Factors influencing pre-service science teacher’s GPA on bilingual science teacher education program

I Nugraha*
Science Education, Universitas Pendidikan Indonesia, Bandung, Indonesia

*Corresponding author’s email: ikmandanugraha@upi.edu

Abstract. The needs for English speaking teachers in major cities continue to rise along with the increasing number of multicultural students due to population growth. The challenge to fulfill the need has an implication with how the teachers for the future are selected and prepared. This study seeks to explore the possible effects of gender, origin, school type, entry qualifications (Test of English as a Foreign Language/TOEFL) score on student performance (Grade Point Average/GPA) in a bilingual science teacher education program in Indonesia. This study was a cross sectional survey study in first year students who enrolled science teacher education program. The study employed a sample of (N=62) of a first-year student enrolling science teacher education program. The results from Path Analysis via regression to predict factors influencing student’s GPA scores posited that there is no direct effect of student’s origin on GPA and TOEFL has a direct effect on GPA. From this study, the recommendation is to conduct a follow up program on bilingual science teacher program to improve students TOEFL scores because TOEFL score has a direct effect on student’s GPA.

1. Introduction

The needs for teachers in major cities continue to rise along with the increasing number of students due to population growth. Not only numbers of the teachers that become the issue, but there is also a need to improve the quality of teachers and teaching. The challenge to enhance teacher quality and teaching has an implication with how the teachers for the future are selected and prepared. The most common questions appear regarding how the process of preparing teacher in education program in university. There is no specific answer for the questions because there is no a good measure about how well the future teachers are prepared. In the absence of such a good measure, evaluations of teacher education programs tend to be based on less adequate evidence relating to intended course content and graduates’ perceptions of how well they have been prepared [1]

Three questions that can be addressed to university as provider of teacher education [2], the question are (1) What kinds of knowledge do effective teachers need to have about their subject matter and about the learning process and development of their students?; (2) What skills do teachers need in order to provide productive learning experiences for a diverse set of students, to offer informative feedback on students’ ideas, and to critically evaluate their own teaching practices and improve them?; and (3) What professional commitments do teachers need to help every child succeed and to continue to develop their own knowledge and skills, both as individuals and as members of a collective profession?.

All of the questions must be answered during the process of teacher education program. All the skills must be trained in order to facilitate student’s learning. One of the key information to evaluate
The success of teacher education program is by using student’s academic achievement/GPA (Grade Point Average). Many studies revealed that student’s achievement are strongly influenced by many factors such as: gender, family income, first generation status, campus residency, college GPA, self-concept, university supports, admission score and language proficiency [3–8].

In science teacher education program, English is one of the skills that must be owned by the student, especially for the teacher who are prepared to teach in multicultural environment. English is needed not only for daily activities but also for teaching. In term of teaching, the use of terms in one discipline and another discipline can have different meaning. Science teachers when deliver lesson in English should know the specific academic language that students need in order to communicate their knowledge of scientific concepts, processes, functions and purposes. Asking scientific questions, analyzing scientific ideas, evaluating experimental evidence and making conclusions are common things during science teaching. In order to achieve those skills, teachers should help student notice key grammatical patterns as well as key content vocabulary.

Many studies regarding factor influencing student’s academic achievement. Study showed that gender, school type, motive, attitude and many other factors, but the study about English as the factor has been rarely found. It is because most research concern on the academic achievement not on language that is used to deliver the lesson. In term of university academic achievement, the study also emphasizes on student’s entry qualifications and prerequisites. Study showed that well entry qualifications influence student performance [9]. This study seeks to explore factors influencing and the possible effects of gender, origin, school type, entry qualifications (TOEFL like test in this case) on student performance (GPA). The focus questions of the study are: 1. What are the descriptive information of the students? 2. Can GPA achievement be predicted by gender, student demographic area (origin), School type, and TOEFL score?

2. Methods
The research was conducted by cross sectional survey design in first year students who enrolled science teacher education. Cross sectional survey was chosen because the sample was drawn from a predetermined population [10]. In this case was first year student enrolling the program. There was no instrument administered of this study because the data were coming from first year student database in department of science education. The data were further analyzed through Path Analysis via regression to predict factors influencing student’s GPA scores posited that there is no direct effect of student’s origin on GPA and TOEFL has a direct effect on GPA.

The study employed of a sample of (N=62) of a first-year student enrolling science teacher education program. Data are gathered from student with the same group. For the first-year student, the course was conducted in large class for basic topic such as general biology, general physics, general chemistry and basic mathematics.

3. Results and Discussion
3.1. Descriptive information of the student
The study employed a sample of (N=64) first-year students from bilingual science teacher education program. The sample consist of 15 Male students (24.2%) and 47 Female students (75.8%). The students were also grouped based on their home resident (origin), there were 26 students (41.9%) come from Urban area and 36 Students come from Sub-urban area. Students origin were grouped based on their administrative area in their area. Students who are grouped as Urban is stay in city (Kota) and the students who were grouped as Sub-urban come from district area. The detail information of the student’s demographics characteristics can be found the table 1 below.

