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RESEARCH ARTICLE

THE GAP BETWEEN INDIGENOUS TECHNOLOGY AND TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING IN GHANA

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Abstract:

Indigenous technology has been the cultural base for scientific development of a group of people in every society (Warren, 1990). The word indigenous has always been referred to as those ideas originating or occurring naturally in a particular society. Technology is the application of scientific knowledge for practical purposes. Indigenous technologies, therefore, focus on cultural technological activities that cultrate the tempo of development of society. Indigenous technology is acquired through non formal education while Technical Vocational Education and Training (TVET) is acquired through formal education. Technical Vocational Education and Training (TVET) synchronizes technology and education. It creates the enabling environment as a stepping stone towards acquiring employable skills for poverty reduction by impacting technical skills through training. There has been a wide gap between indigenous technology acquisition which is through non formal way of education sometimes referred to as Traditional Occupational Training and Technical Vocational Education and Training which is acquired through formal education which is structured and characterized by teaching/ learning by way of a well designed curricula. According to Bempong and Nsiah (2010), there is a wide gap between Indigenous Technology and Technical Vocational Education and Training in terms of acquisition and practice.

The aim of the paper to explore the opportunities that can be harnessed to close the gap between Indigenous Technology and Technical Vocational Educational and Training in Ghana. The research was based on field survey, personal observations, literature review and consultation with key stakeholders in indigenous technology and TVET sector. Findings from the study indicate among other things that Ghana has many areas of indigenous technology which can be recognized and harnessed to narrow the gap between Indigenous Technology and Technical Vocational Education and Training in Ghana so as to move the country forward. It is recommended that there should be a strong collaboration between indigenous technology practitioners and TVET in Ghana.

Key words: TVET, Indigenous, Technology, Synchronizes.

Introduction

Education in its general sense is a form of learning in which knowledge, skills and attitudes of a group of people are transferred from one generation to the next through teaching, training and research.(Piaget,1969). Education therefore is supposed to affect the way one thinks, feels or acts. UNESCO (1974) defines education as ‘’All actions and influences directed to develop and cultivate a person’s ‘mental abilities, knowledge, skills, attitudes and behaviours in such a way that the individuals personality may be developed to the fullest and be of positive value to the society in which he/she lives. The United Nations Educational scientific and cultural organization (UNESCO) and the International Labour Organization(ILO) document ‘Technical Vocational Education and Training for the Twenty first century(ILO, 2002) defines Technical Vocational Education and Training as those aspects of the educational process involving in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of the economic and social life.’ It is set up to equip people with the technical and professional skills needed for the development of the country. Indigenous technology has been the cultural base for scientific and technological development of a group of people. Indigenous activity refers to the idea originating or occurring naturally in a particular society or place. Indigenous Technology, therefore, refers to the native origin of an idea, innovation or technology.(Grenier,1998)

A combination of Indigenous Technology and Technical /Vocational helps one to equip him /herself with the skills and qualities needed not only to be employed but also set up his/her own enterprise and employ others to contribute

to the development of the country. TVET programmes help the graduate to go into self-employment by initiating new business ventures and ultimately becoming employers in their own business.

Statement of the problem

A wide gap exists between Indigenous Technology on one side and Technical Vocational Education and Training on the other in Ghana. (Bempong and Nsiah,2010). Indigenous technology is acquired through a non formal way - traditional methods of learning such as wood carving whilst Technical Vocational Education is acquired through formal education in institutions such as Vocational and Technical colleges as well as Universities. A combination of the two will see not only increase in production levels but also high quality products produced for consumption. In Ghana there has been a wide gap between the two. For Example the wood carvers do not see why they have to collaborate with Wood Technology Department of Polytechnics for and improvement in their products. Potential areas of harnessing collaborations are yet to be identified. Would indigenous technology practitioners and their products be better off if they collaborate with TVET or left on their own to undergo some months of training so that they acquire the necessary skills to be perfect in their fields?. This paper therefore aims at identifying key potential areas of collaborations between TVET and indigenous technology in order to improve production and efficiency in the sectors.

Research Questions

The following four research questions constituted the core of the study. These are:

- What type of technical and vocational training has owners of indigenous technology centers and their employees acquired?
- What are the potential areas of collaborations between TVET and indigenous technology?
- What benefits emanate from the collaborations?
- What skills do indigenous practitioners get through the collaborations?

The objectives of the research

The objectives of this research are two folds namely general and specific. The general objective of the study is to add to the body of knowledge in terms of activities performed by indigenous technology practitioners and TVET in Ghana.

Specifically the study aims at

- Ascertaining benefits if any that could be gained from collaborations between indigenous Technology and TVET.
- Examining the concept of TVET in Ghana
- Identifying and explaining the main areas of indigenous technology in Ghana.
- Finding possible areas of collaboration between indigenous technology and Technical Vocational Education and Training in Ghana.
- Identifying ways that can close the gap between indigenous technology and TVET.

