Developing and improving Competences of Educators/Teaching Staffs of Indonesian National Police School (Sekolah Polisi Negara/Spn)

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ABSTRACT

The purpose of this research is to discuss and analyze the root of the problems of the low competences of teaching staffs at Indonesian National Police School (SPN) and the factors that may contribute to it which include: recruitment and selection systems, placement, competency improvement program, and reward system. This research is a qualitative approach with a case study. The research addresses interviews and discussions with SPN educators, education experts from Police of Republic of Indonesia (POLRI), academic education experts human resource management experts from academia, and police officers who graduated from SPN. Data collection methods include: interviews, focus group discussion (FGD), observation, related documents studies, and review of previous research. The results of this study indicate that low competences of SPN teachers is rooted from the absence of a competency-based recruitment system. POLRI career development system does not yet include and regulate career development of SPN teachers as part of police career development. This research recommends and proposes a competency-based SPN teaching career development system as a whole.

Keywords: competency development, teaching staff, National Police School, career development system.

Introductions

Indonesian National Police School (SPN) is one of education and training units within the Police of Republik of Indonesia. SPN has a duty, function and role as an education provider for the formation of a Police Brigadier as the main executor of police duties. Teachers at SPN are the most important component of education to support the achievement of student outcomes [1]. Several existing studies showed the relationship between the availability of competent teachers as an important component of education with the competences of graduates or student outcomes. The quality of graduates cannot be separated from competences of teaching staffs [2],[3].

Teaching competences have a significant influence in producing graduate competences, for this reason, competent SPN teachers are required. There are five main components of competences; knowledge, skills, self-concept and values, physical characteristics and motives that include emotions, and desires and physiological needs that drive action [4]. To improve the competences of SPN teaching staffs, competency-based human resource management is needed, including career development of teaching staffs. The fact is teaching staffs at SPN only 43.33% of teaching staffs are competent and only 45% of those who are certified as teachers (POLRI research and development center, 2016) [5].

Competent teachers are expected to perform productively in carrying out their duties and support the performance of educational institutions that in turn provide benefits to organization (Baron &Amstrong, 2007) [6]. The unavailability of SPN teacher career development system is the root of the problem that cause the lack of interest in

becoming a teacher at SPN. Empirically, the current assignment of teaching staff at SPN in general is not in line with the related background needed, instead most of them are personnel who are looking for "jobs" and promotion, personnel with almost retirement age, and personnel with problems during their serving time in the regional police task force. These factors contribute to competences problem of the SPN teaching staffs.

A competency-based career development system and a mechanism for improving the competences of SPN teaching staffs in the framework of developing professional POLRI are needed. Improving the competences of SPN teaching staffs is absolutely necessary to support and to realize a competency-based education. Professional competences of the SPN teachers are presumed affect the achievement and motivation of SPN students, while their pedagogical competences in designing and implementing teaching and learning process, and evaluating learning outcomes, will contribute to student development that help students to their various potentials [7]. Professional competences of teachers in the context of implementing the duties and roles of education instructors, also have an impact on the quality of instructional activities in learning and teaching process [8].

This research suggests career development for teaching staffs at SPN that support career development system of POLRI as a whole, and guideline on the competency-based teaching development for the teaching staffs. These are ere expected to support the SPN as an institution to be a center of excellence in realizing quality, competent human resources of the Police Brigadier through education and

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training that in turn support the implementation of police technical functions.

Literature Review

There are several studies that have been conducted by previous researchers related to the competence of teaching staff /educators. That teacher competence is needed to improve the quality of graduates. Research by ChairulAnam, on improving the quality of the National Police School educators to face global security challenges, with an approach to increasing motivation through teacher welfare [9]. According to Lorenz Lasssnigg, it is an important aspect of implementing competency-based education. [10]. The support of high-performing NES organizations with competent teachers is in line with research on highperformance organizations [11]. According to Hakim, the Contribution of Competence Teacher is very dominant in producing quality graduates [12]. Research conducted by Izadina, developing the identity of educators is a central process to become a teacher who acts as a quality educator [13]. John Loughran's research confirms that there is a growing interest in the professional development of educators because the demands, expectations, and requirements of teacher education are under supervision Learning management is needed for teachers [14]. The teacher is a major component in education [15]. In this study, to improve the competence of teachers in SPN, a competency-based career development system is needed.

