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Full Length Research Paper

Linking vocational education and training (VET) progression pathways into the academic route in Tanzania: Case study in electrical and mechanical engineering programmes at Arusha technical college (ATC)

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The bridging course was designed by the Vocational and Education Training Authority (VETA) in collaboration with three technical Colleges/Institutions: Arusha Technical College, Dar es Salaam Institute of Technology and Mbeya University of Science and Technology under the auspices of National Council for Technical Education (NACTE). The course was an immediate solution to the missing link between the Vocational Education and Training (VET) pathway for graduates and the Tanzanian national education model. Data were collected from a random sample of 350 students, from various parts of the country, to analyze the problem. Comparison tests of performance between students from the bridging course and from other educational routes were conducted. Results demonstrate that, the bridging course is a substantive solution to enabling VET students to progress toward further studies. Bridging courses in Technical Colleges and Institutes of Technology offer a valuable contribution to the vocational training sector if sponsored by both Government and Private sector in terms of fiscal and non-fiscal resources.

Key words: VETA, NACTE, progression pathways, bridging Course, academic route.

INTRODUCTION

Employment is one of the key challenges facing the population's youth in Tanzania. The situation is characterized by an imbalance that exists between demand and supply of labour in the country's current labour market. It is currently estimated that between 800,000 and 1,000,000 graduates enter the labour market each year while conversely the market generates around only 6% of new jobs each year (Mcha, 2012). Clearly, technical vocational education and Training (TVET) has an important role in building prosperity and social cohesion. The importance of TVET and each institutions potential to contribute to economic growth of Africa, has

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returned to the development agenda after years of neglect (Tripney and Hombrados, 2013).

Accordingly, a continent wide strategy has arisen that is aimed at bringing about a paradigm shift in TVET by developing the idea that TVET prepares young people to become active job creators rather than job seekers, and dispelling the myth that TVET is a refuge for those who have failed in general education. The strategy demonstrates that even the most sophisticated TVET qualifications require prior training and this falls well within the broader framework of TVET (African Union Commission, 2016).

TVET has been successful in some countries as a result of the presence of a well-defined education system of the respective country. Specifically, those countries demonstrated clear continuation pathways for learners to progress to higher levels of education provided that they meet admission requirements. For example, Australia follows a three-tier model which includes primary education, followed by secondary education and tertiary education. Tertiary education includes: Universities, Technical and Further Education (TAFE) colleges and Vocational Education and Training (VET) providers (Dill and Beerkens, 2010).

Ghana, is another example where the structure of the education system consists of six years of primary school and three years of junior secondary school, which make up the basic education level; three years of senior secondary school, forming the secondary level; and two to four years of tertiary level education. VET is available at all three levels of education (Christina, 2012). In the same vein, Brazil has a well-defined progression pathway whereby vocational and professional education operate on three levels: level one is the basic vocational education, level two is technical vocational education, and level three is technical professional education (Ministry of Higher Education and Science, 2016).

In Tanzania, VETA was established by the Parliament Act of Parliament No. 1, of the United Republic of Tanzania in 1994. VETA is the authority responsible for co-ordinating the provision of services and disseminate of information pertinent to training providers in their endeavour to adjust training to meet the needs of the labour market in Tanzania. VETA as an authority has multiple roles namely; policy making, setting standards, financing training providers (TPs), operating its own training centres, as well as offering services such as vocational teacher training and trade testing. VETA was established to meet social demand and labour market needs in all sectors of the Tanzanian economy (formal and informal) and to provide suitable training and training facilities at the same time. More specifically, VETA was given the task of ensuring that the VET system became demand-oriented, cost effective and gradually decentralised its functions to the country's regions.

In general, the provision of Vocational Education and Training in Tanzania has been dominated by the following Actors: Company Based Training Centres, Private Vocational Training Institutions, Church Vocational Training Centres (CVTC), VETA Owned Training Centres and Vocational Training Provision under ministries.

Vocational training providers generally provide one or two years of basic training at a Vocational Training Centre that prepare students for the following trade tests; III (semi-skilled), II (skilled), and I (highly skilled) in a Competence Based Education Training (CBET) framework. The trade test is about to be replaced by the National Vocational Award (NVA) level I, II and III respectively. The minimum entry requirement is standard seven (Primary Leaving Education Certificate).

