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THE IMPLICATIONS OF COLLABORATIVE INDUSTRIAL ATTACHMENTS FOR KENYA VISION 2030 DEVELOPMENT PROGRAMMES

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ABSTRACT

The purpose of this study is to establish the influence of industrial attachment on instructors' and students' competence in creative innovations for improved industrial output. The study also attempted to determine the influence of TSIA activities on the quality of students' industrial output in Kenya. The study found that TSIA plays an important role in establishing the link with socio-industrial partners, relating teaching and learning processes to the latest development in the industries, providing opportunities for working with most current technology, machinery, equipment, tools and systems, contributing to product and industrial processes through creative innovations, involvement of industrial staff in students' competence development, reducing cost of recruitment and hence improving industrial savings. The study conclude that, if collaborative industrial attachment between instructors and students is adopted and strictly followed, there is the possibility of an improved students' competence in creative innovations leading to globally competitive industrial out-put. The study recommend the involvement of industrial and social partners in standardized assessment of collaborative supervised industrial attachment for students and academic staff.

Keywords: Collaborative Industrial Attachment, Quality Training, Kenya.

1. INTRODUCTION

Students' industrial attachment had been practiced for several decades. However, teaching staffs' industrial attachment (TSIA) was a novel idea in Kenya among other developing countries. TSIA could improve the learning environment for competence-based training and assessment (CBTA). TSIA would also boost the abilities of staffs in determining relevant content materials; provide linkages with industries on-the-job training and use of

appropriate pedagogical strategies for graduates' competitive-edge in the world of work. Competent human capital development in the current technological trends would encourage creative innovations for rapid industrialization desired in Kenya. Shortage of creative innovations among technical and vocational graduates which was associated with instructional challenges had persisted. However, reviewed literature focused on research and publications, instructors' in-service training (INSET), further education, social and industrial partners' participation in developing curriculum among other strategies for improving students' performance in curriculum based examinations. Although TSIA could encourage creative innovation and catalyze rapid industrialization, it had not been fully exploited. Yet, graduates lack of creative innovations had persisted.

Kenya, among other developing countries and the world over had endeavored to provide flexible technical, industrial, vocational and entrepreneurship training (TIVET) aimed at: training skilled manpower; prepare the youth for self-employment; generate new knowledge through research and creative innovations and stimulate industrial take-off (Brunnet, 2006; GoK, 2005 and Muthoni, 2012). Besides other running costs, Kenya among other developing countries spent the scarce foreign exchange for importing expensive equipments for TIVET (Kerre, 2010 and Muthaa, 2009) while TIVET was about five (5) times more expensive than general education (Kerre, 2010). Yet, the investment had not been commensurate with graduate output. The studies by (Brunnet, 2006; GoK, 2005; Kerre, 2010; Muthoni, 2012 and Ngware, 2000) had not attempted to investigate the influence of TSIA as a catalyst for creative innovations for the desired rapid industrialization in Kenya.

On-the-job and off-the-job continuous academic staff training and development could spur colleagues and students' to creative innovations. The rapid changes in technology, increased knowledge-based economy, the use of information communication technology (ICT) for diagnostic evaluation of automated systems in maintenance, repair and operations (MRO) and labor market conditions could call for an elaborate teaching staffs' industrial attachment (TSIA) for implementation of competence-based training and assessment (CBTA) (Duger, 2011; GoK, 2010; Kuppe & Loring, 2006 and Yan, 2011).

The TSIA collaborated with supervised industrial attachment (SIA) for students would assure creative innovation development. A standardized academic staff and their students' industrial attachment could spur Kenya to increased knowledge-based economy, provide employable skills and create opportunities for self-employment. Creative innovations could encourage job creation through increased productivity in agricultural activities, reduce food insecurity, provide adequate medical care, clean water, efficient transport and communication networks, optimize industrial processes and lead to creative industrial products for socio-economic development as enshrined in vision 2030 (GoK, 2005; ILO, 2010; Kerre, 2010 and NCST, 2012).