Methods

This research is a qualitative research with a case study and inductive tendency. Data collection methods include: interviews, focus group discussion (FGD), observation, documents study, coupled with review on some previous research. Data analysis and data validation are conducted with triangulation. The informants in this study are choosing purposively due to their knowledge and expertise in training and education comprise SPN teaching staffs, experts in education and human resources management, and some graduates from SPN. Data analysis includes transcribing, verifying, quoting and coding, checking, and summarizing.

Research findings highlight an answer to research problems by proposing career development system for teaching staff at SPN and a system for enhancing competences of the teaching staffs which affect the quality of the graduates. These are expected to contribute to a more integrative human resources management of POLRI personnel in line with POLRI values; professional, modern, and trusted.

Some important and valuable informants include: the Head of SPN, teaching staffs of SPN, police officers who graduated from SPN, human resource management experts from academics, education experts from POLRI, academic education experts human resource management from university, and officials from Human Resource Bureau of POLRI Headquarters.

Results and Discussion Result

Competency-based human resource teaching system is needed as a solution to produce competent teachers. Recruitment and selection are part of a competency-based career development system. Competence as "the basic characteristics individual of an include; characteristics, self-concept, knowledge, and skills [16]. The higher the competences the higher the performance achieved. Within this context, teaching staffs at SPN as professional teachers are obliged to produce competent graduates. Competences encourage people to do their job more effectively. Performance is obtained from a certain job function as an activity that is carried out during a certain period of time [17]. Individual performance (P) is a function (f) of ability motivation and opportunity (AMO). P = f (AMO) (Individual performance is the functioning of abilities, motivation, and opportunities) [18]. Changes in AMO, affect changes in P (performance).

To obtain competence teaching staffs of SPN that are able to support performance, in line with system theory, there has to be a good flow of input, process, and output. The input of quality human resources through assessment is enhanced tthough processing (training and development), that in turn will result in quality output of competent teaching staffs. The competences of SPN teaching staffs are related also to teacher training that is still relatively low. As stated earlier, only 43.33% of teaching staffs are competence and only 45% of those who are certified as teachers. Another factor that causes the relatively low quality of SPN teaching staffs is that they are assigned to SPN as teachers only to look for promotion or "jobs" of Adjunct Senior Police (AKBP) or Police Senior Commissioner (KOMBES). After the "jobs" are obtained, they will immediately leave / move from SPN and returned to work in the regional police work unit (POLRI R& D center, 2016).

Research on needs-based teacher quality improvement program model conducted in 29 countries consisting of 16 developing countries and 13 industrial countries, showed that in 16 developing countries, the contribution of teachers to learning achievement is 34%, management 22%, learning time 18%, and physical facilities 26%. In 13 industrial countries the contribution of teachers is 36%, management 23%, study time 22%, and physical facilities 19% [19].

There are several factors that may influence the failure of SPN educators in the pedagogical and professional aspects of the formation of student culture. In education and training process at SPN, there are 4 main causes of failures [20]. Firstly, the policy to transfer/place POLRI members who have deviant behavior and actions to the SPN institution. Secondly, the position as teaching staffs at SPN provide them with authoritative power, whereas in other social practices they have no power at all. Thirdly, the configuration of knowledge related to the professionalism of police duties for teaching staff is more narrated in the curriculum than the formation of the POLRI normative culture which has an impact on pedagogical competences. Fourthly, phrases: "ready to be wrong", which means that subordinates are accustomed just to say/admit wrong when it is not in accordance with the superior's wishes / superior's perception;

"must be smart" which has a negative connotation, that is, if a member makes a mistake or deviations, just cover it up so that other people don't know it which is interpreted that whatever the obstacles are, that must be done and can be done.

There is a necessity to change the culture and mindset in recruiting, placing, and assigning teaching staffs at SPN. This research proposes a solution to increase the competences of SPN students by developing a competency-based development system and a mechanism for improving the competences of teaching staffs/teachers or educators, supported by "proper" recruitment, selection, placement, and reward system of SPN teaching staffs. Human resources management for teaching staffs at SPN is basically follow human resource management in general. However, recruitment and selection, placement and promotion of teaching staffs at SPN need to be emphasized in the form of competency-based SPN teaching staffs development supported by competency improvement mechanism.

