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Projection in Education: Conditions for the Sustainable Development of Vietnamese Education

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Abstract: Projection in education is one of the important bases for the implementation of the sustainable and crucial strategies to ensure the development of national education, including Vietnam. As a country in Southeast Asia with the distinctive characteristics of culture and history, Vietnam has the certain advantages and disadvantages in the development of education. In this study, the projection of Vietnamese students of each school level in the period of 2015 – 2035, was referred in comparison with the projection of the teacher resource in all school levels as one of the conditions for the basic educational development in Vietnam. The study was conducted using an integrated projection in education's formula, combined with a census (birth rate - for students; the number of teachers from Department of Education and Training's reports, the pedagogy students prepare for graduation - for teachers) from 32 provinces and cities of Vietnam and analyzed on the rate of population change over the years. The results showed that the shortage of the teacher resource (especially the preschool teachers) and the erratic increase in the number of the children born in the good years according to the Eastern concept were the anxious issues when developing Vietnamese education and integrating into the global development trend.

Keywords: *Projection in education, educational development condition, sustainable development, Vietnamese education.*

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Introduction

The projection of the number of the children and students attending to school is the action strategy to ensure the conditions for the educational development which have been invested by many countries around the world, including Vietnam, in the past years. In the world, the studies of projection the students or projection in education had been carried out for a long time (Cox & Blake, 1991; Ezhovkina & Ryabova, 2015; Gautam, Bulley, von Hippel & Suddendorf, 2017; Keita & Tilahun, 2016; Lee & Mason, 2007).

Over the past few years, the statistical data of the Vietnamese General Department of Statistics and some annual reports of the relevant agencies as well as departments concerned about this issue (Communist Party of Vietnam, 2017; Hanoi People's Committee, 2018; General Department of Statistics, 2017; Prime Minister, 2017). However, the implementation usually took place in the form of census, so the projection data was always a relative issue and not really quantitatively convincing in terms of the requirements of the scientific research. Previous studies in Viet showed some related contents: Integrating the population into the labor resource development program in Vietnam (Nguyen, 1996); applying the statistical methods to the population projection in some provinces (Nguyen, 1994). The Ministry of Education and Training had also given attention to the Vietnamese population and the number of the children attending school in the past few years (Ministry of Education and Training, 2012; Ministry of Education and Training,

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2013). However, the data source was highly dependent on the General Department of Statistics as well as the initial data, the objectivity was not really guaranteed or met the expected standards.

It could be said that the projection of students attending to school was used in many interdisciplinary relationships, in which, the influence on education was a key and decisive impact. The projection of the students would help the educational managers actively adjust the number of the teachers appropriately, ensuring the quality of education. In contrast, the development of teacher staff was also put in the correlation with the students to have the right direction for training and developing the teacher staff rightly (Gizir, 2019). However, it was not simple to obtain the systematic data at the national level. In the USA, to project the education from 2002 to 2027, the National Center for Education Statistics used national data on enrollment and graduates for at least the past 15 years and projections to the year 2027. Also included were state-level data on enrollment in public elementary and secondary schools and public high schools beginning in 1990, with projections to 2027. The state-level data, Asian and Pacific Islanders' data were not included in this report. A trend test using linear regression was conducted to test for structure in the data over the time period (2002 – 2027). If the p value for the trend variable was less than .05, the text stated that the statistic had either increased or decreased. If the p value was greater than 0.05 and the data for both the first and last years of the time period came from a universe sample and/or were projections, then the text compared the first and last years in the time period (Hussar & Bailey, 2019). This projection in education depended on mathematical statistics.

For a more multi-dimensional view, when considering some indicators of the students and teachers or the other relevant conditions of Vietnam in correlation to some countries with the developed education in Asia like Korea, Singapore (the countries with the highest Pisa test in the world) (Morris, 2015) showed: Firstly, due to the declining birth rates, the student/teacher ratio of these countries was very low. There were even places in these countries where the private or experimental schools and the group schools starting to appear with around 20 students per school (Deng & Gopinathan, 2016). These were the favorable conditions for the comprehensive development of students' qualities and competencies. Therefore, the student/teacher ratio was one of the criteria that needed to be considered in developing the strategies to improve the quality of Vietnamese education in the current situation as well as in the near-future roadmap. Secondly, the standards for recruiting teachers in these countries were very strict with very high competition rates and strict training processes and procedures (Cheung, Sit, Soh, Jeong & Mak, 2014). Moreover, with very specific and detailed professional standards as well as the process of recognizing very professional standards, it was not easy for a teacher to be qualified for a job (Lau, 2014). Therefore, if Vietnam wanted to improve the quality of the teachers, it was necessary to build a set of recruitment criteria that were both suitable for Vietnam's own conditions and the international standards, which was based on the projection of the teachers for each school level.