The education system in Tanzania is described by the model in Figure 1. There are fourteen (14) different routes (R1 to R14) to progress academically from primary education (certificate level) to doctoral level. Students normally spend seven years in primary school and after graduation those who pass at a reasonable standard are eligible to join secondary school through route R1. The selection of students who will join secondary education is undertaken by the Ministry of Education Science and Technology (MOEST).

Students who fail to meet the selection standard to join secondary education are eligible to apply individually to join VETA studies through route R2. At the secondary education level, a minimum of four years is required to graduate and those who pass at this level and meet the entry requirement of advanced level secondary schools or technical colleges will join through R3. The selection exercise is also undertaken by MOEST and at advanced level students complete two years' of study before they are eligible to graduate. Before graduating from secondary education, students normally complete a set of forms which determine their interest, either to join advanced level or technical college studies. MOEST applies this tool as part of the selection exercise for those who are interested in opting to join technical colleges or institutes of technology; are selected to join via route R4.

The R4 route offers professional training and with exit points at each National Technical Award (NTA) level. Each level has a minimum of one year of study. Students who pass ordinary level secondary examinations and whose grades are not sufficient to qualify for advanced level of secondary education, may apply to technical colleges individually and join via the route R4. They are able to qualify through this route only if they have achieved a minimum of grade D in Science subjects, specifically Mathematics and Physics. Additionally, they are required to attend and pass an eight week long pre-entry course.

The pre-entry course is there to upgrade the qualification standard so that it is attains parity with those who are directly selected by MOEST. Students who fail the ordinary secondary examinations and those who fail

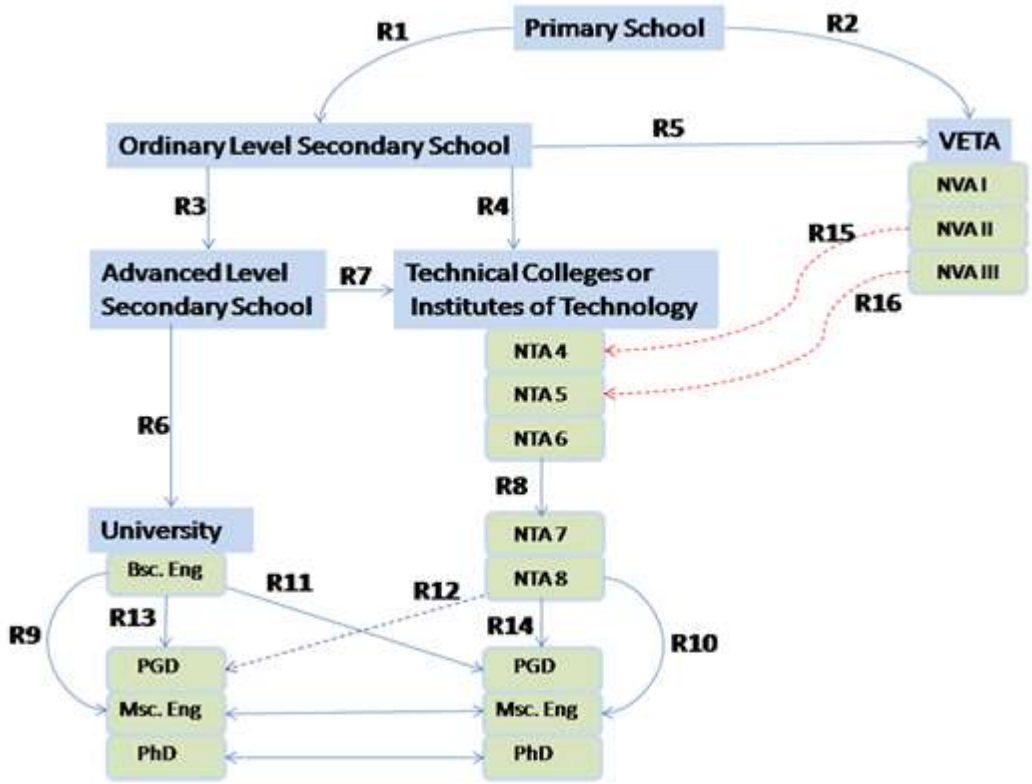

Figure 1. Education progression pathways in Tanzania.

the pre-entry course may go back via route R5 to join VETA studies.