Despite the need for qualified personnel, students' technical and vocational competence in creative innovations had been low (Kerre, 2010 and King and Palmer, 2010). Low TIVET graduates' competence in creative innovations had been associated with instructional challenges which include poor training strategies, instructors' lack of industrial experience and inadequate training equipments and facilities as well inappropriate TIVET educators' training and development (GoK, 2009; Ngerechi, 2003 and Yan, 2011). Dominative instructional strategies which were prevalent in TIVET institutions could help students acquire facts, theories and principles for examination purposes but not develop the necessary skills and competencies needed for creative innovations (Khakala, 2009 and Kerre, 2011). TIVET instructors could require retraining through in-service training (INSET) which has a bias in industrial attachment and collaborated with the supervised industrial attachment of students for optimum results. However, the current scenario was that collaboration between TSIA and supervised students industrial attachment had not been fully exploited.

1.1 STATEMENT OF THE PROBLEM

Low competence in creative innovations among TIVET students had been a great source of concern to various stakeholders because the graduates' industrial output was not commensurate with the investments. The low competence in creative innovations could be attributed to instructional challenges because little attention was given to the instructors' development and training. TIVET instructors were found to lack industrial experience hence, 90% of those working in public TIVET systems could need upgrading. The purpose of this study was to establish the influence of industrial attachment on instructors' and students' competence in creative innovations for industrial output with customer sufficiency. The objective of this study was to determine the influence of TSIA activities on the quality of students' industrial output in Kenya.

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2. LITERATURE REVIEW

The global view of TIVET instructions in the developed countries such as Britain, Germany and Japan among others was anchored on the advent of: digital simulation for learning in engineering, creative designing, architect, and actuarial science (Zachary, 2009); robot teachers in Japan (Gatonye & Mathenge, 2009); mobile phone learning in Korea (Nyantino, 2009). Instructional activities could help students to effectively use the physical tools for enjoyment, nurture social interactive, creative and innovative learning (Kerre, 2010; Muthoni, 2012 and Zachary, 2009). Students in Singapore used team-based technology for simulation of real world projects. The technology used in Singapore included IDEALab and mobile devices for innovations and designing for enterprise applications (Maithya & Ndebu, 2011 and Yan, 211).

To overcome the challenge of overuse of digital simulation without hands-experience, the Germany dual system of education provided practical experiences to students in TIVET by division of time between working in industries, school instructions through industry-based projects (Kerre, 2010 and Kuppe, & Loring, 2006). Similarly, Singapore TIVET instruction emphasized hands-on (manipulative skills), minds-on (intellectual skills) and hearts-on (soft-skills) philosophy. The emphasis was work-flow of industrial practices that provided experiential understanding of real workplace and develop relevant industry portfolios (ILO, 2010 and Yan, 2011). The collaboration between teaching staffs and students' industrial attachment could deal with the complexities of real world problems of deadlines and resource constraints (Kuppe, & Loring, 2006). European Union member countries such as the UK, Switzerland, Republic of Ireland and Sweden recognized the role of industries in students' situational training and collaborative learning in provision of competence-based training and assessment (CBTA) (Brunnet, 2006; Duger, 2011 and Wu, 2011). In particular, the European

Union member countries recognized the need to involve skilled academic staff to work in partnership with industries to provide mentoring and coaching of apprentices (ILO, 2010). However, collaborative learning among teaching staff and their students had not been given due attention.

The Kenyan desire to develop TIVET graduates with 21st century creative innovations for rapid industrialization depended on her ability to tap from foreign exchange potential in renewable energy and green technology along with skills gap in new and emerging technology (Kerre, 2011 and Kerre, 2010). Similarly, developed economies such as the USA, European Union member countries recognized the role of competence-based training and assessment (CBTA) to tap from renewable energy and green technology global market potential. The leading green technology economies included Japan, Germany and China (Kerre, 2010). Germany, aimed at using renewable energy as impetus for exports, economic growth and a means of reducing youth unemployment by offering 170,000 jobs (ILO, 2010; Kuppe, & Loring, 2006 and Brunet, 2006). China was also expected to set up clean coal and wind power plants and planned to triple her wind power generation by 2010 so as to become the largest wind power producer by 2020. California in the US planned to reduce carbon gas emissions by 25% by 2020 and cut the emission by 80% by 2050 (Wu, 2011 and Kerre, 2010). However, involvement of social and industrial partners in collaboration between teaching staff and students in the 21st century instruction in TIVET disciplines to enable them make use of the new and emerging technologies in developing countries like Kenya had not been fully exploited (Kerre, 2010, 2011 and Wu, 2011).

