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Original Research Article

Skills acquisition in Science, Technology, Engineering and Mathematics (STEM) education and graduates profitability in Kwara State, Nigeria

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The study examined the benefit inherent in skills acquisition in Science, Technology, Engineering and Mathematics (STEM) education vis-à-vis the institutions attended by and courses offered by graduates of colleges of education to their environment. Two research questions and three hypotheses were respectively addressed. An ex-post-facto design was adopted. A sample of 385 (125 Mathematics and 260 Integrated Science) college graduates selected via quota sampling participated in the study. Graduates Profitability Scale was the instrument used for collecting data whose reliability index was .81 as computed from test retest reliability. Data collected were treated with statistical tools that provided results for answering the research questions and explanation for tested hypotheses. It was found that college graduates were beneficial to their environment with regards to the institutions and courses offered which showed no significant difference but the desirability of the institutions and courses offered by the college graduates were both positively correlated linearly. It was recommended in view of the findings that all round training should be sustained for all courses offered in colleges of education, teachers in training should be prepared to acquire dynamics such as trouble shooting capabilities with goal oriented usability which school managers are seeking for as well as showcase ability to communicate effectively.

Keywords: Courses, graduates, institutions, skills and society

INTRODUCTION

The tenet of teaching Science, Technology, Engineering and Mathematics (STEM) Education in learning institutions is such that emphasizes the acquisition of quality knowledge and skills from the instruction and training in an institution. This position was supported by Amanchukwu (2011) who stated that quality education revolves around three key features namely: content relevance, access and observance of individual's rights. STEM education has been known for quality in all its ramifications because it is cardinal that quality education is prerequisite for physical, social, economic and interpersonal interactions within a social setting. One of the reasons therefore, that may prompt every parent to send their children or wards to school is to help the individual child develop potentials of life.

The goals of institutions of learning are generally meant for learners to be empowered right from the elementary level, get them prepared for good citizenship and to become great future servant leaders. STEM education by its structure is a sure way for preparing individuals in such a way as to be profitable. This is actualized without any aorta of doubt since the individuals would have ample opportunities to acquire skills, knowledge and wherewithal to live in a pluralistic setting. Bridgstock (2009) has proposed knowledge and skills which are important for profitability to comprise generic skills, career management skills and discipline-specific knowledge required for performance in a work situation. Likewise, Andrews and Higson (2008) conceived generic skills as 'soft skills', while Mayer (1992)

considered it as 'core skills', 'transferable skills' and 'key competencies', which are the key skills and capabilities transferable to a wide range of tasks and contexts beyond the university setting (National Skills Task Force [NSTF] 2000; Gilbert et al., 2004).

The National Policy on Education (FGN, 2008,2013) as indicated in its section 3, provides an outline of the means to achieve some objectives that nourish career development in the likes of: offering diversified curriculum to cater for differences in talents, opportunities and future roles (Section 3 b); provides trained manpower in applied science, technology and commerce at sub-professional grades (section 3d); provides entrepreneurial, technical and vocational job-specific skills for self-reliance, and for agricultural, industrial, commercial and economic development (section 3d). In order to realize these objectives among other else the curriculum for senior secondary education provides fields of studies in science, technology, general mathematics, trade subjects with entrepreneurial studies. In addition, the Government permits the participation of voluntary agencies but is responsible for regulatory role.

The tertiary level of education is to as well consolidate in-depth acquisition of knowledge and skill in case the child intends to pursue a given career. This is what section 5 of the National Policy on Education (FGN, 2008, 2013) spelt out in clear terms that the tertiary educational institutions are mandated to contribute to profitable national development through high level manpower training; provision of accessible and affordable quality learning opportunities in formal and informal education in response to the needs and interests of all Nigerians; provision of high quality career counseling and lifelong learning programmes that prepare learners with the knowledge and skills for self-reliance and the world of work; reduction of skill shortages through the production of skilled manpower relevant to the needs of the society; and promotion and encouragement of scholarship entrepreneurship and community service. The tertiary educational institutions are thus expected to accomplish the set objectives by providing a more practically based curriculum relevant to the needs of the society.

