Industry-Related Mathematics Skills Acquisition for Job Performance by Senior Secondary School Students in Anambra State, Nigeria

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Abstract

The industry-related mathematics skills acquisition for job performance by senior secondary school students in Anambra State, Nigeria was determined. Descriptive survey design was adopted. Three research questions guided the study and two hypotheses were tested at 0.05 level of significance. The study was carried out in in the State. Sample comprised 2,495 senior secondary schools three (SS3) mathematics students drawn from a population of 42,002 in the state through stratified random sampling technique. The Industrial Mathematics Skills Acquisition Test (IMSAT) was used as instrument for data collection. The IMSAT was validated by three experts and Kuder-Richardson Formula 20 was used to establish its reliability which yielded a reliability index of 0.89. The IMSAT was administered to students from the sampled schools. The research questions were answered using aggregate score, mean and standard deviation while hypotheses were tested using t-test. Findings of the study indicated that: majority of the students irrespective of gender and school location had good acquisition of industry-related mathematics skills for job performance; there was no significant difference between male and female, urban and rural students on industry-related mathematics skills acquisition. It was concluded that in Anambra State senior secondary schools, students were sufficiently exposed to industry-related mathematics skills for gainful employment in industries. Based on the findings, it was recommended among others that; mathematics teachers should continue to teach mathematics in such a way that the students' good acquisition of industry-related mathematics skills will be sustained.

Keywords: Industry-related mathematics, Skills acquisition, Job performance.

Introduction

Unemployment remains one of the most critical problems facing African nations today. Nigeria which is the most populous nation in Africa and second largest economy in the continent with a population of over 180 million is endowed with diverse human and material resources. The Nigerian Bureau of Statistics (NBS, 2018) recently put the number of unemployed as at the 3rd quarter of 2018 at 90.5 million and the underemployed at 18 million. From this unemployed population, the youths constitute about 38 percent. As a direct response to this challenge, millions of these youths brave the risk of voluntary enslavement in other countries in their search for greener pastures. Some of them travel through the risky

Mediterranean Sea on their way to Europe and many have died in the process. Moreover, most graduates have been recruited into the rank of armed robbers, kidnappers, terrorists, herdsmen and insurgents. Though the Nigerian government had made efforts to create jobs, it must be realized that to reduce unemployment in any country, all hands must be on deck, individuals, private sectors and government at all levels.

In line with this view, Ogbe (2006) stated that job creation acquired through youth empowerment is expected to reverse the structural weakness and imbalance in the economy by providing strategic focus and direction in the youths. Job creation is defined as the provision of new opportunities for paid employment, especially for those who are unemployed. To meet up with these challenges facing the youths, the governments had embarked on the youth empowerment programmes. Youth empowerment according to Jimba (2006) involves different ways the youths can be facilitated to cause changes in their lifestyle. It encompasses different ways youths can be exposed to different trades that may help them to engage in sustainable paid and self-employment. In an attempt to reduce unemployment among youths, different skills acquisition programmes have been initiated by the Federal and State governments. All these efforts do not seem to have yielded desired results.

Form research on developing entrepreneurial skills in secondary school students through effective mathematics education, Uka (2015) found that both students and teachers need knowledge of mathematics skills to be good entrepreneurs. This means that there is strong positive relationship between mathematics skills and industrial skills acquisition. This has lent anchorage to the research on industry-related mathematics skills acquisition for job performance by senior secondary school students in Anambra State. Industry-related mathematics is a combination of two concepts: industry and mathematics. Industry is defined as a process of making products by using machinery and factories or a group of business that provide a particular product or services (Webster, 2014). Mathematics skills are defined as

necessary and appropriate skills a mathematician should acquire that can be transferable to job. Enhancing the young person's employability through sound mathematics skills helps business gain more from the work experiences (Kilpatrick, Swafford & Findell, 2001). Industry-related mathematics skills therefore, are the basic mathematics skills that industries are willing to pay for that will engender job performance

Job performance is defined by Natasha, et al (2018) as all the behaviours employees engage in while at work. Salas, Rosen, Held and Weissmuller (2009) contributed that job performance is essentially a person's behaviour in the context of doing a task. Performance is determined by the amount of skills that the learner has acquired. The acquisition of industry-related mathematics skills by senior secondary school students may be related to gender and location. Gender can be classified into masculine and feminine. It is defined by Bravo-Bauman (2000) as the social construction of male and female identity. Hyde, Lindberry, Linn, Ellis and Williams (2008) found that when it comes to mathematics skills, girls and boys are similarly capable. They reported that in children from grades two to eleven, there was no gender difference for mathematics skills.

