Affective and Cognitive Variables as Determinant of College Exit Examination Achievement in Bonga College of Teacher Education, Ethiopia

Desta Geneme,* Mulugeta Atnafu, Esayas Weldetinsae and Anteneh Tefera
Addis Ababa University
Addis Ababa, Ethiopia

Abstract

The purpose of this study was to examine the affective and cognitive variables of pre-service teachers in Bonga College of Teacher Education. Using available sampling, all 144 student teachers of mathematics and environmental science generalist program were taken as a sample. The study used nonsurvey design and it utilized quantitative research method of data collection. From the independent t-test, correlation, and regression analysis, the study found that college cumulative grade point average was a dominant and significant predictor of generalist program student teachers’ exit examination achievement in the institution. The study further indicated the existence of statistically significant difference in the mean content achievement and college cumulative grade point average score.

Keywords: Attitude; college cumulative grade point average; content knowledge; motivational orientation; pedagogical knowledge

Introduction

Educational institutions perform a significant function of providing learning experiences to their students to lead school teaching-learning process. The key personnel in the institutions who hold significant roles to bring about this change at schools are the teachers. According to Panigrani (2013), the teacher is the most important element in any educational program. It is the teacher who is dominantly responsible for the implementation of quality educational processes at all levels. This shows that it is impossible to think of a quality of education without having academically qualified and professionally responsible teachers in the schools. Researchers agree that the availability of well-trained and both professionally and academically competent teachers is central to improving the quality of education at both primary and secondary levels in many countries (Mpokosa and Ndaruhutse 2008).

As it is ascertained in the Education and Training Policy of Ethiopia (1994), teachers are expected to have the ability, diligence, and professional interest, physical and mental fitness appropriate for the profession. According to MoE (2012), teacher education and training programs should give high emphasis on basic knowledge, professional code of ethics, methodology, and practical trainings.

Effective learning in schools is the result of effective teaching, which is the responsibility of the teacher. In this regard, Mcber (2000)
Recent studies have been conducted on relationship between achievement and affective dimension of teachers: motivational orientation and attitude. According to Mulugeta (2014), attitude to teaching profession is an important parameter of effective teachers. As a result of this study, he found that some teachers do not possess positive attitude in teaching Mathematics and the study confirmed that salary was among the causes for lack of motivation to teach school subjects. Similarly, a study...
by Evans (2008) indicated the existence of significant correlations between attitudes toward the subject and content knowledge of teachers, and found that teachers who had good knowledge of the subject matter have significantly better attitudes toward content and teaching the subject. In addition, according to Smith (2009), there exists a significant and positive relationship between teacher content knowledge and student learning. However; a study by Metin, Acisli and Kolomuc (2012) indicated that teachers’ level of education is not the factor for prospective teachers’ attitude towards teaching.

With respect to motivation; a study by Peklaj and Levpušček (2007) recommends institutions to consider students’ motivation before schooling processes of learners. According to this study, institutions need to promote student motivation by choosing relevant, authentic problems that are related to students’ future profession. Thus, exploring the relationship between attitude towards teaching lower primary school Mathematics and Science and motivational orientation of prospective teachers with regard to their content and pedagogical knowledge achievement and student teachers’ CGPA is important and this can have clear educational implication in lower primary school learning. Therefore, the following research questions were designed to be answered by the study.

1. What are the extent of the primary school mathematics and environmental science student teachers’ attitude, motivation, content knowledge (CK), pedagogical knowledge (PK), college cumulative grade point average (CGPA) and exit examination achievement?

2. Are there significant mean differences between CK, PK, college CGPA and exit examination achievement of student teachers?

3. Are there significant relationships between attitude, motivation, CK, PK, college CGPA and exit examination achievement of student teachers?

4. To what extent do the independent variables of the study contribute to the variation in prospective mathematics and science teachers’ exit examination achievement uniquely and/or in common?

Methodology

Research Design

The research method used in this study was quantitative. Moreover, the researchers used quantitative survey tools to collect data from participants of the study. Thus, this research followed a survey research design.

Population and Sampling

According to the data obtained from Bonga College of Teacher Education Registrar Office, the total number of 150 mathematics and environmental science generalist graduating class students attended their third year courses in 2017 and all these student teachers were considered as the population of the study. Though the researchers planned to use available sampling techniques to include all these student teachers in the study, only 144 student teachers returned the questionnaires and were involved in the study as participants.

