



East African Journal of Education Studies

eajes.eanso.org

Volume 7, Issue 2, 2024

Print ISSN: 2707-3939 | Online ISSN: 2707-3947

Title DOI: <https://doi.org/10.37284/2707-3947>



EAST AFRICAN
NATURE &
SCIENCE
ORGANIZATION

Original Article

Predictors of Growth Mindset among Ghanaian Classroom College of Education Teacher Trainees

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Article DOI: <https://doi.org/10.37284/eajes.7.2.1945>

Date Published: **ABSTRACT**

26 May 2024

Keywords:

Growth Mindset,
Teacher
Education,
Ghana,
Random Forests

The study aimed to examine the important predictors of Ghanaian classroom Diploma in Basic Education teacher trainees' growth mindset toward student learning. Participants included a purposive sample of 328 (177 male and 151 female) second- and third-year teacher trainees in one college of education in the northern part of Ghana. The predictor variables were the type of program, year in program, age, sex, and marital status. The student learning subscale of the Physical Education and Sports Ability Survey (Sofo et al., 2016) served as the main data source. The items were adapted for the classroom setting. Most of the trainees had a growth mindset but with some fixed ideas for student learning (80.18%). Approximately 19.21% of the trainees had a strong growth mindset in student learning. The mean decreased Gini (MDG) values for the year in the program, program type, and marital status (married vs. single) showed that these predictors were important for student learning. A logistic regression analysis showed that type of program, year in program, and marital status were significant predictors of growth mindset for student learning. Trainees in the early childhood program were approximately seven times more likely to have a growth mindset regarding student learning compared to those in the primary education program. Trainees in their third year were approximately 145 times more likely to have a growth mindset regarding student learning compared to trainees in their second year. Single teacher trainees were approximately 213 times more likely to have a growth mindset regarding student learning compared to married teacher trainees. The study provides insights for teacher educators regarding the profiles and factors that promote the development of a growth mindset in teacher education settings in Ghana.

APA CITATION

Sofo, S., Thompson, E. & Asola, E. F. (2024). Predictors of Growth Mindset among Ghanaian Classroom College of Education Teacher Trainees *East African Journal of Education Studies*, 7(2), 323-329. <https://doi.org/10.37284/eajes.7.2.1945>

CHICAGO CITATION

Sofo, Seidu, Emmanuel Thompson and Eugene F. Asola. 2024. "Predictors of Growth Mindset among Ghanaian Classroom College of Education Teacher Trainees". *East African Journal of Education Studies* 7 (2), 323-329. <https://doi.org/10.37284/eajes.7.2.1945>

HARVARD CITATION

Sofo, S., Thompson, E. & Asola, E. F. (2024) "Predictors of Growth Mindset among Ghanaian Classroom College of Education Teacher Trainees", *East African Journal of Education Studies*, 7(2), pp. 323-329. doi: 10.37284/eajes.7.2.1945.

IEEE CITATION

S., Sofo, E., Thompson & E. F., Asola "Predictors of Growth Mindset among Ghanaian Classroom College of Education Teacher Trainees" *EAJES*, vol. 7, no. 2, pp. 323-329, May. 2024. doi: 10.37284/eajes.7.2.1945.

MLA CITATION

Sofo, Seidu, Emmanuel Thompson & Eugene F. Asola. "Predictors of Growth Mindset among Ghanaian Classroom College of Education Teacher Trainees". *East African Journal of Education Studies*, Vol. 7, no. 2, May. 2024, pp. 323-329, doi:10.37284/eajes.7.2.1945.

INTRODUCTION

The concept of a growth mindset has received significant attention in the field of education (Dweck, 2006). A person with a growth mindset believes that abilities and intelligence can be developed through effort, learning, and perseverance (Dweck, 2006). This contrasts with a fixed mindset, where individuals believe that their abilities are static and cannot be changed significantly. Adopting a growth mindset has been shown to significantly affect students' motivation, learning, and overall academic success (Blackwell et al., 2007; Dweck, 2008). A growth mindset has been shown to affect the academic delay of gratification directly (Zhao et al., 2023), an important component of self-control and self-regulation (Bembenutty & Karabenick, 1998).