Significance of the research

- The study will contribute immensely to knowledge in areas of indigenous technology and TVET.
- The study will also be a reference material for future researchers in Technical Education
- The results of the study could enhance teaching and learning of indigenous technology not only in technical institutions but also in Polytechnics and Universities in Ghana.
- The results of the study could assist personnel in the indigenous technology industries to upgrade their methods of production and packaging of products.

Limitations of the research

The researchers encountered a number of problems in the study:

Firstly although it was the aim of the researchers to cover the whole country not every part was visited however some selected areas like Sunyani polytechnic, Koforidua Polytechnic, a Technical and other indigenous technology establishment were visited.

Secondly there was problem of poor road networks to most areas visited for the research.

Thirdly, many respondents failed to answer some of the questions on the questionnaire but rather answered those

that favored them. This means that some vital information could be hidden from the researchers by the respondents. Despite all these challenges the researchers did all that they could to ensure that the needed information were got for the research .

Delimitations of the research

The research and its findings are limited to indigenous technology and technical education in Ghana. However this does not hinder the outcome of the research being applicable to other areas of technology.

Methodology

The research design for the study was descriptive. Descriptive survey design as pointed out by Sowa(2003) involves collecting data in order to test hypothesis or answer questions concerning the current status of the subject of the study. When we use descriptive statistics ,it is useful to summarize our group of data using combination of tabulated description(ie tables) , graphical description (i.e graphs and charts) and statistical commentary(ie discussions of the results).All the above were used in the present study.

Research format

Many research formats are available for a researcher to choose from in the research process .These include exploratory, explanatory and causal formats among others. Exploratory and causal formats were used for the study. Exploratory research is conducted for a problem that has not been clearly defined and relies on secondary data alongside primary data among other attributes the researchers adopted the format because when there is the need for a cause and effect relationship in a study causal format is handy and this is applicable to the current study In this study therefore the causes for the wide gap between indigenous technology and Technical Vocational Education and Training would be extensively exhausted.

The primary data

Researchers obtained primary data using questionnaires and interviews. Trips were undertaking to areas such as Bonwire Kente Weaving Community, Ntonso Adinkra cloth Centre, Ahwiaa Wood carving Centre all in the Ashanti region of Ghana. Other centres of indigenous technology visited were Chorkor fish smoking centre in Accra, The Aburi Woodcarving center, The Gari processing centre at Adeiso in the Eastern region, Dr. Ofori Herbal Centre at Techiman in the Brong-Ahafo region and the Salaga Soap making Center in the Northen Region. All these areas were visited for observation and interview purposes. The researchers also visited Technical Vocational Institutions and some Polytechnics in Ghana such as Wa technical institute, Sunyani Polytechnic,Takoradi Polytechnic and Catholic Technical Institute in Sunyani, Suhum Technical Institute and St. Paul Technical institute, kukurantumi. All these areas were visited for observation and interview purposes.

Secondary data were obtained largely through the analysis of the various documents relevant to the study. This include Grenier (1998) which provided baseline information for the study.

Study Population

The targeted populations for the study included people engaged in indigenous technology enterprises such as Kente weaving , Tye and Dye and Wood Carving . Others were students and heads of technical institutions as well as owners of formal technical enterprises such as furniture companies and building construction companies.

Sample Size

A sample according to Koul(2002) is proportion or a subset of a larger group. It is assumed to be a representative of the entire population if important characteristics are distributed similarly in both groups. A sample is important because it is expected to give a mirror image of the larger population. For the sample size determination, of the study**,** the researchers adopted the formula propounded by fisher, Laing, Stroeckel and Townsand(1998) in addition to the formula postulated by Nwana(1992) in some cases. This method would be used in this study because a sample of indigenous technology and TVET practitioners gives a mirror image of the two sectors

Sample size for the purpose of this study consisted of the following: 240 questionnaires were distributed to owners and workers of indigenous technology centers, students and staff members of TVET and some customers who were met at centers during visitations. Interviews were conducted on 60 respondents who were also owners of indigenous technology centers and students and staff members of TVET who were not given questionnaires. 40 respondents

were observed and the focus group members in 12 centers visited totaled 120. In all the sample size for the study were 460 respondents.

Research instruments

Questionnaires, interviews, observations and focus group discussions were some of the instruments used. A combination of structured and semi structured questionnaires which included opened as well as close ended questions was used. A semi structured interview guide similar to the questionnaire was adopted in the interview. Key informants interviewed were owners of indigenous technology establishment. Students and staff members of Polytechnics .At every center visited some workers and clients constituted focus group for discussions on the topic.
Again some owners of indigenous technology establishment like carpenters, masons, woodcarvers and kente weavers were purposively selected for some discussions. These discussions highlighted the importance of their activities and other related issues.