Instruments and Data Sources

Two self-report questionnaires were administered to gather primary information concerning the independent variables under the study, namely: attitude towards teaching, and motivational orientation of student teachers. In addition, secondary data (student teachers’ CGPA and exit examination results) were collected from Bonga Teacher Education College.
Attitude Questionnaire

The Likert Scale is one of the most widely used methods to measure attitude. Attitude scale designed by Fennema and Sherman (1976) and modified and used for this study in order to determine the attitude of student teachers towards teaching lower primary school Mathematics and Science. There were 15 attitude scale items in terms of strongly agree, agree, undecided, disagree, or strongly disagree.

Motivational Orientation Questionnaire

Academic Motivation Scale designed by Vallerand, et al (1992) was adapted and used in this study in order to determine the motivational orientation of prospective teachers. There were 16 motivational orientation questionnaire items that were adapted in five points scale that ranged from strongly disagree to strongly agree; and out of these eight were intrinsic motivation questions and eight were extrinsic motivation questions.

Validity and Reliability of the Instruments

The attitude and motivational questionnaires were reviewed based on the comments of professionals for the face and content validity. A pilot study was conducted to determine the validity and reliability of the scales to thirty two mathematics and environmental science generalist program student teachers who were selected randomly from graduating class of student teachers in Hawassa College. From the pilot study, the alpha coefficient of Cronbach yielded 0.84 for the attitude questionnaire and 0.85 for the motivation questionnaire. Cronbach Alpha Coefficients of reliability for the two variables indicated that they have high internal-consistency reliability.

Methods of Data Analysis

Since all the likert scales were an ordinal of 5 levels Likert scales and the skewness of the distribution for all items lied between -1 and +1, this indicated that the data are not significantly different from normal. These justify that the variable was distributed approximately normally, inferential statistics was used. Therefore, for this study all affective and cognitive variables of the data, and analysis techniques used, standard deviation, percentage, independent t-test, Pearson correlation, and multiple regression analysis.

Results and Discussion

Results

The first research question was ‘What are the extent of the primary school mathematics and environmental science student teachers’ attitude, motivation, content knowledge (CK), pedagogical knowledge (PK), college cumulative grade point average (CGPA), and exit examination achievement?’ and was analyzed by mean and standard deviation. Table 1 presents the descriptive statistics of the attitude, motivation, CK, PK, College CGPA and exit examination achievement.

The descriptive statistics of the data indicated that the mean score of attitude, motivation, content knowledge, pedagogical knowledge, cumulative grade point average, and exit examination were moderate scores.

The second research question was ‘Are there significant mean differences between CK, PK, college CGPA and exit examination achievement of student teachers?’ Data were analyzed through paired t test. Table 2 is the
In order to see if there exists difference in the CK and PK average, and CGPA and exit examination achievements of the graduates, the researchers used paired samples t-test. The result of paired samples t-test among the average of content knowledge (47.81) and pedagogical knowledge (48.61) of mathematics and environmental science graduates showed that the difference between the mean achievements in both tests was not significant \( (t(143)=-.82713, p>0.05) \). The result of paired samples t test among the average CGPA (58.05) and exit examination achievement (sum of content and pedagogical knowledge) (59.98) of mathematics and environmental science graduates showed that the difference between the mean achievements in both tests was significant \( (t(143)=2.403, p<0.05) \). Thus, it is concluded that there was no significant mean achievement difference between CK and PK average but the difference between CGPA and exit examination achievements was significant.

The third research question was ‘Are there significant relationships between attitude, motivation, CK, PK, college CGPA and exit examination achievement of student teachers?’ and was analyzed by Pearson correlation. Table 3 is the Pearson correlations between the mean attitude, motivation, CK, PK, college CGPA, and exit examination achievement.

