An Identification and Assessment of the Needs and Necessary Conditions for Transferring Students from Informal to Formal Education System, a Case Study of Complementary Basic Education (COBET)

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Abstract

Complimentary Basic Education in Tanzania (COBET) is a community-based programme that provides opportunity to over aged children to be enrolled in formal education system. COBET was a programme initiated to provide opportunity for the acquisition of basic education to out of school children aged between 8 to 18 years. Dar es Salaam is one of the Tanzania regions which lead in terms of children wondering in the street. Therefore, studying the situation of COBET, identify and assess the needs and necessary conditions for transferring students from these COBET centres to formal education system is very important as it will give chance to street children and those pupils dropout from formal primary schools back to formal education system through COBET. In this study a sample of 424 eligible COBET students from Dar es Salaam region were used. Principal Component Analysis (PCA) was used to study the needs and necessary conditions for transferring COBET students to formal education. The study reveals that 53% of the total respondents were males whereas females were 47%. PCA reveals that the needs and necessary conditions for active COBET centers were being explained by three components in each

dependent and independent variables. The findings suggest that, the needs and necessary conditions for active COBET centers include availability of students/pupils, books, desks, premises (classrooms) and COBET facilitators.

Keywords: COBET, PCA, students, education

Introduction

A growing number of agencies worldwide are working with non-formal educational programmes. Some of the earliest programmes were found in Europe after the Second World War. Many non-formal programmes now exist throughout the world (Bequele, 1998). The Millennium Development Goals (MDGs) initiative calls upon developed and developing countries to work in partnership towards a world with less poverty, that guarantees basic education for children, equal opportunities for women, and a healthier environment. The initiative includes two objectives, focusing on education namely: (1) achieving universal primary education [UPE] and (2) gender equality in education, both by 2015.

According to the fundamental policy, non-formal education is generalised as out of school education, distinguished from formal education which is obtained in schools. However, either type may include, at certain stages, some aspects of the other. There are two main categories of non-formal education which are the non-formal education itself and Adult Education. Complimentary Basic Education programme was established, to offer a second chance to over aged out of school children to acquire quality basic education, including life and survival skills (UNICEF, 2006). Tanzania is striving towards education for all. Complementary Basic Education in Tanzania (COBET) or its Kiswahili equivalent "Mpango wa Elimu ya Msingi Kwa Walioikosa" (MEMKWA) was a programme initiated to provide opportunity for the acquisition of basic education to out of school children aged between 8 to 18 years, with a special focus on girls and vulnerable children following a specialized three-year

course of study (Johnson *et al*., 2005). In recent years, COBET has been affected significantly by a massive decline in number of COBET centers due to limited resources (URT, 2008) and existence of children who are out of school (Ngodu, 2010). Several studies have been conducted to examine factors associated with enrolment and existence of COBET centers at regional and zonal level (UNICEF, 2006). Most of the studies were centered in COBET piloted districts and applied qualitative technique (Levira, 2002; Michael, 2008).

The performance of the programme in Tanzania was promising in terms of gross enrolment rate. Regarding the enrolment in Complementary Basic Education in Tanzania (COBET), learners in Cohort I (aged 8 – 13) and Cohort II (aged 14-18) in 2012 was 76,867 as compared to 82,459 in 2011 which was a decrease of 5,592 (7.3%). This decrease of learners in Cohort I and Cohort II reflects the decrease of existence of out of school children, which is compatible with the planned COBET programme (URT, 2012). However, the decrease may not necessarily be attributed to decreased number of out of school children as learners might have not enrolled to COBET classes due to other reasons. The reasons may include lack of sensitization, lack of facilitators and un-conducive environment in the centers (URT, 2012). The sustainability of the programme would depend on close cooperation between the governmental, non-governmental organizations, communities and donors (Gaudenzia, 2001).

That is why PCA was applied to assess and identify the needs and necessary conditions for transferring students from COBET to formal education. By needs we mean the needs for the COBET students (such as being healthier, uniforms, fees, to have time for schooling, parents/guardian awareness and pupils/students awareness towards importance of education and COBET) whereas the necessary conditions here we mean other necessary requirements for the programme to exist (such as facilitators/teachers, classrooms, desks, books, and well refined curriculum).

