

# Assessment of employability skills development opportunities for senior secondary school chemistry students

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Accepted 25<sup>th</sup> September, 2013

**Abstract.** The study centered on students' employability skills which include skills and potentials for obtaining and succeeding in a job. It assessed senior secondary school chemistry students' employability skills as well as science teachers' sense of efficacy in helping students acquire the skills. Also, the study ascertained science teachers' perceptions regarding the extent to which science students are exposed to employability enhancing activities. Using survey design, data were collected from 200-student and 40-teacher respondents. The study used three (3) questionnaires, namely: Student Employability Skills Questionnaire (SESQ), Employability Opportunity Questionnaire (EOQ) and Employability Efficacy Questionnaire (EEQ). Findings showed that the science students' employability skills scores were > 2.0 criteria, thus they were considered competent. While numeracy, independent study skills and team work were highly ranked students' skills, other skills like problem-solving, ICT skills and time management were ranked low. The study also found that different employability skills development opportunities abound in the schools in varying degrees. Also, a generally high sense of efficacy was found among science teachers, though they expressed sense of weakness in fostering students' ICT and numerical skills. It was suggested that school authorities should create enabling environment where the development of employability skills will thrive; and that science teachers should provide enrichment activities especially to develop students' competency in problem-solving and ICT.

**Keywords:** Employability, employability skills, sense of efficacy, school activities.

## INTRODUCTION

Education is regarded as an instrument per excellence for sustainable national development and global competitiveness. Education enables people to compete favourably with the best of the world; and it has long-standing connection with the economy. Particularly, an adequate supply into the labour market of graduates with viable skills underpins a nation's ability to position itself against global competitors and increase its capacity for innovation and enterprise (Toland, 2011). Thus, amidst the increasing global socio-economic challenges, nations are investing in education that will produce highly self-reliant, confident and competent graduates. There is a

renewing focus on development of functional and technical skills as well as work-related competency among the youth within and outside the school system.

Stakeholders in education including employers of labour are concerned about the school students' acquisition of skills relevant to today's world of work. Though students may have acquired necessary subject specific skills, it is not sufficient for them to be recruited. And employers are expressing dissatisfaction with graduates' overall work-related skills and preparedness for job. Education columnists (Parker, 2011; Dixon, 2013), while lamenting graduates' unpreparedness to

compete for existing jobs, indict colleges and universities for not teaching students basic skills that lead to critical thinking. School leavers need to learn alongside academic studies character and life skills which consist of developing self-esteem, self-confidence, interpersonal skills and ability to cope with the real world of work.

This concern for school graduates' skillfulness and readiness for the world of work has led to the concepts of "employability" and "employability skills" which cuts across different fields of studies and career enterprises. Researchers and educationists (Yorke, 2005; Yorke and Knight, 2006; Toland, 2011) have rendered various descriptions of employability. According to Yorke (2005) employability refers to a graduate's achievements and his/her potential for obtaining, and succeeding, in graduate-level job-placement. He clarified that employability connotes a graduates' "potential to obtain a graduate job, and should not be confused with the actual acquisition of a graduate job" (p.2). Also, Martin et al. (2008) noted that gaining employability skills should be seen as "a continuum of learning that supports job progression, not just entry into the workforce".

Yorke and Knight (2006) defined employability as: "a set of achievements – skills, understanding and personal attributes that make graduates more likely to gain employment and be successful in their chosen occupations..." (p.8). According to Toland (2011), employability skills are non-discipline specific, economically valuable skills required to get initial employment, progress in a job, as well as securing another job when desired. In this study, employability refers to the set of skills, competency and attributes that increase school leavers' chances of obtaining initial worthwhile employment, maintaining and progressing in the employment, obtaining new employment if required, and being satisfied on the job.

Highlighting the 'set of skills', 'competency' or 'attributes' that constitute employability skills have been a concern to various studies and institutions. According to Martin et al. (2008), "the employability landscape is complex..." (p.1), and the skills needed for employability depend on many different factors such as job type, industrial sector and career stage. This makes it difficult to create one universally relevant definition or list of employability skills. Martin et al. (2008) however identified and based their study on 14 employability skills: communication, team-working, problem-solving, literacy, numeracy, general information technology (IT), timekeeping, business awareness, customer-care, personal presentation, enthusiasm/commitment, enterprising, vocational job-seeking and advanced vocational job-specific skills.

Careers and Employability Centre, Loughborough University (n.d.) described employability skills as the professional competency sought after by employers which their students are helped to develop alongside subject/discipline. These skills include analytical and problem-solving skills, numeracy, confidence, time management, team working, communication skills,

information technology, and monitoring skills. Similarly, the Placement and Careers Centre of Brunel University London (n.d.) identified 9 employability skills: communication, self-reliance, organization, initiative and enterprise, commercial awareness, problem-solving, team work and leadership, time management, and customer services. According to Learner (2012), eight nationally agreed employability skills in Australia are: communication; planning and organizing; teamwork, problem solving; self-management; initiative and enterprise; technology; and learning. The Victorian Certificate of Education (VCE) Chemistry students were provided opportunities to develop the skills.