Table 3 shows that there are significant and positive association between the variables of the student teachers attitude and motivation, and among CK, PK, college CGPA, and exit exam achievement, but there is no significant difference between any of the affective variables (attitude and motivation) with the cognitive variables (CK, PK, college CGPA, and exit exam achievement). There is a very high association between CK and exit examination achievement \( (r=.958) \); moderate association between PK and exit examination achievement \( (r=.534) \); and attitude and motivation \( (r=.460) \); and low association between CK and PK \( (r=.254) \); CK and college CGPA \( (r=.297) \); PK and college CGPA \( (r=.239) \); and college CGPA and exit examination achievement \( (r=.335) \). For the other pairs of variables, there are no significant relationships.

The fourth research question was ‘To what extent do the independent variables of the study contribute to the variation in prospective mathematics and science teachers’ exit examination achievement uniquely and/or in common?’ To determine the extent of contribution to the variation on prospective teachers’ achievement in the regional exit examination, the researchers used multiple regression analysis. The following tables (table 4 and 5) present the contribution of the variables under this study to the variation in achievement.

Table 4 above shows that the multiple correlation (R) between exit examination achievement and all variables under study
was 0.345 and the coefficient of determination was 0.119. This shows that 11.9% of the variance in exit examination achievement was contributed by all variables in this study (F=6.315, p<0.05). The significance of F-value implies that the variables of the present study predict exit examination achievement at least for this group of student teachers. The result of this study, on the other hand shows that the remaining 88.1% of variance in exit examination achievement was contributed by variables other than college CGPA, motivational orientation and attitude.

In multiple regression analysis table, college CGPA was a significant predictor variable and it explained 11.09% of the variance in exit examination achievement (t=4.167, P<0.05). Other variables, specifically, attitude towards teaching (0.82%) and motivational orientation (0.015%) both contributed insignificant

### Table 2. Descriptive statistics and paired samples t-test between CK and PK; and exit examination achievement and CGPA score

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CK</td>
<td>144</td>
<td>47.81</td>
<td>7.693</td>
<td>-0.827</td>
<td>143</td>
<td>0.409</td>
</tr>
<tr>
<td>PK</td>
<td>144</td>
<td>48.61</td>
<td>10.965</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CGPA</td>
<td>144</td>
<td>58.05</td>
<td>7.641</td>
<td>2.403</td>
<td>143</td>
<td>0.018</td>
</tr>
<tr>
<td>Exit Exam</td>
<td>144</td>
<td>59.96</td>
<td>8.799</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3. Inter-correlation matrix indicating the relationship among variables of the study

<table>
<thead>
<tr>
<th>Variables</th>
<th>X₁</th>
<th>X₂</th>
<th>X₃</th>
<th>X₄</th>
<th>X₅</th>
<th>X₆</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude (X₁)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation (X₂)</td>
<td>.460**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CK (X₃)</td>
<td>.087</td>
<td>-.005</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PK (X₄)</td>
<td>.072</td>
<td>.105</td>
<td>.254**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CGPA (X₅)</td>
<td>.036</td>
<td>-.046</td>
<td>.297**</td>
<td>.239**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Exit Exam (X₆)</td>
<td>.098</td>
<td>.029</td>
<td>.958**</td>
<td>.534**</td>
<td>.335**</td>
<td>1</td>
</tr>
</tbody>
</table>

** significant at alpha level 0.05 (Two Tailed).

### Table 4. Summary of multiple regression analysis result that shows contribution of all variables under study

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>SE</th>
<th>R² change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.345</td>
<td>0.119</td>
<td>0.10</td>
<td>8.34560</td>
<td>0.119</td>
<td>6.315</td>
<td>3</td>
<td>140</td>
<td>0.000</td>
</tr>
</tbody>
</table>

### Table 5. Multiple regression analysis table that shows the contribution of the independent variables to the exit examination achievement

<table>
<thead>
<tr>
<th>Variables</th>
<th>r</th>
<th>B</th>
<th>SE</th>
<th>Beta</th>
<th>% of contribution</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td></td>
<td>34.168</td>
<td>6.526</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>.098</td>
<td>.959</td>
<td>1.025</td>
<td>.084</td>
<td>.8232%</td>
<td>.936</td>
<td>.351</td>
</tr>
<tr>
<td>Motivation</td>
<td>.029</td>
<td>.055</td>
<td>.927</td>
<td>.005</td>
<td>.0145%</td>
<td>.06</td>
<td>.953</td>
</tr>
<tr>
<td>CGPA</td>
<td>.334</td>
<td>9.527</td>
<td>2.286</td>
<td>.332</td>
<td>11.0888%</td>
<td>4.167</td>
<td>.000</td>
</tr>
</tbody>
</table>
variation to exit examination achievement. Thus, the result of this study shows that the most dominant variable to predict exit examination achievement among all the variables under the study was college CGPA result. Thus, from the above regression model, the regression equation of the prediction of the dependent variable exit examination achievement (X6) using the independent variable CCGPA (X5) can be stated as X6 = 34.168 + 9.527X5.