Materials and Methods

Population

Target population was Dar es Salaam region COBET students. Questionnaire was designed and used to interview COBET students. Students were informed prior to their class sessions and were encouraged to participate. The questionnaires were distributed to the students who were able to read and write, in the centers at the end of their scheduled class sessions with cooperation of the teachers/facilitators in charge. Filled questionnaires were then collected immediately after the sessions. For those who were not able to read and write interview were used to fill the questionnaires.

Sampling Design and Sample Size

The adopted sampling design was stratified multistage sampling. Initially, the population of Dar es Salaam region COBET students was stratified into three municipals which were Kinondoni, Ilala and Temeke. Then from each municipal, the number of students selected was proportional to the total number of students in each Municipal. To ensure that the final sample includes at least 324 usable responses for PCA, it was wise to administer the questionnaire to between 374-424 respondents (Hatcher & Stepanski, 1994). Therefore, a total of 424 students from Dar es Salaam region were selected for the study. The data processing, descriptive analysis and PCA were performed in SPSS V20.

Principal Component Analysis

Principal Component Analysis (PCA) was invented in 1901 by Karl Pearson. It is mostly used as a tool in exploratory data analysis and for making predictive models (Pearson, 1901). This is a multivariate method used for data reduction purposes; the basic idea is to represent a set of variables by a smaller number of variables called principal components. These are chosen in such a way that they are uncorrelated and are therefore measuring different, unrelated aspects, or dimensions of the data (Cornish, 2007). The analysis of principal components often reveals relationships that were not

previously suspected and hence allows interpretations that would not ordinarily result (Johnson *et al*., 1992). Dataset should be analyzed independently in the first case; one set of data plays the role of predictors (or independent) variables and the second set of data corresponds to measurements (or dependent variables) (Abdi, 2003b). Rodrigues in 2007 made an extension of principal component analysis where he made only an observation of the dependent variables. He further recommended dependent and independent variables to be run independently since other researchers mostly use independent observations (Rodrigues, 2007). Therefore in this study independent and dependent variables were analyzed independently by using PCA.

Principal components depend solely on the covariance matrix $\sum$ or the correlation matrix ρ of the random variables $X_1, X_2, X_3 \ldots X_p$ with Eigen values $\lambda_1 \geq \lambda_2, \geq \lambda_3 \geq \ldots \geq \lambda_p \geq 0$. A few orthogonal linear combination of variables created are called principal components, $X_1, X_2, X_3 \ldots X_p$ these are the original variables while $Y_1, Y_2, \ldots, Y_k$ where $k < p$ are principal components.

When we do Principal Components Analysis, we usually get what are called Eigen values $(l_1^{'}, l_2^{'}, l_3^{'}, \ldots, l_p^{'})$, Eigen values are the variances of the principal components. In other words, the first Eigen is the variance of the first principal component, the second Eigen value is the variance of the second principal components and so on. Essentially, any principal components that account for only a small proportion of the variation in the data are discarded. Data screening was done by using communalities and the check for complex structure. All variables having communality less than 0.5 or having complex structure were all removed (University of Texas, 1997-2003; Field, 2010). Principal Component Analysis was carried out separately for dependent and independent variables as suggested by Abdi (2003b), Rodrigues (2007), and Matteson *et al.* (2013). Also checking for multicollinearity was done which could be detected by looking at the determinant of the R-matrix. To avoid

multicollinearity, determinant should be greater than 0.00001 (Field, 2005). In this study dependent and independent components, determinant of R-Matrix were 0.770 and 0.579 respectively which were greater than 0.00001.

Results

In this section Descriptive Analysis and Principal Component Analysis (PCA) was performed using data collected from the COBET students in order to identify and assess the needs and necessary conditions for transferring students from COBET to formal education.

