European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejes.v8i2.3621 Volume 8 | Issue 2 | 2021

DO KENYAN UNIVERSITY STEM GRADUATES POSSESS EMPLOYABLE SKILLS FOR THE JOB MARKET?

Josephat M. Kiweu[2i], David Mulwa[1], Jacinta Kinyili[2], Pamela Muriungi[3], Richard Kimiti[4], James Muola[5]

[1,3,4,5]School of Education, Machakos University, Kenya

[2]School of Business and Economics, Machakos University, Kenya

Abstract:

Economic growth world over is based on the supply and availability of Science, Technology, Engineering and Mathematics graduates due to their desired skills. However, a major concern in most developing countries including Kenya is whether STEM graduates possess the skills required by labour market. This study therefore seeks to find out if there exists a 'skills gap problem' in STEM graduates emerging from Kenyan Universities. The study adopted a descriptive survey research design. The sample size of the study were 66 lecturers, 59 laboratory technologists and 275 students in the STEM disciplines in the four technology-based universities in Kenya. A purposive sample of four employers where most STEM graduates seek internship were used to seek employer views on competency of the graduates. Data was collected through five sets of questionnaires for each for lecturers, laboratory technologists, employers, alumni and students. Analysis of data was done through the use of descriptive and inferential statistics. The findings suggest that STEM graduates coming out from Kenyan universities don't receive enough training thus requiring more exposure on practical sessions to be productive and more mentoring. Training based on STEM curriculum was relevant for the Kenyan industries despite the study indicating that there are inadequacies with the STEM training facilities. The study also revealed that the staff handling the students are competent, and theoretical and practical lessons are adequately prepared.

[i] Correspondence: email jkiweu@mksu.ac.ke

Keywords: science, technology, engineering and mathematics, Kenyan universities

1. Introduction

There is general consensus that graduates in science, technology, engineering, and mathematics (STEM) are desired in many economies of the world (Chetty, 2012). In the United States of America, STEM based careers are growing at 17%, while others are growing at 9.8% and STEM degree holders have a higher income even in non-STEM careers (Engineering for Kids, 2016). This is based on the fact that STEM degrees are assumed to provide high-skilled workers while the rest of the graduates from universities are deemed low-skilled workers (Maselli & Beblavý, 2013).

In many economies of the world economic growth is based on the supply and availability of Science, Technology, Engineering and Mathematics graduates due to their desired skills (Beblavý et al., 2013). Indeed, in modern economies, the concern is not whether there is enrolment in higher education, but how many numbers are enrolled in STEM programmes. Industry forecast demand for STEM skills is often in short supply in many countries. While the study of 'hard' subjects, such as STEM offers better employment and pay prospects, a major concern in most developing countries including Kenya is whether STEM graduates possess the skills required by labour market. This paper examines, in a comparative manner the skills possessed by Kenyan STEM graduates and the demand by industry in order to assess the relevance of University STEM programmes in meeting industry needs.

In Kenya, the Kenyan Vision 2030 and the Constitution place a premium on the generation and management of a knowledge-based economy and the need to raise productivity and efficiency. To address this need, STEM (Science, Technology, Engineering and Mathematics) courses have been embraced as an essential ingredient for industrialization and sustainable development (Republic of Kenya, 2007). Many countries have realized that the capacity to compete in the global market is highly dependent on the ability to innovate and apply relevant technology to industry. As a result of this realization, STEM related programmes have since become a priority and gained popularity in the recent past. In Kenya innovation in science and technology has been considered as the key to a thriving economy.

From the medical scientists who develop treatments for diseases to the civil engineers who design and build a nation's infrastructure, every aspect of human life is based on the discoveries and developments of scientists and engineers. Consequently, technological innovation in the modern age is only obtainable through the expertise of specialists with knowledge of STEM skills. Societies seeking new scientific knowledge and encouraging creative and technological innovations can utilize STEM skill sets to increase productivity and experience long term sustained economic growth. Countries prioritizing STEM education and research will make significant advances in alleviating poverty and sustaining economic, cultural and societal growth. Therefore, the role of STEM in developing countries is undoubtedly of significant importance, just as it is in our modern world.

