

The Impact of National Science and Technology Program for the 2016-2020 period on the Fundamental and Comprehensive Reform of Vietnam's Education

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Abstract

In the process of presiding over the implementation of the National Science and Technology program for the 2016-2020 period: "Research and development of educational science to meet the requirements of fundamental and comprehensive innovation of education in Vietnam", the Ministry of Education and Training has conducted four stages of appraisal evaluation, mid-term evaluation, final evaluation and impact evaluation. This research focuses on determining the actual impact/effectiveness of the program at the time of ending, by analyzing the difference between the results before and after applying the research results of the program of the same group of subjects. The findings have proven that the KHGD/16-20 program has improved the quality and effectiveness of educational scientific research, contributing to answering theoretical and practical issues raised in the process of fundamental and comprehensive innovation of education in Vietnam. At the same time, it also points out some inadequacies and limitations in managing and implementing the program.

Keywords: *Science and Technology Program; Assessment of the Educational Science Program; Evaluation of the impact of the Program.*

1. Introduction

On November 4, 2013, the Central Executive Committee issued Resolution No. 29-NQ/TW on fundamental and comprehensive innovation in Education and Training (Resolution 29) with the overall goal: Create fundamental changes in the quality and effectiveness of education and training; increasingly meet the construction and defense of the Fatherland and the learning needs of the people. Educate Vietnamese people to develop comprehensively and best promote the potential and creativity of each individual; love family, love Fatherland, love fellow citizens; live well and work effectively. Build an open education, with reasonable educational structures and methods, associated with building a learning society; ensure conditions for improving quality; standardization, modernization, democratization, socialization and international integration. Strive for the target that by 2030, education in Vietnam will reach an advanced level in the region. The resolution also clearly stated that one of the nine tasks and solutions is "Pay attention to research in educational science and management science, focus on investing in improving the capacity, quality, and operational efficiency of the national educational science research agency. Improve the quality of researchers and educational experts. Implement the national research program on educational science".

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To implement the above requirement, the Minister of Science and Technology (S&T) issued Decision No. 888/QĐ-BKHHCN dated May 4, 2015 approving the National Science and Technology Program for the 2016-2020 period “Research and development of educational science to meet the requirements of fundamental and comprehensive innovation of education in Vietnam” (code KHGD/16-20), with the goal of “Improving the quality and effectiveness of educational scientific research, contributing to answering theoretical and practical issues raised in the process of fundamental and comprehensive innovation of education and training in Vietnam”.

According to IAIA (International Association for Impact evaluation) , impact evaluation is the process of determining the actual or future effectiveness of a program that has been, is being, or is expected to be implemented; “impact” is the difference between what would happen if the activity was done or not. According to Gertler, Paul J (2016), impact evaluation is a type of evaluation to answer the questions: What is the impact (or causal influence) of a program on the desired outcome? If there is no program, what will happen to the beneficiaries? Therefore, according to Dina Pomeranz (2011), to evaluate the impact of the program, it is necessary to determine a hypothetical situation "if there was no program", called the counterfactual: compare the results between the control group (those who do not participate in the program) and the beneficiary group (those who participate in the program).

The Ministry of Education and Training has presided over the implementation of the KHGD/16-20 program since 2017 and will complete it by 2022. The program's impact evaluation aims to determine the actual effectiveness of the program immediately after it has been successfully accepted. This article is the research result of the Ministry-level Science and Technology project, code B2022-BKG21 "Scientific basis of proposed research directions on science and education in Vietnam for the 2021-2030 period".

2. Overview of research on impact evaluation of science and technology programs

2.1. International experience

In China, the National Center of Science and Technology Evaluation (NCSTE) is assigned to evaluate government-funded programs. In 2001, NCSTE issued "Science and Technology Evaluation Standards" including three components: (i) Principles, ethical codes and evaluation terminology; (ii) Processes, obligations and rights of relevant parties; and (iii) Commitment to independence, objectivity, and fairness. NCSTE conducted an evaluation: High technology research and development program - Program 863 for the 1986-2001 period; Basic research program 973; National intellectual property strategy; National science and technology innovation policy; etc (Ta Doan Trinh 2010, Tian Delu 2010, and Pan Luo 2007).