Modeling Kenyan and African countries among other developing countries TIVET on East and South Eastern Asian countries (Chinese Taipei, Japan, Hong Kong, and Singapore) was aimed at encouraging and supporting knowledge-based economies, skills development and respond to modern and emerging technological advancement, enormous energy need for industrialization by 2030 and modernization in a competitive world (Kerre, 2011). Singapore competed globally and favorably ahead of emerging industrial tigers like Korea, China and India (Agrawal, 2011) because of her prowess in encouraging and supporting knowledge-based economies, industry-related skills development that respond to modern and emerging technological advancement (Kerre, 2011; Yan, 2011 and Mar, 2011). Although Singapore had superior TIVET instructions, Indian and Chinese home-based industrial production which used hand-held tools where learners produced for the market were a notch higher. Particularly, Chinese TIVET instructions were rich in preparation for 21st century employability skills development based on the use of practical and occupational for agricultural skills training and innovations. Consequently, Chinese industries produced cement, synthetic fibers, plastics, paper and paperboard; bicycles, motor vehicles and television receivers, and pharmaceuticals (Maclean, 2007). The above scenario related to integration of home-based industries in education where learners produce for the market suggested the need for the involvement of students in industries could spur Kenya to rapid industrialization. However, collaboration of teaching staff and students in home-based industrial production had not been given due attention.

Unlike the Chinese, the Indian youth, preferred white collar jobs to home-based industries and farm based occupations (Agrawal, 2011 and Wu, 2011). The situation could be associated with more emphasis on general education compared TIVET instruction. TIVET instructions in India, Bangladesh and the Mongolian was faced by challenges including shortage of instructors, shortage of funds and a mismatch between supplied and demanded skills. The intervention strategies adopted by India and Bangladesh involved private-public partnership, provision of adequately trained teaching staff and performance based funding as well as competence-based training and assessment facilitated through TIVET-industries partnership (ILO, 2010; Kerre, 2011 and Ngerechi, 2003). Particularly, the industry-TIVET

partnership aimed at in-company training, provision of training equipments, practical training, and setting up workshops, laboratories and support delivery of modern training materials.

The provision of TIVET instructions in Kenya among other African countries such as Egypt, Nigeria and Tanzania was characterized by instructional related challenges that include: shortage of qualified staff, institutions lack of modern equipments and facilities, teaching staffs lack of industrial experience and overemphasis on theoretical and analytical skills with less practical activities for creative innovations (Amuka, Olel & Gravenir, 2011 and Muthaa, 2009). Students related challenges included high failure and referral rate leading to mass wastage, students' lack of prerequisite skills, low student morale to study due to the view that TIVET was meant for the less academically able students hence reduced internal efficiency (Kerre, 2010; Muthaa, 2009 and Ngerechi, 2003). Particularly, Nigerian TIVET had high instructor-student ratio, obsolete equipment, and low morale among teaching staff. In Kenya and Egypt, lack of training quality and relevance and shortage of modern equipments and facilities had been witnessed while in Kenya and Nigeria there were shortage of qualified staff, institutions lack of modern equipments and facilities, teaching staffs lack of industrial experience and shortage of funding to finance TIVET activities. The above challenges could shock competence for creative innovations. Social and industrial partners could play an important role in improving quality and relevance of training; encourage competence-based training and assessment as well as sourcing of funding to meet TIVETs logistical and instructional financial needs. However, collaborative industrial attachment of teaching staff and students as an intervention strategy for creative innovations had not been given due attention.