In this study, with the purpose to ensure the sustainable development of the national education, the projection of students and teachers needed for all school levels in Vietnam with the population projection algorithm was conducted. This was one of the important conditions to get an overview of the projection in education not only in Vietnam, but also in other Asian countries with the same culture.

Methodology

Study design

The projection method to find the students attending to school

To solve the projection problem, firstly, it was necessary to collect the population data and the population projection data (the school age children from preschool to high school) according to the variance model and analyzed each 5-year period data with the defined process. Next, setting up the projection criteria to make the additional projections during the projection process for the analysis of the projection data.

- Criteria 1: Number of the students, children per teacher;
- Criteria 2: Natural change and its variation based on human resource: retirement age, job transfer – job resignation.
- Criteria 3: Analyzing and comparing the number of the children and students according to each level, grade level and appropriate time frame.

The projection method for teachers

Projecting the need of teachers for each school level

- Find the total number of the current primary teachers
- Number of the primary teachers preparing to retire + profession transfer
- Find the number of the grade 5 students moving to the secondary school
- Find the number of the children preparing to go to the primary school at grade 1

=> Number of the primary students = the students of grade 1+ 2 + 3+ 4 + the children preparing to enter grade 1- grade 5

- Need for the primary teachers for 1 year = [(Number of the primary students / number of the teachers according to the class standard prescribed by the Ministry) - (Number of the available teachers + the retired teachers for the year)]

- Allocating the data of the total shortage teacher and the shortage teachers by subject

Projecting the teacher suppliers (redundancy and shortage)

- Find the number of the pedagogical students of each level and each year

- Teacher suppliers = The number of the teachers of each subject / each level in shortage in part 1 - Number of the pedagogical students graduated from each school level in the year => the negative or positive results?

- Projection for the following years after the equal advance, the number of the teachers for each subject / each level in shortage in part 1 and the number of the students in years 1, 2, 3 trained for each level

=> Projection for the specific data for the coming years by translating the previous year's data for the following year

Participants

The total number of the children born in Vietnam every 5 years between 2015 – 2035, data collected from the annual report of Advertisement Company and the relevant sources:

+ Ministry of Health

+ General Department of Statistics

+ Ministry of Labor, War Invalids and Social Affairs

+ Vietnam population census report.

The projection data of the number of students were connected in a multidimensional way and ensured its objectivity.

Teacher projection: The total number of the teachers from preschool to high school in 32 provinces and cities from Da Nang to Ca Mau was the official data source certified by the Departments of Education and Training.

Results

Based on the results of the population census data, the projection results of the students were conducted with the determined research methods. More specifically, the projection results were analyzed with the whole Vietnamese population sample (see Table 1) as follows:

Table 1. General projection of the students of the whole country in the period 2010 – 2035

School level	2010	2015	2020	2025	2030	2035
Kindergarten (18 – 36 months)	4,295,846	4,484,843	4,634,281	4,277,033	4,444,874	4,193,336
Preschool (3 – 6 years old)	4,136,273	4,199,890	4,379,122	4,524,413	4,317,408	4,382,988
Primary school (6 – 11 years old)	6,712,698	6,935,756	7,171,780	7,455,227	7,318,257	7,237,480
Secondary school (12 – 15 years old)	5,645,730	5,336,518	5,568,647	5,778,901	6,003,671	5,819,581
High school (16 – 18 years old)	5,087,292	3,925,589	4,031,678	4,205,832	4,414,708	4,567,353
Total	25,877,839	24,882,596	25,785,508	26,241,406	26,498,918	26,200,738

The children at kindergarten age has increased and decreased erratically over the years. In particular, in 2010, 2015 and 2020, there had been a slight increase of 150,000 to 200,000 children / 5 years, equivalent to 3-4% / 5 years. Notably, it is projected that the kindergarten children will decrease significantly by 2025 with the rate of 7.7% compared to 2020 - nearly equal to the increase in the children attending to school for 10 years from 2010 to 2020 with 357,248 children. By 2030, the kindergartens will increase to 167,841 children - nearly 4% compared to 2025; then decreasing by 251,538 children with the rate of 5.66% compared to 2030 in 2035.