Successful, advanced level secondary education graduates, progress through R6 to university to pursue bachelors' degree. In Tanzania, students are required to apply through the Central Admission System (CAS), owned and monitored by Tanzania Commissions for Universities (TCU). Students who fail their advanced level examinations and a few who pass but are more interest in pursuing a vocational career, can through R7 join technical education provided that they studied science combinations. Route R8 is for graduates of the ordinary diploma in technical education (NTA6) who comply with the NACTE and TCU entry qualification to the higher diploma NTA7. Application is normally made through CAS via NACTE. The NTA7 is minimum of two years in duration and one year for NTA8 which is a bachelors' degree.

Graduates with bachelor degree from universities and technical institutions may progress directly to master's level (two years programme) through routes R9 and R10, respectively. Alternatively, graduates may opt to take a one-year Post Graduate Diploma (PGD) through one of the routes; R11, R12, R13 and R14, and upon graduating a candidate may upgrade the PGD into a master's degree by completing a one-year dissertation. Finally, master degree holders may register on a three years programme of doctoral studies.

In Tanzania, the structure of the education system provides a progression pathway that extends from primary school, through secondary level and beyond to tertiary and doctoral level. The concept of the bridging course emerged after VETA and NACTE attempted to address the issue that although VET graduates can complete their education with the NVA III or trade test grade I, there are no further study pathways for individuals to progress beyond this. This study has arisen out of the need to address this issue and to determine whether the bridging course does provide formal and clear progression pathways for VET graduates to further study.

Statement of the problem

For students who pass primary and ordinary level secondary examinations in Tanzania, there are clear formal pathways from primary education to tertiary education, including universities and technical colleges or institutes of technology. It is relatively straight forward for individuals to join VET studies if they have failed or

Table 1. Number of students passed bridging and admitted to diploma programmes.

Academic year	NTA	Electrical			Mechanical		
		F	M	Total	F	M	Total
2012/2013	Level 4	0	2	2	1	3	4
	Level 5	4	22	26	0	16	16
2013/2014	Level 4	2	5	7	0	3	3
	Level 5	1	29	30	0	16	16
2014/2015	Level 4	1	20	21	0	9	9
	Level 5	4	39	43	0	16	16
2015/2016	Level 4	3	12	15	2	36	38
	Level 5	8	19	27	2	9	11
Total	-	23	148	171	5	108	113

Source: A courtesy of the registrar Arusha Technical College (F-Female, M-Male).

passed primary and secondary school examinations. Since 1994, when VETA was established, VET graduates have been looking for a way to progress to higher learning levels, but there had been no formal or informal pathways to higher learning institutions in Tanzania.

Objective of the study

The main objective of the study is to establish formal, proper and correct progression pathways of VET graduates for further studies. This study aims to evaluate the progress of students from VETA who obtained places at Technical Colleges or Institutes of Technology after completing the bridging course. It compares the progress of VETA graduates joined Technical Colleges or Institutes of Technology via either route R15 or R16 with students from either route R4 or R7. It examines the challenges they faced once admitted to diploma programmes and whether they consider the bridging course to be adequate preparation for entering Technical Colleges or Institutes of Technology.

METHODOLOGY

This study adopted a mixed methodology, combining both qualitative and quantitative research methods. In this approach, the quantitative data obtained from various sources were complemented with qualitative information cited in some documents. A mixed methods approach was used in order to increase reliability of the data. Specifically, the study evaluated a Bridging Course that was designed by VETA and NACTE in collaboration with Technical Institutions for Mechanical and Electrical engineering programmes at Arusha Technical College to analyze the progression pathways problem.

A random sample of 350 students was obtained from various parts of the country through advertisements in local radios, televisions and newspapers about the bridging course. The same advertisement was made available in the College website, www.atc.ac.tz at the end of February every year. The advertisement has the pontential to include all new students enrolled in the bridging course every year from 2012/2013 to 2015/2016 academic years (Table 1) and those who managed to progress.