Helping students develop employability skills is vital for coping with today's economic realities. Researchers, employers and education providers are devising strategies to promote development of soft, transferable or employability skills. McGrath (n.d.) asserts that students' employability skills will improve by maintaining a working relationship/interaction between schools and employers, understanding of industrial realities, work placement for staff and students, as well as adapting new approach to teaching and learning that highlights core skills and attitudes, job seeking skills and a repackaged set of technical and occupational skills. According to Learner (2012), students may develop employability skills through learning activities. The opportunity to engage in a range of learning activities, both co- and extra-curricular activities contribute to students' employability. Employability is enhanced when students actively engage in a range of learning activities (including personal development planning), and when the connection of these activities with employability is made clear to them (The Higher Education Academic, 2006).

Employability skills cuts across all discipline and can be promoted in all disciplines. In Chemistry and other science-related fields, education providers and researchers (Martin et al., 2008; Toland, 2011) have sought to explore employability skills relevant to industrial work and employment. Strategies to increase Chemistry and Engineering students' employability skills include extensive hand-on experimental work, design and research projects, oral and written presentations and group work (Loughborough University, n.d.; University of Leed, n.d.; University of Wales, 2012). Others include a year-long industrial attachment, establishment of careers/employability centre and organizing career seminars, taste of industry visits, and promotion of relevant extra-curricular activities. Martin et al. (2008) related Problem-Based Learning (PBL) to employability skills development. They asserted that PBL does offer more to students than content knowledge through the development of critical reasoning, teamwork and problem solving skills.

Most of the studies on employability have been rooted in higher education; few or none have really paid attention to secondary school leavers' employability. Yet, education providers are expected to respond to

employability imperative at all levels (McGrath, n.d.). This study fills the gap in focusing attention on employability skills at the senior secondary school level. Education at this level is intended to produce graduates with 'all-round development' (NERDC, 2008), however, a lot is still left to be desired. According to Imaginative Mind (2013), despite teacher and student effort over recent years, a shocking 17% of teenagers are leaving school functionally illiterate and unable to cope with the challenges of everyday life. Dixons (2013) warned that schools may be failing in their responsibility of teaching life- and work-related skills and leaving youths unemployed or stagnated in careers. Employability skills are even more needful in developing countries where secondary school students' drop-out rate is high and the prospect for further education is slim.

Responding to this problem, the Nigerian Educational Research and Development Council (NERDC) developed a functional curriculum for all round development of students at the basic and senior secondary school level. Its philosophy envisions morally sound school graduates who, besides being well prepared for higher education, have acquired relevant functional trade and entrepreneurial skills needed for poverty eradication, job creation and wealth generation. The curriculum included several skills enrichment activities for teachers and students following inputs from wide-range of stakeholders including employers of labour. The aim is to address, among school leavers, the dearth of technical as well as employability skills, the incidence of high unemployment and 'unfitness' for the workplace; and meet the Millennium Development Goals, MDGs (NERDC, 2008).

NERDC adopted two approaches to realize the goal of developing in all students functional and transferable skills. First, the introduction of a set of core compulsory trade/entrepreneurship subjects; and then, infusing into each subject relevant employability skills along with professional skills in the subject area (Orji, 2011). In this study, the researcher focused on 10 employability skills (Appendix I), viz: communication, problem-solving, team work, planning and organizing, creativity/innovation, independent study, numeracy, ICT, self-management and time management. Using the 10 employability skills, the study sought to ascertain the employability skills level of chemistry students, and the learning opportunities students get to develop employability skills in the senior secondary schools. The study also sought to ascertain science teachers' sense of efficacy in teaching these skills. The study was guided by three research questions:

1. What is the science students' self-perceived employability skills level?
2. How is the students' perceived employability skills competency ranked?
3. What opportunities are available for students' employability skills development?
4. What are science teachers' senses of efficacy in

promoting students' employability skills?

## METHODOLOGY

The study used survey research design. This design involves the collection of information from a sample of individuals through their responses to predetermined questions. Survey design was chosen for this study as it is most appropriate for gathering information "as it is" on students' employability skills and teachers' perception of employability skills opportunities, without changing or modifying the situation under investigation. No cause-and-effect relationship was sought.

The population of study consisted of all science students in the senior secondary schools in Gwagwalada Area Council, Abuja. There are 51 schools in Gwagwalada Area Council (FCT Abuja, 2009) out of which 12 public schools were selected by stratified random sampling for the study. The schools selected offered chemistry at the senior secondary level. 120 senior secondary chemistry students (10 per school) and 24 science teachers (2 per school) participated in the study. Simple random sampling technique was used to obtain the student and teacher samples from each of the sampled schools.

The research instruments included three (3) questionnaires, namely: Student Employability Skills Questionnaire (SESQ), Employability Opportunity Questionnaire (EOQ) and Employability Efficacy Questionnaire (EEQ). The SESQ (Appendix 1) captured students' assessments of their employability skills. It is a 30 item questionnaire with 5 point loading ranging from 'Excellent' (4) to 'Not at all' (0). The items were group according to the 10 skills categories. The EOQ (Appendix II) is a 23-item questionnaire with 5 ordered response options ranging from 'None' to 'Very Much' (0 to 4). The respondents (teachers) were requested to indicate how much exposure students get in the 23 employability skills development activities. Similarly, the EEQ is a 12-item questionnaire with 5 ordered response options ranging from 'Nothing' to 'Very Much' (0 to 4). It was designed to obtain science teachers' sense of efficacy - that is, their self-perceived competency in developing employability skills in chemistry students.