In term of secondary school experience, table 1 also shows student’s school experience (school type). There are 44 students (71%) come from Public school, 12 students (19.3%) come from private school and the 6 students come from International school. International schools in this group were private school in urban area which run International curriculum in their schools.
Table 1. Demographics characteristics of students (N=62)

| Characteristics | n  | %   |
|-----------------|----|-----|
| Gender          |    |     |
| Male            | 15 | 24.2|
| Female          | 47 | 75.8|
| Origin          |    |     |
| Urban           | 26 | 41.9|
| Sub-urban       | 36 | 58.1|
| School          |    |     |
| Public          | 44 | 71  |
| Private         | 12 | 19.3|
| International   | 6  | 9.7 |

Another descriptive information was about student’s TOEFL school and GPA. Table 2 presents the mean of student’s last TOEFL score and GPA. Student’s TOEFL Scores was last TOEFL score which valid at least 1 years before the enrollment. Male students possess lower mean TOEFL scores (M=493.27; SD=25.85) compared to female students (M=508.19; SD=40.86). Students from urban area has higher mean TOEFL scores (524.19; SD=28.25) compared to students from Sub-urban area. Regarding student’ school type, Students from International schools have highest mean TOEFL scores (M=549.83; SD=48.25) followed by students from private school (M=504.08; SD=28.44) and students from public schools (M=498.70; SD=35.50).

Table 2. Mean of Student’s TOEFL Scores and GPA by Gender, Origin and School

| Characteristics | TOEFL  | GPA  |
|-----------------|--------|------|
|                 | M      | SD   | M    | SD   |
| Gender          |        |      |      |      |
| Male            | 493.73 | 25.85| 3.45 | 0.24 |
| Female          | 508.19 | 40.86| 3.40 | 0.33 |
| Origin          |        |      |      |      |
| Urban           | 524.19 | 28.25| 3.51 | 0.27 |
| Sub-urban       | 490.61 | 41.75| 3.34 | 0.32 |
| School          |        |      |      |      |
| Public          | 498.70 | 35.50| 3.36 | 0.33 |
| Private         | 504.08 | 28.44| 3.48 | 0.25 |
| International   | 549.83 | 48.25| 3.60 | 0.19 |

GPA Scores for gender, origin and school type, the students also showed different mean. Male students showed higher mean of GPA scores (M=3.45; SD=0.24) compared to female students (M=3.40; SD=0.33). Students who come from urban area showed higher mean of GPA (M=3.51; SD=0.27) compared to students who come from sub-urban area (M=3.54; SD=0.32). And students from international school showed the highest GPA scores (M=3.36; SD=0.33), followed by students from private school (M=3.48; SD=0.25) and students from public school (M=3.36; SD=0.33).

3.2. *Path analysis via regression to predict factors influencing Student’s GPA Scores.*

To answer the question, the hypothesized model was developed as the prediction of the ability of four predictors (Gender, student’s origin, school type) to predict student’s GPA. The model can be seen in Figure 1. as follow.
Figure 1. Hypothesized model as the prediction of the ability of four predictors (Gender, student’s origin, school type) to predict student’s GPA.

A block 1 hierarchical multiple regression was administered to assess the ability of four predictors (Gender, student’s origin, school type) to predict student’s TOEFL scores in the hypothesized model (Figure. 1). Gender were entered in step 1, with insignificant change in total variance explained ($F_{change} = 1.65, p = 0.20$). After entering origin at step 2, the total variance explained by the model as a whole was 22% or there was an additional 19% of the variance in TOEFL ($F_{change} = 14.24, p=0.00$). Two school type variables were entered in step 3 with insignificant change in total variance explained ($F_{change} = 1.79$ $p = 0.18$). Model drawn from the first regression analysis can be seen in table 4.

Table 3. Regression analysis summary of gender, school origin and school type predicting TOEFL scores

| Hierarchical step | Predictor Variable | $R^2$ | $R^2$ change | $F_{change}$ | $P$ |
|------------------|-------------------|-------|--------------|--------------|-----|
| 1                | Gender            | 0.03  | 0.27         | 1.65         | 0.20|
| 2                | Origin            | 0.22  | 0.19         | 14.24        | 0.00|
| 3                | Private school    | 0.26  | 0.05         | 1.79         | 0.18|
|                  | International     |       |              |              |     |
|                  | school            |       |              |              |     |

Table 4. Model drawn from regression analysis summary of gender, school origin and school type predicting TOEFL scores

|                  | B      | SE B | $\beta$ | $t$   | $p$  |
|------------------|--------|------|---------|------|-----|
| Model 2 (intercept) | 494.01 | 6.25 | 91.94 | 0.00 |
| Origin            | 33.32  | 8.83 | 0.43   | 3.77 | 0.00 |

Based on the analyses, Model 2 is the best-fit model to explain the variance of TOEFL scores. In this model, one predictor was statistically significant, with origin recording a higher beta value ($\beta = 0.43$, $p = 0.000$).
Table 5. Regression analysis summary of gender, school origin, school type and TOEFL scores predicting GPA scores

| Hierarchical step | Predictor Variable | $R^2$  | $R^2$ change | F change | p    |
|-------------------|-------------------|-------|-----------|---------|------|
| 1                 | Gender            | 0.005 | 0.005     | 0.300   | 0.586|
| 2                 | Origin            | 0.073 | 0.68      | 4.321   | 0.42 |
| 3                 | Private school    | 0.105 | 0.32      | 1.011   | 0.370|
|                   | International     |       |           |         |      |
| 4                 | TOEFL             | 0.427 | 0.367     | 38.88   | 0.000|

