Projection of the Needs of Vocational High School Teachers in Study Program of Design Modelling and Building Information: Disparity Analysis in West Java Regions

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ABSTRACT

One of the determining factors for the success of the educational process in Vocational High Schools (SMK) is the role of the teacher in the vocational school. Particularly in the context of SMK Building Engineering, productive teachers of Design Modelling and Building Information (DPIB) play a vital role. Since there is still disparity in the quantity and quality of DPIB teachers in West Java and there is a need for equal distribution of teacher availability in the future, it is deemed necessary to map the current supply of teachers and analyse teacher needs based on enrolment/growth in the number of students in the future. The purpose of this study is to map the quantity of productive teachers, calculate the projected needs of productive teachers, and analyse the disparities in conditions in the next 10 years in the four regional areas of West Java. The research was conducted with a quantitative research approach. Secondary research data were obtained from the Education Office of West Java Province. The unit of analysis is the city/district in West Java, with overall number of 27 districts. The unit of analysis in the study area of West Java is grouped into four regions (Region I, II, III, IV) based on geographic location, for the purpose of mean-difference test analysis. The projection analysis technique for productive teacher needs uses the projection technique, while the four regional disparity analysis technique uses the Anova different test technique. The results of the study show that the need for DPIB productive teachers in 2021/2022 to 2031/2032 has increased every year. The number of DPIB productive teacher shortages in Regional IV (*Garut, Tasikmalaya, Ciamis, Pangandaran, Kuningan, Majalengka, Indramayu, Cirebon)* is greater than in other regions (Regional I, II, III) in West Java. The recommendations from this study can be utilized by West Java Provincial Government, especially Regional IV, which further can conduct more thorough review of the condition of teachers both in terms of quantity and quality. Thus, the Provincial and District Government can carry out appropriate and comprehensive planning to meet future teacher needs in this region. This research recommendation can then be followed up by West Java Provincial Education Office, District Education Office, and vocational schools in West Java

Keywords: *Teacher Needs, Projection of needs, Productive Teachers, Modelling and Information Design, Regional Disparities.*

1. INTRODUCTION

This issue of teacher shortage and fulfilment of teacher needs is still a challenge in our education system, both in quality and quantity. The concern about supply and demand of future teachers has been long discussed, ranging from the issue of teacher adequacy in terms of number, and current concerns more on teacher quality. Indonesia is facing a shortage of teachers, especially vocational teachers, with a need for an additional 1 million teachers within the public school system [1]. If this issue is left unaddressed, the shortage of teachers has an impact on the quality of education.

It is undeniable that the teacher component greatly contributes to improving the quality of education, therefore, this issue is worthy of our attention. Fulfilment of the number of teachers in accordance with the standards is one of the factors to advance and improve the

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quality of education [2]. Based on ratio standard of teacher and student, the limited number of teachers in a school can affect the number of students who can be enrolled in that school. In this case, it is not only the quantity of teachers that is important, the quality or quality of teachers in schools must also be good.

Vocational High Schools (SMK) in Indonesia (including in West Java Province) have a variety of skills and competency programs. One of these competencies is the Building Information and Modelling Design competence. Of the 2,939 Vocational Schools in West Java Province, there are 49 Vocational Schools holding the Modelling Design and Building Information major. The SMK consists of 35 public vocational schools and 14 private vocational schools. Most of the students who enter the Building Information and Modelling Design major are male, while female students tend to major in the Business and Management cluster.

In contrast to High School (SMA), Vocational Schools organize productive subjects to prepare students to have competencies in accordance with predetermined expertise programs. As for what is meant by productive group subjects, namely subjects related to the vocational competence of each department which are grouped into three groups, namely Basic Vocational Fields, Basic Vocational Competence and Vocational Competence [3]. (Ministry of Education and Culture: 2011) In practice, productive subjects will be carried out in two groups in one study group with each group supported by one teacher based on the Technical Guidelines for Implementing Joint Regulations Concerning the Structuring and Mapping of PNS Teachers [4] (Ministry of Education and Culture: 2011). If you look at the needs of productive teachers for Vocational High Schools (SMK) based on existing areas of expertise compared to ideal needs, Indonesia is still experiencing a shortage of teachers, with the greatest need for productive subject teachers. On the other hand, calculations carried out in the field for productive group subjects are still managed by one teacher in one study group.