In 2015, the preschool children increased slightly by 63,617 children, accounting for 1.53% compared to 2010. It is projected that in the next 10 years (2015 to 2025) the preschool children will increase faster with an average rate of 3.79 % / 5 years of fluctuating around 150,000 children / 5 years. Thus, with the natural variance, in the next 9 years, the preschool teachers will quit and transfer their job about 0.6% annually (updated data from the provinces). However, the projection data showed that the preschool children decrease to about 200,000 children, equivalent to 4.57% compared to 2025 in 2030; then increasing slightly by 1.5% compared to 2030 in 2035.

For the primary education – there were the highest students compared to other school levels. Even for the preschool children of the 5 - 6 years old age, for the past few years, the children attending preschool has also fluctuated around 96% - 99%), the children tended to increase gradually with an average fluctuation of about 250,000 children / 5 years equivalent to the average rate of about 3.56% / 5 years for 15 years from 2010 to 2025. After that, the average reduction of 100,000 children / 5 years corresponds to an average rate of 1.4% / 5 years for 10 years later (from 2025 to 2035). At the secondary level, from 2010 to 2015 the children attending to school decreased by 309,212, equivalent to 5.47%. It is projected that the children at this level in the next 15 years (from 2015 to 2030) will increase by an average of 200,000 children / 5 years, accounting for the average rate of 4% / 5 years and then decreasing at the rate of 3% compared to 2030 by 2035.

It was worth noting that there was a large decrease of the students attending to high school in 2015 - a decrease of 22.83% compared to the students in 2010 with about 1,161,703 students. This had a strong influence on the plan of the personnel implementation at this school level in the recent years. However, it is projected in the next 30 years from 2015 to 2035 that the high school students will gradually increase by an average of 150,000 students / 5 years, with an average growth rate of 3.86% / 5 years.

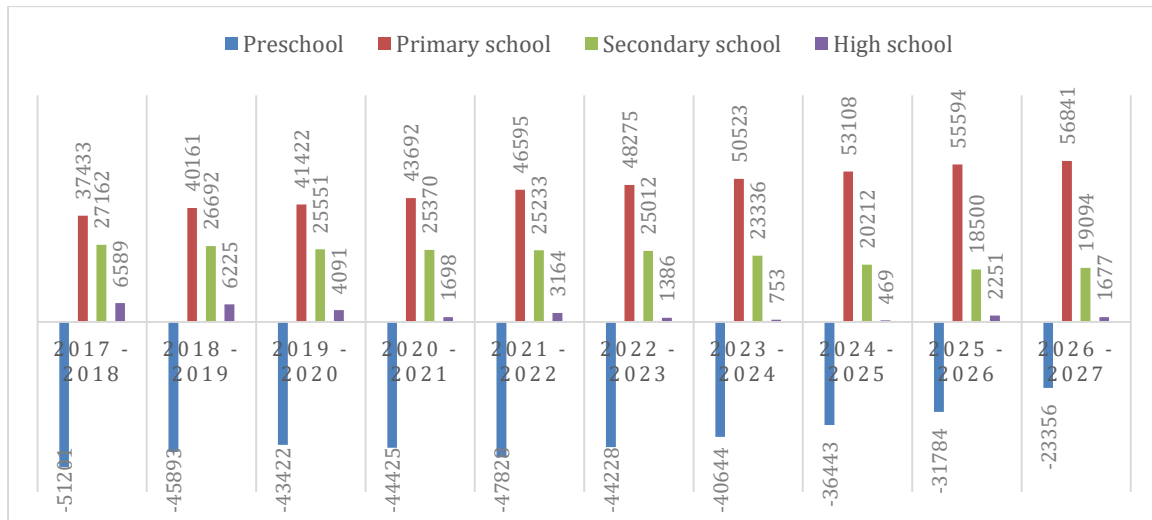


Figure 1. Situation of lack/sufficiency of teachers at all school levels in Vietnam in the period 2017 – 2027

The projection results were scientific if they are placed in the certain correlations. For example, the correlation between the projection data and the teacher situation (see Figure 1). Based on the current scale of the preschool education, the current teacher assignment mode and the school standards, it is easy to see the preschool teachers in the projection has still been in the lack of teachers in the next 10 years. Specifically, for the 10 years, there has been a shortage of from more than 12,000 teachers to the highest of 25,000 preschool teachers. The highest shortage of the preschool teachers falls in the period 2020-2021 with 24,820 teachers. This clearly showed that the demand for the pre-school teachers in practice is still inadequate. The projection shows that without the reasonable solutions, there will be a risk of long-lasting shortage and sharp increase in 2022-2023. The above data also shows that since 2017, the number of the preschool teachers has been lacking about 24,314 teachers. This can be explained by many different reasons such as the fact that the preschool teachers in 2016 were still lacking and lasting until 2017. On the other hand, considering the natural population increase, in 2017, the number of the children increased in the variant cycle, so the lack of the preschool teachers was somewhat affected.