Hyde and Mertz (2009) added that while more boys than girls score at the highest level in mathematics, gender gap has been closing over time. In fact, they reported that the gap is smaller in countries with greater gender equality. Offiah and Egolum (2007) revealed that male students are academically superior to their female counterpart in mathematics skills. Adesina, Adigun, Irunokhali, Onihuna and Sada (2015) also reported no significant difference between mathematics skills acquisition and gender. On location Ugwuanyi (2016) and Oredein (2016) showed that; school location has a significant effect on students' skills acquision in sciences. Also Unodiaku (2013) found that there was a significant difference in the mean errors made by urban and rural SSI entrants as measured by MATHRET. He suggested therefore that location is a significant factor that influences the degree of readiness of JS3 students achieving from

junior secondary school level to senior secondary school level to acquire higher mathematics skills.

Skills acquisition is the bane of Nigeria's industrialization. Multinational Corporations (MNCs) have often preferred foreign to local labour in Nigeria due to the unskilled nature of the Nigerian labour force. It is in this context that unskilled labour force has remained a serious setback to Nigerian's industrialization and its growth and development. This has made the present study relevant which seeks to determine the industry-related mathematics skills acquisition by secondary school students that will make them competent workers in industries. This is a means of ensuring a sufficient level of industrial skills acquisition required for a fast pace of curbing unemployment in Nigeria. The problem of the study is 'What industry-related mathematics skills acquisition have senior secondary school students for job performance in Anambra State?'

Purpose of the Study

The purpose of the study was to determine the industry-related mathematics skills acquisition for job performance by senior secondary school three (SS3) students in Anambra State.

Specifically, this study sought to determine the:

1. Industry-related mathematics skills acquisition by SS3 students in Anambra State.
2. Industry-related mathematics skills acquisition by SS3 male and female students.
3. Industry-related mathematics skills acquisition by SS3 students from urban and rural schools.

Research Questions

1. What is the aggregate score of industry-related mathematics skills acquisition of senior secondary school year three (SS3) students in Anambra State?
2. What are the industry-related mathematics skills acquisition mean scores of male and female secondary school students?
3. What are the industry-related mathematics skills acquisition mean scores of urban and rural secondary school students?

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

1. There is no significant difference between the mean scores of male and female SS3 secondary school students on industry-related mathematics skills acquisition.
2. There is no significant difference between the mean scores of urban and rural SS3 secondary school students on industry-related mathematics skills acquisition.

Method

The study adopted a descriptive survey design. The study was carried out in secondary schools in Anambra State. The population for the study was 42,002(34,105 private and 7,894 public) students. The sample for the study comprised 2,495 SS3 students in Anambra State. The sample was composed using multistage sampling technique. One instrument tagged Industrial Mathematics Skills Acquisition Test (IMSAT) was used to collect data for the study. Three experts from the Departments of Science Education, Educational Foundations and Guidance and Counselling in Nnamdi Azikiwe University, Awka validated the instrument. Reliability of IMSAT was established using Kuder-Richardson 20 Formula. The reliability coefficient of 0.89 was obtained. The IMSAT was administered to 2,495 SS3 students from the sampled schools. Aggregate score was used to answer research question one. Mean and standard deviation were used to answer research questions two and three while t-test was used

to test the null hypotheses at 0.05 alpha level. The benchmark is if mean ≥50, it means good acquisition but if mean< 50, it is poor acquisition for the research questions. In testing the hypotheses, the decision is to reject the null hypothesis if the P-value is less than the significant value of 0.05, otherwise, do not reject the null hypothesis.