The instruments were given to two experts in educational measurement and evaluation, and curriculum development who provided face validation of the instrument, rephrasing and rewriting some items to suite respondents. Inclusion of items from the various dimensions of employability skills ensured content validity of the questionnaires. The reliabilities of the instruments were determined using test-retest method. The EOQ and EEQ were completed by 10 SS1 Chemistry teachers drawn from schools other than those used for the study. After 4 weeks, the teachers completed same questionnaires. The two sets of teacher responses on the

**Table 1.** Frequency, weighted mean scores and standard deviation of responses to items on students' employability skills.

| Skill statements   | Not at all (0) | Very little (1) | Somewhat (2) | Very well (3) | Excellently (4) | N   | Weighted mean | Std. deviation | *Assessment |
|--------------------|----------------|-----------------|--------------|---------------|-----------------|-----|---------------|----------------|-------------|
| Statement 1        | 1              | 2               | 13           | 27            | 77              | 120 | 3.48          | .820           | Competent   |
| Statement 2        | 0              | 12              | 19           | 56            | 33              | 120 | 2.92          | .913           | Competent   |
| Statement 3        | 2              | 7               | 24           | 28            | 59              | 120 | 3.13          | 1.034          | Competent   |
| Statement 4        | 2              | 18              | 34           | 46            | 20              | 120 | 2.55          | .986           | Competent   |
| Statement 5        | 7              | 19              | 30           | 51            | 13              | 120 | 2.37          | 1.061          | Competent   |
| Statement 6        | 6              | 6               | 27           | 47            | 33              | 119 | 2.80          | 1.062          | Competent   |
| Statement 7        | 0              | 2               | 8            | 36            | 74              | 120 | 3.52          | .698           | Competent   |
| Statement 8        | 5              | 14              | 13           | 43            | 43              | 118 | 2.89          | 1.153          | Competent   |
| Statement 9        | 3              | 8               | 22           | 47            | 38              | 118 | 2.92          | 1.006          | Competent   |
| Statement 10       | 0              | 1               | 9            | 31            | 78              | 119 | 3.56          | .672           | Competent   |
| Statement 11       | 4              | 8               | 20           | 56            | 31              | 119 | 2.86          | .994           | Competent   |
| Statement 12       | 2              | 7               | 24           | 48            | 39              | 120 | 2.96          | .956           | Competent   |
| Statement 13       | 3              | 10              | 22           | 54            | 28              | 117 | 2.80          | .985           | Competent   |
| Statement 14       | 2              | 12              | 19           | 44            | 39              | 116 | 2.91          | 1.035          | Competent   |
| Statement 15       | 2              | 2               | 15           | 59            | 40              | 118 | 3.13          | .822           | Competent   |
| Statement 16       | 2              | 4               | 8            | 51            | 55              | 120 | 3.28          | .860           | Competent   |
| Statement 17       | 1              | 4               | 23           | 50            | 41              | 119 | 3.06          | .866           | Competent   |
| Statement 18       | 1              | 4               | 8            | 49            | 58              | 120 | 3.33          | .811           | Competent   |
| Statement 19       | 3              | 5               | 13           | 37            | 61              | 119 | 3.24          | .983           | Competent   |
| Statement 20       | 0              | 2               | 2            | 14            | 100             | 118 | 3.80          | .548           | Competent   |
| Statement 21       | 1              | 2               | 7            | 33            | 77              | 120 | 3.53          | .756           | Competent   |
| Statement 22       | 2              | 6               | 21           | 53            | 33              | 115 | 2.95          | .916           | Competent   |
| Statement 23       | 0              | 3               | 9            | 30            | 77              | 119 | 3.52          | .746           | Competent   |
| Statement 24       | 1              | 7               | 18           | 65            | 27              | 118 | 2.93          | .834           | Competent   |
| Statement 25       | 3              | 15              | 33           | 37            | 28              | 116 | 2.62          | 1.069          | Competent   |
| Statement 26       | 7              | 11              | 11           | 31            | 59              | 119 | 3.04          | 1.224          | Competent   |
| Statement 27       | 19             | 19              | 25           | 36            | 21              | 120 | 2.18          | 1.333          | Competent   |
| Statement 28       | 3              | 9               | 17           | 52            | 38              | 119 | 2.95          | .999           | Competent   |
| Statement 29       | 3              | 9               | 22           | 55            | 31              | 120 | 2.85          | .976           | Competent   |
| Statement 30       | 3              | 10              | 35           | 44            | 24              | 116 | 2.66          | .988           | Competent   |
| Statement 31       | 6              | 6               | 26           | 41            | 41              | 120 | 2.88          | 1.097          | Competent   |
| Statement 32       | 5              | 15              | 20           | 56            | 24              | 120 | 2.66          | 1.065          | Competent   |
| Valid N (listwise) |                |                 |              |               |                 | 92  |               |                |             |

\*Assessment point: Mean = >2.0 (Competent); mean < 2 (Not Competent)

questionnaires were correlated. The EOQ and EEQ gave r values of 0.70 and 0.77, respectively. For the SESQ, 20 students completed the questionnaire twice in 4 weeks internal to obtain 2 sets of responses which were also correlated. r value of 0.65 was obtained from the scores.