Based on the current scale of the primary education, the school and class standards, the number of the children per teacher, the progress of the number of the students going to primary school is predicted without lack of teachers in the next 10 years. Specifically, the data of the 10 consecutive years, the number of the primary teachers will be able to be redundant compared to the demand of about 5,000 teachers. This is an acceptable figure calculated with 32 provinces in general. For secondary education, the data shows that for 10 years, there will still be enough secondary teachers, the proportion decreased gradually in the chain and by the last 2 years in the chain, there was only about 1,500 lower secondary teachers facing redundancy. At the high school level, the situation of high school teachers has a surplus in the first 3 years in the projection chain revolving around the number of 4,000 to 5,000 teachers, in which the data proved that the period with the highest number of teachers was 2017 - 2018.

Discussion

It was found that the projection data on the students at all school levels in general and in each individual level showed a certain increase or decrease due to the basic causes such as birth rate each year - according to the concept of a good and bad zodiac year to have children, the students repeating, leaving school, fluctuating with the tendency of increasing

young labor force. Some special years such as the Qui (癸) year, which had a good zodiac in the concept of the Eastern culture, had the most influence on the number of births (Kwok, 1997). Although the students in some special years was not too high. But if it was put in correlation to the teacher resource, the needs of the parents and the expectations of the society, the specific years such as 2022, 2024 (good fortune Chinese zodiac birth-year) were the years at risk of lack of the primary teachers, lack of facilities and infrastructure as well as the conditions involved if no preparations were considered carefully. With a variation of more than 1,000,000 and a frame of over 3,000,000 children, the grades 1, 6, and 10 were those that could lead to an unexpected teacher shortage. Therefore, in the planning of education personnel, the work of teacher training, the allocation of teacher education targets, and the teacher contingency were the important requirements that needed to be ensured to meet the changes with the projection results. Besides, having the communication strategies to solve the spike in birth rates in good zodiac years which could ensure enough classrooms and teachers for each class in those years could be a possible solution.

In the next 10 years - at least by 2025, the situation would take place in the direction of the steady increase in the students at preschool and primary school. This projection was an important basis to prepare the resources in terms of teacher staff, facilities and infrastructure and other factors for short-term and long-term teacher training in the next 30 years to ensure the effectiveness and quality for Vietnamese education. For considering the natural variance of the number of the annual retired preschool teachers, preschool teachers were at risk of shortage. Vietnam was at risk of not ensuring the pre-school teachers without having the strategy of the investment in the educational facilities and infrastructure as well as developing the human resource for the preschool teachers. In addition, improving the professional quality of current preschool teachers was also a matter of concern to keep the current preschool teachers continuing to work and develop themselves in their jobs. According to Uyar, Genc and Yasar (2018), good preparation of goal orientations, critical thinking dispositions and self-regulation skills would help preschool teachers achieve more academic achievements in their jobs, enhance the spirit of dedication to their careers and also limit the career changes. In parallel, the preparing solutions for the primary teachers as well as the preschool teachers tended to be in the shortage; it was important to pay attention to the time the children attending to primary schools was less, maybe it was the opportunity to arrange less classrooms or to test the new teaching methodology models to help students maximize their positive and active learning.

The projection results were also considered in terms of its relationship to the population changes and the changes related to the students in the world as well as the orientation of Vietnamese education development and the key tasks of the Ministry of Education and Training were being implemented. Therefore, the consideration of the conditions in each region and each province, especially in the remote and mountainous areas, and their own characteristics such as the distance between schools and home, and the number of the children per class were not the same. This was not to be mentioned in the large cities, the parents' demand on the primary education had been raised (Duong, Nguyen & Nguyen, (2017), so the above amount of teacher redundancy could be un-significantly explained.