Graduates profitability as opined by Yorke and Knight (2006) is a set of achievements – skills, understandings and personal attributes that make graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy. It follows from the foregoing that for graduates from institutions of learning to contribute to the economic development of a nation after the academic rigour, such graduates must have acquired possible skills relevant to and required in the society. The possible profitable skills required of graduates of STEM education could include: practical, communication, generic, computational, management and general awareness skills. STEM education is saddled with the responsibility of assuring teacher standards. The National Commission for Colleges of Education has purported that Teacher standards represent a measurable and public statement of the quality and professionalism regarding the required knowledge, skills and attitudes of teachers (NCCE, 2012). As a guide, colleges of education are expected to produce into the labour market graduates teachers who are well motivated with high personal and professional discipline, integrity and competence which this study vigorously pursued relative to STEM education. It is essential that aside the required content knowledge, graduate teachers ought to manifest those opportunities provided by graduating institutions that help them acquire skills and attitudes looked out for in an effective teacher.

Statement of the Problem

To showcase the standards required of teachers at any level, they needed to be employed having met some requisite conditions that are specifically manifested during interviews. Performance at interviews by graduates seeking to be profitable alone may not abrogate other observable but measurable pragmatic factors that justify investment. It is assumed that the pragmatic factors are verified through the skills rendered onto graduate teachers from institutions that trained them according to the fields of study. Literature has it that Employers have reported applicants with an unsatisfactory understanding of business and lacking in workplace experience and laboratory skills. Without mincing words, the extent to which a teacher is profitable can be better determined on the job as she or he discharges the duties assigned on daily basis. This was the basis for which this study investigated the profitability of STEM education graduate teachers' skills acquisition in their society.

Aim and Objectives of the Study

This study was carried out with the aim of determining the extent of the profitability of the skills STEM education graduates acquired while in training especially in the areas of Mathematics and Integrated Science from Colleges of education in the North Central zone of Nigeria. In this regards, the objectives of the study were to: determine how profitable the skills of colleges of education graduates were to their environment; and examine the extent to which Mathematics and Integrated science graduates provided profitable skills to their environment on the job.

Research Questions

1. How profitable/beneficial are the professional skills of graduates of colleges of education to their immediate community?
2. To what extent have graduates of Mathematics and Integrated Science education provided professional profitable skills to their immediate environment?

Research Hypotheses

1. There is no significant difference in the profitability or benefit of the professional skills of graduates of colleges of education to the immediate community?.

2. There is no significant difference in the profitability of the professional skills of Mathematics and Integrated Science education graduates to their immediate environment.
3. There is no significant correlation on the profitability or benefit of the professional skills of graduates of colleges of education with the institutions of training and courses studied.

Scope of the study

The study covered the benefits of the professional skills of Mathematics and Integrated Science graduates from colleges of education to the community as determined from observations obtainable from workplaces which are usually within the basic-9 schools management in Kwara state of Nigeria.

Significance of the Study

The findings of the study revealed the benefits of professional skills of STEM education graduates as applied in the learning of Mathematics and Integrated Science and teaching in Basic-9 schools. The study identified the extent to which STEM education graduates provided professional skills that were profitable to their community. Also, the outcome of this study provided a guide for STEM education graduates to apply knowledge acquired in dealing with the complex and diverse challenges confronting learners in and out of the school on daily basis.

Conceptual Framework

The basic underlying condition for an individual to be profitable or beneficial in life is to have acquired a skill or skills from or having undergone a course of training. STEM education is unequivocally provided for mathematics and Integrated Science teachers in colleges of education either public (Federal, State, National Teachers Institute) or private (Dambatta and Salman, 2014). It is obligatory for colleges of education to produce teachers for basic education schools (National Commission for Colleges of Education, NCCE, 2012). It is assumed that such category of teachers are equipped with necessary skills for self actualization through rigorous training coordinated through lectures, educational field trips, group work, projects, micro-teaching, co-teaching, teaching practice and Students Industrial Work Experience Scheme (SIWES) in the conventional colleges.

The training could as well be conducted via distance learning conducted as sandwich complemented with weekly tutorials or part-time on the evenings of Fridays and full Saturdays with structured written materials in the form of learning modules (Dambatta and Salman, 2014). These engagements grant the set of graduates from the programmes to be awarded a Nigeria Certificate in Education (NCE) which as entrenched in the National Commission for Colleges of Education by the Federal Republic of Nigeria (FRN, 2012) is the minimum qualification required for teaching in Nigeria schools. With this qualification, the holder of NCE can as privileged to hold sessions of lessons proportionately in basic-9 level depending on segmentation into the nursery, primary and the junior secondary levels of education.