The Kenyan government was committed to overcome instructional challenges in an attempt to improve competence in TIVET disciplines. The Kenyan intervention mechanism was TIVET, social and industrial partnership through active and continuous transfer of technology (Kerre, 2010; Ngerechi, 2003 and Muthaa, 2009). Similarly, Nigeria, Egypt, Republic of Ireland, Sweden, Switzerland, Brazil, India, Mongolia among others sought to work with social and industrial partners such as industrial supervisors, private enterprise training companies, trade unions and employer associations. Their partnership was meant to provide opportunities for students' supervised industrial attachment, competence-based training and assessment, financial support, streamlining TIVET instructional policies and review of curricular and ethic policies (ILO, 2010, Kerre, 2011 and Ngerechi, 2003). The academic staffs partnership with industrial supervisors, employer associations and trade unions sought to develop instructors' retraining packages to establish master trainers, establish opportunities for joint policy planning formulation and development, experience in work and business processes (Kuppe, & Loring, 2006). In Brazil, the funding was to be managed by employer organizations. The trade unions were to identify the key competency needs. The enterprises identified training priorities and carried out course curriculum design (ILO, 2010). The teaching staff industrial attachment if adopted and practiced could work toward offering consultant services, supervise students during their industrial attachment, provide theoretical courses to the apprentices, conduct research and development to improve the industrial processes and develop goods and services that are globally competitive. Although collaboration between teaching and students' industrial attachment could improve creative innovations, the strategy had not been fully exploited in Africa at least in Kenya among developing countries. Hence, the study was justified.

3. METHODOLOGY

A cross-sectional descriptive survey research design was used. Questionnaires and students were administered to fifty (50) students and twenty three (23) academic staff. Semi-structured interview schedule was used with thirteen (13) industrial supervisors in Kenya. The instruments were used to collect data related to the role of collaborative industrial attachment

between teaching staff and students in developing creative and innovative competence needed for rapid industrialization. The study represented the results in the frequency table showing the frequency and percentages in parentheses on the opinion of students, lecturers and industrial supervisors on the role of supervised industrial attachment. The results were discussed to respond to research objectives and questions.

4. RESULTS AND DISCUSSIONS

The results were analyzed and discussed under the following five study question: (i) What are the benefits of teaching staff industrial attachment? (ii) What activities can be carried out by teaching staff industrial attachment for competence development? (iii) What competence in soft skills is developed by teaching staff and their students through industrial attachment? (iv) What challenges are faced students during industrial attachment? Appendices 1-4 presents the results of the analyses. Appendix 1 presents the result of question 1, Appendix 2 presents the result of question 2, so also are appendices 3 and 4 associated with corresponding questions.

This study is consistent with Kerre (2011) and Kerre (2010) which suggest that industrial attachment could meet the Kenyan TIVET instructors' experiential training needs. Similarly, our study and those of ILO (2010), Kerre (2011), and Obonyo (2011) affirms that the developing and transitional countries like Kenya, Singapore, Egypt, India, China and Ghana need re-orientation of their TIVET educators' training and continuous development to meet the challenge of modern, changing and emerging technologies. The agreed intervention could spur Kenyan manpower into creative innovations necessary to tap into the greening economy, obtain the scientific and technological human and material resources needed for use of renewable energy; reduce carbon emissions; introduce environmental friendly industrial systems and be globally competitive.

Our current study is in agreement with the work by Brown (2003), Duger, (2011), ILO (2010), Kerre (2010), Kuppe, & Loring, (2006) and Yan (2011) which found that the academic staffs partnership with industrial supervisors, employer associations and trade unions could seek to develop instructors' retraining packages to establish master trainers, establish opportunities for joint policy planning formulation and development, experience in work and business processes. The partnership between TIVET teaching staff and industries in Kenya, among other countries such as Brazil was meant to provide opportunities for students' supervised industrial attachment, competence-based training and assessment, financial support, streamlining TIVET instructional policies, and industrial attachment for students, review of curricula and ethic policies and ensure that funding was managed by employer organizations. The current study and the work by Duger (2011), Kuppe & Loring (2006) and Yan (2011) concurred that trade unions could identify key competency needs. The current study and the work by Duger agreed that Kenyan and Australian TIVET staff and industries could adopt market-based pricing to meet the training needs through benchmarking where clients negotiated and purchased needed training.