Table 1: Number of Respondents Descriptive Results

Variables		Number of Respondents	Percentage (%)
Ilala Municipal	Bryceson	18	4.2
	Buguruni	7	1.7
	Chema	55	13.0
	Juhudi	14	3.3
Kinondoni Municipal	Kawe "A"	38	9.0
	Kimara baruti	28	6.6
	Magomeni	7	1.7
	Mkwawa	64	15.1
	Msasani "A"	43	10.1
	Msewe	20	4.7
Temeke Municipal	Mtoni	38	9.0
	Mwangaza	28	6.6
	Mzimuni	19	4.5
	Scadet	8	1.9
	Upendo	18	4.2
	Yombo	19	4.5
Sex	Male	224	53
	Female	200	47

Variables		Number of Respondents	Percentage (%)
Age	< 8	5	1.2
	8 – 13	283	66.7
	14 -18	129	30.4
	> 18	7	1.7
Number of years spent in the COBET center	Less than 1	61	14.4
	1	156	36.8
	2	124	29.2
	3	71	16.7
	More than 3	11	2.6
Cohorts	Cohort I	271	66.7
	Cohort II	153	30.4

Demographic Characteristics

Table 1 reveals that 53% of the total respondents were males whereas females were 47%. Interviewed students were grouped into two age groups. The criteria used for grouping the age was based on valid COBET age, i.e. being either in cohort I 8-13 years or cohort II 14-18 years. Table 1 shows that students aged between 8-13 years were 66.7% and all those aged between 14-18 years were 30.4%. Overall, the total sampled students aged between 8-18 years accounted for 97.1% of the sampled students. Thus, 97% of the respondents belonged to the valid age of being COBET students (URT, 2004). Table 1, presents a total number of 16 COBET centres selected for this study. Mkwawa COBET centre had about 15.1% of all the selected students, Chema about 13%, Msasani "A" 10.1 % followed by Mtoni and Kawe "A" both had about 9 % each while the centers with lowest number of students were Buguruni and Magomeni centers with about 1.7% each. The number and percentage of respondents in three Municipalities were as follows: (310) 73.1 % from Kinondoni chosen from 10 COBET centers; (68) 16% from Ilala chosen from 4 COBET centres and, (46) 10.8% from Temeke chosen from 2 COBET centers.

Moreover, this study reveals that 3% of the COBET students in the centers did not belong to valid programme age group. Those aged more than 18 years accounted for about 1.7 % and below 8 years were about 1.2 %.

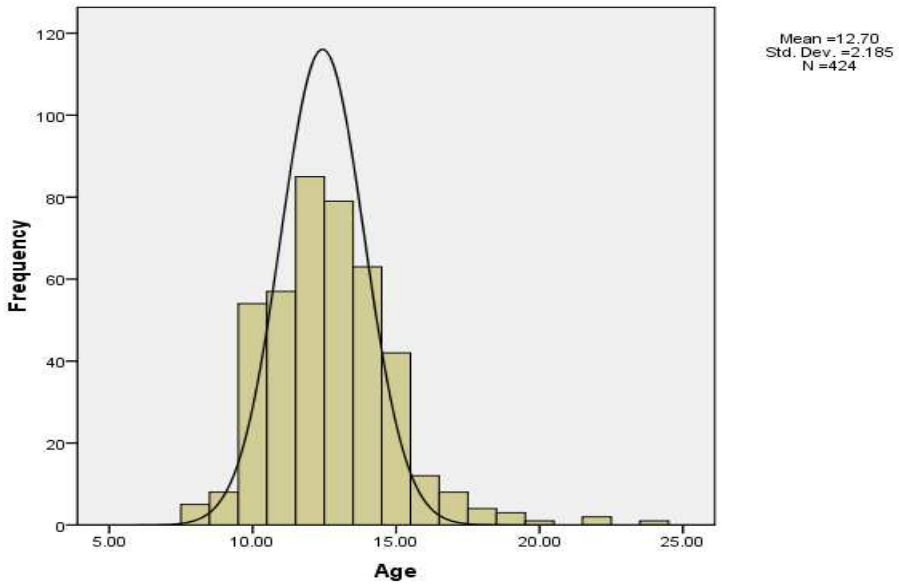

Figure 1: A*ge Distribution of COBET Students*

Figure 1, shows age distribution of the respondents. There was a positive skew to the distribution indicating that a large number of respondents had ages toward the lower end of the scale. That is, more than 60 percent of the students were aged between 8 and 13 (of about 66.7% of the total number of students). COBET learners cohort I accounted for about 66.7% of the total respondents while cohort II accounted for the remaining 30.4%. This shows that most of the COBET learners were between 8-13 years which is the age group belonging to cohort I (see Table 1).