It is obvious that for NCE holders to be profitable in the society, they would need to acquire a set of compendium of skills inward out. Such skills may include but not limited to: communication, personal, interpersonal, numerical, general awareness. Any gap between the skills required in the teaching and learning industry and those possessed by the graduates may pose a great deal of hindrance to young graduates' prosperity. This is the reason for this study on profitability of STEM education graduates in North central, Nigeria.

METHODOLOGY

The study adopted an ex-post-facto – a causal-comparative study which is a form of descriptive studies under quasi-experimental design, this is because direct manipulation or control was not possible and as such subjects or treatment cannot be assigned since the independent variable had already occurred. The researchers ascribed profitability of college graduates to the types of courses and institutions from which they received training.

The research population targeted for the study comprised 7,355 Mathematics and Integrated Science NCE graduates from colleges of education within Kwara State of Nigeria. A quota sampling procedure was adopted because as contained in Dunn (2001), it is based on specified number of participants with special interest of the population which is graduates from colleges of education in Kwara State in this study. Of the 16 local government areas (LGA) in the State, 4 LGAs were selected based on the locations of the colleges. In order to ascertain the sample size 'n' from the population, 'n' was obtained according to Sambo (2008) by $n = (Z_{\alpha/2})^2 pq/E^2$, where $z = 1.96$ for confidence level of 95%, $E = 0.05$ the maximum error, p and $q = 0.5$ each. A size of 384.16 was calculated as appropriate for selection in the study. Thus 385 graduates participated in the study. Of the 385 sample involved in the study, 125 and 260 participants were taken proportionately from Mathematics and Integrated Science graduate teachers respectively. Of the 125 Mathematics graduates, 50 were females and 75 males, while of the 260 Integrated Science graduates, 150 were females and 110 were males. Likewise, 90 of the graduates were taken from graduates of a private college and 295 taken from those of public colleges (100 each from COE Oro and Ilorin, 95 from COE Technical Lafiagi and 90 from Nana Aisha COE Ilorin respectively).

Graduates Profitability Scale (GPS) was used to produce data for the study. The scale was an adapted 3-point Likert-type Scale (Vagias, 2006) made of 15 items soliciting responses on how and the extent to which graduates could be profitable which ranged from 'perfectly acceptable', and 'acceptable' to 'unacceptable'. GPS underwent validation by presenting a copy each to three experts in test and measurement education, Science education and Psychology. Since reliability of any given measure can be quantified or

Table 1. Mean ($\bar{x}$) Graduates Profitability by Trained College.

Graduating College	N	$\bar{x}$	Std Dev
COE Oro	2.40	1.75	1.170
COE Ilorin	100	1.85	1.268
COE (Tech) Lafiagi	95	2.30	1.261
Nana Aisha COE Ilorin	90	2.40	1.046

Source: Field work (2021)

Table 2. ANOVA of Trained College by Graduates Profitability.

Source of Variance	Sum of Square	df	Mean Square	F	F
Between Groups (Combined)	6.250	3	2.083	1.533	.213
Within Groups	103.300	381	1.359		
Total	109.550	384			

Source: Field work (2021)

assessed using Pearson correlation coefficient, the study correlated one set of scores on a measure with another set from the same measure collected at different point in time and using test-retest reliability to ascertain the Pearson 'r' of the instrument for which its index (r) = .81. This index affirmed the guarantee that according to Dunn (2001), any such numerical index that falls within a range of +.70 and +.90 for an instrument indicates how stable or consistent the scores on a measure are across two or more administrations.

The researchers and the assistant team mobilized one another in the administration of the instrument on the sample (school managers) for a reliable data source. Ethical issues were addressed by considering ethical principles of autonomy, non-malfeasance, beneficence and justice in the conduct of the study. The team provided the plain aim of the study to the participants, and avoided any sensitive nature of the respondents affairs, the respondents were assured that all information supplied were confidential and for the purpose of the study only and ensure that all promises made were fulfilled. The study could not determine the proportion of enrolment into Mathematics and Integrated Science education and graduates available afterwards for the benefit of the society. Researchers could not satisfactorily ascertain the proportion of Mathematics and Integrated Science graduates who were beneficial to those who were not.

The statistical tools employed for the analysis of relevant data gathered were of both descriptive and inferential. Basically, the data collected were treated by mean, t-test, correlational analyses since they give a measure for two variables called bivariate statistics as well as ANOVA. As such a measure of the degree of covariability between two variables and a measure of closeness of fit of a regression line to the distribution of observations would be possible.