Based on observations made at the Education Office of West Java Province, there are still vocational teachers who add teaching hours to other schools in order to fulfil a minimum teaching hour of 24 hours per week. This is one of the causes of certification so that teachers must fulfill the mandatory teaching hours of at least 24 hours in order to obtain certification allowances. The teaching hours are also required to be in accordance with the educator's certificate. However, there are also some teachers who have teaching hours per week of more than 24 hours. From these conditions, it is necessary to analyze the availability of existing teachers and their future needs. In planning it must consider policies related to the implementation of education, especially SMK. It should be considered that Civil Servants (PNS) teachers have a retirement age as well as the growth trend of existing students (groups). Planning carried out regarding the condition of teachers in West Java Province by the Education Office is usually only planned for the year concerned regarding the strengths and needs of teachers seen from the point of view of the subjects.

In terms of time, educational planning is classified into three types, namely long-term, medium-term and short-term planning. Long-term planning is a type of planning that is carried out for a minimum of 10 years. Medium term planning is carried out over 1 year to 5 years, and short term planning is carried out for a maximum of 1 year. researchers will use the opinion of Made Pidarta because it is for a minimum period of 10 years. Therefore, if the number of teachers in the future can be fulfilled, it is necessary to make projections regarding the availability of teachers, especially SMKs in the next 10 years, namely 2021/2022-2030/3031 so that they can be taken into consideration in making policies, one of which is in conducting teacher recruitment.

1.1. Definition of Planning

Planning can be interpreted as a process of preparing various decisions that will be implemented in the future to achieve predetermined goals [5]. In addition, it is also stated that planning can be interpreted as an effort made in order to combine national ideals and available resources needed to realize these ideals.

The Center for Education Statistics defines planning as a process of making decisions to do something in the future by using limited resources to achieve a goal [6]. From this definition it can be concluded that planning is closely related to future conditions to be achieved with better conditions than present conditions. While planning is also interpreted as a process of forecasting, developing, implementing and controlling which becomes an institution that has the appropriate number of employees, the correct placement of employees, the right time economically and is more useful [7].

Based on these definitions, it can be concluded that planning is a decision-making process consisting of processes ranging from forecasting to control. This decision will be implemented in the future with the hope that the future will be better than current conditions by utilizing available resources in the hope that the goals can be achieved.

1.2. Principles of Educational Planning

In compiling an educational plan, guidelines are needed so that you can plan well. The guidelines needed in an educational plan include the principles in preparing a plan so that the plan can function properly as well as in its implementation. The planning for teacher needs is part of education system planning as a whole [5].

Related to this, several principles must be considered in preparing an educational plan, namely [4]: (1) Interdisciplinary, (2) Flexible, (3) Rational Objects, (4) Not starting from zero but from what is owned, (5) A vehicle for gathering strengths in a coordinated manner, (6) Compiled with data, (7) Controlling one's own strengths (8) Comprehensive and scientific.

1.3. Types of Educational Planning

There are various types of educational planning depending on the perspective of the planning, including the aspect of time, method, and scope [3]. The description of the three types of educational planning is as follows.

1.3.1. Type of planning in terms of time

When viewed in terms of time, educational planning is classified into three types, namely long-term, medium-term and short-term planning [4]. Long-term planning is a type of planning that is carried out for a minimum of 10 years. Medium term planning is carried out over one year to five years, and short term planning is carried out for a maximum of one year. Based on this opinion, researchers will use the opinion of Pidarta to examine teacher needs in the long term, namely ten years.