Also, the data from survey reveals that COBET students who spent a single year in the centers, accounted for 36.8%, followed by those who spent two years (29.2 %) then 3 years (16.7%). Since these data were collected at the beginning of the year 2013 between January and

March, there were also new comers who had spent less than a year which were about 14.4% of the total respondents. This study also reveals that there were those who had spent more than three years (2.6%), which is against COBET curriculum programme design (see Table 1).

Principal Component Analysis for Dependent Variables

Principal Component Analysis was carried out for different responses on questions relating to what factors made students to join COBET as well as their understanding towards the objectives of establishing COBET. After carrying out the principal component analysis, information contained in the dependent variables was represented by three components which include;

Component 1

Items: Illness cause me to dropout from formal education system and hence join COBET in order to return back to formal education; Taking care of ill people made me drop out from formal primary education hence joins COBET.

Component 2

Items: Poor understanding of my parents/guardians on the importance of education made me lack the opportunity to join formal education hence join COBET; Lack of needs is the cause for me to join COBET.

Component 3

Three years of staying in COBET centers is enough to cover the curriculum.

Kaiser-Meyer-Olkin (KMO):

Kaiser (1974) recommended accepting values greater than 0.5 as acceptable, value below this should lead to the researcher to collect more data, otherwise would be required to rethink which variables to include. For these data, the value was 0.515, which fell within

acceptable value. This shows that principal component analysis was appropriate for this data (see Table 2).

Table 2: KMO and Bartlett's Test for Dependent Components

Kaiser-Meyer-Olkin: Measure of Sampling Adequacy		0.515
Bartlett's Test of Sphericity	Approx. Chi-Square	109.288
	Df	10
	Sig.	0.000

Total Variance Explained by Each Component

From factor extraction, the Eigen values associated with each linear component before extraction, after extraction and after rotation were computed using SPSS software. Before extraction, finding indicated five linear components were identified. The Eigen values associated with each component represented the variance explained by that particular component. The Eigen values were displayed in terms of the percentage of variance explained.

First component explained 30.74% of total variance whereas second component explained 21.79% of total variance. Lastly, the third component explained 20.38% of total variance respectively. Rotation has the effect of optimizing the factor structure and it tends to make the three components with equal relative importance. Therefore, after extraction, the first component accounted for 27.1%, the second accounted for 25.2% and the third accounted for 20.7% of the total variance respectively. All three components retained were able to explain 72.9% of the total variance (see Table 3).

Table 3: Total Variance Explained by Dependent Variables

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.537	30.740	30.740	1.537	30.740	30.740	1.352	27.049	27.049
2	1.090	21.794	52.533	1.090	21.794	52.533	1.260	25.209	52.258
3	1.019	20.376	72.910	1.019	20.376	72.910	1.033	20.652	72.910
4	.764	15.289	88.198						
5	.590	11.802	100.000						

Principal Component Analysis for Independent Variables

Principal component analysis was carried out on different sets of independent variables aimed at understanding of COBET and the necessary conditions for transferring students through COBET to formal education. The analysis resulted into three components which were:

Component 1: Necessary needs for COBET Centers

Items: More teachers are needed in my centre; more desks are needed since in my class other students lack desks; more books are needed in my centre.

Component 2: Necessary needs for Transferring from COBET to Normal Curriculum

Items: COBET should be upgraded into formal primary education; COBET is just a formal primary education in a different form.

Component 3: Understanding of Students towards COBET Objectives

Items: I have planned to continue with further education after successfully completing COBET, I can join COBET if I lack an opportunity to join any kind of formal education.