One area that has not been studied in education in Ghana is the need to understand the predictors of a growth mindset among prospective teachers. A growth mindset, characterized by the belief in the malleability of one's abilities through effort and learning (Dweck, 2006), is not a uniform trait but a dynamic construct influenced by various factors (Yeager & Dweck, 2012). Previous studies have identified possible predictors of growth mindset as the teacher's sociocultural background, prior academic experiences, and instructional practices (Blackwell et al., 2007; Hong, 2013; Sisk et al., 2018). For example, instructional approaches that emphasize effort and learning from mistakes would more likely promote a growth mindset. However, the interaction and relative contribution of these predictors in the context of teacher education are unclear. An understanding of these predictors is essential because it can inform targeted interventions and curriculum enhancements to foster growth mindsets among teacher trainees, ultimately benefiting their students' learning experiences (Haimovitz & Dweck, 2016).

Some studies on the effectiveness of growth mindset interventions did not find a significant association between growth mindset and academic achievement (Sisk et al., 2018). However, there is evidence that growth mindset interventions may have some benefit for low socioeconomic students (Claro et al., 2016; Sisk et al., 2018).

People will, in challenging situations, tend to invest more effort to improve their situation (Lui et al., 2014). Ghana places a strong focus on the education of its youth, recognizing that well-trained teachers are essential to achieving educational goals and national development. The country recognizes that teacher education programs play an important role in shaping the country's educational future (Akyeampong, 2017). A growth mindset among teacher trainees can help them with the knowledge and efficacy of student learning. In addition, a developmental perspective can provide teachers with the flexibility needed to promote creativity development and overcome challenges in the education system in Ghana (Adom et al., 2021). Ghanaian society places a high value on education, and students often face tremendous pressure to excel academically. The pressure to excel academically can sometimes create a fixed mindset and fear of failure among students (Adu, 2023). There is, therefore, a need to formulate effective and contextually meaningful policies as these play an important role in the determination of educational attitudes and practices (Annan, 2020).

According to Dweck (2006), having a growth mindset means believing that one's abilities can be improved through dedication and effort. This mindset is more beneficial for achieving success compared to a fixed mindset, which views qualities as unchangeable (Dweck, 2006). This is particularly important in education, where a

teacher's mindset has a significant impact on their motivation, resilience, and teaching strategies (Dweck et al., 2014). For example, Shoshani (2021) reported that high school mathematics teachers who had more growth mindset were more engaged and enthusiastic and were more likely to experience professional well-being. Additionally, Rattan et al. (2012) have demonstrated that teachers who praised students' effort rather than their intelligence fostered a growth mindset, leading to higher resilience in the face of academic challenges.

Purpose of the Study

An understanding of the factors that promote a growth mindset among teacher trainees can impact their pedagogical skills and enhance in them the psychological attributes necessary for effective teaching and learning. While the advantages of a growth mindset for students have been well-researched (Blackwell et al., 2007), little attention has been given to identifying the specific factors that foster a growth mindset. Therefore, the purpose of the study was to examine the important predictors of Ghanaian classroom Diploma in Basic Education teacher trainees' growth mindset toward student learning. The findings can provide insights regarding the factors that promote the development of a growth mindset among teacher trainees in Ghana. This, in turn, can empower policymakers and educators to design and implement appropriate interventions.

Research Questions

The following research questions guided the study:

- What are the growth mindset profiles of Ghanaian classroom teacher trainees?
- What are the important predictors of Ghanaian classroom teacher trainees' growth mindset for student learning?

MATERIALS AND METHODS

Participants

Participants included a purposive sample of 328 (177 male and 151 female) trainees; second-year (152) and third-year (176) teacher trainees

enrolled in a Diploma in Basic Education program at one college of education in the northern part of Ghana. They were aged 19-35 years ($M = 24.45$; $SD = 2.36$). The trainees were enrolled in the General Basic (Primary) Education (178) and Early Childhood Education (150) programs at the time of the study. First year teacher trainees had not yet reported to campus at the time of data collection for the study. Therefore, only second and third year trainees were invited, and 339 agreed to participate in the study. Data for 11 completed questionnaires were deleted due to missing data, resulting in a sample size of 328. The use of purposive sampling allowed us to target the population, teacher trainees, and the construct of growth mindset. Additionally, purposive sampling was useful in the study of growth mindset among teacher trainees in Ghana where there are no published studies on the topic.