The questionnaires were distributed to the respondents directly by the researcher who have earlier on secured from school managements authorization for the exercise. All the questionnaires were completed and returned within 2 days. The responses were analyzed using descriptive statistics including mean, standard deviation and percentage. The SPSS 15 software facilitated the data analysis.

## RESULTS

### Research question 1

What is the science students' self-perceived employability skills competency?

Table 1 presents the simple statistics of the science students' responses to statements on their employability skills level; while Table 2 presents the mean scores, standard deviation and overall mean of responses to items on the 10 employability skills categories. Table 1 reveals that the weighted mean scores of students'

**Table 2.** Mean scores, standard deviation and overall mean of responses to items on 10 Employability skills categories.

| S/N | Employability skills categories | Skill statements | N   | Weighted mean | Std. deviation | *cMean & (std. deviation) |
|-----|---------------------------------|------------------|-----|---------------|----------------|---------------------------|
| 1.  | Communication                   | Statement 1      | 120 | 3.48          | .820           | 3.18 (.282)               |
|     |                                 | Statement 2      | 120 | 2.92          | .913           |                           |
|     |                                 | Statement 3      | 120 | 3.13          | 1.034          |                           |
| 2.  | Problem solving                 | Statement 4      | 120 | 2.55          | .986           | 2.57 (.216)               |
|     |                                 | Statement 5      | 120 | 2.37          | 1.061          |                           |
|     |                                 | Statement 6      | 119 | 2.80          | 1.062          |                           |
| 3.  | Team work                       | Statement 7      | 120 | 3.52          | .698           | 3.22 (.272)               |
|     |                                 | Statement 8      | 118 | 2.89          | 1.153          |                           |
|     |                                 | Statement 9      | 118 | 2.92          | 1.006          |                           |
|     |                                 | Statement 10     | 119 | 3.56          | .672           |                           |
|     |                                 | Statement 17     | 119 | 3.06          | .866           |                           |
|     |                                 | Statement 18     | 120 | 3.33          | .811           |                           |
| 4.  | Planning & organizing           | Statement 11     | 119 | 2.86          | .994           | 2.87 (.081)               |
|     |                                 | Statement 12     | 120 | 2.96          | .956           |                           |
|     |                                 | Statement 13     | 117 | 2.80          | .985           |                           |
| 5.  | Creativity/Innovation           | Statement 14     | 116 | 2.91          | 1.035          | 3.11 (.186)               |
|     |                                 | Statement 15     | 118 | 3.13          | .822           |                           |
|     |                                 | Statement 16     | 120 | 3.28          | .860           |                           |
| 6.  | Independent study               | Statement 20     | 118 | 3.80          | .548           | 3.43 (.434)               |
|     |                                 | Statement 21     | 120 | 3.53          | .756           |                           |
|     |                                 | Statement 22     | 115 | 2.95          | .916           |                           |
| 7.  | Numeracy                        | Statement 23     | 119 | 3.52          | .746           | 3.23 (.417)               |
|     |                                 | Statement 24     | 118 | 2.93          | .834           |                           |
| 8.  | ICT skills                      | Statement 25     | 116 | 2.62          | 1.069          | 2.61 (.430)               |
|     |                                 | Statement 26     | 119 | 3.04          | 1.224          |                           |
|     |                                 | Statement 27     | 120 | 2.18          | 1.333          |                           |
| 9.  | Self management                 | Statement 28     | 119 | 2.95          | .999           | 2.90 (.071)               |
|     |                                 | Statement 29     | 120 | 2.85          | .976           |                           |
| 10. | Time management                 | Statement 30     | 116 | 2.66          | .988           | 2.73 (.127)               |
|     |                                 | Statement 31     | 120 | 2.88          | 1.097          |                           |
|     |                                 | Statement 32     | 120 | 2.66          | 1.065          |                           |

Valid N (listwise) = 92 Overall mean= 2.99 (Std. dev = .292)

\*cMean = mean for employability skill sub-categories

responses to the 32 employability skills statements are all more than the assessment point (2.0). This implies that the science students perceived themselves as competent in all 32 employability skills statements. Taken individually, the response mean scores ranged from 2.18 (Statement 27) to 3.8 (Statement 20). However,

combining/categorizing similar statements reveals response range of 2.57 to 3.52 (Table 2).

Table 2 reveals category means of 3.18, 2.57, 3.22, 2.87, 3.11, 3.43, 3.23, 2.61, 2.90 and 2.73 for communication, problem-solving, team work, planning and organizing, creativity and innovation, independent

**Table 3.** Ranking of science students' perceived employability skills competency.

| Skills ranking   | Employability skills    | Category weighted mean |
|------------------|-------------------------|------------------------|
| 1 <sup>st</sup>  | Independent study       | 3.43                   |
| 2 <sup>nd</sup>  | Numeracy                | 3.23                   |
| 3 <sup>rd</sup>  | Team work               | 3.22                   |
| 4 <sup>th</sup>  | Communication           | 3.18                   |
| 5 <sup>th</sup>  | Creativity/Innovation   | 3.11                   |
| 6 <sup>th</sup>  | Self-management         | 2.9                    |
| 7 <sup>th</sup>  | Planning and organizing | 2.87                   |
| 8 <sup>th</sup>  | Time management         | 2.73                   |
| 9 <sup>th</sup>  | ICT skills              | 2.61                   |
| 10 <sup>th</sup> | Problem solving         | 2.57                   |

study, numeracy, ICT skills, self-management and time management, respectively. The finding reveals that students perceived themselves as competent all 10 employability skills categories. The overall mean scores of all responses is 2.99 (Std. deviation = .292). Thus, overall employability skills competency is "Very Well" (3).