The three plans are related to one another. Long term planning is the main planning of medium and short term planning. Likewise, medium-term planning is the source of short-term planning. From this explanation it can be seen that short-term planning is an elaboration of medium-term and long-term planning. All three have a relationship that cannot be separated or standalone but must be relevant.

1.3.2. Type of planning in terms of scope

Macro planning includes educational planning that covers the entire nation which is usually handled by the central government [3]. Meanwhile, meso-planning is planning that has a narrower scope than macro planning, which covers a certain area, for example one province as a result of the different conditions and situations of each region. Micro planning has the smallest scope because it only covers one educational institution or a small group of institutions that are almost the same and close together [3].

1.3.3. Type of planning in terms of nature

Based on its nature, educational planning is grouped into two, namely strategic planning and operational planning. Strategic planning is planning related to policies taken, approaches used, needs, missions, and goals to be achieved. While operational planning is planning related to the business used to realize the strategic plan or planning objectives. From this explanation it can be said that the operational plan is a tool that will be used to achieve a strategic plan [3].

1.4. Review of Research on Teacher Needs Projection

Research on the importance of calculating teacher demand and teacher needs projections are prevalent. The study conducted by Sutcher et al highlighted that teacher demand has been increasing due to changes in student enrolment, shifts in pupil-teacher ratios, and high levels of teacher attrition. This study was conducted in the United States based on serial data retrieved from US National Database in 2016, and discussed factors contributing to the shortages and identified actions that might ameliorate the shortage trends [4].

The study conducted by Massachusetts Department of Elementary and Secondary Education (ESE) examined the aggregate projections of teacher annual supply and demand, detailed supply and demand projections by program area; detailed supply and demand projections by teacher demographic groups; and detailed supply and demand projections by region in Massachusetts [5].

2. METHOD

This research is categorized as using quantitative approach, in the field of educational planning research, using the projection. This study uses a projective method to plan teacher needs. For the sake of calculation, a more pragmatic approach was used because it is functional. The projection calculation was conducted based on several teacher projection formulas. This research was conducted from July 2022 to August 2022, with data from the year academic of 2017/2018 to 2021/2022. The locus of research is in West Java Province. The unit of analysis is the city/district in West Java, with overall number of 27 districts. The unit of analysis in the study area of West Java is grouped into four regions (Region I, II, III, IV) based on geographic location, for the purpose of mean-difference test analysis.

2.1. Data and Data Sources

The teacher data taken was teachers in the productive subject group at the Vocational High School, Building Information and Modelling Design competence in West Java Province. The data used in this study consisted of: curriculum structure, retirement age data for teachers with government employee status (PNS), teacher teaching load and the number of classes available. The data was obtained based on the recapitulation of education data at the West Java Provincial Education Office and from operators of each school as secondary data. In detail, the data used in this study are: (1) Data on the number of productive group teachers at the Design Modelling and Building Information Vocational Schools

in West Java Province, (2) Data on the number of study groups of students at the Design Modelling and Building Information Vocational Schools in the Province West Java in 2017/2018- 2021/2022., (3) Data on the structure of the 2013 curriculum for the 2013 Vocational High School Design Modelling and Building Information family.

It is hoped that the results of the analysis of all the data and issues discussed will describe the process of distributing teaching staff as well as the projected number of educators needed in an area, especially in West Java Province in the upcoming years.

2.2. Data analysis technique

In this study, there were two stages in analysing the data in order to obtain projections of teacher needs. These stages consist of an analysis of projected needs for productive teachers, and an analysis of the differences in the needs of vocational teachers in the four regions of the West Java Region.

2.2.1. Analysis of projected needs for productive teachers in vocational high school

The projection data analysis carried out is a study with a trend based on basic data assumptions, namely data that exists today that is used to predict future conditions. The basic data taken by the researchers is data on the development of the number of classes in the last five years, namely the 2017/2018 school year to the 2021/2022 school year to estimate conditions that will occur in the next ten years, namely the 2021/2022 school year to 2030/2031 school year.