Tables 2 and 3 present the combined number students completing the bridging course. The bridging course started in the 2012/2013 academic year with the objective of imparting knowledge in Mathematics, Physical Science and communication skills to VET graduates. These were identified as areas of challenge that assist students in progressing academically and professionally through other routes. Furthermore, through the bridging course the VET graduates are introduced to the subjects of their respective professions and computer knowledge is part and parcel of the course to ensure they have reached a level equivalent with other students from other routes. The course is taught at Arusha Technical College during vacation for the period of ten-weeks full time for students with NVA II to join NTA 4 and NVA III to join NTA 5 after passing the bridging course via routes R15 and R16, respectively (Figure 1). Teachers from Arusha Technical College are involved in teaching the bridging course students.

The progression of the bridging course students from NTA 4 to NTA 5 or from NTA5 to NTA 6 was monitored and well documented for three years consecutively as a pilot study. The College offers diploma courses on a full time basis only, semester 1 (17 weeks) and semester 2 (17 weeks) of the academic year. The assumption is that students who have completed the bridging course can perform as well in diploma courses, as students from other routes. A comparison of the performance between students from the bridging course and those from other roots was done to determine if bridging course is an effective pathway.

More information regarding the Bridging course pathways for VET graduates were collected through oral interview. Two different groups were asked the following questions:

Q1. As a student in diploma courses joined from bridging course, what challenges do you face or faced in your progress if any?
Q2. Do you think that VETA and bridging course contents assist you in your diploma studies? Give reasons to your answer.

Table 2. Number of students enrolled, passed and failed from both routes from Electrical programme.

Academic year	Levels	Enrolled			Passed			Failed		
		BR	OR	T	BR	OR	T	BR	OR	T
2012/2013	NTA 4	2	48	50	1	46	47	1	2	3
	NTA 5	26	39	65	17	36	53	9	3	12
	NTA 6	0	29	29	0	27	27	0	2	2
2013/2014	NTA 4	7	42	49	5	37	42	2	5	7
	NTA 5	31	36	67	19	33	52	12	3	15
	NTA 6	17	31	48	10	26	36	7	5	12
2014/2015	NTA 4	21	67	88	10	55	65	11	12	23
	NTA 5	45	24	69	35	21	56	10	3	13
	NTA 6	19	37	56	7	25	32	12	12	24
2015/2016	NTA 4	15	22	37	8	20	28	7	2	9
	NTA 5	27	19	46	26	11	37	1	8	9
	NTA 6	38	26	64	37	22	59	1	4	5
Grand Total		248	420	668	175	359	534	73	61	134

Legend: BR-Bridging route; OR-Other routes; T-Total.

Table 3. Number of students enrolled, passed and failed from both routes from Mechanical programme.

Academic year	Levels	Enrolled			Passed			Failed		
		BR	OR	T	BR	OR	T	BR	OR	T
2012/2013	NTA 4	4	38	42	1	31	32	3	7	10
	NTA 5	16	22	38	0	22	22	16	0	16
	NTA 6	0	28	28	0	28	28	0	0	0
2013/2014	NTA 4	3	33	36	1	29	30	2	4	6
	NTA 5	0	40	40	0	37	37	0	3	3
	NTA 6	0	27	27	0	26	26	0	1	1
2014/2015	NTA 4	9	34	43	2	32	34	7	2	9
	NTA 5	17	23	40	0	23	23	17	0	17
	NTA 6	0	36	36	0	30	30	0	6	6
2015/2016	NTA 4	38	35	73	36	35	71	2	0	2
	NTA 5	13	28	41	11	28	39	2	0	2
	NTA 6	2	30	32	2	30	32	0	0	0
Grand Total		102	374	476	53	351	404	49	23	72

Legend: BR-Bridging Route; OR-Other Routes; T-Total.

Q3. Should the bridging course continue after these three years? Give reasons to your answer.