Kaiser-Meyer-Olkin (KMO)

This is a measure of sampling adequacy. For these independent variables sampling adequacy was 0.599, which fell into acceptable value to be confident that principal component analysis was appropriate for this data set (see Table 4).

Bartlett's measure: The test needs to be significant. For these data, Bartlett's test was highly significant ($p < 0.001$) and therefore principal component analysis was appropriate (see Table 4).

Table 4: KMO and Bartlett's test for Independent Variables

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.599
Bartlett's Test of Sphericity	Approx. Chi-Square	228.094
	Df	21
	Sig.	0

Null hypothesis (H_o) was rejected and R-Matrix was not an identity matrix

Total Variance Explained by Retained Components

Before extraction, findings indicated 7 linear components were identified. After extraction, three components were retained. Component 1 explained 26.65% of the total variance, component 2 explained 17.65% of the total variance whereas component 3 explained 15.52% of the total variance. Rotation has the effect of optimizing the components structure and it tends to make the three components with equal relative importance, so after rotation; component 1 accounted for 21.92%, component 2 accounted for 19.50% while component 3 accounted for 18.40% of the total

variance. All three components retained explained 59.83% of the total variance (see Table 5).

Table 5: Total Variance Explained by Independent Components

Component	Initial Eigen Values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.866	26.656	26.656	1.866	26.656	26.656	1.535	21.926	21.926
2	1.236	17.652	44.308	1.236	17.652	44.308	1.365	19.503	41.429
3	1.087	15.523	59.831	1.087	15.523	59.831	1.288	18.402	59.831
4	.836	11.940	71.771						
5	.794	11.340	83.111						
6	.621	8.867	91.978						
7	.562	8.022	100.000						

Extraction Method: Principal Component Analysis

Discussion

COBET students were interviewed to assess and identify the needs and necessary conditions for students to be transferred from informal education to formal education using PCA. This study finding based on components resulted in both dependent and independent variables identified the needs and conditions to be: students should stay in COBET centers for three years, more facilitators, desks, and books were needed in centers as well as upgrading of COBET into formal primary education. Researches conducted by Levira (2002), Gaudenzia (2001) and Michael (2008) support this study finding which show that, there were shortage of books, desks, and COBET facilitators in their results. This study finding reveals that in terms of enrolment, male (53%) were having higher enrollment compared to female (47%). Similar, the study conducted by Bwatwa in 2010 revealed the same results. One of the aim of establishing COBET was to give first priority for female

students/pupils, this result reveals that males enrollment was higher compared to the females. In terms of factors which lead students to join COBET were: illness; taking care of ill people; poor understanding of parents/guardians on the importance of education and lack of necessary needs. The above were among the factors which lead Malawi and Ghana to establish Complimentary Basic Education so as to bring back dropout students and those not enrolled at all to formal education.

Conclusions

The situation and necessary needs for transferring COBET students to formal education in Dar es Salaam region can be described by three dependent and three independent components. Also it can be concluded that, the mean enrolment for male is higher as compared to that of female.

Recommendations

Based on the initial objective of the establishment of COBET, the programme was planned to last for 5 years. This research however, reveals that, there are still students in COBET centers looking for opportunity to continue with further study in formal education system after completing COBET. This study identifies the needs and conditions needed for COBET to plan to be sustainable programme for this vulnerable group. The dropouts from formal primary education among many reasons included pregnancy, illness, and poverty are shown to be increasing, yet other children are not enrolled to formal schools at all. Thus, having this programme on a sustainable basis, will help those learners aged 8-18 years who are now not enrolled or dropped from formal schooling, to get the chance to again go back to school hence guarantee another chance of getting basic education.

Local Government Authorities and MoEVT through Adult and Informal Education departments should include honoraria for the COBET facilitators in their financial year budgets. On the other, hand special grants should be set by both Local and Central Government

Authorities so as to make sure all necessary resources and conditions for smooth the running of COBET are available.