2.2.1.1. Determine the projection of the study group

The group projection method used in this study is the growth rate, to obtain the percentage of the group growth rate every 30 years from the last five years. The formula that will be used to calculate this growth rate is a formula that is often used in statistics as well as social sciences [5] which can be seen in equation (1).

$$\mathrm{ATR_n} = \frac{R_n - R_{n-1}}{R_{n-1}} \times 100 \quad (1)$$

ATR_n is the growth rate of class n year, Rn is group year n, and R_(n-1) is group year n-1.

By calculating the school class growth rate for each year, it can be calculated the projected school class every year for the next ten years, namely in 2021/2022 to 2030/2031 with a trend study using the school class growth data each year in 2017/2018 to 2021/2022 with equation (2).

$$R\_(n+1)=[(1+(ATRn/100)] \quad (2)$$

Where, R_(n+1) = projected year group n+1; R_n = number of years n; and ATR_n = group growth rate from n-1 to n years.

2.2.1.2. Calculating the Number of Productive Teachers Required

The calculation of teacher needs is carried out using two versions of the calculation, namely the ideal calculation in accordance with the Technical Implementation of the Joint Regulations on the Arrangement and Equalization of PNS Teachers and the calculation carried out in the field by the West Java Provincial Education Office. The formula for calculating the need for the number of productive group subject teachers in each year is presented in equations (3) and (4) as follows [2]:

$$\mathbf{KG}_p = \frac{JTM}{24} \quad (3)$$

KGp = [(MP b+c x Jml rombel tingkat I x 2) + (MP b+c x Jml rombel tingkat II x 2)+ (MP b+c x Jml rombel tingkat III x 2) + (MPa x Jml Rombel tingkat I x 1) + (MPa x Jml Rombel tingkat II x 1)] / 24 (4)

With a = Basic Vocational Competency group subjects, b = Vocational Competency Basic subjects, and c = Vocational Competency group subjects.

With the main formula as above, several versions of the calculation are then carried out where for the Basic Vocational Competency 32 and Vocational Competency groups are divided into two groups, each of which is taught by one teacher so that it is multiplied by two. Meanwhile, for calculations in the field, it is still multiplied by one. The calculation version for the Modelling Design and Building Information major by including the eye of the basic vocational field group is carried out with equation (5) for ideal calculations, and equation (6) for calculations in the field as follows:

KGp = [(MP b+c x Jml rombel tingkat I x 2) + (MP b+c x Jml rombel tingkat II x 2)+ (MP b+c x Jml rombel tingkat III x 2) + (MPa x Jml Rombel tingkat I x 1) + (MPa x Jml Rombel tingkat II x 1)] / 24 (5)

KGp = [(MP a+b+c x Jml rombel tingkat I x 1) + (MP a+b+c x Jml rombel tingkat II x 1)+ (MP b+c x Jml rombel tingkat III x 1)] / 24 (6)

The calculation version for the Modeling Design and Building Information major without including the eyes of

the basic vocational field groups is carried out with equation (7) for ideal calculations, and equation (8) for calculations in the field as follows:

$$KGp = [(MP\ b+c \times Jml\ rombel\ tingkat\ I \times 2) + (MP\ b+c \times Jml\ rombel\ tingkat\ II \times 2) + (MP\ b+c \times Jml\ rombel\ tingkat\ III \times 2) + (MPa \times Jml\ Rombel\ tingkat\ I \times 1) + (MPa \times Jml\ Rombel\ tingkat\ II \times 1)] / 24 \quad (7)$$

$$KGp = [(MP\ a+b+c \times Jml\ rombel\ tingkat\ I \times 1) + (MP\ a+b+c \times Jml\ rombel\ tingkat\ II \times 1) + (MP\ b+c \times Jml\ rombel\ tingkat\ III \times 1)] / 24 \quad (8)$$

Where KGp = the need for productive teachers; MP = number of subject hours; a = number of hours of subjects in the Basic Vocational Field group; b = number of hours of Vocational Competency Basic subjects, and c = Vocational Competency group subjects.