The first group comprised of 56 students currently enrolled in diploma courses after completing the bridging route, and a second group involved 20 students who had been discontinued from studies because they did not pass examinations required to progress to the next level. Since students in the second group are not on campus, telephone correspondence was used.

RESULTS

The findings revealed that majority of the students who attended the bridging course were admitted to diploma

Table 4. Summary results of oral interview.

Question number	Percentage of students (%)	Responses from students on the asked questions, they straight stated as follows:
Q1	82	Theory examinations including cross cutting subjects, which are mathematics, communication skills, computer and entrepreneurship were major challenges
	14	No major academic challenge
	4	They faced relatively social challenges because of age variations
Q2	62	No, because in trade test mode of training, related subjects like Mathematics, English, Computer skills and Entrepreneurship do exist in VETA content but for leisure and are not examined.
	30	Yes, at the CBET mode of training, related subjects are there and are well examined, even though at VETA level are relatively simple compared to those at diploma level
	8	No, because they have been miss located according to their qualifications
Q3	71.4	The bridging should continue because it is the only pathway for them currently available in the country.
	28.6	Bridging course should continue but subject to the changes of curriculums of ordinary diploma

programmes in Mechanical and Electrical programmes. The data for various years starting from academic year 2012/2013 to 2015/2016 are shown in Table 1.

The findings in Table 1 show that the total number of students who were admitted to diploma courses via the bridging course increased over four years. The results further show that the numbers increased from 48 students in 2012/2013 to 56 students in 2013/2014, 89 students in 2014/2015 to 91 students in 2015/2016. This is a significant increase in number of students accessing further studies through the bridging course route.

The students who are admitted through the bridging course route normally merged with other students from other routes, R4 and R7 as shown in Figure 1 and Tables 2 and 3. All NACTE academic standards and quality assurance were observed regardless of students' entry route. At the end of each year, students at each level sat examinations. Table 2 and 3 shows the number of students enrolled and their performance in terms of pass and fail at each level. The data in Tables 2 and 3 is the combined data from Table 1 and data from other routes including re-admissions, however dropouts, post-ponements and those who exited before NTA 6 or transferred to other institutions were not considered in this study. On the other hand, for the purpose of making data presentation easy, students who were subjected to repeat a year in the same level were considered as failures. A total of 668 students were enrolled in Electrical engineering programme for four different years as shown in Table 2, 248 (37%) from bridging route and 420 (63%) from other routes. The general performance in examinations shows that 175 (70.6%) students from the bridging course route and 359 (85.5%) from other routes passed their examinations.

In Table 3 showing the students undertaking the Mechanical engineering programme, a total of 476 students were enrolled from the bridging course and other routes: 102 (21.4%) from the bridging course and 374 (78.6%) from other routes. Table 3 shows that 53 (52%) out of 102 students from the bridging course and 351 (93.9%) out of 374 students from other routes passed their examinations in at least one level. Looking at NTA 6 as an exit level with diploma qualifications, only two students from bridging course graduated in Mechanical engineering programme in the academic years 2013/14,2014/15 and 2015/2016. Note that in 2012/13 no students from the bridging course were enrolled in NTA 6, because all students from this route must either have been enrolled in NTA 4 or NTA 5.

A sample of 76 students, of which 56 students were currently enrolled in ordinary diploma courses were interviewed face-to-face and 20 students enrolled through the bridging course, who are already discontinued from studies, were interviewed by telephone and responded positively to the questions. Table 4 shows the summary of clustered responses of interviewed students.

DISCUSSION AND CONCLUSION

The results in Table 2 for the electrical engineering programme depict the strength of students from the bridging course against students from other routes. A total 175 (70.6%) out of 248 students from the bridging course route, and 359 (85.5%) out of 420 students from other routes passed their examinations. Comparing the performance of these two groups, there is a slight difference of 14.9% which is not significant. This

difference can be attributed to some students from the bridging course, having been in employment and not in an academic environment. This study recommends that the working environment should be associated with on job training to uplift academic standards. This also is supported by Black and Yasukawa (2013), who in their study, noted the importance of pedagogy fitting with workplace practice of jobs that learners will progress to. The analysis demonstrates that the bridging course is a successful pathway to higher academic levels.