Whereas countries have prioritized the training of STEM graduates, education and industry analysts report a persistence lack of graduates in science, technology, engineering, and mathematics (STEM). A review by Nation Newsplex (Kenya Daily Nation, 9/12/2017) reveals that only one in four (25%) undergraduates is studying a course in Science, Technology, Engineering and Mathematics (STEM), despite the large number of related programmes on offer and the critical role they play in development. In contrast, more than two in five students (43 per cent) are enrolled in Business and Education courses. This points to scarcity of STEM graduates and the inability of the country to match its academic input with industrial needs.

Advancement in technology and equipping the youth with relevant knowledge and skills in the 21st century demands is a noble goal of any government on matters education. However, besides severe skills shortages in STEM, a major concern raised by the public about Kenyan university graduates generally is how they are 'half baked'. This concern motivated the current study, particularly to investigate whether Kenyan STEM graduates possess practical usable skills for the market place. As noted by the Project Director for Research and Information at Linking Industry with Academia Trust (LIWA), STEM graduates lack requisite skills because of lack of facilities and resources at universities to facilitate high quality learning (Daily Nation/Newsplex, Saturday, December 9, 2017). This study therefore seeks to find out if there exists a 'skills gap problem' in STEM graduates emerging from Kenyan Universities.

The paper explores if STEM graduates are workforce ready as often employers argue "*it's not only the quantity of STEM graduates that is the problem, but their quality"*. This begs the question; are Kenyan colleges and universities producing STEM graduates that have skill deficiencies? Given the emphasis of STEM skills in the Kenya Big 4 development agenda currently under execution, it is important to understand the nature and existence of the problem to address it well.

2. Research Questions and Methodology

The overall objective of this study is to assess if there exists a skills gap among STEM graduates leaving Kenyan universities. Towards meeting this objective, the following research questions below summarize relevant points that will be examined relating to STEM skills gap problem.

1) Is there a mismatch between what is being taught to Kenyan students and what prerequisite skills businesses say they require?
2) Are STEM graduates employable because they possess necessary skill sets or there are no STEM jobs in Kenya?
3) Do STEM graduates possess the 'right' skills or they are not 'job ready'?
4) Are STEM graduates technically deficient?

3. Methodology

The study adopted a descriptive survey research design. The target population of the study were lecturers, laboratory technologists and students in the STEM disciplines in the four technology-based universities in Kenya. The universities were Jomo Kenyatta University of Agriculture and Technology (JKUAT), Dedan Kimathi University of Technology (DeKUT), Technical University of Kenya (TUK) and Technical University of Mombasa (TUM). Using simple and stratified sampling, 80 lecturers, 60 laboratory technologists and 300 students were selected from three universities.

Additionally, a purposive sample of 4 employers where most STEM graduates seek internship were used to assess applicability of learned skills and also to seek employer views on competency of the graduates. Though Technical University of Mombasa (TUM) was one of the targeted universities, it was excluded during the sampling stage. Data was collected through five sets of questionnaires for each for lecturers, laboratory technologists, employers, alumni and students. Analysis of data was done through the use of descriptive and inferential statistics.

4. Results of the Study

The questionnaires response rate was 66 (53%) for lecturers, 59(98%) for laboratory technologists and 275 (92%) for students. Thirty one (31) STEM professionals in various fields responded to the alumni questionnaire while four key employers also responded. The findings were organized along the research questions as outlined.

3.1 Qualifications of the Academic Staff Who Teach STEM programmes in the Kenyan Universities

Lack of resources at universities to facilitate high quality learning is cited by experts as one of reasons STEM graduates lack requisite skills. This study sought to find out if universities offering STEM programmes have qualified lecturers. The findings showed that 96.6% of the STEM lecturers interviewed had Master's degree while 3.4% were Ph D holders (Table 1).

Table 1: Level of Qualification of University Lecturers

Qualification	University			Total
	JKUAT	TUK	DeKUT	
Masters	6 (100.0%)	15 (93.8%)	7 (100%.0)	28 (96.6%)
PhD		1 (6.2%)		1 (3.4%)
Total	**6 (100.0%)**	**16 (100.0%)**	**7 (100.0%)**	**29 (100.0%)**

NB: Only 29 respondents indicated their qualification level.