Technical Education in Ghana

Technical education cannot be separated from Grammar type of education in Ghana at the basic level but rather a combination of the two at the same will be beneficial to the country. This is due to the fact that at the basic level complementary efforts are adopted by teachers to introduce the pupils to reading, writing and at the same time basic technical knowledge. Since 1992 the educational system of Ghana has been the Free Compulsory Universal Basic Education (FCUBE).The 11 years of basic education consist of the following:
.2 years of kindergarten education starting from age four.
.6 years of primary education starting from age six.
.3 years of Junior Secondary Education starting from age twelve
These really lead to 3 years of secondary education from age fifteen
Tertiary education in Ghana consists of education and training at the following institutions.
4 years of University Education in Ghana
3 years of polytechnic education in Ghana
3 years College of Education in Ghana
2 years of nursing training in Ghana
2 years of Agricultural training in Ghana.
These and other tertiary institutions serve as tertiary education in Ghana.(Nsiah-Gyabaah,2009)

The main focus for the development of technical and vocational education in Ghana is to equip the youth with technical and professional skills needed for the socio- economic development of the nation by providing a career focus and ‘’hands on skills’’ based education. This is for the youth who have completed Junior High school and Senior High school education to be self employed.
In Ghana there are both private and public institutions that offer Technical and Vocational Training and Education. These give opportunities for students to progress through the technical vocational institutions, through polytechnics to the universities.
Technical and vocational training at the pre – tertiary education level covers areas such as
1. Traditional apprentice training centres
2. Vocational training institutes both public and private
3. Technical Institutions such as Secondary Technical schools both private and public.
Technical and Vocational Education Training is therefore to provide a mix of knowledge and career focused, hands –on, skills based education that is needed to run the productive sectors of the economy and build the nation. (Anamuah Mensah ,2002)It leads to the provision of technical practitioners such as craftsmen, artisans who design, fabricate, install, operate and maintain the machines and equipment, technicians, engineers and technologists.
Technical and Vocational Education at the tertiary level is with the Universities and Polytechnics to offer technical education. The University of Education with branches in Winneba, Kumasi and Mampong runs courses for tertiary students, It offers courses in Wood Technology Education through the Masters to the PhD level.
The Kwame Nkrumah University of Science and Technology also offers courses in various fields such as Civil Engineering, Electrical and Building Technology to the PhD level. Others such as University for Development Studies, University of Mines,Tarkwa, are all also Universities that offer Technical Vocational and Education training at the tertiary level.

Figure 1.
TVET Institutions in Ghana - Region by Region

(TVET Institutions)

Region	Public	Private	Total	Percentage (%)
Ashanti	25	54	79	16.00
Brong-Ahafo	20	19	39	7.90
Central	17	44	61	12.35
Eastern	24	48	72	14.60
Greater Accra	23	68	67	17.60
Volta	24	37	61	12.35
Western	26	17	43	8.70
Northern	15	2	17	3.40
Upper East	13	1	14	2.80
Upper West	14	7	21	4.30
Total	201	293	494	100

Source: National Co-ordinating Committee for Technical and Vocational Education and Training, (NACVET, 2005).

POSSIBLE AREAS OF COLLABORATION BETWEEN INDIGENOUS TECHNOLOGY AND TVET

A. Indigenous Technology and Technical Vocational and Education Training in Textile production

Kente weaving is an indigenous technology which has been with us over 300 years ago.
(Ansu-Kyeremeh,1998) It involves the weaving of cotton on a loom with either a single weave or double weave. In the same way the Adinkra cloth, Batik Tye and Dye have all come from indigenous technologies. The establishment of large scale production centre of traditional cloth at Bonwire has lead to improvement in the method of weaving from single to double and even triple weaves.This has brought about the emergence of different types of kente such as ''Sikafutroo'', ''Fathia fata Nkrumah'', ''Kuffuoapagya Ghana'', ''Adwini Asa'' etc. and these have been patronized both locally and internationally. In the same vein, therefore Tye and Dye centers have been established where the use of indigenous technology for manufacturing is done.