### Research question 2

How is the students' perceived employability skills competency ranked?

Table 3 presents the ranking of mean scores for the categories of employability skills of science students. Table 3 reveals that Independent study (3.43) and Numeracy (3.23) were the two highly ranked employability skills competence as perceived by the students. On the contrary, the least ranked skill, that is, the employability skill in which students perceived themselves the least competent is problem-solving skills (2.57) followed by ICT skills (2.61). Thus, the table reveals that students' perceived employability skills competence ranged from 2.57 to 3.43.

### Research question 3

What opportunities are available for students' employability skills development?

Table 4 presents the statistics for teachers' perceptions of how much of the 23 employability skills development activities or opportunities are offered the science students in the school. Table 4 reveals mean scores range of 0.71 to 3.21 with 2.074 as the overall mean score (std. = 0.75444). The study also reveals that the top five employability enhancing opportunities made available to students include: participation in JETS/Science Club (3.21), Extra-curricular activities (3.08), Team work/working with others (2.92), Laboratory work (2.75) and Writing laboratory reports (2.75). Also, the five

employability enhancing activities in which the students have the least exposure include: Industrial attachment or placement (0.71), part-time work experience (0.83), Course on employability (0.88), Interaction with job placement agencies (1.25) and Visit to industries (1.25). Using the predefined weighting (ranging from 0 = None to 4 = Very Much), the study reveals that the students have little or no exposure in 21 of the 23 employability activities (91.3%). Only about 8.7% of the opportunities is really available or offered to students.

### Research question 4

What is the science teachers' sense of efficacy in promoting students' employability skills?

Table 5 provides the statistics for the respondents' sense of efficacy in promoting students' employability skills. Table 5 reveals a high sense of efficacy in fostering students' employability skills. The mean scores of responses range from 2.58 to 3.38. The highest 'sense of efficacy' scores are observed for creativity/innovation (3.38) and communication skills (3.25); while the least efficacy scores are observed for ICT (2.58), Numeracy skills (2.67) and Independent study (2.92).

## DISCUSSION

The findings of the study show an overall students' perceived competency in employability skills. Considering the fact that these were secondary school students, the findings are interesting in that they negate the commonly held view that school graduates are lacking in employability skills (Parker, 2011; Dixon, 2013). It is worth noting however that students' competency vary across the various categories of employability skills. The order of competency is as follow: Numeracy > Independent study > Team work > Communication > Creativity/Innovation > Self-management > Planning and Organizing > Time Management > ICT Skills > Problem-

**Table 4.** Frequency, mean scores and standard deviation of responses to items on students' employability skills development activities/opportunity.

| N/S | Employability activities                            | None (0) | Very little (1) | Little (2) | Much (3) | Very much (4) | N  | Weighted mean | Std. Dev. |
|-----|---|----------|-----------------|------------|----------|---------------|----|---------------|-----------|
| 1.  | Hands on experiential work                          | 0        | 2               | 7          | 11       | 4             | 24 | 2.71          | .859      |
| 2.  | Independent research project                        | 1        | 8               | 4          | 7        | 4             | 24 | 2.21          | 1.215     |
| 3.  | Visit to industries                                 | 11       | 2               | 6          | 4        | 1             | 24 | 1.25          | 1.327     |
| 4.  | Excursions and field trips                          | 6        | 7               | 7          | 3        | 1             | 24 | 1.42          | 1.139     |
| 5.  | Lectures/seminars from scientists or industrialists | 7        | 7               | 5          | 5        | 0             | 24 | 1.33          | 1.129     |
| 6.  | Careers seminars                                    | 1        | 4               | 9          | 6        | 4             | 24 | 2.33          | 1.090     |
| 7.  | Students talk-shows/debates                         | 1        | 1               | 9          | 2        | 0             | 24 | 2.50          | .722      |
| 8.  | Student oral/written presentations                  | 3        | 1               | 7          | 5        | 8             | 24 | 2.58          | 1.349     |
| 9.  | Laboratory work                                     | 1        | 2               | 5          | 10       | 6             | 24 | 2.75          | 1.073     |
| 10. | Writing laboratory reports                          | 1        | 9               | 9          | 5        | 0             | 24 | 2.75          | .847      |
| 11. | Team work/working with others                       | 2        | 6               | 6          | 10       | 0             | 24 | 2.92          | 1.213     |
| 12. | Course on employability                             | 15       | 0               | 6          | 3        | 0             | 24 | .88           | 1.191     |
| 13. | Skill acquisition program/course                    | 4        | 3               | 10         | 7        | 0             | 24 | 1.83          | 1.049     |
| 14. | Trade/entrepreneurship                              | 2        | 2               | 9          | 10       | 1             | 24 | 2.25          | .989      |
| 15. | Industrial attachment or placement                  | 14       | 5               | 4          | 1        | 0             | 24 | .71           | 1.042     |
| 16. | Part-time work experience                           | 11       | 7               | 5          | 1        | 0             | 24 | .83           | .917      |
| 17. | Extra-curricular activities (school teams, sports)  | 0        | 0               | 2          | 3        | 9             | 24 | 3.08          | .830      |
| 18. | Participation in JETS/Science Club                  | 0        | 1               | 3          | 10       | 10            | 24 | 3.21          | .833      |
| 19. | Information communication technology                | 2        | 3               | 6          | 7        | 6             | 24 | 2.50          | 1.251     |
| 20. | Internet Research/Information retrieval course      | 0        | 6               | 6          | 8        | 4             | 24 | 2.42          | 1.060     |
| 21. | Accounting/business subjects (e.g. as electives)    | 2        | 3               | 8          | 10       | 1             | 24 | 2.21          | 1.021     |
| 22. | Interaction with job/work placement agencies        | 4        | 12              | 6          | 2        | 0             | 24 | 1.25          | .847      |
| 23. | Creating Student skills portfolios (self record)    | 0        | 7               | 15         | 2        | 0             | 24 | 1.79          | .588      |
|     | Valid N (listwise)                                  |          |                 |            |          |               | 24 |               |           |
|     | Overall score                                       |          |                 |            |          |               |    | 2.074         | .7544     |