As a requirement, lecturers are meant to have a connection with industry through their professional bodies' affiliation. A survey of professional body affiliation indicates that eighty point nine (80.9%) percent of the lecturers acknowledged being accredited to professional bodies (see Table 2). Further, majority (36.8%) of the lecturers indicated that

they have less than 3 years' experience with 32.4% having 3-6 years' experience. However, the relation between experience and University was significant, $\chi 2$ (12, N=68) =31.641, p=.002. That is, some Universities required higher level of experience than others, probably because of their age. Generally, DeKUT (as a younger university) lectures have fewer years of experience compared to JKUAT and TUK lecturers. More (96.3%) of the DeKUT lecturers have less than six (6) years' experience compared to 45% from JKUAT and 55% from TUK.

Table 2: Accreditation of Lecturers by Professional Bodies

		University				Total
		JKUAT	**TUK**	**DeKUT**	**TUM**	
Accredited	Yes	13 (65.0%)	4 (20.0%)	26 (96.3%)	-	55 (80.9%)
	No	7 (35.0%)	16 (80%)	1 (3.7%)	1 (100.0%	13 (19.1%)
	Total	**20 (100.0%)**	**20 (100.0%)**	**27 (100.0%)**	**1 (100.0%**	**68 (100.0%)**
Accrediting Body	Not Sure	13 (65.0%)	17 (85.0%)	27 (100.0%)	1(100.0%	58 (85.3%
	EBK	3 (15.0%)	3 (15.0%)	-	-	7 (10.3%)
	KTRB	1 (5.0%)	-	-	-	1 (1.5%)
	KMPDU	1 (5.0%)	-	-	-	1 (1.5%)
	CUE	2 (10.0%)	-	-	-	2 (3.0%)
	Total	**20 (100.0%)**	**20 (100.0%)**	**27 (100.0%)**	**1 (100.0%**	**68 (100.0%)**

On the part of Lab Technologists, 35% were diploma graduates with 32% having degrees, 18% Masters and 16% indicating that they were qualified (Table 3). The findings indicated that there was a significant relation to university as well (Table 4). JKUAT had more laboratory technologists with Masters compared to the TUK and DeKUT. Still, majority (42%) of the laboratory technologists reported having experience between 3-6 years while 27% had more than 10 years' experience and 20% having 7-10 years' experience (Table 5). Relation between laboratory technologists' experience and University was significant, $\chi 2$ (6, N=59) =21.573, p=.001 (Table 6), such that 88% of the JKUAT technologists had more than 6 years' experience compared to 36% from TUK and 23% from DeKUT with more than 6 years' experience.

Table 3: Overall Assessment on Qualification of the Laboratory Technologists Qualification

		University			Total
		JKUAT	**TUK**	**DeKUT**	
Assessment about the qualification	Diploma	1 (5%)	5 (29%)	10 (37%)	16 (25%)
	Degree	2 (9%)	9 (53%)	10 (37%)	21 (32%)
	Masters	7 (33%)	2 (12%)	3 (11%)	12 (18%)
	Qualified	11 (53%)	1 (6%)	4 (19%)	16 (25%)
Total		**21 (100%)**	**17 (100%)**	**27 (100%)**	**65 (100%)**

Table 4: The Relation between Qualification of Laboratory Technologists and University

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	**33.980**[a]	**12**	**.001**
Likelihood Ratio	41.496	12	.000
Linear-by-Linear Association	18.623	1	.000
N of Valid Cases	59		

a. 17 cells (81.0%) have expected count less than 5. The minimum expected count is .27.

Table 5: Laboratory Technologists Working Experience

		University			**Total**
		JKUAT	**TUK**	**DeKUT**	
Assessment about the experience	<3 years	3 (18.8%)	16 (94.1%)	21 (80.8%)	40 (67.8%)
	3 - 6 years	11 (68.8%)	1 (5.9%)	5 (19.2%)	17 (28.8%)
	7 - 10 years	2 (12.5%)	-	-	2 (3.4%)
Total		**16 (100.0%)**	**17 (100.0%)**	**26 (100.0%)**	**59 (100.0%)**

Table 6: The Relationship between Laboratory Technology Experience and the University

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	26.222[a]	4	.000
Likelihood Ratio	27.269	4	.000
Linear-by-Linear Association	15.096	1	.000
N of Valid Cases	59		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .54.