In the Technical Vocational Institutions, although in the past textile as a course was run it was limited only to swinging. Not much effort was made to take students to most Indigenous Technological Institutions for training on how to come out with the production of kente, Adinkra cloth etc. on large scale. However in recent times some institutions such as Kwame Nkrumah University of Science and Technology, Accra Polytechnic, Takoradi Polytechnic, Kumasi Polytechnic and recently Sunyani Polytechnic have started programmes in Textile with different names for the courses at both the Diploma and Degree levels such as Fashion and Design, Fashion and Decorations, Textiles and Fashions. This is a good start but there has not been much efforts to introduce indigenous technologies in textiles to the students for example technical institutions taking them to indigenous technology centres to see how they can blend the formal education with local production of kente , smock, batick tye and dye. According to the Chief Kente Weaver at Bonwire and the owner of the Adinkra centre at Ntonso all in Ashanti Region for over 30 years of their work no educational institution has visited them to examine the skills and methods applied at the center neither have they also been contracted to teach the technology in any institution in Ghana. They however said foreigners especially Americans rather come for lessons to the center and some of their colleagues have been invited by institutions in America to impact their skills and technical know- how to students there. According to them it is due to lack of knowledge about the indigenous technology sector and how it relates to TVET. There has also not seen a harmonious effort by all the stakeholders in the Technical and Vocational Institutions, Polytechnics and Universities to come out with one name and well defined objectives to establish the link for increase productivity and improve quality of products. The researchers are of the view that collaboration between the two sectors . Indigenous traditional technology practitioners and TVET where students from the latter can go for practical attachments in the former could be a step in the right direction. However there is the need to address some challenges which are likely to impede the smooth take off of the collaboration. For example, there is the need to have a well designed / furnished center for the teaching and learning of indigenous technology and students should be encouraged to appreciate the contributions of the indigenous skills.

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Figure 2. Picture of kente weaving at Bonwire , Ashanti region.
Source: Field Trip (2011)

Indigenous Technology and wood Technology Education in the Technical Institutions

Ghana like most countries in the tropical zones has wide forest woodland belt which produces wood for the industry. Over the years, indigenous technology has been used to transform wood into carvings and furniture. Aburi in the Eastern region of Ghana,Asikuma in the Volta region, Sokoban wood village and Ahwiaa all in the Ashanti Region. These have not only met the local needs in the housing and decorative industry but internationally foreigners have patronized these products.

Wood technology in Technical Educational institutions has been the basis for wood usage in carpentry and joinery programmes in most technical vocational institutions in Ghana. In recent years, Polytechnics in Koforidua, Accra and Sunyani have started wood technology programmes as a way of giving the wood technology education some importance. The University of Education Kumasi also runs courses in wood technology from diploma, masters to the PhD level. There has seen some collaborations with students visiting indigenous centers for skill acquisition and in the same way there has been short training workshops organized by these formal institutions for practitioners in indigenous technology as a way of blending indigenous skills with modern technologies such as the handling of modern tools and machines. A woodcarver at Aburi asserted that he has a programme in which some technical institutions and come with their students for practical attachment every year. He also said that in the Eastern Region most of the cavers collaborate with the technical institutions whereby indigenous craftsmen take some of their woods to the workshops of the TVET institutions to use their machines for good finishing works. He said with these arrangements they are able to improve upon the finished products and learn how to use the machines. The result is that indigenous craftsmen now have good prices for their products. There are strong linkages between TVET and indigenous industry in areas such as wood carvings, wooden doors, chairs and other items that use indigenous technology These collaborations have been successful compared to other areas due to the high interest shown by

both indigenous and TVET practitioners. This is because of easy availability of wooden materials and proper curricular for integration as a means of increasing productivity.

Figure 3.Wood carving centre, Ahwiaa, Ashanti Region.

Source: Field Trip (2011)

Indigenous Technology and Building Technology Education in Ghana.

The provision of shelter with materials from the immediate environment has been a basic means of providing affordable accommodation for people in Africa. The transformation of the indigenous technology sector in recent times has seen the moulding and baking of bricks in large quantities in places such as Tanoso, Mankranso and other places for building affordable houses in some rural and urban areas in Ghana. Apostle Kwadwo Sarfo has come out with blocks moulding machines that produce ten blocks at a time. The link between indigenous technology and technical education in construction has already started with certain innovations in technologies taking place in our technical institutions and polytechnics .The building of salancrete blocks which is a combination of sand,laterite and cement for affordable and durable housing projects. According to Adinkrah –Appiah(2009) blocks moulded with indigenous technology through laterite plus sand and cement known as the salancrete blocks turn out to be stronger than the sandcrete blocks which is a combination of cement and sand after 28 days comprehensive strength test.Again according to the same research the comparative cost analysis indicates that it cost less to produce the indigenous salancrete block which is valued at Ghc 0.85 per unit compared to sandcrete blocks which cost GHC.0.90 per unit.The Building Technology Department of Sunyani Polytechnic has successfully set up a centre that uses the local laterite soil for landcrete blocks as a centre for co-coordinating the innovations between indigenous technology and technical education in the region. This has been successful as a number of technical institutions in the region visit the centre for their practical lessons. Again due to affordability and durability as proofed by the research a number people patronize the blocks in Sunyani polytechnic for their building projects. The polytechnic itself is using these blocks from indigenous materials and technology to construct its nursery classroom blocks.Polytechnics and Technical Institutions can collaborate with indigenous technological innovations to come up with machines for moulding blocks in large quantities. The Kwame Nkrumah University of Science and Technology now runs courses in building technology from degree through to the masters and PHD level. Increase collaborations are key to the provision of affordable housing in most rural and urban communities in Ghana.