**Table 5.** Frequency, mean scores and standard deviation of responses to items on science teachers' sense of efficacy in promoting students' employability skills.

| N/S | Skill statements      | Nothing (0) | Very little (1) | Little (2) | Much (3) | Very much (4) | N  | Weighted mean | Std. dev. |
|-----|-----------------------|-------------|-----------------|------------|----------|---------------|----|---------------|-----------|
| 1.  | Problem solving       | 0           | 0               | 3          | 18       | 3             | 24 | 3.00          | .511      |
| 2.  | Independent study     | 2           | 0               | 1          | 16       | 5             | 24 | 2.92          | 1.018     |
| 3.  | Numeracy              | 0           | 2               | 5          | 16       | 1             | 24 | 2.67          | .702      |
| 4.  | Communication         | 0           | 0               | 1          | 16       | 7             | 24 | 3.25          | .532      |
| 5.  | ICT skills            | 0           | 4               | 5          | 12       | 3             | 24 | 2.58          | .929      |
| 6.  | Team work             | 0           | 2               | 0          | 14       | 8             | 24 | 3.17          | .816      |
| 7.  | Self management       | 0           | 0               | 2          | 16       | 6             | 24 | 3.17          | .565      |
| 9.  | Planning & organizing | 0           | 0               | 7          | 8        | 9             | 24 | 3.08          | .830      |
| 8.  | Creativity/Innovation | 0           | 0               | 4          | 7        | 13            | 24 | 3.38          | .770      |
| 10. | Time management       | 2           | 0               | 3          | 12       | 7             | 24 | 2.92          | 1.100     |
|     | Valid N (listwise)    |             |                 |            |          |               | 24 |               |           |

Solving. Though students showed competency in all skills (mean scores > 2), only the first 5 gave "very much" competency, that is gave mean scores  $\geq 3$ . Problem-solving skill, which should have been common to science

students, was the least perceived competency among the students.

The findings indicated that schools offer students different opportunities/activities in varying degree that

promote students' employability skills. Topping the list of activities are participation in JETS/Science Club, extra-curricular activities, working with others, laboratory work and writing laboratory reports. These activities are similar to those listed by Loughborough University (n.d), University of Leed (n.d) and University of Wales (2012) as employability skills development opportunities for their science and engineering students.

The teachers believed they could do more than "little" in training students in employability skills. This belief is reflected in the above 2.5 mean scores for the 10 skills. Particularly, high teacher sense of efficacy mean scores ( $\geq 3$ ) were obtained for problem-solving, communication, teamwork, self-management, planning /organizing and creativity/Innovation. ICT skills, though appreciably scored, was the least among the skills teachers thought they could foster in the students. This agrees with common notion that teachers find it difficult to use and teach ICT.

## CONCLUSION

The concept of "student employability skills" has increasingly become the concern of stakeholders in education and indeed employers of labour. It comprises of students' skills and potentials for obtaining and succeeding in a job. This study was centered on senior secondary school chemistry students' employability skills as well as science teachers' sense of efficacy in helping them acquire the skills. It was ascertained that while the science students were generally competent, they were not excellently competent in some employability skills, such as problem-solving, ICT and time-management skills. The study also related science teachers' high sense of efficacy in fostering students' employability skills, and highlighted their perceptions of school opportunities for developing the skills.

## RECOMMENDATIONS

The study makes the following recommendations:

1. Schools should create environments that enhance students' acquisition and development of job- or employment-related skills.
2. Schools/science teachers should provide enrichment activities to develop their students' competency in problem-solving and ICT.
3. Opportunities should be created in schools for students to participate more in industrial attachment/placement, part-time work experience, taking courses on employability, interaction with job/work placement agencies, visit to industries, and other infrequent but vital employability promoting activities.
4. Practicing and trainee teachers of science should be trained and re-trained on employability skills development

strategies to enhance their sense of efficacy and practices in fostering students' competences in employability skills, especially ICT, numeracy, time-management and independent study skills.

