The correlation between supervisor’s h-index and the number of PMDSU student’s publications

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Abstract. Integrated Master-Doctor program for excellent undergraduate student (Pendidikan Magister Menuju Doktor untuk Sarjana Unggul hereafter PMDSU) is a government program in the effort to increase the number of doctors and the number of international publications for doctoral supervisors in Indonesia. The program has been running since 2013 and has received students in 4 batches until 2018. Based on the year of entry, PMDSU batch I should have completed the study and PMDSU batch II has entered its final year. From that endeavour, this paper describes the achievements of PMDSU student and supervisor’s publications. The hypothesis raised is the number of publications and supervisor’s h-index influences the number of joint scientific publications between students and supervisor for batch I and II. PMDSU students and supervisors batch I and batch II are spread across 12 educational institutions in Indonesia. The findings show that the highest number of student’s publication is 17 articles. The level of participation of PMDSU students in scientific articles reaches 60% of 323 registered students. Based on student participation, an increase in the number of supervisor’s scientific articles was influenced weakly by the participation of PMDSU students. At the other hand, the supervisor’s h-index is also very weak in influencing the number of publications published by PMDSU students. Based on the results obtained, student’s participation can slightly increase the number of supervisor scientific articles, and the supervisor’s h-index has no relation to the number of publications published by PMDSU students.

1. Introduction

In Indonesia, international publications have lagged too far when compared to fellow ASEAN countries whose population is far less than the population of Indonesia. This prompted the Indonesian government to continue making and increasing the number of lecturers with Master and Doctor academic qualifications. PMDSU is one of the breakthroughs to accelerate the number of Doctor in Indonesia and encourage international publications. Universities and ministries must be able to prepare young people to face future challenges [1].

Fifty-seven students enrolled the first batch of PMDSU Scholarship (PMDSU batch I) and supervised by 27 supervisors spread across six universities. The universities organize the batch I PMDSU such as Institut Pertanian Bogor (IPB), Institut Teknologi Bandung (ITB), Institut Teknologi Sepuluh Nopember (ITS), Universitas Andalas (UNAND), Universitas Gadjah Mada (UGM) and Universitas Indonesia (UI). At this period, PDMSU batch I students who have achieved doctoral degrees have published 116 articles in international journals. The implementation of PMDSU batch II
and batch III has been carried out consecutively in 2015 and 2017, and not programmed in 2016. The number of student of PMDSU scholarship batch II was 323 students who were supervised by 176 supervisors from 12 universities (including Universitas Airlangga (UNAIR), Universitas Diponegoro (UNDIP), Universitas Hasanuddin (UNHAS), Universitas Sriwijaya (UNSRI), Universitas Sumatera Utara (USU), and Universitas Syiah Kuala (UNSYIAH)).

In terms of the number of students and supervisors, PMDSU entered an increasingly complex phase. It is not only the problem completing master's and doctoral studies, but the relationship between students and supervisors are also the focus of attention. Students must be able to absorb and implement the knowledge acquired in research independently. Previous research [2] has examined that in discussions between students and supervisors, students are often faced with open statements without clear targets. Another study [3] stated that students and supervisors should increase awareness about the research targets set in dissertation research. In contrast, students were more pleased with fast-track supervisor method [4].

The profile data of professors become qualifications and considerations about student success. Students are required to participate in research and publish the research in proceedings or international journals. Based on this motivation, this study aims to analyze the relationship between supervisor qualifications and the success of student studies. The object of analysis taken is supervisor’s h-index and the number of student publications.

2. Material and Method
Data were obtained from 323 students and 175 supervisors included in the PMDSU program batch I and II. In general, there are two sets of data collection in this study. The first set is data on the number of PMDSU students who publish articles with supervisors and the number of supervisors' publications. The second set is the supervisor h-index data in 2019 and the maximum number of articles produced by PMDSU students with their respective supervisors.

The correlation between PMDSU student participation and the addition of the number of supervisors' scientific articles is calculated using three steps. The first step is to identify the number and names of PMDSU students batch I and II under the guidance of the same supervisor. The next step is to determine the number of students who succeed in publishing Scopus indexed scientific articles with their supervisors. Finally, calculate the correlation between student participation and the addition of supervisor articles with the following formula [5]:

\[
\text{Cor}(X) = \frac{\text{Cov}(X, Y)}{\sqrt{\text{Var}(X)} \sqrt{\text{Var}(Y)}}
\]

where \(\text{Cov}(X, Y)\) is covariance between the number of student participation and the addition of the number of supervisors' scientific articles, while \(\text{Var}(X)\) and \(\text{Var}(Y)\) are the variances of each data. Possible correlation results are the participation of PMDSU students \(X\) affecting or not affecting the increase in the number of supervisor articles \(Y\).