Figure 4. Blocks moulding, Sunyani, .Brong Ahafo

Indigenous Technology and food processing in Technical Institutions in Ghana

The use of indigenous technology in the transformation of cassava into gari on large scale has become one of the means of wealth creation for most people in the rural areas of Ghana where cassava is cultivated in abundance. The processing of raw cassava into gari as a staple food in Ghana has gone through modernization in the quest to produce it on a large scale. The establishment of gari processing centres by the 31st December Women Movement in places like Cape Coast and Elmina in the Central region, Vume and Sogakope in the Volta Region of Ghana has led to the patronage of gari in both local and international markets such as Burkina Faso, Mali, Niger and the United States of America. Production of gari is now on large scale with not only the use of firewood as fuel but with innovations like the use of Liquefied Petroleum Gas.(LPG)The Mechanical engineering Departments of most Polytechnics have the capacity to spearhead this collaboration by designing metal processing plants for processing gari , frying of fish and the preservation of fish which might be an improvement over the Chorkor smoker, ovens and cold stores, not only on large scale but also in a hygienic manner that meet international standards. Even though capital might be a big challenge in this collaborations the provision of machines, equipment and plants needed by the various Mechanical departments of most Technical institutions will be an opportunity for the local indigenous artisans to visit the various institutional centres for effective and efficient collaboration which will lead to the production of affordable, durable and environmentally friendly food processing machines.

The Departments of Hospitality and Tourism in most Polytechnics in Ghana have been a collaborative point for food processing, preservation and integrating the production of local dishes into the curricular of formal technical and vocational education. The University of Education Kumasi campus runs courses in Hospitality and Catering up to the masters' level.The preparation of local dishes can also be incorporated into the curricula of the educational sector in order for the students to learn how to prepare food such as Apeasiea, Apamprasa, Garifotoo etc. These collaborations will not only enhance the nutritional value of local dishes but also meet the international needs of most tourists.

Figure 5. Picture of gari processing centre,Adeiso. Eastern Region
Source: Field Survey (2011)

Challenges faced in narrowing the gap between Indigenous Technology and Technical Vocational and educational Training in Ghana.

Over the years, Indigenous technology has faced a lot of challenges in its quest to develop and expand its activities through collaborations with Technical and Vocational Education training.

Indigenous technology faces the problem of inadequate funds in its quest to have effective collaboration with TVET. The industry's expansion relies more on capital needed to be injected for the expansion in its various fields of production activities. These problems have come from so many fronts. Most practitioners, lack that creative idea to acquire loans or credit facilities for expansion as well as the inability of the banks to provide loans due to lack of collateral security. Direct governmental intervention through financial and facilities support has been absent over the years. Therefore funds for practical attachment, workshops etc are all absent.

The old adage western idea about Africa as the suppliers of raw materials as well as the market base for the western goods and not producers of manufacturing goods has been another disincentive for the growth and sustenance of indigenous technology. Goods produced under indigenous technology in collaborations with Technical educational institutions have been rejected in the western markets or have attracted low prices. The reason being that they are shoddy. Even internally, most people have been brain –washed to believe that everything produced through indigenous technology is not worth it or indicate poverty. Examples can be shoes, dresses and others. Akpeteshie,a local gin has received a ban from the European at certain times while Europeans schnapps have received support and assistance from European governments. Therefore the collaborations for its expansion have not received the enthusiasm and relevance.

Thirdly another problem faced by indigenous technology programmes is that Africa has still not been able to wean itself from the colonial form of education which relegates technological industrial education to the

background and focuses on liberal and general courses. There is therefore a big gap for technological expertise to uphold, defend and promote indigenous technology compared to Western Technologies.

Indigenous technology has over the years faced the problem of cultural superstitious beliefs which are deep rooted in our society. Indigenous technology has therefore been tied to spiritual abstract activities without scientific analysis to the sector's activities and how to improve upon it. A number of these indigenous technological centres have therefore not been able to prove how they had come by most of their achievements, making the educated elites such as professors in tertiary technical institutions like Universities to see it as nonsensical. Examples can be some of Apostle Sarfo's achievements in which one needs just a clap to switch on or off a television, such collaborations have therefore not been effective.

The indigenous technology field has been preoccupied by illiterates who have not had formal education, therefore documentation of the format, interpretation and developmental phases have become a problem. For effective collaboration they may need to document their technological ideas and be prepared to equally receive some formal education.

The indigenous technologies have not received enough governmental as well as individual citizens' support and encouragement. People rather support foreign industrial technological development in Ghana at the expense of local indigenous technological institutions for example by awarding contracts and loans guaranteed for foreign industries, the construction of dams and the sports stadia are few examples in Ghana.

Data Collection, Analysis and findings

Data for the study was collected from both indigenous technological establishments such as kente weaving centers, wood carving and building construction enterprises as well staff members of Polytechnics and Technical Vocational Institutes of formal education. TVET .240 respondents were used in the research.