2.2.2. Analysis of differences in the needs of vocational school teachers in the four West Java regional areas.

In studying the differences in the needs of vocational school teachers in four regions in West Java Province, researchers carried out several stages of data analysis. The first stage is to state the null hypothesis (Ho) and the alternative hypothesis (Ha) as stated in equation (9).

$$Ho : \mu1 = \mu2 = \mu3 = \mu4 = \mu5$$

$$Ha : \mu1 \neq \mu2 \neq \mu3 \neq \mu4 \neq \mu5 \quad (9)$$

Then the researcher determines the acceptance areas of Ho and Ha by testing using ANOVA using the F distribution. The significance level used is 5% and the degrees of freedom (df) consist of numerator: k-1 and denominator: N-k.

Then the researcher determines the statistical test value or F-ratio using the formula as listed in Equation (10) as follows:

$$F\text{-ratio} = \frac{\text{Variance between sample}}{\text{Variance within sample}} \quad (10)$$

From these results, if the F-ratio <critical point then Ho is accepted. Finally, the researcher draws conclusions based on the results of statistical calculations where if Ho is accepted, then there is no difference in the number of productive teacher needs for Modeling Design and Building Information in the four regional areas of West Java.

3. RESULTS AND DISCUSSIONS

3.1. Demographics

The projection of the need for productive teachers in each regional area is different from one another. The calculations also use two general formulas, namely the formula for ideal teacher needs according to the Technical Guidelines for Implementing the Joint Regulations on the Arrangement and Equalization of PNS Teachers and the calculation of teacher needs carried out in the field. From each calculation, several versions will also be carried out, each of which will be explained considering that a plan must be flexible. Calculations are not only carried out using ideal calculations because the application is still quite difficult. This is because in special ideal calculations for productive subjects, Basic Competency Skills and Skills Competency, each class is divided into two and each group is taught by one teacher. Thus it will require twice as much teachers, classrooms, and learning facilities.

The teacher referred to in this study is a productive teacher with the competence in Building Modelling and Information Design. In addition, calculations are carried out taking into account teachers who will retire in the projected year, especially for teachers with government employee status (*Pegawai negeri Sipil/PNS*). This is because government employee teacher and teachers with working contract status (*Pegawai Pemerintah dengan Perjanjian Kerja/PPPK*) have a retirement age that can be calculated at the age of 60 years. Whereas for non-PNS teachers it is assumed that the conditions in terms of quantity are constant or the same as the basic data for calculations, namely 2021/2022 and the existing PNS have not been transferred outside West Java province or transferred to assignments outside the teacher.

3.2. Teacher Need Calculation

From the calculation results, The projected need of DPIB productive teachers in each region in West Java during 2021/2022 to 2031/2032 has increased every year.Projection for each region are illustrated in Figure 1 to Figure 4. It can be concluded that the number of productive teacher needs for Design Modelling and Building Information in Regional IV is more than in other regions in West Java. As a whole, the results of the projection of the need for productive teachers in Building Modelling and Information Design in the four regional areas of West Java without including the basic group of expertise can be seen in Figure 5.