Korea enacted the Law on Science and Technology Reform in 1997, and the Korea Institute of S&T Evaluation and Planning (KISTEP) conducted “investigation, analysis, and evaluation” of national R&D programs. Each program is evaluated according to three groups of criteria (Effectiveness, Management efficiency, Program outcomes) and ranked according to the percentage of total criteria archived: A (> 90%); B (70-90%); C (30-70%); D (10-30%) and E (70%); Medium (30-70%); Poor (<30%) (Ha and Anh 2020).

The United States has deployed a toolkit to evaluate the effectiveness/impact of federal programs (PART - Program Assessment Rating Tool), including 25 questions divided into 4 groups, weighted: Program goals and design (5 questions, weighted 20%); Strategic plan (8 questions, weighted 10%); Program management (7 questions, weighted 20%); and Program results (5 questions, weighted 50%). During the 2002-2008 period, the Office of Management and Budget used PART to evaluate about 1,000 federal programs according to the following levels: Effective (85-100 points), Fairly effective (70-84

points), Satisfactory (50-69 points) and Not effective (0-49 points) (Office of Management and Budget 2007; John B. Gilmour 2007; and GPRA modernization act of 2010).

In the UK, evaluation of the impact of the program is carried out according to the following steps: Identify goals and expected results; identify customer; identify research goals and problems; choose an evaluation approach; determine data requirements; determine required resources; conduct evaluation and use evaluation results. They use a number of methods to identify control groups (such as randomized trials, regression discontinuity, etc.) and evaluate economic efficiency (such as CEA Cost-Effectiveness analysis, CBA Cost-Benefit analysis) (HM Treasury 2011, 2013).

The European Commission provides criteria for evaluating the potential impact of the program including: Quantity and quality of jobs, consumers, small and medium enterprises, technological development and innovation, international trade and cross-border investment; Investment costs, operating costs, enterprise products and services, macroeconomics, public administration, and national development (Pham Quynh Anh 2016).

In summary, for the above countries, evaluation of the impact of science and technology programs is mandatory according to the Science and Technology Codes, which focuses on determining the cause and effect relationship after the intervention of the program. To measure the impact of the program, compare the program's beneficiary group with the control group to clarify: What would happen to the program's beneficiaries if there was no intervention from the program?

2.2. Vietnam's experience

In the Law on Science and Technology 2000 and the Law on Science and Technology 2013, the issues of selection, evaluation, and acceptance of the results of implementing science and technology tasks are mentioned. Therefore, science and technology management agencies of Ministries and Branches have carried out input evaluation activities (determining tasks, selecting leading organizations and individuals), mid-term evaluation and acceptance of science and technology tasks/programs. However, impact/effectiveness evaluation has hardly been done.

Since 2013, the Vietnam Centre for Science and Technology Evaluation under the Ministry of Science and Technology has been assigned the task of researching the methodology to evaluate the effectiveness and impact of science and technology programs (Oanh, 2012), the Centre has tested: Evaluating the effectiveness of applying the results of the project "Research on improving varieties to increase yield and quality for some key forest tree species".

Oanh (2015) continues to improve the methodology for evaluating science and technology programs through pilot evaluation of a science and technology program for the 2006-2010 period. Implementation practice shows that when carrying out impact evaluation, the most difficult thing is collecting information and data to serve the evaluation and a large investment of financial resources is required.

In 2015-2016, two key state-level science and technology programs in the 2001-2015 period (KC.04 program on biotechnology, KX.01 program on economics) were evaluated according to 03 criteria: suitability, effectiveness and efficiency (Duong 2016). The evaluation results are considered by experts to be reliable and meaningful in planning national science and technology programs.

In 2018 and 2019, Ngoc (2019) conducted an impact evaluation of key state-level science and technology programs KC.01, KC.03, KC.05, KC.06, KC.07 and KC. 10 for the period from 2011 to 2015. The implementation of these tasks has brought many valuable

experiences in both theoretical knowledge and practical skills. In addition, it has contributed to restructuring science and technology programs.