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**Appendix I: Chemistry Student Employability Skills Questionnaire (SESQ)**

Dear Student, please circle the option that best describe your level of competence in the following statements. [4 = Excellently; 3 = Very well; 2 = Somewhat; 1 = Just a little; 0 = Not at all]

| S/N                              | Skills statements scoring   |   |   |   |   |   |
|----------------------------------|---|---|---|---|---|---|
| <b>Communication</b>             |   |   |   |   |   |   |
| 1.                               | I can speak and write clearly so that others understand   | 4 | 3 | 2 | 1 | 0 |
| 2.                               | I can read and understand information in words, graphs, diagrams, or charts   | 4 | 3 | 2 | 1 | 0 |
| 3.                               | I listen and ask questions in order to understand instructions and other people's points of view                                    | 4 | 3 | 2 | 1 | 0 |
| <b>Problem-solving</b>           |   |   |   |   |   |   |
| 4.                               | I can assess situations, identify problems and evaluate solutions   | 4 | 3 | 2 | 1 | 0 |
| 5.                               | I recognize the many dimensions of a problem and can determine a root cause   | 4 | 3 | 2 | 1 | 0 |
| 6.                               | I'm not afraid to be creative when solving problem problems. I like to make sure the solution works in case improvement is required | 4 | 3 | 2 | 1 | 0 |
| <b>Team work</b>                 |   |   |   |   |   |   |
| 7.                               | I work/co-operate well with other students and team leaders   | 4 | 3 | 2 | 1 | 0 |
| 8.                               | I can lead a team work at school  | 4 | 3 | 2 | 1 | 0 |
| 9.                               | I have the skills of negotiating/persuading   | 4 | 3 | 2 | 1 | 0 |
| 10.                              | I place much value on respect for others  | 4 | 3 | 2 | 1 | 0 |
| <b>Planning &amp; organizing</b> |   |   |   |   |   |   |
| 11.                              | I am good at managing time and priorities – setting timelines   | 4 | 3 | 2 | 1 | 0 |
| 12.                              | I am good at taking initiative and making decisions   | 4 | 3 | 2 | 1 | 0 |
| 13.                              | I am a good at being resourceful  | 4 | 3 | 2 | 1 | 0 |
| <b>Creativity/innovation</b>     |   |   |   |   |   |   |
| 14.                              | When doing a task, I often devise new ways to do it faster and better   | 4 | 3 | 2 | 1 | 0 |
| 15.                              | I usually come up with creative and innovative ideas during group work  | 4 | 3 | 2 | 1 | 0 |
| 16.                              | I like trying out things myself   | 4 | 3 | 2 | 1 | 0 |
| <b>Working with others</b>       |   |   |   |   |   |   |
| 17.                              | I enjoy working as part of a team   | 4 | 3 | 2 | 1 | 0 |
| 18.                              | I like to contribute to common goals  | 4 | 3 | 2 | 1 | 0 |
| 19.                              | I enjoy the "give and take" of working in a group   | 4 | 3 | 2 | 1 | 0 |
| <b>Independent study</b>         |   |   |   |   |   |   |
| 20.                              | I like to learn new things  | 4 | 3 | 2 | 1 | 0 |
| 21.                              | I learn from my mistakes and can accept feedback  | 4 | 3 | 2 | 1 | 0 |
| 22.                              | I can identify and access learning opportunities  | 4 | 3 | 2 | 1 | 0 |
| <b>Numeracy skills</b>           |   |   |   |   |   |   |
| 23.                              | I can use basic mathematical functions of plus, minus, multiply and divide  | 4 | 3 | 2 | 1 | 0 |
| 24.                              | I can solve problems using math and science concepts  | 4 | 3 | 2 | 1 | 0 |
| <b>ICT Skills</b>                |   |   |   |   |   |   |
| 25.                              | I am familiar with word processing  | 4 | 3 | 2 | 1 | 0 |
| 26.                              | I can browse the internet for information for my study and to do assignments  | 4 | 3 | 2 | 1 | 0 |
| 27.                              | I am familiar with the use of emails to send and receive mails  | 4 | 3 | 2 | 1 | 0 |
| <b>Self-management skills</b>    |   |   |   |   |   |   |
| 28.                              | I can learn very quickly  | 4 | 3 | 2 | 1 | 0 |

**Appendix I: contd**

|                                     |   |   |   |   |   |   |
|-------------------------------------|---|---|---|---|---|---|
| 29.                                 | I have high sense of direction                                  | 4 | 3 | 2 | 1 | 0 |
| <b>Time management/prioritizing</b> |   |   |   |   |   |   |
| 30.                                 | Setting priorities is not a problem to me                       | 4 | 3 | 2 | 1 | 0 |
| 31.                                 | I am good at time management; in my work I often meet deadlines | 4 | 3 | 2 | 1 | 0 |
| 32.                                 | I can manage/do several tasks at once                           | 4 | 3 | 2 | 1 | 0 |