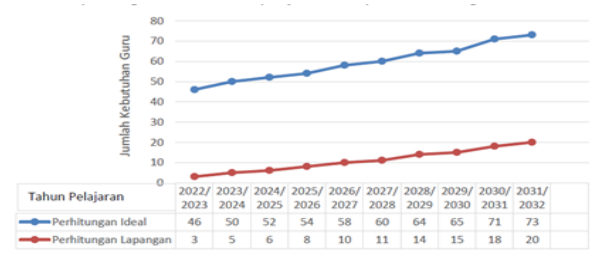

Figure 1 Graph of projected DPIB productive teacher needs in Regional 1 of West Java

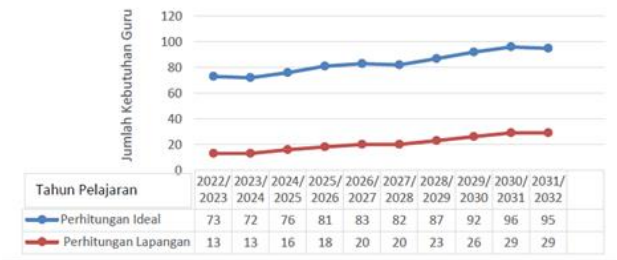

Figure 2 Graph of projected DPIB productive teacher needs in Regional 2 of West Java

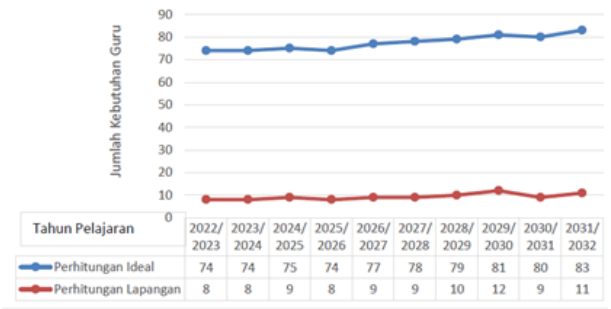

Figure 3 Graph of projected DPIB productive teacher needs in Regional 3 of West Java

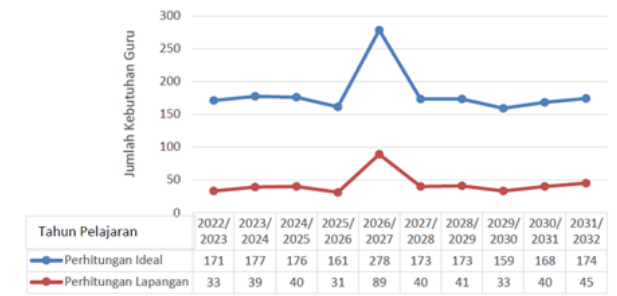

Figure 4 Graph of projected DPIB productive teacher needs in Regional 4 of West Java

By comparing the four graphs in Figure 1 to Figure 4, it is shown that the severity of teacher shortage is more prevalent in Regional 4 West Java.Regional 4 comprised of Garut, Tasikmalaya, Ciamis, Pangandaran, Kuningan, Majalengka, Indramayu, and Cirebon Regency. It can be seen that Region IV needs more productive teachers in Modelling Design and Building Information compared to Region I, Region II, and Region III.

3.3. Disparity Analysis

The results of the ANOVA test with the data show that there are differences in the number of needs/requirements for teachers in the four regional areas of West Java. Regional I and Regional II, have sig. 0.641 > 0.05, then Ho is accepted (not significantly different). Mean difference: -0.29 – (-0.67) = 0.381, meaning that between Region I and Region II are not significantly different. Regional I and Regional III, have sig. 0.471 > 0.05, then Ho is accepted (not significantly different). Mean difference: -0.29 – 0.40 = -0.686, meaning that between Region I and Region III are not significantly different. Regional I and Regional IV, have sig. 0.048 <0.05, then Ho is rejected (significantly different). Mean Difference: -0.29 – (-1.76) = 1.479, which means that Regional I and Regional II differ significantly, and Regional IV has more number of DPIB productive DPIB productive teacher needs. Regional II and Regional III, have sig. 0.242 > 0.05, then Ho is accepted (not significantly different). Mean Difference: -0.67– 0.40 = -1.067, meaning that between Regions II and Regions III is not significantly different. Regional II and Regional IV, have sig. 0.106 > 0.05, then Ho is accepted (not significantly different). Mean difference: -0.67– (-1.76) = 1.098, meaning that between Regions II and Regions IV is not significantly different, Regions III and Regions IV have a sig. 0.012 > 0.05, Ho is rejected (significantly different). Mean difference: 0.40 – (-1.76) = 2.165, meaning that between Regions III and Region IV are significantly different, and Region IV has more number of DPIB productive DPIB productive teacher needs.