The development and improvement system in general needs to take into account that the system should encourage the followings. Firstly, facilitate people to increase their knowledge, expertise and behavioral attitudes needed in carrying out their duties [21]. Secondly, increase competences, productivity and professionalism in order to create a high-performance, competent, consistent, and committed organization that will increase the trust to POLRI. The improvement of competences of teaching staffs include; mastery of teaching materials and skills in managing learning and understanding learning evaluation, poses pedagogic competences in managing teaching and learning process (recognize the characteristics of students, mastering learning theory and principles of learning, able to develop curriculum, create educational learning activities, develop student potentials, able to communicate with students, assess and evaluate learning). Thirdly, encourage people to be able to do certain jobs rationally, mastering knowledge tools (theories and concepts, principles and rules, hypotheses and generalizations, data and information) in the field of work, mastering skill sets (strategies and tactics, methods and techniques, procedures and mechanisms, means and instruments), understand the minimum normative eligibility standards for success conditions, has the motivation to perform its duties, and has the authority to demonstrate and test their competences in order to gain recognition [22].

How competency-based development and improvement system of SPN teaching staff support professional POLRI? Teacher professional competences will significantly affect the quality of the learning process, have positive effect on teacher pedagogical knowledge, enthusiasm for teaching, and self-regulating skills on the quality of teaching, and affect the quality of students SPN is an educational institution that organize education for Police Brigadier as the main implementer of police duties (POLRI Headquarters, 2015). The fact that 55% teaching staffs at SPN are incompetence (POLRI education and training institution, 2019). Indicates that POLRI needs to reassess its human resources management for SPN teaching staffs, comprises the following important elements; recruitment, selection, placement, education and training, performance appraisal, reward, and retirement [23].

In the aspect of education and training, there are important elements such as competency improvement programs and program compatibility with the needs of teacher competence improvement. Discussed the important of pedagogical competences, especially in relation to the level of understanding of students, teaching design, and implementation of diagnostic learning, learning evaluation, student development, which has provided significant support in the form of professional pedagogical teaching. Within this context, SPN teaching staffs should also poses a pedagogical ability that may ensure the quality of the graduates [24].

Illustrated that there is a growing interest in professional development of educators because the increasing demands, expectations and requirements of teachers that draw attention. Teachers competences are needed for the effectiveness of developing knowledge, skills and abilities of students [25]. This study outlined some factors that are critical to teacher development, including transitions related to the teaching profession, the nature of teacher education, and the importance of teacher education practice. A cultural change in police institution is necessary. The professionalism of police in England and Wales is part of this process [26].

Ongoing cultural changes are needed to make police institution fits in a rapidly changing environment. A framework for a better understanding of what it means to develop professional teachers/educators provide who further explained that teachers are one of the main components in primary and secondary education which have important role in determining future generations. To carry out these important tasks, teachers need a high level of commitment to the profession. Within this context POLRI/SPN needs to be concerned with police professionalism and factor that create professional commitment such as quality of work life [27].

Raised the model of need-based quality improvement program and described that in 29 countries, among the various inputs that determine the quality of education (as indicated by student achievement), it is found that more than a third quality of educations are determined by teachers. Teacher competences haves a significant impact and is increasingly important in the midst of limited facilities and infrastructure, such as in developing countries [28].

In 16 developing countries teachers contributed 34% to learning achievement, 22% management, 18% study time, 26% physical facilities. In 13 industrialized countries, the contribution of teachers is 36%, management 23%, study time 22% and physical facilities 19%. Future human resource development strategies bring the organization to be more productive. The importance of enhancing people competences for teaching and learning is increasingly realized by organizations. There is a relationship between the quality of teachers, graduate quality, and graduate performance [29].

Discussion

Quality human resource/teachers are expected to have their contributions to the aspects of pedagogical, personality, professional and social competences, which need to be continuously developed in a competency-based education [30]. The interview with educators of SPN, POLRI education experts, and human resources experts from academics,

suggested that as a solution to improve student competences and teaching staffs career development system are needed. POLRI and SPN should establish a system for the development of SPN teaching staff. A system to solve the root cause of the low competency of educators at SPN, a competency-based teacher career development system and the mechanism for improving competences of SPN teaching staffs.