A block 2 hierarchical multiple regression was administered to assess the ability of five predictors (Gender, student’s origin, school type and TOEFL score) to predict student’s GPA (table. 5). Gender were entered in step 1, with insignificant change in total variance explained ($F$ change = 0.300, $p = 0.586$). After entering origin at step 2, with insignificant change in total variance explained ($F$ change = 4.321, $p = 0.42$). Two school type variables were entered in step 3 with insignificant change in total variance explained ($F$ change = 1.011 $p = 0.37$). And TOEFL scores was entered in step 4, the total variance explained by the model as a whole was 43 % or there was an additional 36 % in the variance of GPA scores. Model drawn from the second regression analysis can be seen in table 6.

Table 6. Model drawn from regression analysis summary of gender, school origin and school type predicting TOEFL scores

|       | B     | SE B  | $\beta$ | T     | P     |
|-------|-------|-------|---------|-------|-------|
| Model 4 | TOEFL | 0.006 | 0.001   | 0.705 | 6.236 | 0.00  |

Based on the second analyses, Model 4 (figure 2) is the best-fit model to explain the variance of GPA. In this model, one predictor was statistically significant, with origin recording a higher beta value ($\beta = 0.705$, $p = 0.000$).

Figure 2. Path analysis via regression to predict factors influencing Student’s GPA Scores.

This model of Figure 2, posited that there is no direct effect of student’s origin on GPA (that its only effect is an indirect one channeled through TOEFL) and TOEFL has a direct effect on GPA. The model confirmed that gender and school type have no direct effect on both TOEFL and GPA. This finding consistent with the summary from ETS test worldwide that general TOEFL score between male and Female was not significantly different [11]. Until this study reported, there was no related research that compare the differences between students from public high school, private high school and International high school regarding their TOEFL scores and it has never been explained in summary from ETS test worldwide because the variables that were explained ranging from level of education, professional
license, gender, native language, non-native language and geographic regions [11]. The possible explanation from this finding was because students from international students were used to use English in their previous school experiences.

Student’s origin has direct effect on TOEFL score. This finding inline with the previous study that student’s origin or geographic region has a close relation with TOEFL Score [6,11]. TOEFL score has direct effect on student’s GPA confirms previous studies which revealed that increasing TOEFL score leads to increased overall GPA[5,12,13]

4. Conclusion
It is concluded that student’s origin or geographic region has a close relation with TOEFL Score and TOEFL score has direct effect on student’s GPA. In bilingual education program, all of those factors must come into consideration in improving student’s GPA.

5. References
[1] Ingvarson L, Reid K, Buckley S, Kleinhenz E, Masters G N and Rowley G 2014 Best Practice Teacher Education Programs and Australia’s Own Programs
[2] Darling-Hammond L and Bransford J 2007 Preparing teachers for a changing world: What teachers should learn and be able to do (John Wiley & Sons)
[3] Andemariam K, Tsegai S, Andre R S, Dhumal P and Tessema M T 2015 Work Participation and Academic Achievement: Eur. J. Bus. Soc. Sci. 3 15–32
[4] Craft Defreitas S and Rinn A 2013 FIRST GENERATION - Academic achievement in first generation college students: The role of academic self-concept J. Scholarsh. Teach. Learn. 13 57–67
[5] Hagedorn L S and Ren J 2012 International Graduate Students’ Academic Performance: What Are the Influencing Factors?
[6] Hountras P T, Brandt K R and Brandt K R 1970 Relation of Student Residence to Academic Performance in College Relation Academic of to Residence in College Performance Student J. Educ. Res. 63 351–4
[7] Koretz D, Yu C, Mbekeni P P, Langi M, Dhaliwal T and Braslow D 2016 Predicting Freshman Grade Point Average From College Admissions Test Scores and State High School Test Scores AERA Open 2 2323285841667060
[8] Mushtaq I and Khan S N 2012 Factors Affecting Students’ Academic Performance Glob. J. Manag. Bus. Res. 12 17–22
[9] Mlambo V 2012 An analysis of some factors affecting student academic performance in an introductory biochemistry course at the University of the West Indies Caribb. Teach. Sch. 1 79–92
[10] Fraenkel J R, Wallen N E and Hyun H H 2013 How to design and evaluate research in education vol 7 (New York:McGraw-Hill)
[11] ETS 2011 Test and Score Data Summary for TOEFL® Internet-based and Paper-based Tests
[12] Wait I W and Gressel J W 2009 Relationship between TOEFL score and academic success for international engineering students Journal of Engineering Education 98 4 389-398
[13] Martirosyan N M, Hwang E and Wanjohi R 2015 Impact of English Proficiency and Academic Performance of International Students J. Int. Students 5 60–71