The findings show that resource personnel for both lecturers and Lab Technologists met the minimum requirements in terms of qualification and experience for their responsibilities. That is, masters' degree for Lecturers and Diploma for Lab Technologists. However, the findings suggest the older the university the more the experience and better qualification of resource personnel than younger universities. This may suggest that older universities could be churning out more technically competent graduates to the job market because they have better resources and learning environment.

3.2 Achievement of STEM Learning Outcomes

The study examined the level of achievement for learning outcomes in STEM programmes. This was done seeking the opinion of lecturers, lab technologists, students in 3rd to 5th year and also alumni working in STEM jobs. The findings from the lecturers indicated that forty percent (40%) were affirmative the STEM learning outcomes are achieved at the time of graduation while 30% indicated that the outcomes are somehow achieved (Figure 1).

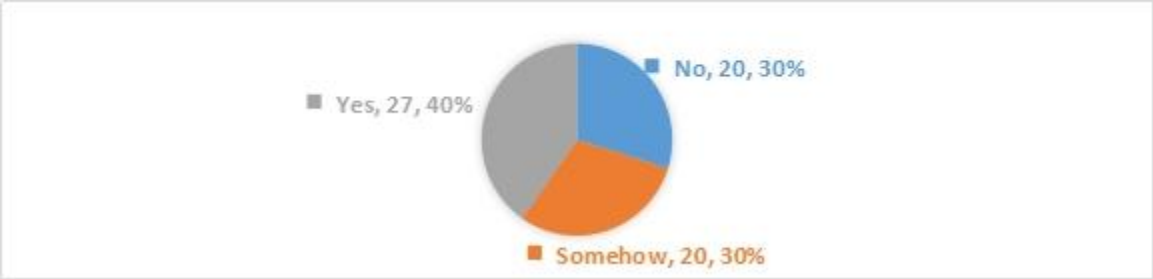

Figure 1: Achievement of Learning Outcome as Perceived by Lecturers

For the Laboratory Technologists, cumulatively 81.4% agreed that the STEM practical outcomes are achieved (see Table 7). However, more Lab Technologists (96.6%) from DeKUT were in agreement compared to JKUAT (81.2%) and TUK (58.8%) Laboratory Technologists. Seventy-four point five percent (74.5%) agreed that learning outcomes of STEM programmes achieved at graduation.

Table 7: Lab Tech Opinion: Are STEM Practical Learning Outcomes Achieved?

		University			Total
		JKUAT	**TUK**	**DKUT**	
Learning outcomes	No	3 (18.8%)	7 (41.2%)	1 (3.8%)	11 (18.6%)
for STEM practical sessions	Yes	13 (81.2%)	10 (58.8%)	25 (96.2%)	48 (81.4%)
Total		**16 (100.0%)**	**17 (100.0%)**	**26 (100.0%)**	**59 (100.0%)**

The student perspective yielded similar results, where 74% (Table 8) felt that the outcomes were achieved. The relation between students' opinion on outcomes of STEM courses and the university was significant, $\chi 2$ (2, N=274) =10.791, p=.005 (Table 9). Cross tabulation results revealed that differentially 85.7% of DeKUT, 70.7% of TUK and 65.6% of JKUAT students agreed. The study demonstrated achievement of STEM learning outcomes as more than 70% of the lecturers, Lab Technologists and students were in agreement that learning outcomes of STEM programmes achieved at graduation.

Table 8: Student Perspective: Are Learning Outcomes of STEM Course Achieved at the end of the Training?

		University			Total
		JKUAT	**TUK**	**DKUT**	
Are learning outcomes	No	29 (34.5%)	27 (29.3%)	14 (14.3%)	70 (25.5%)
of STEM programmes	Yes	55 (65.5%)	65 (70.7%)	84 (85.7%)	204 (74.5%)
achieved at graduation?					
Total		**84 (100.0%)**	**92 (100.0%)**	**98 (100.0%)**	**274 (100.0%)**

The relation between opinion on outcomes of STEM course and the university was significant, χ^2 (2, *N*=274) =10.791, *p*=.005.

Table 9: The Relation between Opinion on Outcomes of STEM Course and the University

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	10.791[a]	2	.005
Likelihood Ratio	11.398	2	.003
Linear-by-Linear Association	9.971	1	.002
N of Valid Cases	274		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 21.46.