The same step is carried out on the correlation between the supervisor h-index and the maximum number of student scientific articles. First, data on the maximum number of student publications is obtained from data of students participating in scientific articles. Retrieval of maximum data on student publications is based on the principle of bias described hereafter discussed. The second step is to determine the supervisor h-index data in 2019 based on Scopus. Calculating the h-index correlation and the number of student publications is the last step. Correlation is calculated with the following formula:

\[
\text{Cor}(X) = \frac{\text{Cov}(X, Y)}{\sqrt{\text{Var}(X)} \sqrt{\text{Var}(Y)}}
\]
where \( \text{Cov}(X, Y) \) is the covariance between the supervisor h-index and the maximum number of student scientific articles, while \( \text{ar}(X_2) \) and \( \text{ar}(Y_2) \) are variances formed from the data taken. This correlation can tell the relationship that is 0 as the scale does not affect and one as the perfect effect.

3. Result and Discussion

3.1. Data description

The data obtained from Scopus are presented in Table 1. The data are taken from the Scopus website in May, 1st 2019.

Table 1. Numbers of PMDSU students who published Scopus-indexed articles

| No | Institution | Number of Student | Number of Student Participation | Rate of Student Participation |
|----|-------------|------------------|--------------------------------|-------------------------------|
| 1  | IPB         | 92               | 37                             | 0.40                          |
| 2  | ITB         | 42               | 27                             | 0.64                          |
| 3  | ITS         | 39               | 30                             | 0.77                          |
| 4  | UNAIR       | 7                | 4                              | 0.57                          |
| 5  | UNAND       | 33               | 19                             | 0.58                          |
| 6  | UNDIP       | 12               | 11                             | 0.92                          |
| 7  | UGM         | 53               | 33                             | 0.62                          |
| 8  | UNHAS       | 6                | 4                              | 0.67                          |
| 9  | UI          | 6                | 3                              | 0.50                          |
| 10 | UNSRI       | 12               | 11                             | 0.92                          |
| 11 | USU         | 7                | 5                              | 0.71                          |
| 12 | UNSYIAH     | 14               | 9                              | 0.64                          |
|    | Total       | 323              | 193                            | 0.60                          |

Table 1 showed that PMDSU student participation or students who published paper is sufficient in both research and scientific articles. Based on the division of institutions, the majority of institutions have successfully absorbed student participation in research and articles. In general, the participation rate of PMDSU students in article publications is 60%.

3.2. Correlation of PMDSU student participation in increasing supervisor's scientific articles

The first correlation parameter is looking for a relationship between participation of PMDSU students in scientific articles and the number of increases in supervisor scientific articles.
Figure 1 shows the number of students participating in research and publication of Scopus indexed scientific articles. The variable student participation is considered as one of the reasons for the increase in the number of supervisor publications. The distribution of students per supervisor is at least 1 and at most 3. Figure 1 also shows that some supervisors succeeded in involving their students in research and publication of scientific articles.

Figure 2 illustrates the increase in supervisor publications during the period 2015-2019 (May, 1st 2019). Some supervisors managed to publish more than 40 articles in that period either as the main author or correspondence or as members. Most supervisors published fewer than 20 articles in that period, so the average increase in the number of supervisor articles was 17 articles.

The results of the correlation calculation between the participation of PMDSU students and the number of increases in supervisor scientific articles were 0.289 or 28.9%. The figure shows that student participation in research has a weak influence on the increase in the number of publications of the supervisor's scientific articles. This is reasonable considering that supervisors have other research proposals besides PMDSU research. The PMDSU students are not involved in other research.
proposals conducted by the supervisors. Also, the supervisors guide the final projects or thesis of other students published in Scopus indexed journals and proceedings.

3.3. Correlation of the supervisor's h-index to the maximum number of PMDSU student scientific articles

The second correlation parameter is to look at the relationship between the supervisor h-index and the maximum number of PMDSU student publications. A supervisor can have 1 to 3 PMDSU students. From those obtained, several supervisors have papers with more than one student. If the total number of student publications is analyzed, there is a large bias in decision making. This bias can be caused by several students participating in joint articles, comparisons with supervisors who have fewer students, and the total number of student publications greater than the number of supervisors' scientific articles. Therefore, the largest number of student publications is considered fair enough to represent supervisor h-index relationships and student publications.