Through an overview of the experiences of some countries in the world and Vietnam, it shows that in order to implement this work in Vietnam in a methodical and accurate way, it is necessary to have: Regulations on the evaluation of science and technology programs; an organization that conducts the evaluation of science and technology programs; and the cost of conducting the evaluation funded by the state budget.

3. Methods for evaluation of the impact of KHGD/16-20 program

Some popular methods for evaluating the impact of Science and Technology Programs today are: Pre-post, Randomized evaluation, Matching and Propensity Scores, Differences in Differences, Regression Discontinuity and Simple Difference [2]. In particular, the simple and appropriate method in Vietnam is the Pre-post: instead of using two experimental and control groups, use the same group before and after the program starts. Specifically, the impacts are measured by the difference between the performance results before and after the program intervention of the same group of subjects.

The impact evaluation process of the KHGD/16-20 program includes the following 5 main steps (Ngoc, Chien, and Huy):

Step 1: Collect information about the subject to be evaluated

Research legal documents; documents related to the Science and Technology program (Summary report, research results, training, technology, commercialization, process of transferring project results, etc.). Organize seminars with the Program Steering Committee, program managers, and participants in program topics.

Step 2: Design the evaluation

Objective: evaluate the impact of the KHDG 2016-2020 program based on the requirements of Decision No. 888/QĐ-BKHHCN approving the program

Program assessment criteria:

- (1) Relevance to addressing the needs and priorities of Vietnam's educational development: The important role of the areas that the program supports in educational innovation; The necessity of the Program to improve the quality of education; Clarity and feasibility of goals and priority areas of the program.
- (2) Resources for program implementation: Total funding must be sufficient and available to achieve all set goals; Quality of human resources and organization in charge of science and technology tasks.
- (3) Program management: Implementation plan is clear and scientific; The selection and acceptance process is transparent and effective; Manage the implementation process effectively; Monitor implementation progress and evaluate results systematically.
- (4) Valuable and measurable research results: Scientific knowledge is new and valuable; Outputs are measured (number of scientific articles, conferences, seminars)
- (5) Valuable and measurable technological results: New technologies and solutions have high application potential; Register intellectual property for inventions and useful solutions; Products, services, etc.
- (6) Transfer and commercialization of science and technology results: Generated scientific/technology knowledge is transferred to users; New products and services are developed and commercialized; Researchers establish enterprises to commercialize research results.

(7) Impact on science and technology capacity and potential: Organizations participating in the program will have their science and technology capacity and potential improved; Research organizations must strengthen cooperation with other research organizations and users; Participating/cooperating parties have their capacity improved.

(8) Sustainable socio-economic impact: Improve productivity, innovation capacity and competitiveness for enterprises; Contribute to economic growth and create new jobs; Provide solutions to solve important problems of education.

Step 3: Investigate and collect information from the following groups of subjects:

- Two organizations preside over the science and technology task (including the Vietnam Institute of Educational Sciences and Hanoi University of Education): collect information and data on the implementation process, and how results are transferred in practice and program management;

- A number of organizations participating/coordinating in research and units using the results of the program (including the Education Quality Management Agency, Department of Primary Education, Department of Secondary Education, Vietnam Academy of Social Sciences): collect information and data on the content of participation, products transferred and the impact/effectiveness on them;

- Officials, experts, graduate students and graduate students participating in the implementation of the project: collect information and data about research products and the impact that each project brings to them;

Step 4: Conduct in-depth investigation

In-depth interviews at the scene: Vietnam Institute of Educational Sciences; Hanoi University of Education; Education Quality Management Agency; Department of Secondary Education; and Office of KHGD 16-20 Program.

Step 5: Analyze, process data and create an evaluation report.