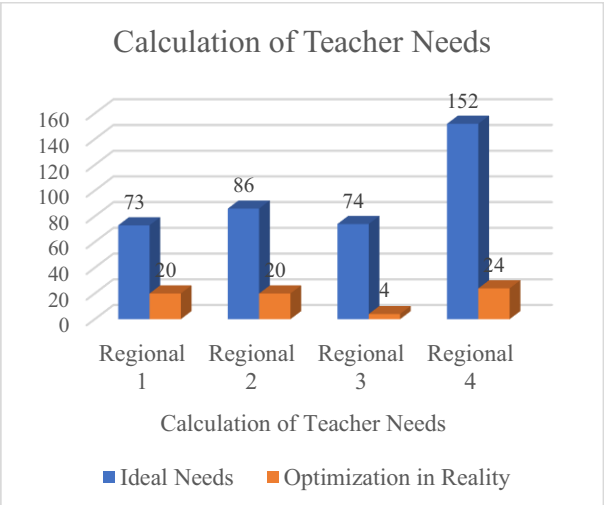

Figure 5 Graph of projected DPIB productive teacher needs in the four regional areas of West Java without including basic group subject areas of expertise.

Based on the results of the data test using One Way Anova, it can be seen that there are significant differences

in average productive teacher needs between the four regional areas in West Java. Regional I and Regional II, have sig. 0.641 > 0.05, then Ho is accepted (not significantly different). Regional I and Regional III, have sig. 0.471 > 0.05, then Ho is accepted (not significantly different). Regional I and Regional IV, have sig. 0.048 <0.05, then Ho is rejected (significantly different). Regional II and Regional III, have sig. 0.242 > 0.05, then Ho is accepted (not significantly different). Regional II and Regional IV, have sig. 0.106 > 0.05, then Ho is accepted (not significantly different in Region III and Region IV, has a sig. value of 0.012 > 0.05, Ho is rejected (significantly different).

It can be concluded that the need for productive teachers in Building Design Modeling and Information in Region IV is greater than in Regions I and III. Meanwhile, Regional II and Regional IV were not significantly different.

3.4. Discussion

This study has calculated teacher shortage and the need for productive teachers in Building Design Modeling and Information in all regions in West Java, Indonesia. This is conforming the teacher shortage and recruitment need for ameliorate the gap as discussed by previous research conducted by Sutcher [3} and American Association for Employment in Education [8 in United States]. The condition in West Java is similar to what happened in the states in United States. Understanding the shortage as analysed by this study is similar to the effort tp understand teacher shortage analized in the study conducted by Regional Education Laboratory Program [9] and the result are used to forecast future teacher enrollment by opening teacher recruitment.

The condition in West Java is also similar to what happened in India. Calculation of the shortage as analysed by this study is similar to the calculation teacher shortage analized in the study conducted by Datta[10] in India, using teh dat ain 2017-2018. First, the calculation is was conducted using ideal situation, followed by optimization, so that the severity of the shortage is withered. Datta [10} also highlighted the major efficiencies that can result from evidence-based policy on minimum viable school-size, teacher allocation norms, permissible maximum pupil teacher ratios, and teacher deployment. Based on that optimization, the gap between teacher demand and supply is narrowed in India. The same applied in our study, when we calculate the ideal teacher need and the optimization in the field.