Instrument and Variables

An adapted version of the student learning subscale of the Physical Education and Sports Ability Survey (PESAS) (Sofu et al., 2016) served as the main data source. The PESAS was, in turn, developed from the Dweck Mindset Inventory (Dweck, 2006). The items were adapted for the classroom setting. The student learning subscale consisted of 12 items on a 4-point Likert scale of strongly agree (4), agree (3), disagree (2), and strongly agree (1), with "4" being the highest and "1" the lowest for items that were positively stated. The sum of the responses for the 12 items constituted a participant's score (mindset profile). Thus, a participant could have a minimum score of 12 and a maximum score of 48. The mindset profiles and their corresponding scores were strong fixed mindset (1-12), fixed mindset with growth ideas (13-24), growth mindset with fixed ideas (25-36), and strong growth mindset (37-48). The teacher trainees' growth mindset toward student learning served as the response variables. The predictor variables were the type of program, year in program, age, sex, and marital status.

Statistical Analysis

Random Forest Parameters and Evaluation Metric

For all the models estimated using the random forest algorithm for classification, we used the square root of the number of predictors and rounded to the nearest whole number as the number of predictors randomly sampled as candidates at each split (James et al., 2021). We set the variable importance argument to TRUE in the “random Forest()” function and the number of trees was set to the default of 500. The evaluation metric for the random forests for classification was the Out-of-bag (OOB) error metric. This metric measures the prediction error rate for the random forests method. The OOB estimate for the error rate for student learning was 14.33%.

Predictor Importance and Logistic Regression

We used the mean decrease Gini (MDG) value (cut-off point = 10) to determine predictor importance. The higher the value, the greater the importance of the predictor. Predictors with MDG values of at least 10 were important. For student learning, year in program, program, and marital

status (married vs single) were important predictors according to their MDG values. For robustness, and to obtain a more interpretable model to guide practitioners, we estimated the binary logistic regression model and obtained the estimated Odds Ratios and their corresponding 95% confidence intervals. Results of the logistic regression were consistent with the random forests results and hence serve as a check for the robustness of our results.

RESULTS

Teacher Trainees’ Growth Mindset Profiles for Student Learning

The first research question examined the growth mindset profiles of Ghanaian classroom teacher trainees. *Table 1* data on teacher trainees’ growth mindset profiles for student learning. Most of the trainees had a growth mindset but with some fixed ideas for student learning (80.18%). A little over 19 percent of the trainees had a strong growth mindset in student learning. Conversely, only approximately 0.31% of the trainees had a strong fixed mindset or a fixed mindset with growth ideas.

Table 1: Teacher trainees’ growth mindset profiles for student learning

Category	Frequency	Percent
Strong Fixed Mindset	1	0.31
Fixed Mindset with Growth Ideas	1	0.31
Growth Mindset with Fixed Ideas	263	80.18
Strong Growth Mindset	63	19.21
Total	328	100.00

Important Predictors of Teacher Trainees’ Growth Mindset

Table 2 represents the Mean Decreased Gini (MDG) for the predictor variables. Year in program had the highest MDG of 49.20, followed by marital status (Single versus Married). Using a

cut-off point of 10 shows that the MDG values for the year in the program, program type, and marital status (married vs. single) were important for student learning. Alternatively, teacher trainees’ sex, age, and marital status (Single versus Other) were not important predictors of teacher trainees’ growth mindset for student learning.

Table 2: Mean Decrease Gini values based on Random Forests Methods

Predictors	MDG
Program (Early Childhood vs Primary)	10.49
Year in Program (3 rd vs 2 nd)	49.20
Age (More than 25 years)	3.31
Sex (Female vs Male)	2.04
Marital Status (Married vs Single)	21.64
Marital Status (Other vs Single)	3.61

Logistic Regression for Predictor Variables and Growth Mindset

We did a logistic regression analysis for the predictors that had MDG values of at least 10. The analysis (See *Table 3*) showed that type of program, year in program, and marital status were significant predictors of growth mindset for student learning. Trainees in the early childhood program were approximately seven times more likely to have a growth mindset regarding student

learning compared to those in the primary education program. Trainees in their third year were approximately 145 times more likely to have a growth mindset regarding student learning compared to trainees in their second year. Single teacher trainees were approximately 213 times more likely to have a growth mindset regarding student learning compared to married teacher trainees.