This study affims the study of Ahmad and Rashid (2011) on need for manpower development in skills for global stability and security, Kairu (2012) study on Kenyan need to develop skills necessary for practice work ethics, Mudashir (2011) on newly employed TIVET instructors lack of industrial skills in Nigeria and Kuppe & Loring (2006) and Norbech (2002) on social and industrial partners role in developing suitable environment for enduring and sustainable creative innovations in engineering education in UK concurred on the need for collaboration of teaching staff and students industrial attachment of for training and development in soft skills. The current study and reviewed literature identified the need for development of manpower with competence in soft skills for sustainable creative innovations for rapid industrialization desired in Kenya.

The current study is consistent with Agrawal (2011) and IICBA (2012) which suggest that the challenges experienced during industrial attachment revolve around little or no support from social and industrial partners. That was because trainees taking industrial attachment sometimes have little or no follow-up (Agrawal, 2011 and IICBA, 2012). The results of the analyses affirms the Kenyan TIVET objective in Kerre (2010), Ngerechi (2003) and Muthaa (2009) on the need to have active and continuous transfer of technology through collaborative approach between TIVET institutions and the relevant industries. The current study concurred with Kuppe & Loring (2006) that although the challenges were experienced during that involvement of industrial and social partners such as industrial supervisors, employer associations and trade unions could develop instructors' retraining packages to establish master trainers, establish opportunities for joint policy planning formulation and development, experience in work and business processes. The funding was to be managed by employer organizations. The trade unions could be involved in identifying the key competency needs. Our current study and the study of Kerre (2010), Ngerechi (2003) and Muthaa (2009) are in agreement that social and industrial partners working with teaching staff in their industrial attachment could develop sound policy, provide accreditation and certify competence-based training and assessment (CBTA).

The findings of the study is consistent with Agrawal (2011) and IICBA (2012) on the need to seek for social and industrial partners such as industrial supervisors, private enterprise training companies, trade unions and employer associations in manpower development of creative innovations. However, the role that could be carried out by teaching staff in industrial attachment to reduce or eliminate the above mentioned limitations had not been fully addressed. The teaching staff industrial attachment could provide a link between TIVET institutions and social as well as industrial partners. The teaching staff industrial attachment if adopted and practiced could work toward offering consultant services, supervise students during their industrial attachment, provide theoretical courses to the apprentices, conduct research and development to improve the industrial processes and develop goods and services that are globally competitive. Although collaboration between teaching and students' industrial attachment could improve creative innovations, the strategy had not been fully exploited in Africa at least in Kenya among developing countries. Hence, the study was justified.

5. CONCLUSION AND RECOMMENDATIONS

This study demonstrated that the supervised industrial attachment plays important role in establishing the links with industrial and socio-partners, relating teaching and learning processes to the latest development in the industries, provide opportunities of working with most current technology, machinery, equipment, tools and systems, contribute to product and industrial processes creative innovations, involve the industrial staff in students' competence development, reduce cost of recruitment and hence improve industrial savings. The study concluded that academic staff and students if they go for industrial attachment at the same time, collaborative teaching and learning would be occur simultaneously to improve students competence creative innovations, support and encourage quality and globally competitive industrial out-put. The study recommends the involvement of industrial and social partners in policy formulation, design, implementation, financing and standardized assessment of collaborative supervised industrial attachment for students and academic staff.