- Carry out quantitative and qualitative analysis of data;

- Conduct evaluations by experts in the same industry

4. Main results of the program

4.1. Relevance to addressing the needs and priorities of education and training innovation

The approved program includes three content groups: (1) Theoretical research to fundamentally innovate Vietnamese educational science in a modern direction, taking evidence-based research as the foundation, suitable for the characteristics of Vietnam and approaching the world level of scientific education; (2) Identify scientific grounds for synchronous innovation of basic elements of the education and training process; and (3) Build a scientific basis for building a system of basic education criteria and indicators. These three content groups are integrated into 49 topics and projects at a rate of 6%, 86% and 8% respectively (Ministry of Science and Technology 2015).

At the same time, 49 topics and projects are also issues that need to be resolved to implement 9 solution tasks (Central Executive Committee 2013): (S1) Strengthen the Party's leadership and the State's management of innovation education; (S2) Continue to innovate strongly and synchronously the basic elements of education; (S3) Fundamentally innovate learner evaluation methods; (S4) Perfect the national education system towards openness, lifelong learning and build a learning society; (S5) Fundamentally innovate educational management; (S6) Develop a team of teachers and managers; (S7) Innovate financial policies and mechanisms, improve investment efficiency; (S8) Improve the quality, efficiency and application of science, technology, educational science and

management science; and (S9) improve the effectiveness of international cooperation in education. Among them, the most concentrated topics are serving the second (24.5%) and fifth (16.3%) solutions (see figure 1).

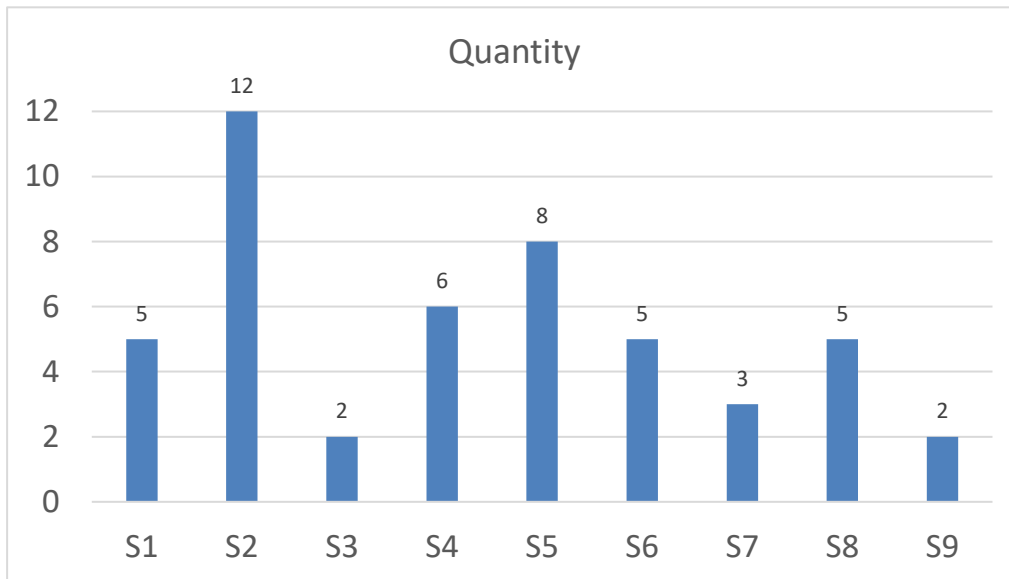


Figure 1. Number of topics and projects to support educational innovation tasks and solutions

4.2. Resources for program implementation

Funding for implementing the Program is mainly from the state budget and science and technology sources, with a total cost of 156,496 million VND. In addition, the Program uses counterpart funding from the host organization's legal source, about 840 million VND (Vinh 2022).

The above system of topics and projects is assigned to 29 science and technology organizations nationwide, of which the largest quantity is assigned to the Vietnam Institute of Educational Sciences (18.4%), followed by Hanoi University of Education (10.2%) and the University of Education, and Vietnam National University, Hanoi (8.2%). This is consistent with the functions, tasks, mission, and extensive experience in researching educational science and management science of the units. In addition, there is also the hosting participation of University of Economics Ho Chi Minh City, Hanoi University of Science and Technology, Academy of Finance, People's Police Academy, Hanoi Law University, etc.