Table. 1. General characteristics of Respondents

Description(Items)	**No. of Respondents**	**Percentages (%)**
Gender		
Male	210	87
Female	30	13
Total	240	100
Age Group		
< 18	5	2
18-25	10	4
26-30	15	6
31-35	30	13
36 and above(35+)	180	75
Total	240	100
Educational Background		
Primary	50	21
Secondary/Vocational	10	4
University	20	8

No formal education	160	67
Total	240	100

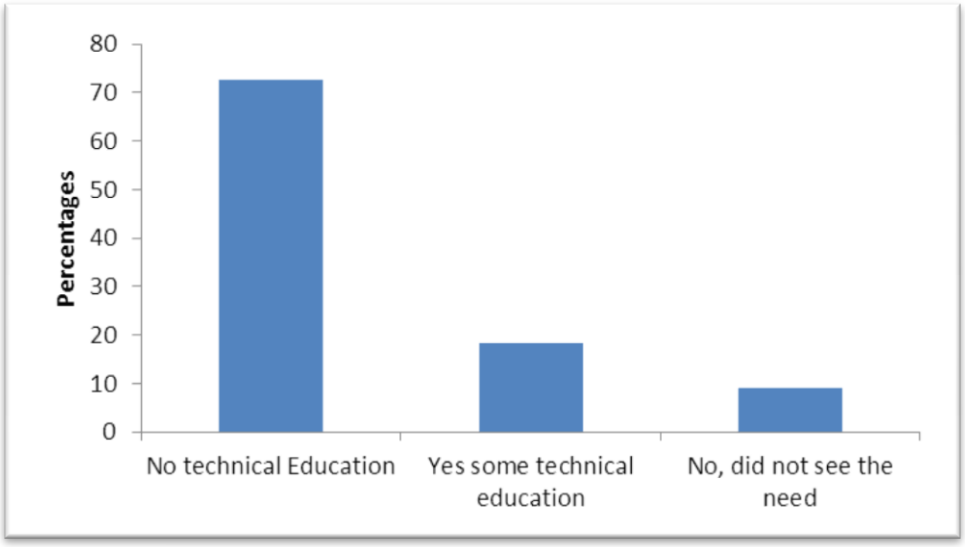
Source: Author's construct (2013)

Table. 1 shows that 210 (87%) of the respondents in this study were males whilst 30 (13 %) were females. This is an indication that majority of people engaged in both indigenous technology and Technical Vocational Education and Training are males. From 60 respondents interviewed majority agreed that indigenous technology is male dominated because females see it as tedious.

The respondents under the age of 18 years in this study were only 5 (2%.) Majority of the respondents are 36years old and above which constitutes180 (75%) of the total respondents. This indicates that people engaged in the indigenous and technical areas are matured because they take a lot of time to be trained for the job.

In terms of Educational background, 160 (67%) had no formal education,50 (21%) had primary education, 10 (4%) had secondary whilst 20(8%) had University education. This is an indication that most indigenous technology practitioners are have low educational background and this is because it does not matter to many of them.

Table 2.**Technical education among owners and staff members of indigenous technology.**

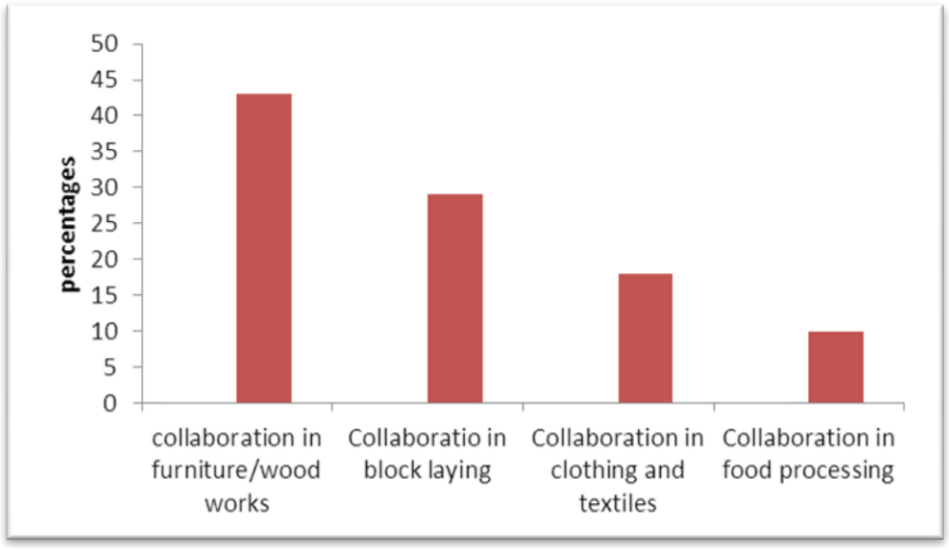


Source: Author's construct (2013)

The data collected indicated that with a total of 240 respondents (73%) 175 of respondents indicated that they had no technical education. (20%) 48 claimed they have some technical education. (9%)22 said that they did not see the need for technical education. This was highlighted during focus group discussions in which members in 6 centers out of 8 centers visited indicated that there was no need for TVET because their fore fathers never had that opportunity but they made it.