**Discussion**

The major objective of this study was to explore the mathematics and science graduates' contributions of attitude towards teaching, motivational orientation and college CGPA on their exit examination achievements. This section discusses the major findings of the study and delivers the position of the findings in relation to former studies. The mean score of attitude, motivation, college cumulative grade point average (CGPA) score, and exit exam score were slightly above average, and the mean score of content knowledge (CK) and pedagogical knowledge (PK) were slightly below the passing mark of 50%. The finding of this study is synonymous with Mulugeta's (2012) finding with respect to achievement in subject area or content knowledge. According to Mulugeta (2012), the achievement of students is lower than the passing mark of 50%.

Teachers' content and pedagogical knowledge systems are among the areas of teachers' competency that positively or negatively affect school outcome. Teacher knowledge is one of the factors that determine children's effective learning. However, there is no clear cut agreement if teachers' content knowledge achievement varies from teachers' pedagogical knowledge achievement. Thus, this study explored the mean achievement difference of prospective teachers' content and pedagogical knowledge achievement and found that there was no significant mean achievement difference between CK and PK of mathematics and environmental science student teachers. This result is consistent with this finding of Kleickmann, et al. (2012) which concluded that the PK and CK achievement difference is not significant. In their study, confirmatory factor analyses showed that PK and CK measurement was satisfactorily invariant across the teacher populations.

College CGPA and exit examination results are the most commonly used graduates' pre work performance indicators that different institutions and work organizations use for employee selection criteria. However, there is no clear and consistent research finding that shows whether these two graduates' scores are related or not. Thus, the finding of the study based on paired samples t test result indicated that the mean achievement exit examination was significantly higher than the college CGPA score. However, the research findings reported different result. For example, Tuner (2005) from a correlational study conducted on registered nurses found that there was no significant relationship between pre-graduation comprehensive tests and program grading scales of National Licensure Examination. Similarly, Clayton (2012) a study that explored the predictive validity of placement exam on success in latter performance found that the incremental validity of the placement exam relative to high school background was weak. The reason for the inconsistency between college CGPA and exit examination achievement may be due to the content areas coverage and assessment techniques' differences in the two assessments. The proportion of the content and pedagogy knowledge in the examinations CGPA and exit examination achievement are different, and the types of examinations are also different. The type of examination in the college exam is more on open ended exam and in exit examination is all closed ended exam.

Exploring the relationship between each of the variables of the study was among the objectives of this study. The result showed that a significant moderate positive relationship
existed between attitude towards teaching and motivational orientation of student teachers. The finding of this study agrees with Perry's (2007) finding. According to Perry (2007), mastery goals were moderately correlated to all constructs of attitude. Moreover, the result of the current study also showed that there existed a significant correlation between content knowledge achievement and pedagogical knowledge achievement but the correlation was weak. According to Smith (2009), teacher knowledge is significantly related to teacher pedagogical effectiveness. Thus, the finding of this study concurs with Smith's empirical research finding. In addition; Smith indicated that the effect of teachers' content knowledge is associated with teachers' pedagogical knowledge through students' learning. Similarly; Yee and Normore (2012), indicated that factors, such as teachers' cognitive ability, subject matter knowledge, knowledge of teaching and learning, licensure, and teaching behaviors in the classroom, are related to teacher quality and increased student achievement. This study found that there existed strong positive relationship between CK and exit examination achievement. On the otherhand, it was found that the correlation between PK and exit examination achievement was significant but moderate. This was because CK and PK were components of total exit examination results of the sample of study. The result of this study further indicated that there existed a significant correlation between CGPA score and content knowledge (CK), and between CGPA and pedagogical knowledge (PK). According to Melaku (2014), GPA and the University entrance exam scores are significantly related and they predict first year college GPA in general. This indicates that College or University students’ academic achievement both in and out of the institution can be correlated and predicted each other. A study by Coble, Crowe, and Allen (2016) agrees that standard achievement test results correlate with college result significantly. Moreover, according to Don Moore, Schurr and Henriksen (1991), National Teacher Examination and GPA of teacher preparation program are correlated positively and the correlation is moderate. Thus, the current research finding agrees with the former research results. However; there was no significant relationship observed for the pairs of the others variables. With respect to these issues, findings of the former research were inconsistent. For example, Skaalvik and Skaalrik (2006) revealed significant relationship between academic performance and motivation. In this sense, academic performance can be connected with content knowledge and pedagogical knowledge performance. In general, the correlation between affective variable and cognitive variable was found not significant.