4. CONCLUSION

It can be concluded that there is a discrepancy in the needs of productive teachers in Design Modelling and Building Information in the four regions in West Java. Region IV needs more productive teachers compared to regions I and III, bearing in mind that in the current conditions this region still has a shortage of productive teachers. This is also coupled with the relatively rapid growth of study groups in this region, related to the rapid growth of population in this region.

Based on the result of this study, there is an urgent need for the fulfilment of lack of quantity of vocational teacher. Overall, if this issue is left unaddressed the shortage of vocational teachers has a direct impact on the quality of education in West Java, Indonesia. Previous research shows that teacher shortages disproportionately impact students, especially students from low-income backgrounds, students with disabilities, and students from rural communities [12]. The fulfilment is very urgent for Region IV. The recruitment of vocational teachers is needed to fill the current gap in quantity. The next recruitment is also needed to keep up with the projection teacher needs in the future. Indonesia as well as The U.S. Department of Education need to establish Partnerships Across States, School Districts, and Colleges of Education to take concerted actions to address the teacher shortage [13].

This study added our previous understanding of vocational teacher shortage in Indonesia. Without highly qualified and motivated teachers, West Java risks attracting less talent into the teaching profession. Efforts to comply with the specialized vocational instructors have been undertaken by the Indonesian government. These efforts including: recruitment of teachers with government employee status (ASN), hiring of temporary/honorary instructors, and the Dual Expertise Program [15]. Another important factor that contribute to the issue of teacher shortage is teacher recruitment process. The recruitment process for teachers in Indonesia has been identified as a factor contributing to the low quality of teachers. The focus is often on meeting the demands of civil servants rather than selecting professional education personnel [16]. Therefore, improving teacher recruitment process is also needed.

5. IMPLICATIONS

The implications of the results of this study are in planning to meet the needs of productive teachers for vocational education in West Java in the next 10 years. Solving the vocational teacher shortage requires long-term strategies that address both recruitment of new teachers and retention of current vocational teachers. Recruitment of vocational teachers should be done by making Public Vocational Education an attractive career path [13].

The growth rate for classes has an impact on the number of projected needs for productive teachers in Building Modelling and Information Design in West Java. The additional need for teachers, especially those with Civil Servant status, has implications for the need to

appoint new staff/teachers. This recruitment of new/additional teachers has implications for increasing the state budget for staff in the education sector. The capacity of each region in the Regional Revenue and Expenditure Budget (APBD) varies according to the conditions of each region. The high demand for teachers cannot be directly appointed because it is adjusted to regional capabilities. However, in the appointment of teachers, the main objective is to improve the quality and quality of education, especially vocational education.

6. RECOMMENDATION

In conclusion, Indonesia more specifically West Java, is in need of a significant number of vocational teachers to meet the demand within the public school system. The fulfilment of teacher needs, especially for vocational education, is our effort to improve the sustainability and quality of vocational education delivery. Therefore, the following recommendation efforts should be made to improve the recruitment process and attract potential and qualified teachers to the teaching profession, especially vocational teachers.

The West Java Provincial Education Office can update data on an ongoing basis at semester intervals, so that the available data is valid and can be accounted for. As well as this data is the most up-to-date data that can be used by all related parties, because educational data is the basic data in making various policies related to education and making improvements in data management, through synchronization with the Central Bureau of Statistics, so that the data becomes valid and can be accounted for.

The recommendation resulted from this research can be used for further education planning at the district level, especially educational agency of districts in Regional IV. Actions in terms of recruiting new teachers for productive courses are urgent priority to follow up the result of this study.

It is recommended that each regional government use the ideal calculation according to the Technical Guidelines for Implementing the Joint Regulations on the Arrangement and Equalization of Teachers with government employee status in fulfilling the needs of calculation that has been set by the government is definitely determined by various basic calculations and research results with the aim of improving the quality of vocational education. For future researchers, the division of regions is not only based on geographical location, but grouping can be based on residency, characteristics and economic growth of each region, and can be directed using a qualitative approach related to teacher competence.

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