For primary school, the redundancy for primary school teachers was not remarkable. Therefore, if the redundant teachers were solved rightly from the first year, the following years would become easy. However, it was easy to see the situation that primary school teachers quitted their jobs was quite significant (Attfield & Vu, 2013) due to the failure control of the post-training employment rate of the intermediate schools or the pedagogical departments of the universities to confirm the right situation of the post-training labor use (Duong et al., 2017). Therefore, it was necessary to have deep analysis to clarify this issue. Certainly, to have a specific local view to realize the situation of the partial lack arising so that there would be strategies to ensure the primary teachers could meet the diverse practices, but not affecting the overall situation, needed more concerns. Moreover, the primary school teachers needed to have class independently (Huynh, 2012), it was necessary to ensure the teachers for providing all possible contingencies.

For the secondary teachers, the redundancy would affect quite a lot. The fact that each teacher could take 1 - 2 extra-standard classes was feasible (Ministry of Education and Training, 2009). The statistical progress also showed that the secondary teachers decreased gradually in the projection chain, so if reducing the training targets, transferring the secondary teachers to take the second degree for the preschool education, this redundancy problem could be solved. On the other hand, in 32 provinces and cities, there were over 15,000 to nearly 20,000 secondary teachers lobbied, encouraged to study for their second degree and the time for their second degree as mentioned was 3 semesters with 3-4 courses for 1-1.5 years needed (Nguyen, 2018). The restructuring in this teaching level would be an effective adjustment step in the labor force of teachers in Vietnam.

The reduction of the product quotas in recruiting high school teachers' training was also necessary and should be applied immediately. In parallel with the reduction of the new training product targets, it was suggested to encourage a contingent of high school teachers in disciplines to take part in studying the second degree: preschool education. However, it was also necessary to look at each province in detail to ensure that the overall number of staff needs to apply for the second degree to study as the solution to change their majors. The progression of the projection chain showed that the high school teachers may not excess due to the variation of the projection and it was lower than 500 teachers at the end of the chain. This showed that the reduction of teacher education targets, the lobby of teachers to take a second degree as well as the organization of the teacher development activities based on the new professional standards of the Ministry of Education and Training would be issued without too much stress in this group of teachers.

On the statistical level, in the 10-year projection chain, the number of the preschool teachers fell below 20,000 and gradually slipped significantly. From here, it could be proposed two parallel options to consider: firstly, increasing the pre-school teacher education targets or at least keeping the preschool education indicators in the overall target of the pedagogical universities and colleges. Option two was to consider developing the internal resources in the preschool education. It was feasible to consider the redundant teachers from other levels of education if the following conditions were met:

- Primary, secondary and high school teachers themselves were aware that their career transfer to the preschool education was a possible solution.
- Teachers needed to be assured of the regime as well as certain favorable conditions.
- Redundant teachers needed to be facilitated in the process of transitioning from their current educational levels to the preschool education.
- The redundant teachers would be trained for their second degrees majoring in preschool education systematically and methodically to ensure to meet the scientific principles and practices. The redundant teachers should be given priority in assigning work immediately after graduation if they reached the professional standards after the second undergraduate training course and did not have to compete with the regular students who have just graduated or even had the right to choose a local work place that they worked before going to school the second degree.

Conclusion

Projection in education was an important basis in developing human resources in education. The projection of the students and teachers in each school level was one of the basic contents of the projection in education. Based on the projection result, the preschool education might continue to be inadequate. The number of primary, secondary and high school students in the chain projection results was not much change in the period 2015 – 2035, the maintenance of the teacher training targets for primary, secondary and high school education was the same as the current situation if the retired teachers, career transfer teachers did not cause the major changes.

The teacher projection results for each school level showed that the shortage of the preschool teachers in the coming period was really a pressure for the preschool education. This issue needed to be further considered and it should be proposed the changes in teacher structure at different levels to allocate human resource in line with the new general education curriculum in Vietnam.

Thus, the projection of increase - decrease in the number of students at each school level over the years and the corresponding number of teachers at each school level could meet teaching standards, combining with the number of retired and career-transferred teachers, was a problem that needed to be solved to ensure the conditions for sustainable education development. The outcome of the projection in education would be an important indicator for educational managers to set investment policies for school facilities, improve the quality of teacher training, or restructure the teachers at all school levels. Therefore, the results of this study not only provided the necessary requirements for the development of education in Vietnam, but also provided the necessary data for developing countries or similar cultures countries to refer and take orientations for sustainable development in education.

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