RESULTS

Table 1 shows the profitability mean score ratings for graduates of COE Oro (M = 1.75, SD = 1.170), Ilorin (M = 1.85, SD = 1.268), Lafiagi (M = 2.30, SD = 1.261) and Nana Aisha COE (M = 2.40, SD = 1.046). A mean score ranging from 1.50 to 2.49 fell within 'acceptable' response for items that sought how STEM education graduates were found to be profitable on the job. The relative small size of the respective standard deviations showed that the profitability of the graduates as regards the colleges that trained them tended to be the same. This implies that all the graduates from the institutions/colleges considered in this study were profitable to their society.

Table 2 reveals $F_{(3,309)}$ = 1.533 at P = .213. Since P>.05, this shows that there was no significant difference in the profitability of the graduates from colleges of Education be it private or public to their immediate society. The hypothesis of no significant difference formulated in this regard was therefore not rejected. This implies that the society considered graduates of colleges of education to have acquired similar training for societal demands which was why they tended to be found of being profitable similarly on the job

The result in Table 3 was obtained after ranking the frequency of profitability (pensionable job, state voluntary service, PTA service, Applicants) by institutions. The bi-serial ranking was then obtained thus: Given $r_{rb} = 2(\bar{Y}_1 - \bar{Y}_0)/n$ and $\bar{Y}_1$ = 2+5+6+7/4 = 5.0; $\bar{Y}_0$ = 1+3+4+8/4 = 4.0, thus we obtained r_{rb} = 2(5.0 -4.0)/8 = .25. The positive (+) sign obtained for 'r' value indicated that both institution types were addressing societal requirements as mandated.

It can be read from Table 4 that the profitability mean scores and standard deviations for Mathematics equal 2.19(1.148) and for Integrated Science graduates, 2.00(1.203) both fell within 'acceptable' response for items that requested opinion on the extent to which graduates could be beneficial. The relative small size of standard deviations indicated that graduates of both Mathematics and Integrated science were rated similarly on the extent of their profitability to the society. This shows that graduates of both fields of study were equally profitable or

Table 3. Rank Bi-serial Correlation of Institutions by profitability

Variable	Ranks: Private = 1; Public = 0							
Institution	0	1	0	0	1	1	1	0
Profitability	1	2	3	4	5	6	7	8

Source: Field work (2021)

Table 4: t-test of courses Graduates offered by profitability

Course	N	$\bar{x}$	Std Dev	df	t	sig (2-tailed)	Mean diff
Mathematics	125	2.19	1.148	383	.702	.485	.1875
Integrated Science	260	2.00	1.203				

Source: Field work (2021)

Table 5. Rank Bi-serial Correlation of Courses by Profitability

Variable	Ranks: Private = 1; Public = 0							
Course	0	1	0	0	1	1	1	0
Profitability	1	2	3	4	5	6	7	8

Source: Field work (2021)

beneficial to the society.

Further, the table shows that t = .702 for df of 383 at P = .485. Since P or α >.05, it shows that there was no significant difference in the profitability of both courses considered in this study to the society as established by a marginal mean difference of .1875. The hypothesis of no significant difference was therefore accepted. This indicates that both courses were profitable to the society.

Table 5 shows the ranking of the frequency of profitability by course of study of graduates. This provided the values for calculating the averages of ranks of each group scores that were used to determine the correlation of course of study of graduates with profitability. Given r_{rb} = $2(\bar{Y}_1 - \bar{Y}_0)/n$ and $\bar{Y}_1$ = 2+4+6+6/4 = 4.5; $\bar{Y}_0$ = 1+3+4+8/4 = 4.0, thus we obtained r_{rb} = 2(4.5 -4.0)/8 = .0125. The positive (+) sign obtained for r value indicated that both courses were desirable in the society.

DISCUSSION

The study found that colleges of education graduates were profitable to their society. This finding was particularly linked to Mathematics and Integrated Science graduates and also indicated that there was no significant difference on how the graduates of both courses acquired the similar training skills for societal demands in their respective institutions of learning. This was corroborated by the desirability obtained through the correlation of the courses and institutions with profitability.