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APPENDICES

Appendix 1: Benefits of Teaching Staff Industrial Attachment

Statement	*Student*	*Lecturer*	*Supervisor*
Impart relevant and up-to-date knowledge and skills to effectively support industries	31(62%)	20(86%)	11(84.6%)
Nurture linkage with industry for students industrial attachment	28(56%)	20(86%)	10(76.9%)
Professional do part-time teaching with apprentices in the industries	29(58%)	19(83%)	9(69.2%)
Appropriate explanations and facilitate discussion giving latest examples	33(66%)	21(91%)	9(69.2%)
Broaden instructors knowledge and experience	34(68%)	17(74%)	12(92.3%)
Able to provide latest information about the industry and expected expertise	30(60%)	19(83%)	11(84.6%)
Facilitate organizational stability and security	33(66%)	18(78%)	12(92.3%)
Elaborate theoretical aspects more effectively and efficiently	31(62%)	17(74%)	11(84.6%)
Improve efficiency and effectiveness in the working culture	34(68%)	20(86%)	12(92.3%)
Inculcate values and develop well balanced students in spiritual and academic achievement	28(56%)	14(61%)	10(76.9%)
Improve confidence in sharing knowledge and skills with colleagues and students	49(98%)	20(86%)	11(84.6%)
Use specialized equipment, machinery and tools not available at college	33(66%)	19(83%)	12(92.3%)
Expose students to challenges faced in the outside world situations	32(64%)	17(74%)	10(76.9%)
Acquaintance with new technologies, machines and equipment function	30(60%)	17(74%)	11(84.6%)
Bridge the gap between higher learning and industry requirements in terms of skills	25(50%)	19(83%)	12(92.3%)
Use hand-outs provided during industrial attachment for instructions	25(50%)	21(91%)	11(84.6%)

Appendix 2: Activities carried out industrial attachment in developing students' competence

Statement	*Lecturer*	*Supervisor*
Carry out industry-related funded research activities to finance TIVET	19(83%	11(84%)
Customer oriented product design and packaging activities	21(91%)	13(100%)
Use specialized equipment, machinery and tools not available at college	17(74%)	12(92%)
Support consultation services to bridge gap between theory and practice	18(78%)	12(92%)
Collection, analysis, presentation, interpretation of data for decision making	20(86%)	13(100%)
Form part of think tank for innovation and problem solving	20(87%)	12(92%)
Sharpen and Apply manipulative skills using hand-held tools and equipments	20(87%)	13(100%)
Work with industrial supervisors in developing manuals for industrial attachment and assessment besides being a co-supervisory and trainer	19(83%)	12(92%)
Acquaintance with how new technologies, machines and equipment function	16(70%)	9(69%)
Participate in brain-storming sessions for problem solving	20(86%)	12(92%)

Appendix 3**:** Competence in Soft Skills Developed through Industrial Attachment

Competence in soft skills developed include:	*Student*	*lecturer*	*Supervisor*
Critical and creative thinking skills	33(66%)	18(78%)	11(84%)
Problem-solving skills	30(60%)	17(74%)	11(84%)
Negotiation skills	31(62%)	16(70%)	10(77%)
Information handling skills for effective communication	29(58%)	17(74%)	12(92%)
Conflict resolution skills	33(66%)	17(74%)	10(77%)
Assertiveness without being offensive	30(60%)	18(78%)	12(92%)
Team-work skills	35(70%)	17(74%)	10(77%)
Ability to engage in community service.	33(66%)	17(74%)	12(92%)
Physical and mental wellbeing	25(50%)	16(70%)	10(77%)
Coping with stress	33(66%)	17(74%)	10(76.9)%
Healthy interpersonal relationships and (psychological health)	34(68%)	21(91%)	12(92.3%)
Make informed and effective decisions (informed choices)	34(68%)	18(78%)	10(76.9%)
Translate knowledge, attitudes, skills and values into action	22(44%)	17(74%)	11(84.6%)

Appendix 4: Challenges are faced by teaching staff and students during industrial attachment

Challenges	*Student*	*Lecturer*	*Supervisor*
Language barriers in multi-national organizations	35(70%)	20(86.9%)	12(92.3%)
Some industrial mentors lack ability to seek for knowledge and information	49(98%)	18(78.2%)	11(84.6%)
Inadequacy of knowledge and skills in college to deal with current industrial needs	33(66%)	19(82.6%)	11(84.65)
Some mentors inflexibility in accommodating alternative conception of the problem	34(68%)	17(73.9%)	12(92.3%)
Few ladies to mentor and encourage their ladies apprentices in the profession	33(66%)	17(73.9%)	9(69.2%)