Moreover, during primary education census for identification of pupils to be enrolled in primary schools, COBET learners/students should also be identified. Sensitization of the parents and the whole community to enroll their children and psychosocial support to the children in COBET centers is also highly needed. This implies that NGOs, Government, CBOs, FBOs, and the whole community should spare more efforts to help these in needy children, more emphasis should be put on the programme and enough consideration should be given to COBET learners by all stakeholders.

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References

Abdi, H. (2003b). Multivariate analysis, In M. Lewis-Beck, A., Bryman, and Futing, T. (Eds), *Encyclopedia for research Methods for the Social Sciences*, Thousand Oaks,CA: Sage.

Abdi, H. and Williams, L. (2010). ''Principal component analysis'', WileyInterdisciplinary Reviews: *Journal on Computational Statistics*, 2: 433-459.

Bequele, A. and Boyden, J. (1998). *Combating Child Labour*. Switzerland: ILO.

Bwata, A.M. and Kamwella, A. S. (2010). Review and Revision of Adult and Non-formal education 2003/4-2007/08.

Cornish, R. (2007). Principal Component Analysis, Mathematical Learning Centre, (3rd Ed), Chapman and Hall.

Field, A. (2005). *Discovering Statistics using SPSS* (2nd Ed) London: Sage.

Galabawa, J. (2003). *Complimentary Basic Education in Tanzania (COBET), Some relation from strategy for access and quality empowerment at primary level.* Dar es Salaam: Dar es Salaam University Press.

Gaudenzia, K. (2001). *Feasibility and Sustainability of Complimentary Basic Education programme in Tanzania:* A case study of Maneromango Division in Masasi District, Dar es Salaam: Dar es Salaam University Press.

Hatcher, L. and Stepanski, E. (1994). A step-by-step approach to using the SAS system for univariate and multivariate statistics, Cary, NC: SAS Institute Inc.

Johnson, H., Lyimo, B. and Keates, D. (2005). Inventory on current Education Policies and Practices, Internationally, Nationally and Regionally on School Cost Exemption and good low Cost Educational Initiatives (Including non-formal education). Moshi: Mkombozi centre for Research Children Printers.

Johnson, R. A. and Wichern, D.W. (1992). *Applied Multivariate Statistical Analysis* (3rdEd). New Jersey: Prentice Hall Inc.

Levira, B. (2002). *Learner's Evaluation of the Complimentary Basic Education Programme in Kisarawe District.* Dar es Salaam: University of Dar es Salaam Press.

Matteson, D. S. and Tsay, R.S. (2013). *Independent Component Analysis via U-Statistics.* United States of America: Cornel University Press.

Michael, L. (2008). *Implementation of Complimentary Basic Education in Tanzania*. Dares Salaam: Dar es Salaam University Press.

Ngodu, A. S. (2010). Alarming Drop-out Rate, A threat of Internal Efficiency in Tanzania Primary Education, United Republic of Tanzania and UNESCO, Ministry of Education and Vocational Training (MOEVT).

Pearson, K. (1901). "On Lines and Planes of Closest Fit to Systems of Points in Space" (PDF). *Philosophical Magazine* 2 (11), 559–572.

Rodrigues, P. C. (2007). Principal Component Analysis of Dependent Data, Nova University of Lisbon, Morte de Caparica, Portugalhttp://matematicas.unex.es retrieved on July, 2013 13:00.

UNICEF (2006). Complementary Basic Education in Tanzania (COBET) Evaluation of the Pilot Project, Dar es Salaam, UNICEF Tanzania.

United Republic of Tanzania (2004). Ministry of Education and Culture Plans, Programmes and Projects. Dar es Salaam, Ministry of Education and Vocational Training.

United Republic of Tanzania, (2008). The development of Education, National Report of United Republic of Tanzania. Ministry of Educational and Vocational Training Mainland and Zanzibar.

United Republic of Tanzania, (2012). Education Sector Development Programme, Education Sector Performance Report 2011/2012, Education Sector Development Committee.

University of Texas, Principal Component Analysis (2003). Data Analysis and Computers II, 1997-2003, www.utexas.edu/ courses/... /sw388r7/....ppt retrieved on 1st February, 2013.