The majority of officials participating in the Program are professors (5.2%), associate professors (20.5%), and doctors (24.8%). Of which 85.7% of chairmen of topics/projects are professors and associate professors to ensure successful leadership of the program (see Figure 2).

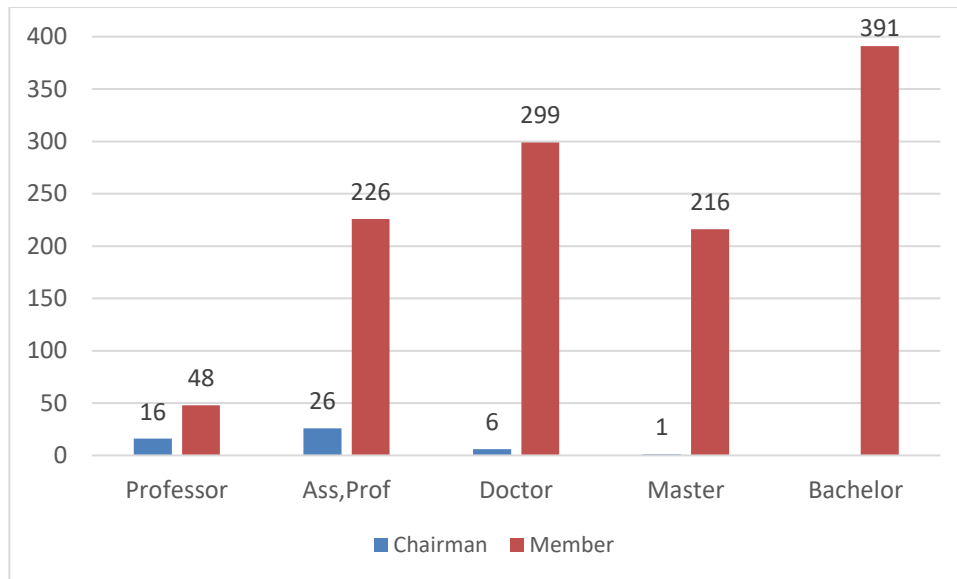


Figure 2. Structure of scientific chairmen and main members of the program

4.3. Management and implementation of the KHGD/16-20 Program

- Activities to identify topics, select individuals and organizations to lead and accept science and technology tasks are carried out according to Circular No. 07/2014/TT-BKHCN dated May 26, 2014 by the Ministry of Science and Technology stipulating the order and procedures for determining national science and technology tasks using state budget; Circular No. 04/2015/TT-BKHCN dated March 11, 2015 by the Ministry of Science and Technology stipulating the inspection, evaluation, adjustment and termination of contracts to implement national science and technology tasks. Ministry of Science and Technology: Preside over building and perfecting mechanisms and policies to implement the Program; approve the program framework and monitor the Program implementation organization; and coordinate with the Ministry of Planning and Investment and the Ministry of Finance to develop estimates, allocate and assign the annual state budget.

- The Ministry of Education and Training presides over the implementation of the Program. The Program Steering Committee is responsible for organizing and managing the implementation of the Program; The Department of Science, Technology and Environment is the focal point for state management of the Program. The Program Steering Committee directs the identification of tasks, selects organizations and individuals to preside over tasks, inspects, evaluates and organizes acceptance of research results. The presiding organizations and task leaders will organize the implementation of tasks according to the signed Contract.

Each topic and project is monitored periodically (every 6 months) and irregularly according to the approved plan; accepted at the grassroots level (chaired by the Science and Technology organization) and accepted at the State level (evaluated by the State Council). There are 46/499 topics and projects successfully defended on time (extended due to the Covid-19 pandemic).

4.4. Valuable research results

Basically, the Program has accomplished the general goal of improving the quality and effectiveness of educational scientific research, contributing to answering theoretical and practical issues in the process of fundamental and comprehensive reform of education in Vietnam; develop Vietnam's educational science to approach the world's educational science level; and build methodologies, criteria, and statistical indicators of some basic education data in Vietnam.