The relation between opinion on outcomes of STEM course and the university was significant, χ^2 (2, N=274) =10.791, p=.005.

The findings on perception of achievement of learning outcomes were triangulated by finding out from those who had graduated with STEM degrees; if the skills they had acquired were applicable and relevant in the work place. A set of 10 questions were presented to STEM alumni, each assessing graduate experiences on application of skills, competencies acquired during their university learning. The questions had a Cronbach alpha of 0.81 indicating that the questions were able to consistently gather information on the matter. About 50% of the graduates had left college in the last 5 years. Table 10 presents the results.

Table 10: Alumni Response: Assessment of Curriculum Relevancy to the Job Market

Please choose the most appropriate response to each question	**Not at all (1)**	**Somewhat (2)**	**Moderately (3)**	**A great deal (4)**	**Mean SD**	**CV**
1. How well did your program prepare you for the career you are in?	1 (3.2%)	5 (16.1%)	16 (51.6%)	9 (29.0%)	*M*=3.06 *SD*=0.77	25.1%
2. The teaching facilities were adequate for equipping me for my work	1 (3.2%)	8 (25.8%)	15 (48.4%)	7 (22.6%)	*M*=2.90 *SD*=0.78	26.8%
3. I was well mentored for the job	1 (3.2%)	28 (90.3%)	1 (3.2%)	1 (3.2%)	*M*=2.06 *SD*=0.44	21.3%
4. As fresh graduate I was able to work and fit on the job immediately	1 (3.2%)	17 (54.8%)	7 (22.6%)	6 (19.4%)	*M*=2.58 *SD*=0.84	32.5%
5. What I learned in the University is applicable in this job?	1 (3.2%)	7 (22.6%)	10 (32.3%)	13 (41.9%)	*M*=3.12 *SD*=0.88	28.2%
6. The skills that I learned in class were useful to perform on the job?	-	6 (19.4%)	16 (51.6%)	9 (29.0%)	*M*=3.09 *SD*=0.70	22.6%
7. I was provided with adequate opportunity to develop necessary competencies	1 (3.2%)	11 (35.5%)	10 (32.3%)	9 (29.0%)	*M*=2.87 *SD*=0.88	30.6%
8. I now belief there are other training	6 (6.5%)	3 (9.7%)	7 (22.6%)	19 (61.3%)	*M*=3.38 *SD*=0.91	26.9%

	opportunities to learn skills for the industry jobs?					
9.	I used most of skills I learned in class	1 (3.2%)	10 (32.3%)	17 (54.8%)	3 (9.7%)	*M*=2.70 *SD*=0.69	25.5%
10.	I attribute success in my career to the University training I received.	2 (6.5%)	4 (12.9%)	16 (51.6%)	9 (29.0%)	*M*=3.03 *SD*=0.83	27.3%
Summation		**-**	**8 (25.8%)**	**16 (51.6%)**	**7 (22.6%)**	***M*=2.88 *SD*=0.44**	**15.3%**
Reliability (Cronbach's Alpha) (N items=10)		**0.808**					

In summary, the findings suggest most (74.2%) of the alumni found the knowledge acquired from university useful in performing their jobs in different fields. The graduates attributed success in their career to the training/skills received at college, whereby they argued that they were well prepared for the job at university and acquired necessary competencies at university. This indeed showed that they were able to do (after graduation), what the employers demanded of them in the work place. In alumni assessment, they pointed out that they were able to do 70% of the time what their supervisors required of them.

The forgoing findings suggest that the curriculum pursued by Kenyan universities handling STEM graduates seems to be relevant and the graduates find that they can at least perform at the job market. Hence this study concludes there is no mismatch between what is taught (knowledge and skills) at university and expectations of STEM employers.

3.3 Are STEM Graduates' Workforce Ready?

An important question in this study is whether STEM graduates in Kenya are employable, and if they are ready for the market. Besides the curriculum being in-sink with what the industry requires, the skills and knowledge that STEM students have acquired by the time they graduate is at best tested by employers. It is these skills that play a key part in the employability of the graduates.

This study undertook a survey from STEM teaching universities on Lecturers', Lab technicians and graduating class on the feedback they get from graduates on the challenges STEM graduates face when seeking for employment. The objective of the survey was to highlight the STEM graduate challenges face during employment.