These means that there has not been much collaboration between the Technical Vocational Education and Training and indigenous technology, so there is need to bring them together to benefit the Ghanaian society.

Table .3.**Collaboration between Indigenous Technology and Technical & Vocational education**

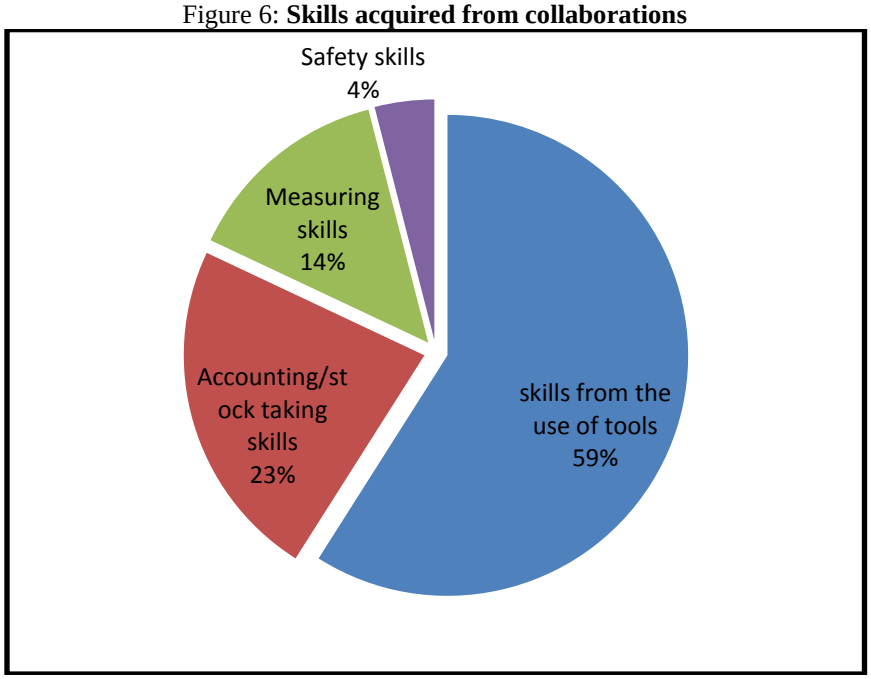


Source: Author's construct (2013)

Table 3. Looks at areas where there can been collaborations between indigenous technology and Technical and Vocational Education. A total of 240 respondents as follows: (42%) 101 indicated that they have collaborated in areas of furniture and wood technology, (30%) 72 says they collaborate in areas of blocklaying whilst (20%) 48 indicate collaboration in clothes and textiles. (10%) 24 agreed that collaboration is in food processing

The results indicates that Ghana has the comparative advantage in wood technology if collaboration between indigenous technology and Technical and Vocational training would be done at the national level to achieve maximum benefit since as high as 101 which is 42% of the total respondents agreed that collaborations are in the areas of furniture and wood technology. Collaboration would increase productivity and income with a case in question being the production of quality beautiful, affordable and durable doors and furniture from Emmanuel Otto Furniture company in Sunyani.It is hoped that more collaborations will take place in order to improve the quality of product as well as increased productivity.

Figure 6: **Skills acquired from collaborations**

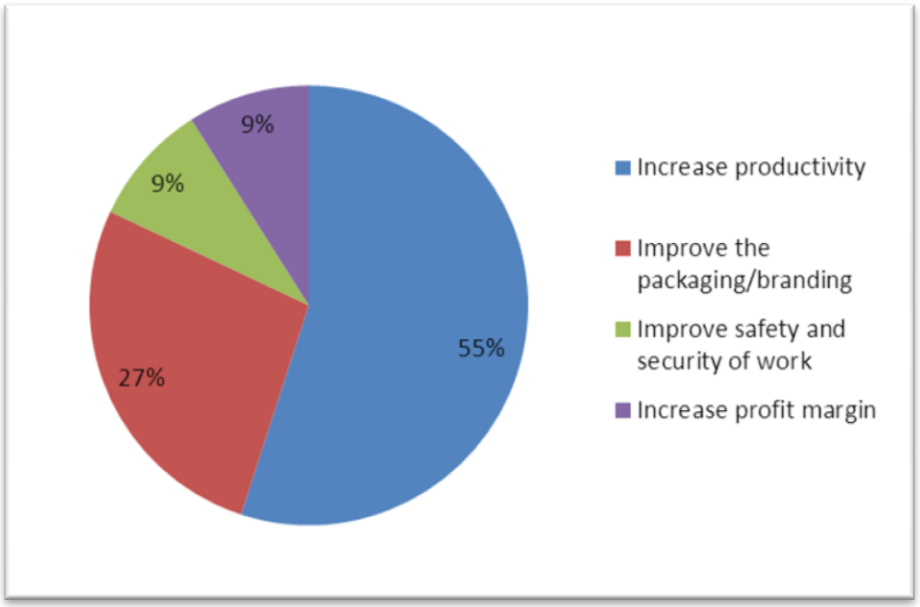


Source: Author's construct (2013)

