing human resources for science and technology in Hai Phong

In addition to the achievements, the development of human resources for science and technology in the city also has some limitations.

The number of human resources for science and technology in Hai Phong is still limited compared to localities with similar socioeconomic conditions and positions. The proportion of human resources for science and technology with university or college degrees or higher compared to the total number of workers working in professional and scientific and technological activities is still modest. The number of Ph. D.s, associate professors, and professors in the total number of human resources for science and technology in particular and the total number of more than 1 million workers in Hai Phong in general is still small.

The number of highly qualified human resources for science and technology mainly works at 03 universities and colleges in the city (accounting for 72.3%), and the number of human resources for science and technology in local and central science and technology organizations accounts for 28.7%. Of the science and technology human resources with post-graduate degrees in the field of science and technology, only 40% are available [8]. This number is still quite low compared to the expectations and development goals of the city in the coming time.

The quality of science and technology human resources in Hai Phong has significantly improved since 2015. However, research, ideas, and inventions are still mainly in the fields of research, and the application and creation of added values are not yet commensurate with the city's investment budget. Currently, Vietnam, in general and localities in particular, are actively competing with countries in the region and the world through the number of international articles in prestigious journals around the world. In Hai Phong, the number of these articles has increased, but compared to the number of science and technology human resources in Hai Phong, the number of articles published in prestigious journals is not commensurate with the potential.

Although the city government has policies and mechanisms for developing human resources in science and technology, currently, the attraction and treatment of talents and human resources in science and technology has not been implemented on a city-wide scale but is only implemented in a project for Hai Phong University. According to the results of in-depth interviews with several science and technology management experts in Hai Phong city, at many public science and technology organizations, the city has not had a satisfactory policy to attract, treat, and improve the qualifications and quality of human resources in science and technology.

Although the Hai Phong city government has made efforts to design an environment for human resources in science and technology to develop, such as digital transformation and development of high-tech application fields, city-level science and technology research is still stuck in administrative procedures and has not promoted connections with businesses to exploit and use research results.

The learning spirit of the people and workers of Hai Phong City in recent times is noteworthy. However, in technical sectors, FDI enterprises and large domestic enterprises investing in Hai Phong still need to spend on retraining costs because human resources do not meet requirements.

3.3. Some Suggestions for Policies on Developing Science And Technology Human Resources In Hai Phong City in The Coming Time

First, develop a comprehensive strategy on planning and job positions for science and technology human resources in the city

Hai Phong city government needs to review and re-evaluate current mechanisms and policies on developing science and technology human resources and implement plans for developing science and technology human resources for each organization and job position in the coming time, especially after Hai Phong merges with localities according to regulations (Pham & Dung, 2022). Hai Phong City needs to develop a comprehensive policy on developing science and technology human resources, such as surveying needs (especially business needs) in 5-year and 10-year periods to have a roadmap for developing science and technology human resources.

It is necessary to complete and supplement to have a science and technology human resources structure suitable to the city's strengths, socio-economic development situation, and science and technology human resources needs (Sparkman, 2015). Currently, the rate of highly qualified science and technology human resources is still modest, so there needs to be a policy mechanism to develop this human resource through increasing investment and financial support for the city's science and technology human resources to study and improve their qualifications (Tung & Van Tri, 2023). On the other hand, Hai Phong has identified the high-tech industry as one of the three pillars of the city's development, so it is necessary to supplement science and technology human resources in engineering and high-tech sectors, supplement science and technology human resources in basic research sectors, and increase investment in applied topics (Tri, 2023).

For administrative activities in science and technology research, it is necessary to shorten the time and implementation procedures so that science and technology research at all levels has quality and saves more time and costs (Thao, 2022). Promote digital application in carrying out administrative procedures in science and technology research; Seriously implement Resolution No. 57-NQ/TW dated December 22, 2024 of the Politburo on breakthroughs in science and technology development, innovation and national digital transformation in granting financial autonomy to science and technology organizations.

In addition to support mechanisms, the city also needs to handle ineffective science and technology research activities with signs of violations, turning science and technology research and application activities into activities that truly bring benefits, efficiency, and value to the city's development.

Second, there needs to be a more drastic policy to attract and reward science and technology human resources. Hai Phong City should have a policy to attract and reward science and technology human resources on a larger scale instead of just implementing the project at Hai Phong University. Other science and technology organizations also need to be concerned and attract science and technology human resources to have a large and quality team. Hai Phong City needs to soon study the invitation of leading experts in the fields of science and technology from home and abroad to work in the city with appropriate financial support (Tien & Anh, 2019). In addition, it is necessary to create a modern environment for science and technology human resources to conduct research and widely apply their research. The policy of attracting science and technology human resources must go hand in hand with the development of open mechanisms, connecting the city government with businesses so that the transfer of research results takes place practically and effectively. If the connection with businesses takes place widely and substantially, businesses will have to pay for the research results of the city's science and technology human resources. This will both help reduce the city's budget expenditure and ensure benefits for the science and technology human resources (Tri & Van Thanh, 2022).

Third, it is necessary to continue investing in developing the education system and promoting the spirit of self-study and lifelong learning of the people in Hai Phong city. Faced with opportunities and challenges in the increasingly fierce competition between countries and localities in science and technology, the core factor for Hai Phong to continue to break through and take off is to build awareness and the spirit of self-study and lifelong learning among the people. The Hai Phong City government needs to include in the education program career orientation activities, activities that arouse pride and the spirit of wanting to contribute and dedicate to the development of the city and the country (Van, 2017). To do this, the participation of the entire city's political system is needed, and the educational factor of family tradition is important.

4. CONCLUSION

Developing science and technology human resources has become one of the decisive factors for the development of Hai Phong City. Given the achievements as well as the difficulties and limitations in developing science and technology human resources in the city in recent times, the Hai Phong city government is facing a choice of development policies in the context of limited resources of the city. The city needs high-quality science and technology human resources, especially those with doctoral degrees. Focusing on developing economic zones and industrial parks, the city requires several science and technology human resources with vocational and intermediate qualifications in the technical field. If both of these labor forces are ensured at the same time, Hai Phong's investment will be dispersed and may be ineffective. Therefore, the city government needs a roadmap and development stages for each key program so that it is truly suitable for the city's potential, business needs, research and application needs in the digital age.

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