Results

Research Question 1:

What aggregate score of industry-related mathematics skills acquisition have senior secondary school year three (SS3) students in Anambra State?

Table 1: Aggregate score placed in range of Industry-Related Mathematics Skills Acquisition by SS3 Students in Anambra State.

Range of Scores	N	%	Remark
0-49	640	29.7	Poor Acquisition
50-100	1514	70.3	Good Acquisition

Table 1 shows that 70.3% of the students with the scores ranging from 50 to 100 had good acquisition of industry-related mathematics skills, while 29.7% of the students who scored between 0 to 49 had poor acquisition of the industry-related mathematics skills.

Research Question 2:

What are the industry-related mathematics skills acquisition mean scores of male and female secondary school students?

Table 2: Mean Scores on the Industry-Related Mathematics Skills Acquisition of Male and Female Secondary School Students.

Group	N	Mean	SD	Remark
Male	861	57.25	14.20	Good Acquisition
Female	1293	56.77	14.10	Good Acquisition

Table 2 indicates that males have mean score = 57.25 (SD=14.20) while females have mean score = 56.77 (SD=14.10). Since both males and females had scores which are greater than the criterion score of 50, they were considered to have good industry-related mathematics skills acquisition in secondary schools.

Research Question 3:

What are the industry-related mathematics skills acquisition mean scores of urban and rural secondary school students?

Table 3: Mean Score on the Industry-Related Mathematics Skills Acquisition of Urban and Rural Secondary School Students.

Group	N	Mean	SD	Remark
Urban	994	57.29	13.54	Good Acquisition
Rural	1160	56.68	14.60	Good Acquisition

Table 3 shows that urban had mean score = 57.29 (SD=13.54) while rural had mean score = 56.68 (SD=14.60). Since both urban and rural secondary school students had scores which are greater than the criterion score of 50, they were considered to have good industry-related mathematics skills acquisition in secondary schools.

Hypotheses 1:

There is no significant difference between the mean score of female and male SS3 school students in industry-related mathematics skills acquisition.

Table 4: t-Test of Significant Difference between the Mean Scores of Male and Female Students on the Industry -Related Mathematics Skills Acquisition.

Group	N	X	SD	df	Cal.t	Crit.t	Decision
Male	861	57.25	14.20	2152	0.773	1.96	Not sig
Female	1293	56.77	14.10				

Table 4 shows that males had mean=57.25 (SD =14.20) while females had mean score = 56.77 (SD=14.10). This has yielded t value=0.77 with critical t=1.96 at df =2125. Now since the calculated t is less than the critical t value, the calculated t value of 0.77 was considered to be non-significant at 0.05 level of significance. This has warranted the non-rejection of the null hypotheses which states that there is no significant difference between the mean scores of males and female SS3 secondary schools student on industry-related mathematics skills acquisition.

Hypotheses 2:

There is no significant difference between the mean scores of urban and rural SS3 secondary school students on industry-related mathematics skills acquisition.

Table 5: t-Test of Significant Difference between the Mean Scores of Urban and Rural Students on the Industry-Related Mathematics Skills Acquisition.

Group	N	Mean	SD	df	Cal. t	Crit t	Decision
Rural	994	57.29	13.57	2152	1.00	1.96	Not sig
Urban	1160	56.68	14.60				

Table 5 reveals that rural had mean score = 57.29 (SD = 13.57) while urban had mean score = 56.68 (SD = 14.60). This has yielded t-value = 1.00 while the critical t = 1.96 at df = 2152. Now, since the calculated t-value is less than the critical t-value, calculated t-value of 1.00 was considered to be non-significant at 0.05 alpha level. Thus, the null hypothesis is not rejected which states that there is no significant difference between the mean score of urban and rural SS3 secondary school students on industry-related mathematics skills acquisition.