![Figure 3. Supervisor’s h-index based on Scopus 2019](image)

Figure 3 shows the supervisor h-index with a maximum h-index of 33. Most of the supervisor h-index is indicated by the median and average h-index, which is 7. While Figure 4 shows the maximum number of PMDSU student article publications. The figure shows that only a few students are able to publish articles in more than four articles while taking master and doctoral education. On average, students are able to publish two articles, but some students reach more than 10 articles.
Correlation parameters indicate that the h-index supervisor has no effect or has a very weak impact on the number of student publications. The parameter value is 0.00892 or 0.89%. This fact explains that the supervisor h-index is not a determinant in the publication of student articles or the success of student studies. As the material for reviewing several other articles, it has provided an overview of student constraints in completing his thesis and dissertation. A brief description is explained as follows:

Hamidah et al [6] explain about complex supervisor and student relationship. There are three things that are revealed, such as the lack of positive communication, lack of support from supervisors, and the potential for conflict between supervisors that affect students. By reducing the potential for these three things to happen, supervisors get good supervisory skills.

Other studies take the perspective of students as object of constraint. Natalia [7] considers that students have an essential role in research settings, but in reality, students have high expectations for supervisors. The results of the study stated that work focus is needed to improve students and supervisors' mutual understanding.

In addition, the research conducted by Nuri [8] explained that students had high expectations for their supervisors. The study made a list of students' expectations and produced the top two things that students wanted were the following plan made with his/her student and being mastery in the field. From the results of several studies, all research directs the reader that the first step towards understanding and accepting others is knowledge and respect [9].

4. Conclusions
Based on the data collected from Scopus, the highest number of student’s publication is 17 articles. The level of participation of PMDSU students in scientific articles reaches 60% of 323 registered students. Based on student participation, an increase in the number of supervisor’s scientific articles was influenced weakly by the participation of PMDSU students. It is possible because the supervisor also made articles from other studies besides the PMDSU research. This weak influence also states that the supervisor does not always involve students in other studies. At the other hand, the supervisor’s h-index is also very weak in influencing the number of publications published by PMDSU students. From these findings, it is clear that h-index is not a benchmark of supervision capability. At the very least, skill supervision can be submitted from parameters other than h-index. Therefore, student’s participation can slightly increase the number of supervisor scientific articles, and the supervisor’s h-index has no relation to the number of publications published by PMDSU students.
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References
[1] Király G and Géring Z 2019 Editorial: Introduction to ‘Futures of Higher Education’ special issue Futures in press https://doi.org/10.1016/j.futures.2019.03.004.
[2] Skovholt K, Nordenström E, and Stokoe E 2019 Evaluative conduct in teacher–student supervision: When students assess their own performance Linguist. Educ. 50 46–55 https://doi.org/10.1016/j.linged.2019.03.001.
[3] Casanave C P 2019 Performing expertise in doctoral dissertations: Thoughts on a fundamental dilemma facing doctoral students and their supervisors J. Second Lang. Writ. 43 57–62 https://doi.org/10.1016/j.jslw.2018.02.005.
[4] Abdullah M N L Y and Evans T 2012 The Relationships Between Postgraduate Research Students’ Psychological Attributes and Their Supervisors’ Supervision Training Procedia - Soc. Behav. Sci. 31 788–793 https://doi.org/10.1016/j.sbspro.2011.12.142.
[5] Bervoets S and Zenou Y 2017 Intergenerational correlation and social interactions in education Eur. Econ. Rev. 92 13–30 https://doi.org/10.1016/j.euroecorev.2016.11.005.
[6] Ismail H M, Majid F A and Ismail I S 2013 "It’s complicated" Relationship: Research Students’ Perspective on Doctoral Supervision Procedia - Soc. Behav. Sci. 90 165–170 https://doi.org/10.1016/j.sbspro.2013.07.078.
[7] Moskvicheva N, Bordovskaia N and Darinskaya L 2015 Role of Students and Supervisors’ Interaction in Research Projects: Expectations and Evaluations Procedia - Soc. Behav. Sci. 171 576–583 https://doi.org/10.1016/j.sbspro.2015.01.163.
[8] Doğan N and Bıkmaz Ö 2015 Expectation of Students from their Thesis Supervisor Procedia - Soc. Behav. Sci. 174 3730–3737 https://doi.org/10.1016/j.sbspro.2015.01.1106.
[9] Basarab E (COCOŞ) 2015 Education, Cultural and Intercultural Relation Procedia - Soc. Behav. Sci. 180 36–41 https://doi.org/10.1016/j.sbspro.2015.02.082.