Total scientific products (Vinh 2022): 230 scientific reports on scientific arguments, lessons learned and recommendations for education in Vietnam; 36 sets of economic and technical criteria or norms; 13 databases, management software or Website; 213 scientific articles in domestic scientific journals, 64 articles in foreign scientific journals, 142 articles published in domestic scientific conference proceedings, and 14 articles in international scientific conferences; and more than 20 monographs, textbooks, reference books, training materials, and instructions have been published

4.5. Valuable intellectual property solutions and certifications

The policies and solutions transferred serve the development and promulgation of 02 Resolutions of the Central Secretariat, 02 Laws and 01 Resolution of the Standing Committee of the National Assembly, 19 Decrees and Decisions of the Government and Prime Minister, 22 Circulars and Decisions of the Ministry of Education and Training; 46 intellectual property certificates are granted for inventions and useful solutions for research groups of topics and projects (Vinh 2022).

4.6. Transfer of educational scientific research results

Scientists have brought scientific research results and action programs of the Government and the Ministry of Education and Training on education and training innovation to the public through more than 400 products of written newspapers, visual newspapers, audio newspapers, electronic newspapers, talk shows, etc. and more than 400 scientific seminars and talk shows.

The program also contributed to the successful training of 48 masters and supported the training of 20 graduate students. Many officials, teachers, pupils, students, parents and communities have been fostered, trained, and guided in expertise, skills, and attitudes in the process of investigation, survey, testing and experimentation for topics and projects under the Program.

4.7. Impact on science and technology capacity and potential

Through the implementation of the Program, host organizations and research groups have expanded cooperation with domestic and foreign partners to share experiences, exchange academics, exchange researchers, and transfer advanced technology and techniques in research and management of the program.

The program has contributed to improving the capacity of scientific staff, especially mobilizing interdisciplinary scientists to participate in educational development. During the implementation process, many chairmen and key members have been appointed to important positions in state management agencies in charge of education and higher education institutions, recognized as meeting standards and appointed to the title of professor, associate professor, etc.

The program also helps central and local managers and educational institution managers understand world educational development trends, as well as develop, promulgate and implement policies to ensure the effectiveness of Vietnam's educational development.

4.8. Sustainable socio-economic impact

The program has provided scientific arguments for the development and promulgation of many educational policies, making important contributions to the country's socio-economic development, such as: Socio-economic development strategy for the 2021-2030 period; Five-year plan for 2021-2025; documents of the 13th National Congress of the Party; Strategy to develop education until 2030, with a vision to 2045; etc.

It can be seen that the main research results of the KHGD/16-20 Program are really meaningful for directing the implementation of innovation in Vietnamese education because:

- It has provided the Ministry of Education and Training with solid arguments as a basis for building and promulgating educational innovation policies, typically: Project on the Law amending and supplementing a number of articles of the Law on Higher Education 2018 and the Law on Education amended in 2019, Preliminary report on 5 years of implementation of Resolution 29 and Plan to continue implementation according to Conclusion No. 51/ KL-TW; Report on evaluation of state budget expenditure on education; etc.

- It has provided many feasible solutions on: Improving the quality of education; preventing school violence; educating ethics and lifestyle; developing a team of teachers and educational managers; planning and arranging the network of higher education institutions and teacher training institutions; developing educational development strategies; building a strategy for developing high-quality human resources, etc. These solutions have been transferred to relevant agencies and units.

- The team of scientists participating in the Program actively contributed opinions (in writing, questionnaires, participating in seminars, scientific talk shows, participating in interviews, talk shows, writing media articles, etc.) to support and accompany the Ministry of Education and Training in the process of implementing Resolution 29, Resolutions of the Central Government, National Assembly, and Government on educational innovation. This shows that scientific research is more closely linked to reality, confirming the great progress and correct direction of the Program.