Discussion

The finding revealed that majority of the students had good acquisition of industry-related mathematics skills. This finding was consistent with that of Nwokolo (2009) that senior secondary school graduates needed 22 skills functions for jobs in industries. Uka (2015) also aligned with the finding of this study who found that both students and teachers need knowledge of mathematical skilled to be good entrepreneurs and there is strong positive relationship between mathematics skills and industrial skills. Finding of Ogan, Ibibio and Francis (2017) also confirmed the result of the present study. Ogan, et al found that students of high mathematic ability have greater mean percentage gain of 41.17% while those of low mathematical ability have 36.93%. This finding has come much as a surprise. This is because of the common global dread for mathematics. It is well known that all over the world people are scared of figures. However, a reasonable explanation of this phenomenon is that gainful

employment in industries is uppermost in the minds of the students considering the high rate of unemployment and the reluctance of Nigerians to work on farms. Hence, students across board were able to learn mathematics skills that can enable them function effectively in industries.

Results of from the study further showed that both male and female students had good industry-related mathematics skills acquisition in secondary schools. There was no significant difference between the mean scores of the male and female SS3 secondary school students on industry-related mathematics skills acquisition. These findings were in agreement with the finding of Benbow, Lubinski, Shea and Eftekhari- Sanjani (2000) that both sexes become exceptionally skillful and perceived themselves as such. Contrary to these findings were the studies by the Else-Quest, Hyde and Linn (2010) that despite overall similarities in mathematics skills, boys felt more confident in their abilities than girls did. Also, findings by Halpern, Benhow, Geary, Gur and Gernsbacher (2013) disagree with this finding. Halpern et al found that males are more variable on most measures of mathematics skills and visual spatial ability. The difference in the males and females acquisition of mathematics skills may be explicated by the fact that history of mathematics education shows that gender skills acquisition gap is due to the social construction of gender roles in society not because women are unwilling or unable to learn mathematics (Doer, 2011). That the present study shows no gender difference may be because the girl child no longer finds comfort in the kitchen. The girl child's psyche had changed overtime. They also aspire to work outside the home.

The results also indicated that both urban and rural students had good industry related mathematics skills acquisition in secondary schools. There was significant difference between the mean scores of urban and rural SS3 secondary school students on industry-related mathematics skills acquisition. The findings were not akin to the findings of Smither and Robinson (2006) that the location of the school had a significant effect upon students' skills

acquisition in mathematics, that students attending rural schools are not as skilful as students from urban schools. Tayaba (2012) found that rural and urban students had comparable levels of skills acquisition yet some rural students out-skilled their urban counterparts in some provinces. Also, Khanal (2016) found that there was significant difference in the use of mathematics skills learning strategies between urban and rural school students. These findings all disagree with the findings of this study. These contrary findings may be because schools in the rural areas suffer dearth of teaching and learning facilities. Most teachers posted to rural locations abscond and reject their postings thereby leaving the rural schools and their students with insufficient or no teaching staff.

That industry-related mathematics did not distinguish between urban and rural school in this study could be explicated in terms of high levels of aspiration of rural students to acquire good skills in the subject which would facilitate their migration to the cities in search of lucrative jobs in industries. Another plausible explanation for this is that rural areas usually lack basic social amenities which often distract the students in urban schools from their studies. Therefore, it follows a corollary that the rural students' lack of social amenities is compensated adequately by their devotion to their studies.

Conclusion

Based on the findings of the study, it was concluded that in Anambra state senior secondary school, students were sufficiently exposed to industry-related mathematics skills for gainful employment in industries. This is premised on the fact that both male and female students from urban and rural public and private school had good acquisition of industry-related mathematics skills.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Mathematics teachers should continue to teach mathematics in such a way that the students' good acquisition of industry-related mathematics skills will be sustained.
2. Industry related mathematics should be used by mathematics teachers to enhance gender equity in acquisition of all students in industrial skills.
3. Managers of schools should ensure equal exposure of urban and rural students to industry-related mathematic skills by maintaining equity in positing and transferring mathematics teachers to both locations.

References

Adesina, O, Adigun, J, Irunokhali, E, Ondure, J.E, Sada, Y. (2015). Effect of gender on students' academic performance in computer studies in secondary school in New Bussa, Borgu L.G.A of Niger State**,** *Journal of Education and Practice,* 6(33), 60-63.