The highest significant contribution for exit examination achievement was by college CGPA. Other variables on attitude towards teaching and motivational orientation, both contributed insignificant variation to exit examination Achievement. Thus, the result of this study showed that the most dominant variable to predict exit examination achievement among all the variables under the study was College CGPA result. Different studies on students’ achievement indicated that college CGPA is one of the predictors of learners’ achievement. For example, Whitehead (2016) form an empirical correlation study conducted in graduating class of Nurses in San Antonio found that college CGPA as one of the predictor on National Council Licensure Examination. However, the variables in this study did not contribute equally to the variation to the achievement.

**Conclusion**

In light of the basic questions raised in this study the following conclusions have been drawn. Predicting the exit examination from the affective and cognitive variables of the study was one of the objectives of the study. In this study, it was found that college CGPA was
a dominant and significant predictor (11.09%) of generalist program student teachers’ exit examination achievement in the institution, and the remaining 88.1% of the variation in achievement was contributed by variables other than the study variables. This finding has a special message for researchers in the area in general and teacher educators in particular to search for other factors that may have contribution on exit examination achievement of generalist program student teachers other than the variables in this study.

The result of the study on the mean achievement difference between content knowledge and pedagogical knowledge result indicated that students do not differ in the two areas of knowledge. However; students were found to differ in their college CGPA score and exit examination achievement significantly. This difference may indicate the mismatch between college course content coverage and exit examination contents and the type of questions. Therefore a study evaluating the contents of the exit examination on a relation to college course content coverage is necessary. Examing the correlation between the variables of the study, attitude to teach was significantly correlated with general motivation to teach. In addition; content knowledge achievement of student teachers was significantly correlated with their pedagogical knowledge achievement. Moreover CK score of student teachers was significantly correlated with CGPA, PK and exit examination achievements. Moreover, CGPA was significantly correlated with PK and exit examination achievements. In addition, the result indicated that PK and exit examination achievement were significantly correlated. However, other variables motivation with CK, attitude with PK, motivation with PK, and attitude with CK were not significantly correlated. CGPA had no significant correlation with other variables: attitude and motivation. Thus, the study concluded that student teachers who have positive attitude to teach have good motivation to teach irrespective of their motivational orientation. In addition, the study concluded that student teachers who have higher achievement in content knowledge have higher achievement in pedagogical knowledge. Similarly; student teachers who have higher college CGPA achieve better in exit examination. The correlation analysis further indicated that none of the affective variables were significantly related with the cognitive variables.

**Recommendations**

Based on the findings to improve and enhance quality of mathematics and science education in lower primary school, primary school teachers should embrace their responsibility. However, expecting quality students’ learning from teacher of lower academic competence is unthinkable. Thus, the concerned education stakeholders in the region, the regional education bureau, the zonal, and Woreda education departments and teacher training colleges should search ways to improve teacher competency in both content and pedagogical area knowledge through inclusion of these knowledge bases as part of teachers’ professional development plan. Since a great amount of variance in the exit examination achievement is unexplained by the independent variables in this study, this finding has a special significance for researchers in the area in general and teacher educators in particular to search for other factors that may have contribution on exit examination achievement of generalist program student teachers other than the variables in this study. This study also examined mean achievement differences in student teachers performance. Results showed that students were different in their college CGPA score and exit examination achievement. This difference may indicate the mismatch between college course content coverage and exit examination contents. Therefore a study evaluating the contents of the exit examination on a relation to college course content coverage is necessary.
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