The findings in Table 11 and Figure 2, indicate Lecturers identified adequate lack of needed practical skills (43.3%, Table 11), difficulty in adopting to new technologies (14.5%) and culture shock (difficulty in adopting to work environment) (9.7%) as the key challenges. The main challenges which STEM graduates face during employment identified by Lab Technologists was inadequate skills (45%, Figure 2a.) followed by technical challenges (24%) and different industrial procedures (9%). Of the graduating students surveyed, 20% and 16% (Figure 2b) fear that they possess inadequate skills or the skill sets are mismatched and aren't able to address the needs of the society.

Table 11: Challenges which STEM Graduates Face during Employment (Lecturers Feedback)

No	Challenges faced by STEM graduates during employment	Count	Percentages
1	Harassment by superiors & Colleagues	3	4.8%
2	Inadequate career mentorship and support	6	9.7%
3	Lack of needed experience/skills	27	43.5%
4	Culture shock (difficulty in adapting to work environment)	6	9.7%
5	Inadequate resources & equipment	1	1.6%
6	Difficulty in adapting to new technologies	9	14.5%
7	Being assigned tasked outside their specialities	1	1.6%
8	Difficulty in decision making	2	3.2%
9	Low remuneration	3	4.8%
10	Limited career growth opportunities	3	4.8%
11	Corruption and favouritism	1	1.6%
	Total	**62**	**100.0%**

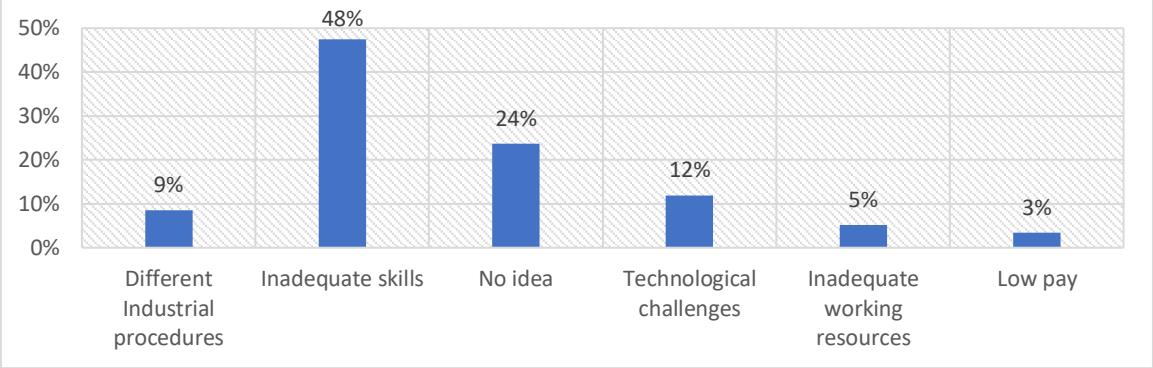

Figure 2a: Challenges Faced by STEM Graduates during Employment (Lab Tech Feedback)