The Mathematics and Integrated Science programmes of colleges adopted the concurrent approach to teacher education in which trainees take education courses and the subject area courses in two different departments. As a result of in-depth coverage of pedagogical skills in education courses and exposure to important and detailed contents in the teaching subjects (Mathematics and Integrated Science), graduates would have uploaded the deep-seated necessities required of a discipline in the graduates for optimal efficiency. The 'acceptable' response on table 1 affirmed that the 'Minimum Standard' that provided a working guide for all colleges of education could have been similarly implemented in such a manner that they have instilled in the graduates they trained to exhibit professional knowledge and competency on how to teach effectively and how learners learn; it could as well be that the graduates possessed professional skills to plan for and assess effective learning or that they were creative in subject matter knowledge and effective in curriculum guide usage in addition to being able to set learning outcomes that took cognizance of learners abilities and were able to use a range of learning techniques and resources to engage learners effectively. This finding was against the outcome of the survey of physics graduates across a number of Australian universities by O'Byrne et al. (2008) or O'Byrne and Mendez (2012) who revealed that university graduates reported considerable gaps between attributes they gained from their undergraduate science degree and what they saw as important to their employment. Though such attributes which included communication skills, planning skills and awareness of ethical and social issues (O'Byrne et al. 2008; O'Byrne and Mendez 2012) were built into the training college graduates underwent as there was no way for anyone to circumvent a thoroughly supervised teaching practice exercise which usually takes up to 18 weeks while in training.

Acquisition of desired skills by Mathematics and Integrated Science teachers is important to enhancing effective teaching as well as providing opportunity for them (graduates) to showcase their worth within their competitive sources of livelihood. Teachers of both subjects are expected to apply the skills acquired adequately to the practice of teaching and learning of the objectives and philosophies of the subjects at all levels of education for the society to appreciate the returns due to their engagements. This study found that Mathematics and Integrated science graduates were profitable as established by 'acceptable' response on table 4 on items that indicated the extent to which these graduates were profitable in the areas of provision and maintenance of complimentary learning environment and the manifestation of the ability to adequately sequence knowledge and drill learners in standard forms of solving problems and pieces of writing. It further shows that teachers were also able to create an applied understanding of education theory relevant to Nigerian schools and organized varied learning tasks for effective classroom practices. More also, the teachers exhibited the ability to model learning materials used in teaching, provided open ended learning experiences to their students, promoted conceptual understanding and development of practical skills and positive attitudes, demonstrated concrete and practical professional competences by coordinating all round co-curricular activities of the forms: lesson, debate, quiz, sporting, farming, and trading; created conducive opportunities for learners participation, freedom to express opinions and engaged in activities that enabled learners discover their potentials as well as contributed to the development of schools in their communities.

Hanson and Overton (2010a,b,c) have presented studies of graduates from chemistry, forensic science and Physics across a number of UK universities which showed that graduates valued generic skills and perceived them to have a greater level of usefulness than subject knowledge. Their reports identified an imbalance between the development of such skills within degree programmes and their use following graduation (Mahbub et al., 2016). Lowden et al. (2011) also found that Employers from both science and non-science sectors in the UK expected graduates to have discipline-specific knowledge and skills from their degrees but also expected them to demonstrate a range of generic skills and attributes including team working, communication, leadership, critical thinking, problem solving and managerial abilities. Just as Ferns (2012) from an Australian study reported that employers considered problem solving, team work and communication as a more critical element of employability than disciplinary knowledge, the finding in this study have shown that college graduates were well grounded in these documented employers needs and the colleges themselves continue to focus on promoting discipline-specific content knowledge (Jones, 2014) in consonance with the generic skills required in the workplace which conferred on them profitability capability.

Conclusion

The study has shown that colleges of education and courses offered, especially Mathematics and Integrated science by graduates were beneficial to both the communities and the graduates themselves which could be due to the processes involved in acquiring the skills demanded by managers of teaching industry. This being so in that the institutions of training and those that engaged the graduates afterwards were economic units of some sought that offer employment and those opportune to be employed become economically empowered to make ends meet. The opportunity was possible because Graduates were made to organize, understand and apply what they learned in order to justify the contents of what they were teaching. This endeavour expanded their abilities to apply what they have learned and to continue to learn and create 'new' knowledge to solve problems they encounter on daily basis. The commitment to provide relevant education to enable citizens contribute to the growth of their communities is enshrined in the Nigerian National Policy on Education (FGN, 2013) which in part states that: the acquisition of appropriate skills, abilities and competencies both mentally and physically is germane to equip individuals to live and contribute to the development of the society.

Recommendations

The findings in this study predicated the following recommendations:

(i). All round training characterized by well-honed life skills spiced with blending resources should be sustained for all courses offered in colleges of education.