In Table 3, a total 53 (52%) out of 102 students from the bridging course route and 351 (93.9%) out of 374 students from other routes passed their examinations in at least one level. Again the bridging course shows strength. In Mechanical engineering programme there is a significant difference of 41.9% of performance when you compare bridging and other entry routes. More specifically in Table 3, only 2 students from the bridging course route have managed to graduate with diplomas in Mechanical engineering programme since it was established. This mass failure may be attributed to the misallocation of students demonstrated in Table 4, where 8% respond to Q2. Students may also fail because of the inability or unwillingness of teachers to alter their methods of teaching to meet the diversity of students. This statement is supported by Faraday et al. (2011), in their study, who noted that good teachers are those who are always learning, building their own skills and teaching themselves.

The main challenge to students from VETA to handle diploma courses is theory examinations and cross cutting subjects (82%) from Table 4. The candidates are supposed to understand that they need to progress, if possible to a bachelor degree and above. Universities and Colleges at degree level train people to become critical thinkers, to understand other people's perspectives and to appreciate the arts. Theoretical perspectives and cross cutting subjects help them achieve the skills of critical thinking. What is required is an emphasis on creating a culture where learners are encouraged to attain their inspirational goals and achieve, and they are supported in their learning (Rowe et al., 2012).

About 14% of students who responded to Q1 were observed to be competent because they did not face any academic challenge. But 4% of students faced social challenges in the fact that some of students from bridging course are mature enough hence young students from other routes do escape them during study discussions. A majority of young students form other routes demonstrate good performance in cross cutting subjects, while those from bridging course are good in practical subjects. We suggest and recommend the students from the bridging course route extend their social aspects to bring compatibility with other students for good performance.

About 62% of students who completed the bridging course and who passed the trade test mode of training in VETA are facing challenges in passing Mathematics, English, Computer skills and Entrepreneurship because they are lacking in basic subject knowledge. This problem has been addressed by VETA for introducing the CBET system where these subjects are taught and examined and 30% of student from Table 4 said the system assisted them in developing more complete subject knowledge. The question remains as to whether the VETA curriculum has enough content to reflect the knowledge base of students at secondary schools? In the Mechanical engineering programme, 8% of students who were interviewed said they have been prerogative denied. They are qualified for Auto-electric and electronic engineering but were enrolled in Mechanical engineering where they are not able to handle mechanical programmes. This happened only because under this pilot study only two programmes, Electrical and Mechanical were available. Upon successful of this bridging course, establishment of bridging cause for other programmes will start to alleviate the misallocation.

Nevertheless, for both groups, 100% of students recommended the bridging course continue because it is helpful regardless of constraints they are facing. Seventy-one percent recommended the bridging course to continue, because it is the only entry route that exists for them. 28% made the same recommendation but with additional observations. They proposed a review of the curriculum, to inform the establishment of professional courses at diploma levels, for example, a diploma courses in refrigeration, automobile, purposely for VETA graduates with practical skills on refrigeration and automobile respectively. However, practically it is not applicable because related subject will be integrated within these programmes which are threat to them.

This study recommends that VETA should take a much stronger role in coordinating the activities in basic VET provision among the various providers, both on national and regional level. This will require development of new higher level programmes and revise the existing programmes to make students cope with Mathematics and Communication skills for further study purposes. It is timely that VETA address the shortcoming of VET programmes that fall under three main categories; (1) the majority of programmes need to cater for basic VET skills, (2) some programmes need to cater for the industry or investor requirements, and finally (3) optional programmes are needed for those who want to progress for higher studies.

The study also recommends that, educational institutions concerned with TVET must be empowered by both Government and private sector in terms of fiscal and non-fiscal resources to encourage more research in the field so as to fulfill current and future and demands. This need arises as a consequence of emerging issues in TVET, namely; apprenticeship, evaluation, and Information Communication and Technology (ICT). In this

way, TVET will be a coherent system whose purpose is to meet the demand of economic development of the continent in terms of quality skilled human resources and sufficient support to meet the needs of human activity for the collective social well-being (African Union Commission, 2016).

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Conflicts of interest

The authors have not declared any conflict of interests.

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