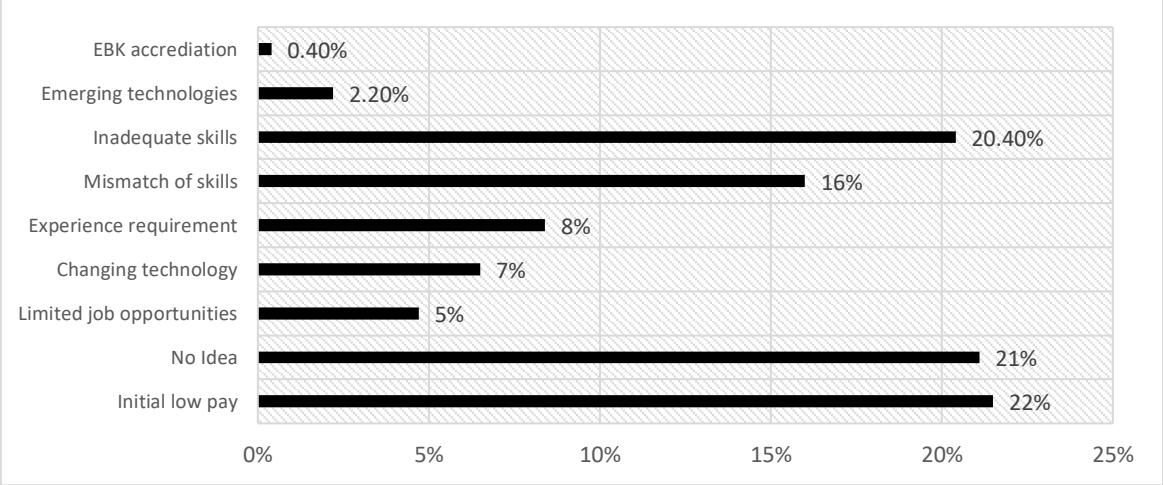

Figure 2b: Challenges Faced by STEM Graduates During Employment (Graduating Class)

The University lecturers and lab technicians believe that this gap on skills can be bridged through training with focus on more practical lessons, enhanced internships/industrial attachments, and exposing the students to the latest technology and new skills.

3.4 Industry Skill Set Requirements for Effective STEM Job Performance

An investigation was done from some employers in Nairobi city to find out employer experiences with STEM graduates. The objective was to highlight if employers were satisfied with level of training of STEM graduates, their concerns on ability to perform and if they were able to hit the ground running with minimal retraining.

A set of 20 questions were addressed to select employers in format of grounded research approach. The study revealed that the industry requires to recruit graduates who are adequately trained on technical skills and possess complementary non-technical skills. The major non-technical skills identified include, teamwork (50%), effective communication (50%) and good presentation skills (50%).

One of the key questions (Table 12) in the interview was; "We find the graduates employable and would take them any other time we need workers, easily adapt to work systems". Majority of the respondents were of the view that, this was "mostly true" based on their experience with recent graduates. However, majority of employers were of the view that, the University training is not enough, and that the graduates require a lot of mentoring to be productive. Another observation was that, STEM graduates learn procedures fast, and supervisors do not keep going over and over, as they seem to understand them. Employers also pointed out that they preferred STEM graduates to other disciplines because based on their experiences, STEM graduates fairly met their expectations.

Table 12: STEM Graduate Competency

Satisfaction with abilities/skills of recent STEM recruits	Completely false	Mostly false	Somewhat true/false	Mostly true	Completely true
1. We belief skills come with training not experience	-	(25%)	(50%)	(25%)	-
2. We find that the graduates are well prepared enough to work and perform the tasks assigned to them	(25%)	(25%)	(25%)	(25%)	-
3. We find the graduates creative and quite resourceful.	-	(25%)	(75%)	-	-
4. We find that the graduates have relevant skills and training for the industry	-	-	(75%)	(25%)	-
5. We find the graduates employable and would take them any other time we need workers, easily adapt to work systems	-	-	(25%)	(75%)	-
6. We get value for money by recruiting from Universities	-	-	(75%)	(25%)	-
7. We find STEM graduates very useful so we keep	-	-	(75%)	(25%)	-

	their recruitment to the minimum.					
8.	STEM graduates learn procedures fast, & supervisors do not keep going over and over, they seem to understand them.	-	(25%)	-	(75%)	-
9.	We find it necessary to retrain STEM graduates, they are ready to work.	-	-	(25%)	(50%)	(25%)
10.	In our opinion, we do not think there is need to combine acquired competencies, or learning at University with workplace exposure	(75%)	(25%)	-	-	-
11.	The University training is enough, the graduates do not require a lot of mentoring to be productive	(25%)	(75%)	-	-	-
12.	Women with a STEM degree are likely than their male counterparts to work in a STEM occupation	(25%)	(25%)	(25%)	(25%)	-
13.	There is lots of expertise in STEM graduates. Certainly, Universities need to better prepare the graduates for employment in the industry	-	(50%)	-	(50%)	-
14.	Science, technology, engineering and mathematics are the key drivers of industrial growth for any country	(25%)	-	(50%)	(25%)	-
15.	I find it helpful to emphasize study of STEM degrees other than other programs.	(50%)	-	(50%)	-	-
16.	Lecturers should expect students to spend significant amounts of time studying STEM courses since everyone knows they guarantee employment.	(25%)	(25%)	(50%)	-	-
17.	The degree the students did prepared them well for a career in Science,	-	-	(75%)	(25%)	-

technology, engineering and mathematics.					
18. Based on your experience with graduates employed in your company, do you think the graduates met your expectations very well?	-	(25%)	(50%)	(25%)	-
19. The content/objectives, skills /competencies of the university programmes match our expectations and what we look for when hiring.	-	(25%)	(50%)	(25%)	-
20. We consider preparation for professional work by the STEM program to be satisfactory and the curriculum very relevant.	-	(75%)	(25%)	-	-
Summation (Overall Graduate Competency)	-	(25%)	(75%)	-	-
Reliability (Cronbach's Alpha) (N items=20)	**0.618**				