From figure. 6 above, with a total of 240 respondents. (59%) 142 of respondents indicated that they are able to learn the use of modern tools in the collaborations. (23%) 55 of respondents said they were able to learn basic accounting principles from the collaborations. (14%) 34 of respondents indicated they were able to learn new methods of measurements and finally (14%) 10 of respondents indicated they were able to learn safety skills in their operations.

The results indicate that majority of respondents 59%(142) were able to learn the use of modern tools in the collaborations. This means collaborations would bring a lot of benefits from measuring skills to stock taking and the use of tools in the technical vocational sector. However Technological industries especially indigenous sector would benefit the most since the skills of modern tools will be impacted for increased productivity. This was collaborated by two wood carvers in Asikuma and Ahiwaa in the Eastern and Ashanti region respectively. They both pointed out that in the discussions that they were able to learn skills in the used of modern machines in the industry through collaborations with Technical institutions in their respective regions.

Figure 7. **Benefits of collaboration**



Source: Author's construct 2013

Table.7 shows the results of benefits of collaboration between indigenous technology practitioners and Technical Vocational Education and Training. (55%) 132 who are in the majority indicated that such collaboration bring increase productivity, (27%) 65 said such collaborations improves the packing of the product. (9%) 22 agreed that such collaborations ensure security and safety of the members of staff during operations. Another (9%) 22 also agreed that collaborations increase their profit margins

This means that Ghana must encourage collaboration between the two sectors for increase in productivity and improve the packaging of the products in indigenous technological sectors of manufacturing, food processing etc. of the country. These would help meet international standards for increase foreign exchange earnings for the country. A woodcarver in Ahwiaa confirmed how he has been able to export more carving to the U.S in recent times after collaborations with the Kumasi technical institute resulting in the improvement of his finish products making it more and more attractive.

Conclusion

Indigenous Technology has been with us from time immemorial and as traditional occupation collaboration with TVET will provide the transformation needed for the technological advancement of the country. These collaborations would lead to increase productivity and improved branding of the products. It would also help in the safety of the workers in indigenous technological establishments through the transfer of modern and safety means of handling tools which would propel the collaborations to lead to an overall increase in the country's economic growth and development.

Recommendations for improving the collaborations between Indigenous Technology and Technical Education in Ghana.

Firstly, the youth in Ghana needs to be encouraged to learn the indigenous activities like kente weaving etc. so that they will be able to transfer the knowledge to the next generation as way of preserving these technical ideas.

Secondly, the establishment of more Regional Technology and Industrial Science Centers(Gratis) across the length and breadth of the country can help co-ordinate the activities of various technological institutions in the various communities. These centers need to transformed in order to be abreast with technological advancement and play it role in the country. For example practitioners in kente weaving and brick moulding will use indigenous methods of production could be another in Technical institutions on special programes that aim at enhancing their productivity.

Thirdly, private – public partnership must be built between indigenous technology and TVET so that each sector could learn from the other. For example successful individuals who have achieved success in their fields of endeavors either in indigenous technology or TVETS could be co-opted as resource persons to impact their knowledge and expertise at the centers.

Government must increase its financial support to some of the small scale indigenous technology practitioners to help them expand their activities and make indigenous technological ideas accessible to the public.

It is also recommended that students offering courses in Electrical, Building Technology, Wood Technology, Textiles and others in technical institutions in the country that have their counterparts in the indigenous sector could be made to have industrial attachments with the traditional establishment so that they could learn the traditional methods in addition to what they have learnt in school.

Effort must be made to change public attitude and perception towards technical education and products from indigenous technology in order for people to patronize made in Ghana goods rather than seeing it as shoddy. These will not national identity and local economic empowerment.

Again the researchers are of the opinion that the government should establish many indigenous technical and vocational training centers in the country so that as many as possible people especially the youth will get easy access to such inventions. This will be possible if the youth are encouraged to know the value of Traditional indigenous technological education.

Stakeholders in Technical and Vocational Institutions in Ghana must try and harmonize their areas of collaborations and come out with some courses which will require collaborative teaching and learning in both Formal technical education and indigenous technology.

Technical Institutions and universities can collaborate with indigenous technology practitioners to come out with designs improve and increase productivity for foreign exchange.

Finally stakeholders in the formal Technical and Vocational sectors must be educated on the relevance and benefits of such collaborations with indigenous technology industry through seminars, workshop and exhibitions of indigenous technology products during trade fairs.

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