Benbow, C. P., Lubinski, D., Shea, D. L., & Eftekhari-Sanjani, H. (2000). Sex differences in mathematical reasoning ability at age 13: their status 20 years later. *Psychological science*, *11*(6), 474–480. https://doi.org/10.1111/1467-9280.00291

Bravo-Baumann, H. (2000). *Capitalization on the experiences on the contribution of livestock projects to gender issues: Working document.* Bern Swiss: Agency for Development and cooperation.

Else-Quest N.M.; Hyde J.S. & Linn M.C. (2010). *Cross national patterns of gender differences in mathematics:* A meta-analysis. Retrieved from *https://www.ncbi.nlm.nih.gov*

Halpern, D.F. Benhow, C.P. Geary, D.C. Gur, R.C. Hyde, J.S, & Gernsbacher, M.A. (2013) The science of sex difference in science and mathematics https://www.ncbi.nlm.nih.gov/pubmed/25530726

Hyde, J.S. Lindbery, S.M. Linn, M.C. Ellis A.B. Williams, C.C. (2008). Gender similarities characterize mathematics performance. *Science, 321* (2), 491-495.

Hyde, J.S. & Mert, J.E. (2009). Gender, culture and mathematics performance. *Proceeding of National Academy of Science, 106*(22), 8801-8807.

Jimba, D. (2006). Youth empowerment for sustainable development. In contemporary issues and challenges for sustainable development in the new millennium The Nigeria Experience. *A book of reading school of arts and social science.* KSCOE: Akpa.

Khanal, B. (2016) Learning strategies used by urban and rural school students. Retrieved from https://www.researchgate.net/publication/309406644

Kilpatrick, J: Swafford, J & Findell. B. (2001) Adding it up: Helping Children learn mathematics, Washington: National Academy Press, 461

Natasha, F: Mariano, C.B: Rego, M.C; Campos, M; Ladilucy, P.A. & Franciso A.C. (2018) Job Performance analysis: Scientific studies. Journal of Management and Psychology from 2006-2015 https://doi.org/10.1002/pig 21248

Nwokolo, H. (2009) *Survey of mathematical concepts and skills needed by senior secondary school graduates to perform optimally at jobs in instries.* Unpublished Dissertation. Nnamdi Azikiwe University, Awka.

Offiah, F. C. & Egolum, E.O. (2017). Effects of prior knowledge of some relevant mathematical concepts on students achievement in stoichemistry. *Journal of Science Engineering and Technology,6* (149), 7676-7685.

Ogan, C; Ibibio, G. & Francis, O.I. (2017). Effects of mathematics knowledge on physics students performance in electromagnetism, Retrieved from *https://creativecommons.org/licenses/by/4.0*

Ogbe, N. E. (2006). The current state of Nigerian economy. *Bullion, Abuja: Central bank of Nigeria,10* (1), 17-23.

Salas, E; Rosen, M.A; held, J.D. & Weissmuller, J.J. (2009). Performance measurement in simulation-based training. A review and best practices. *Simulation of Gaming,* 40(3), 328-376.

Smither, A. & Robinson, P. (2006). *The paradox of single-sex and co-educational schooling,* Buckingham: Carmichael press

Tayaba, S. (2012) Rural-urban gaps in academic achievement, schooling, conditions, students, and teachers' characteristics in Pakistan. *International Journal of Educational Management.* Retrieved from *https://www-emeraldinsight.com/doi/abs/10.1108/09513554121119*

Ugwuanyi, A. A. (2016). *Science process skills acquired by senior secondary school chemistry students in Enugu Education Zone.* An unpublished Master Thesis, University of Nigeria, Nsukka.

Uka, N.K. (2015) Developing entrepreneurial skills in secondary school students, through effective mathematics education in Aba, Nigeria. *International journal of Education Learning and Development, 3* (7), 1-11.

Unodiaku, S.S. (2013). Influence of sex and ability level on students mathematics readiness in Enugu State. *Journal of Education and Practice, 4*(14). 222-228.

Webster Dictionary (2014) Industry (definition). Retrieved from http://www.merriam-webster.com/disturary/industry