5. Conclusion

The main concern for the current study was to investigate whether Kenyan STEM graduates possess practical usable skills for the market place. This paper therefore sought to assess if STEM graduates are workforce ready, if they have necessary skills for the job market as often employers argue "*it's not only the quantity of STEM graduates that is the problem, but their quality*". The survey results underscore the need for a joint effort between industry and academia to bridge the gap between employer expectations and graduates' skills. Majority of employers were of the view that, the University training is not enough, and that the graduates require a lot of mentoring to be productive. The expectations gap on skills can be bridged through training with focus on more practical lessons, enhanced internships/industrial attachments, and exposing the students to the latest technology and new skills.

The study findings pointed to a lack of adequate practical skills for STEM graduates coming out from Kenyan universities, at least from feedback on all fronts (employers, lecturers, lab technicians and students). However, the study also found out that training based on STEM curriculum was relevant for the Kenyan industries. Despite the study indicating that there are inadequacies with the STEM training facilities, the study also revealed that the staff handling the students are competent, and theoretical and practical lessons are adequately prepared.

Graduates are adequately prepared and are able to undertake the tasks stipulated at the end of their learning. In alumni assessment, the study showed that STEM graduates

were able to do, what the STEM curriculum had suggested they would be able to do 70% of the time. This means that although there may be inadequacies in the STEM training facilities, these inadequacies do not significantly affect the overall effectiveness programme implementation.

The findings generally indicate that STEM graduates are technically endowed, however lack certain skill sets including soft skills like communication and presentation competencies. Probably, early exposure to practical sessions, long duration attachments would be a better solution.

Conflict of Interest Statement

The authors declare no conflicts of interests.

About the Authors

Prof. Josephat Kiweu is an Associate Professor of Finance and Accounting, Machakos University, Kenya.

Dr. David Mulwa is a Senior Lecturer of Educational Management and Planning, Machakos University, Kenya.

Dr. Jacinta Kinyili is a Lecturer of Human Resource Management, Machakos University, Kenya.

Dr. Pamela Muriungi is a Lecturer of Special Needs Education, Machakos University, Kenya.

Dr. Richard Kimiti is a Senior Lecturer in Curriculum Studies, Machakos University, Kenya.

Prof. James Muola is an Associate Professor of Educational Psychology, Machakos University, Kenya.

References

Beblavý M., Lehouelleur S. & Maselli I. (2013). *Useless degrees or useless statistics? A comparison of the net present value of higher education by field of study in 5 European countries,* NEUJOBS Working Paper, No. D4.4.2.A. http://www.neujobs.eu, Centre for European Policy Studies (CEPS), Comenius University, Brussels 2013.

Chetty, L. R. (2012). *The Role of Science and Technology in the Developing World in the 21st Century*. Institute of Ethics and Emerging Technologies. https://ieet.org/index.php/IEET2/more/chetty20121003.

Daily Nation/Newsplex, Saturday, December 9, 2017. Sciences courses lose popularity to business at university, by Joshua Mutisya.

Engineering for Kids (2016). *Why is STEM Education so Important*? https://www.engineeringforkids.com/about/news/2016/february.

Government of India (2019). *Study in India*. https://www.studyinindia.gov.in/blog/Page/stem-education-India%E2%80%99s-next-frontier.

Maselli I. & Beblavý M. (2013). *The Opportunity Costs of STEM Degrees and the Unmet Needs of the Low-Skilled: Two labour market problems explained.* CEPS Policy Briefs, No. 295, CEPS website http://www.ceps.eu.

Republic of Kenya (2007). Kenya Vision 2030. Republic of Kenya. Government Printer.

States Department of Labour (2019). *Employment Projections 2018-2028.* Bureau of labour Statistics. https://www.bls.gov/news.release/pdf/ecopro.pdf.