5. Conclusions and limitations of the research

5.1. Conclusion

a) Basically, the KHGD/16-20 program has achieved the goal of "Improving the quality and effectiveness of educational scientific research, contributing to answering theoretical and practical issues raised in the process of fundamentally and comprehensively innovate education and training in Vietnam":

- Vietnamese educational science has gradually approached the world's educational science level: Use advanced and modern scientific arguments and theories from around the world in the research process; establish a research logic framework and implement the research process; create research groups and strong research groups, including national and international scientists, researchers, lecturers, graduate students, etc.

- It has provided scientific arguments for educational innovation such as: Model of coordination and interaction between Educational Philosophy and Cultural, Political, Economic, Scientific factors, etc.; Approaches to human resource management, professional capacity development, and rule of law state management; Perspectives on educational development, BEAR model, theory of multiple intelligences, IRT theory, etc. in evaluating learner capacity; Models of university governance according to the level of autonomy and power triangle; Massive Open Online Courses (MOOCs) and E-learning; etc.

- Provides models, conceptual frameworks, evaluation criteria and solutions for a series of issues on: State management in educational innovation; Development of learners' qualities and capacities; Education of ethics, lifestyle, civic awareness, traditional values; Evaluation innovation in education; Innovation of State management of education and administration of educational institutions; Development of a team of teachers and managers; Improvement of the efficiency of using the State budget; internationalization of Vietnamese education; etc.

- Develop methodology, criteria, and statistical indicators for some basic educational data such as: Mental and physiological development according to age; development of intelligence and capacity of high school students; development of local education; scope

of school, class and target audience; number and structure of high school teachers; ICT human resources; etc.

b) There are still some shortcomings and limitations in the process of organizing and implementing the Program, specifically as follows:

- Lack the ordering channels for tasks that guide the future development of Vietnamese education and resolve persistent negative phenomena; some issues related to the implementation of "breakthrough" tasks and solutions such as evaluation, testing, training of high-quality human resources, etc. have not been thoroughly researched.

- Some research results and products have been transferred to relevant parties but have not really met the requirements and expectations. Many proposals and recommendations are still academic and do not have enough solid arguments to help policymakers make scientific and feasible decisions;

- The Program management document system is lacking and overlapping; the process of approving and assigning tasks is quite complicated and takes a long time (6-12 months), leading to loss of topicality and not keeping up with policy development tasks and practical needs of management. There are no specific regulations on the rights, obligations, and responsibilities of relevant parties in ordering, coordinating, transferring, and receiving research results/products.

- Many topics and projects must adjust content, methods, and plans to adapt to the covid-19 pandemic. This partly affects the progress, quality and efficiency of research;

- Funds are allocated insufficiently and slowly, with large cuts, leading to the need to adjust research content and plans, affecting the progress and quality of Program implementation. There is no mechanism to mobilize funding sources other than the state budget to implement the Program.

5.2. Limitations of the research

Because the Vietnamese Government has not yet issued a document regulating the impact evaluation of science and technology programs, the set of evaluation criteria used in this research is referenced from a number of tasks led by the Vietnam Centre for Science and Technology Evaluation, not officially from the State.

The method of impact evaluation used is "pre-post", with the group of participants being representatives from the Vietnam Institute of Educational Sciences, Hanoi University of Education, Quality Management Agency, Department of Education and Department of Secondary Education. The qualitative comments and evaluations of these subjects are based on experience applying the sets of criteria, solutions, technologies transferred, etc. at the time the program is being implemented or has just ended. Therefore, the time is not long enough to clearly see the impact and effectiveness of the program.

Current investigations and surveys are extremely costly in terms of time, human resources and funding. Due to limited funding, the number of participants in program assessment is limited (a total of 45 researchers, specialists, lecturers and educational managers). Therefore, the above assessment results are mainly illustrative of the program's impact evaluation methodology.

Although the program has a database of nearly 1,000 experts in many different fields, however, the selection of experts to conduct impact evaluations to ensure transparency and avoid conflicts of interest is extremely difficult. The main reason is that most of the topics in the program are attended by leading experts in Vietnam, while there is no funding to invite experts from advanced countries to attend.

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