(ii) All teachers in training in colleges of education should be prepared to acquire dynamics such as trouble shooting capabilities with goal oriented usability which school managers are seeking for during recruitment

(iii). Teachers in training should be well-rounded with a good mix of academic achievement, experience, common sense and life skills.

(iv). Any would be profitable teachers should showcase ability to communicate adequately and effectively in a variety of circumstances.

Conflict of interests

The authors declare that there is no conflict of interests regarding the publication of this manuscript.

REFERENCES

Alio BC, Anaeche KC (2014). Strategies for making Mathematics education self-reliant on the millennium. J. Math. Ass. Nigeria. 39(1):141-147.

Amanchukwu RN (2011). The challenges of quality education and good Governance in developing economy. African J. Edu. Tech. 1(3):103-110.

Daluba N (2015). Unemployment among youth and place of vocational technical Education in Nigeria. A Paper presented at 2015 annual conference of the Institute of Education, University of Nigeria, Nsukka.

Dambatta BU, Salman MF (2014). Mathematics teacher preparation in Nigeria: Issues and challenges for functional education and graduate employability. Nigerian, J. Edu. Res. Eva. 13(2):100-110.

Dunn SD (2001). Statistics and data analysis for the behaviourial sciences. New York: McGraw Hill.

Federal Republic of Nigeria (2008, 2013). National Policy on Education. Lagos: NERDC Press.

Federal Republic of Nigeria (2012). National Commission for Colleges of Education Minimum Standard 12 edition. Abuja: NCCE

Ferns S (2012). Graduate employability: Teaching staff, employer and graduate perceptions. Retrieved 20 March, 2021, from http://acen.edu.au/2012conference/wp-content/uploads/2012/11/84_Graduate-employability.pdf

Gilbert R, Balatti J, Turner P, Whitehouse H (2004). The generic skills debate in research higher degrees. Higher Edu. Res. Dev. 23(3):375–388.

Hanson S, Overton T (2010a). Skills required by new chemistry graduates and their development in degree programmes. Hull, UK: Higher Education Academy UK Physical Sciences Centre.

Hanson S, Overton T (2010b). Skills required by new forensic science graduates and their development in degree programmes. Hull, UK: Higher Education Academy UK Physical Sciences Centre.

Hanson S, Overton T (2010c). Skills required by new physics graduates and their development in degree programmes. Hull, UK: Higher Education Academy UK Physical Sciences Centre.

Jones S (2014). Assessing the science knowledge of university students: Perils, pitfalls and possibilities. J. Learn. Des. 7(2): 16–27.

Lowden K, Hall S, Elliot D, Lewin J (2011). Employers' perceptions of the employability skills of new graduates. London, UK: Edge Foundation.

Mahbub S, Tina O, Christopher T, Gerry R (2016). Graduate Employability: Views of Recent Science Graduates and Employers. Int. J. Inn. Sci. Maths. Edu. 24(3):31-48.

Andrews J, Higson H (2008). Graduate employability, 'soft skills' versus 'hard' business knowledge: A European study. Higher Edu. Europe, 33(4):411–422.

Bridgstock R (2009). The graduate attributes we've overlooked: enhancing graduate employability through career management skills. Higher Edu. Res. Dev. 28(1):31–44.

Mayer E (1992). Employment-related key competencies for postcompulsory education and training. Canberra, Australia: Australian Education Council and Ministers for Vocational Education, Employment and Training.

National Skills Task Force [NSTF] (2000). Skills for all: Research report. Suffolk, UK: Department for Education and Employment.

O'Byrne J, Mendez A (2012). Why do physics? Where does it really lead? In A. Hugman & K. Placing (Eds.), Symposium Proceedings: Visualisation and Concept Development, UniServe Science. 199–201. Sydney, Australia: The University of Sydney.

O'Byrne J, Mendez A, Sharma M, Kirkup L, Scott D (2008). Physics graduates in the workforce: Does physics education help? Paper presented at the 18th National Congress of Australian Institute of Physics. Retrieved 20 March, 2021, from http://hdl.handle.net/10453/1135

Sambo AA (2008). Statistical principles for research in education and social sciences. Zaria: S Asekome & co.

Vagias Wade M (2006). Likert-type scale response anchors. Clemson International Institute for Tourism & Research Development, Department of Parks, Recreation and Tourism Management. Clemson University

Yorke M, Knight PT (2006). Embedding employability into the curriculum. In M. Yorke (Ed.), Learning and Employability Series 1, 1–30. York, UK: Higher Education Academy.