The consistent implementation of this system is expected increase the motivation of POLRI personnel and to change the paradigm of POLRI towards the assignment as teaching staffs at SPN, no longer "outcast" personnel but a selected and qualified and competent personnel. The system contains: first, rules on recruitment and selection, as well as placement and career development in which the placement of teaching staff at SPN is done after fulfilling the competency requirements as teaching staff. Second, the rules regarding the duration of the first assignment as educators at SPN for 4 years, and after carrying out their duties they have to meet the minimum performance standards for teachers which are assessed by a team formed by the Head of SPN. The well performed teaching staffs are compensated for occupying a promotion position at the regional police task force. The assignment as a teacher for 4 years is counted as credit points for career development of the personnel.

POLRI and SPN also need to implement the SPN teaching competency improvement model. After personnel are assigned to the SPN and before they are being assigned as a teacher or teaching staff, they must follow the SPN competency enhancement/improvement system as stipulated in the mechanism for increasing teacher competences. The absence of a well-design recruitment and selection system for human resource/teaching staffs at SPN has resulted in the low performance of the teachers. The assignment as teachers at SPN mostly based on the following motives and views; SPN is a temporary place for jobs/promotion seekers, a place for problematic POLRI personnel to learn and change, and is not a place good and ideal policeman.

The unavailability of a competency-based career development system has an impact on the behavior of police personnel, among others, choosing assignments in educational institutions only on the grounds of avoiding assignments in remote areas outside Java (Papua, Ternate, Aceh, North Maluku, etc.) and as a stepping stone for looking for a place of new assignment at the police task force in Java. The period of assignment of teaching staffs at SPN is not certain and not clearly regulated yet, starting from the shortest time, which is 3 months to the longest time, which could be 30 years and never get rotation/mutation. Length of service for teachers at SPN POLDA Metro Jaya, <5 years 18%, <10 years as much as 48%, the rest ≥ 4 years before retirement (POLRI education and training institution, 2019).

There is no system yet for provision of performance allowances for teachers at SPN such as promotion for those who have completed their assignments for 4 years. On the other hand, certification issued by the Institute for Education and Training POLRI (internal unit) is not equally for the same level as teacher certification applicable within the Ministry of Education, and has no civil and financial impact on professional allowance. There is also no system that regulates tour of duty from SPN to the regional police task force or to other education institutions and vice versa. Whereas careers require certainty of assignment as teaching staffs at SPN, both the duration of the assignment and the system that regulates the assignment is part of career development.

Professional performance culture within POLRI is relatively weak. This has resulted in a viewpoint that the POLRI task force is partially seen as a "wet" place and partly a "dry" place, and SPN as an educational institution is a "dry" place. This condition encourages behavior of POLRI personnel who generally avoid to be assigned at SPN and just leave their competences low besides no development system is constructed yet. The research proposes teaching staffs career development system and SPN teacher competences improvement system.

The competency-based SPN teacher career development system is a training system for POLRI personnel assigned to POLRI education institutions. The assignment of POLRI personnel as teaching staff is carried out by Regional Police Human Resource Bureau on the recommendation of the Head of SPN. The criteria for POLRI personnel serving in educational institutions are the best graduates from Police education institutions. The teacher competency map is a comparison of the initial competency level with the expected competences as well as the competences of each individual needed to perform tasks effectively and efficiently. Placement of the teaching staffs by the POLDA Human Resource Bureau at SPN is done on the basis of the following criteria; certified personnel, best graduates from POLRI education institutions, and competent personnel. The Head of SPN is the one who is authorized to place them according to the competences of the candidates.

To improve SPN teaching staffs competences, POLRI needs to apply SPN teaching competences improvement mechanism; 1) conduct initial competency test, 2) conduct continuous competency improvement, the process of professional development of SPN teachers in accordance with the needs to produce quality graduates, 3) strengthen supervision on all activities in regard with competences development of SPN teaching staffs, 4) assignment period as SPN teacher for 4 years to improve the experience SPN teachers and instill POLRI cultural values in educational institutions, 5) conduct effective evaluation in order to get feedback in planning the next activity, and 6) involve education experts from academics to cover more views on the effectiveness of SPN, the teaching staffs, and the graduates of SPN. SPN Teaching Staffs Career Development System and SPN teacher competences improvement system as in the figure below:

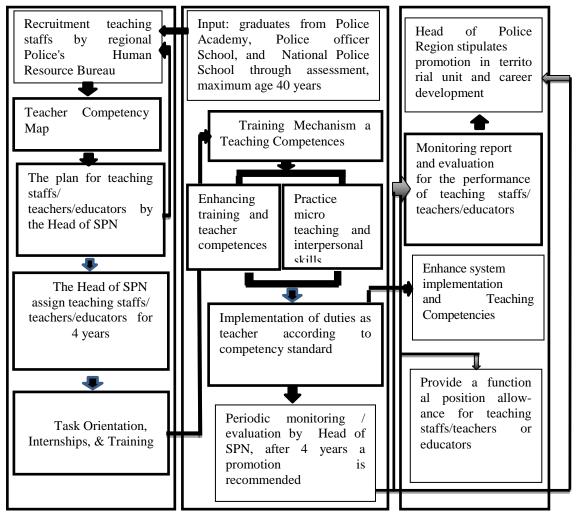


Figure 1. SPN Teaching Staffs/Teachers/Educators Career Development System.

Conclusion

Competence SPN teaching staffs/teachers become the main component of education at SPN to support a proper teaching-learning process in order to develop the quality graduates of SPN. A competency-based SPN teachers career development system supported by the SPN teachers competences improvement mechanism is required in the absence of both systems and the need to strengthen SPN as a center of excellence.

The recruitment, selection, and placement (assignment) processes of POLRI personnel as SPN teaching staffs need to be equipped with some requirements that have to be clearly arranged; initial competency test, best candidates/best graduates from POLRI education units, clear assignment period (4 years), continuous improvement/enhancement program, and effective supervision and evaluation.

Competences improvement/enhancement program of SPN teachers has to cover both pedagogic and professional competences development. The content of the program is suggested to be discussed by a team comprises a consultant in education, management experts, human resource management experts, as well as POLRI education practitioners. Proportional and professional supervision and evaluation by the Head of SPN with the team is needed to

evaluate the results of the implementation of the program and suggest the reward/promotion accordingly. The suitability of the program with the need for SPN teachers to improve their competences is needed to answer the need of SPN as an educational institution. The improvement program is also relevance to the development of professional police personnel/Human Resource of POLRI.

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References

- [1] Kunter, M. (2013). Motivation as an Aspek of Professional Competence: Research Finding on Teacher Enthusiasm.
- [2] Simmill-Binning, D. C., & Towers, D. J. (2017). Education, Training and Learning in Policing in England and Wales. 30.
- [3] Widada, T., Slamet, A., Florentinus, T. S., & Martono,S. (2018). Learning Management in Police Academy

- Educational Institutes and Training. In KnE Social Sciences.
- [4] Boxall, P., & Purcell, J. (2003). *Management, Strategy and Human Resource*. Chouhan, V. S., & Srivastava, S. (2014). Understanding Competencies and Competency Modeling A Literature Survey. *IOSR Journal of Business and Management, 16*(1), 14–22. https://doi.org/10.9790/487x-16111422.
- [5] Bagian Informasi personil Mabes Polri, (2018).Laporan Jumlah Personil Polri.
- [6] Baron, A., Armstrong, M. (2007). Human capital management: achieving added value tHumanResourceough people. London: Kogan Page.
- [7] Hamid Darmadi, M.Pd., M. S. E. R. M. S. P. (2019). Pengantar Pendidikan Era Globalisasi: Konsep Dasar, Teori, Strategi dan Implementasi dalam Pendidikan Globalisasi (R. M. S. PUTRA, ed.). Penerbit An1mage, 2019 ISBN 6026510796, 9786026510792.
- [8] Kunter, M., Klusmann, U., & Richter, D. (2013). Professional Competence of Teachers: Effects on Instructional Quality and Student Development. 105(3), 805–820. https://doi.org/10.1037/a0032583.
- [9] Chairul Anam. (2018). Peningkatan Mutu Tenaga Pendidik SPN guna Menghadapi Tantangan Keamanan Global. 12 no 2. Retrieved from http://www.jurnalptik.id/index.php/JIK/article/view/2
- [10] Lassnigg, L., & 2015, D. (2015). Competence-based education and educational effectiveness A critical review of the research literature on outcome-oriented policy making in education. *Institut Für Höhere Studien (IHS), Wien Institute for Advanced Studies, Vienna*, (Inst. für Höhere Stud. (IHS), Wien Inst. Adv. Stud. Vienna).
- [11] Guido Roijen1, J. S. and R. de V., 1Vesteda Investment Management, T. N., 2Zuyd University of Applied Sciences, T. N., & 3Human Accompany, T. N. (2017). Characteristics of High Performance Organization and Knowledge Productivity of Independent Professionals. International Journal of Management and Applied Research, Vol.4 No.(Roijen). Retrieved from http://www.ijmar.org/v4n2/17-008.html
- [12] Hakim, A. (2015). Volume || 4 || Issue || 2 || Pages || PP. The International Journal Of Engineering And Science (IJES) //, 1–12.
- [13] Izadinia, M. (2014). Teacher educators' identity: a review of literature. *European Journal of Teacher Education*, (DOI: 10.1080/02619768.2014.947025). https://doi.org/DOI:10.1080/02619768.2014.947025.
- [14] Widada, T., Slamet, A., Florentinus, T. S., & Martono, S. (2018). Learning Management in Police Academy Educational Institutes and Training. *In KnE Social Sciences*.
- [15] Hasanati, N. (2018). The Role of Work Life Quality towards Teacher's Professional Commitment. *And Humanities Research*, *Advances i* (Atlantic Press). Retrieved from file:///C:/Users/HP/Downloads/25901861.pdf
- [16] Lyle M. Spencer, Jr., and S. M. S. (1993).