Table 3: P-values and estimated odds ratios based on predictors with MDG ≥ 10

Predictor	P-value (Estimated Log Odds)	Estimated Odds Ratio
Year in Program (Year 3 vs Year 2)	0.000	144.877
Program (Early Childhood vs Primary)	0.000	6.782
Age (>25 vs ≤ 25)	0.492	1.330
Sex (Female vs Male)	0.996	0.998
Marital Status (Single vs Married)	0.000	212.766
Marital Status (Other vs Single)	0.986	0.000

DISCUSSION

This study examined the important predictors of Ghanaian classroom Diploma in Basic Education teacher trainees' growth mindset toward student learning. Teacher trainees in the early childhood program were approximately seven times more likely to have a growth mindset regarding student learning than those in the primary education program. This may be attributed to the more visible growth and development early childhood education trainees observe in young children's abilities, which in turn, may strengthen their belief in the efficacy of a growth mindset approach.

Trainees in their third year were more likely to have a growth mindset regarding student learning than trainees in their second year. The year three trainees having had more exposure and experience with children in real classrooms might have had a deeper understanding of growth mindset than their counterparts in their second year of training.

Sex was not an important predictor of growth mindset in teacher trainees in this study. One explanation for this finding could be that Colleges of Education offer a uniform curriculum that focuses on a growth mindset equally to all teacher trainees. A second reason could be due to psychological attributes. That is, a growth mindset

might be a result of individual differences as such personal experiences, motivation, and resilience. This finding is consistent with Donohue et al.'s (2021) study which reported that the growth mindset of males and females did not differ. Similarly, Nakasiita et al. (2023) found no significant differences between male and female secondary school mathematics students in Uganda. In contrast, Claro and Loeb (2019) reported in a study of grades 4-7 mathematics that girls demonstrated higher growth mindset scores than boys.

Age was also not an important predictor of teacher trainees' growth mindset. This is consistent with previous research that did not find significant differences in growth mindset across ages (Donohue et al., 2021; Nakasiita et al., 2023). Such a selection bias could minimize the observable differences in mindset attributed to age (Jensen, 2015). Another reason could be that core personality traits, such as mindset, become relatively stable in early adulthood (Roberts & DelVecchio, 2000).

Another major finding of our study was that married teacher trainees exhibited lower growth mindset scores than their counterparts who were single. Single-teacher trainees may perceive

themselves to have greater control over their lives than married trainees. This perceived control may lead single trainees to have a stronger belief in their ability to change and improve, consistent with the principles of a growth mindset. Also, compared to married couples, single individuals generally have more personal freedom and independence. This autonomy can lead to a strong belief that they have control over their abilities and can actively work to improve them, consistent with growth mindset principles.

CONCLUSIONS

Our study revealed that three out of six predictors significantly influenced the development of a growth mindset in Ghanaian teacher trainees. Notably, the type of program, year in the program, and marital status significantly predicted their growth mindset regarding student learning. These findings provide important insights for teacher educators regarding the profiles and factors that promote the development of a growth mindset in teacher education settings in Ghana. The findings from this study have implications for teaching and teachers in Ghana. First, teacher education programs should integrate coursework and learning experiences that emphasize the promotion of a growth mindset in their teacher trainees. This, in turn, could better train future teachers to foster growth mindset principles in their future students, thereby enhancing student learning outcomes. Second, the principles of a growth mindset should be integral to continuous professional development for practicing teachers. Professional development workshops can provide opportunities for practicing teachers to stay up to date with best practices in terms of growth mindset development. Third, policymakers can assist teachers in providing learning environments that empower students by fostering growth mindset development. Finally, the findings of this study underscore the importance of cultural sensitivity to the educational system of Ghana. Teacher education programs should recognize the influence of cultural norms and values on the development of a growth mindset among students and implement their curriculum accordingly.

Recommendation for further studies

The present study was conducted on teacher trainees in the Diploma in Basic Education program. This program has been phased out and replaced with the Bachelor of Education (B.Ed.) program at the colleges of education. Future research could be done on trainees pursuing the B.Ed. programs at the colleges of education. The growth mindset of prospective teachers in Ghanaian universities could also be investigated. Furthermore, studies comparing the growth mindset of teacher trainees in different teacher education programs are worth investigating.

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