- Competence at Work. New York: Wiley.
- [17] Kwakman, K., Streumer, J., & Heijden, B. Van Der. (2002). Current HUMAN RESOURCED trends in the Netherlands: conceptualisation and practices Ida Wognum Simone van Zolingen. 2, 358–378.
- [18] Boxall, P., & Purcell, J. (2003). *Management, Strategy and Human Resource*. Chouhan, V. S., & Srivastava, S. (2014). Understanding Competencies and Competency Modeling A Literature Survey. *IOSR Journal of Business and Management, 16*(1), 14–22. https://doi.org/10.9790/487x-16111422.
- [19] Andriani, D. E. (2011). Model Program Peningkatan Mutu Guru Berbasis Kebutuhan. *Majalah Ilmiah Pembelajaran Nomor 1 Volume 7 Mei 2011*, *Volume 1*. Retrieved from. https://media.neliti.com/media/publications/220040-model-program-peningkatan-mutu-guru-berb.pdf.
- [20] Ratmono, B. M. (2013). Membaca Ulang Kultur Kepolisian Negara Republik Indonesia (Sebuah Refleksi Kritis Dari Dalam). *Jurnal Pemikiran Sosiolog, i Volume* 2.
- [21] Amstrong, M. (2014). Amstrong's Handbook of Human Resource Management Practice 11 th Edition. United Kingdom: Kogan Page.
- [22] Andina, E. (2018). Efektivitas Pengukuran Kompetensi Guru. *Aspirasi: Jurnal Masalah-Masalah Sosial*, 9.
- [23] Dessler, G. (2011). *Human Resource Management*. (Twelfth Ed). New Jersey: Pearson Prentice Hall.
- [24] Hakim, A. (2015b). Contribution of Competence Teacher (Pedagogical, Personality, Professional Competence and Social) On the Performance of Learning. The International Journal of Engineering and Science (IJES), 4(2).
- [25] Izadinia, M. (2014). Teacher educators' identity: a review of literature. *European Journal of Teacher Education*, (DOI: 10.1080/02619768.2014.947025). https://doi.org/DOI:10.1080/02619768.2014.947025
- [26] Simmill-Binning, D. C., & Towers, D. J. (2017). Education, Training and Learning in Policing in England and Wales. 30.
- [27] Hasanati, N. (2018). The Role of Work Life Quality towards Teacher's Professional Commitment. *And Humanities Research*, *Advances* (Atlantic Press). Retrieved from file:///C:/Users/HP/Downloads/25901861.pdf
- [28] Andriani, D. E. (2011). Model Program Peningkatan Mutu Guru Berbasis Kebutuhan. *Majalah Ilmiah Pembelajaran Nomor 1 Volume 7 Mei 2011, Volume 1*. Retrieved from https://media.neliti.com/media/publications/220040-model-program-peningkatan-mutu-guru-berb.pdf
- [29] John M. Green (NPS), J. S. (NPS), & (SMU), D. J. S. (2014). The Application of Black Box Theory to System Development. SEDC Washington DC System Engeneering Conveience.
- [30] Hakim, A. (2015a). Contribution of Competence Teacher (Pedagogical, Personality, Professional Competence and Social) On the erformance of Learning. *The International Journal of Engineering and Science (IJES)*, 4(2).