**Appendix II: Employability Opportunity Questionnaire (EOQ)**

**INSTRUCTION:** Dear teacher, kindly circle the number (from 0 - 4) that best describes your response. Note that response options ranges from None (0) to Very Much (4).

|   |   |   |   |   |
|---|---|---|---|---|
| 0 | 1 | 2 | ③ | 4 |
|---|---|---|---|---|

Q1: How much exposure do your students get in the following activities?

| S/N | Activities/opportunities for skills                 | None | Very Little | Little | Much | Very Much |
|-----|---|------|-------------|--------|------|-----------|
| 1.  | Hands on experiential work                          | 0    | 1           | 2      | 3    | 4         |
| 2.  | Independent research project                        | 0    | 1           | 2      | 3    | 4         |
| 3.  | Visit to industries                                 | 0    | 1           | 2      | 3    | 4         |
| 4.  | Excursions and field trips                          | 0    | 1           | 2      | 3    | 4         |
| 5.  | Lectures/seminars from scientists or industrialists | 0    | 1           | 2      | 3    | 4         |
| 6.  | Careers seminars                                    | 0    | 1           | 2      | 3    | 4         |
| 7.  | Students talk-shows/debates                         | 0    | 1           | 2      | 3    | 4         |
| 8.  | Student oral/written presentations                  | 0    | 1           | 2      | 3    | 4         |
| 9.  | Laboratory work                                     | 0    | 1           | 2      | 3    | 4         |
| 10. | Writing laboratory reports                          | 0    | 1           | 2      | 3    | 4         |
| 11. | Team work/working with others                       | 0    | 1           | 2      | 3    | 4         |
| 12. | Course on employability                             | 0    | 1           | 2      | 3    | 4         |
| 13. | Skill acquisition program/course                    | 0    | 1           | 2      | 3    | 4         |
| 14. | Trade/entrepreneurship                              | 0    | 1           | 2      | 3    | 4         |
| 15. | Industrial attachment or placement                  | 0    | 1           | 2      | 3    | 4         |
| 16. | Part-time work experience                           | 0    | 1           | 2      | 3    | 4         |
| 17. | Extra-curricular activities (school teams, sports)  | 0    | 1           | 2      | 3    | 4         |
| 18. | Participation in JETS/Science Club                  | 0    | 1           | 2      | 3    | 4         |
| 19. | Information communication technology                | 0    | 1           | 2      | 3    | 4         |
| 20. | Internet Research/Information retrieval course      | 0    | 1           | 2      | 3    | 4         |
| 21. | Accounting/business subjects (e.g. as electives)    | 0    | 1           | 2      | 3    | 4         |
| 22. | Interaction with job/work placement agencies        | 0    | 1           | 2      | 3    | 4         |
| 23. | Creating Student skills portfolios (self record)    | 0    | 1           | 2      | 3    | 4         |

**Appendix III: Employability Efficacy Questionnaire (EEQ)**

INSTRUCTION: Dear Teacher, kindly circle the number (from 0 - 4) that best describes your response. Note that response options ranges from None (0) to Very Much (4).

|   |   |   |   |   |
|---|---|---|---|---|
| 0 | 1 | 2 | ③ | 4 |
|---|---|---|---|---|

Q2: How much can you do to develop the following skills in your chemistry students?

| S/N | Employability Skills           | Nothing | Very Little | Little | Much | Very Much |
|-----|--------------------------------|---------|-------------|--------|------|-----------|
| 1.  | Problem-solving ability        | 0       | 1           | 2      | 3    | 4         |
| 2.  | Independent study skills       | 0       | 1           | 2      | 3    | 4         |
| 3.  | Numeracy skills                | 0       | 1           | 2      | 3    | 4         |
| 4.  | Communication skills           | 0       | 1           | 2      | 3    | 4         |
| 5.  | Information retrieval skills   | 0       | 1           | 2      | 3    | 4         |
| 6.  | ICT skills                     | 0       | 1           | 2      | 3    | 4         |
| 7.  | Team work/working with others  | 0       | 1           | 2      | 3    | 4         |
| 8.  | Self-management                | 0       | 1           | 2      | 3    | 4         |
| 9.  | Planning and organizing skills | 0       | 1           | 2      | 3    | 4         |
| 10. | Creativity/innovation          | 0       | 1           | 2      | 3    | 4         |
| 11. | Scientific/practical skills    | 0       | 1           | 2      | 3    | 4         |
| 12. | Time management/prioritizing   | 0       | 1           | 2      | 3    | 4         |

**Description of the 12 employability skills**

| S/N | Employability skills           | Description  |
|-----|--------------------------------|--|
| 1.  | Problem-solving                | Analyzing facts and circumstances and applying creative thinking to develop appropriate solutions.   |
| 2.  | Independent study              | Self motivation to learn new things, learning from mistakes, accepting criticism/feedback, identifying and accessing learning opportunities.                 |
| 3.  | Numeracy skills                | Manipulation of numbers, general mathematical awareness and its application in practical contexts.   |
| 4.  | Communication skills           | Application of literacy, ability to produce clear, structured written work and oral literacy, including listening and questioning.                           |
| 5.  | ICT skills                     | Basic IT skills, including familiarity with word processing, spreadsheets, file management and use of internet search engines; information retrieval skills. |
| 6.  | Team working skills            | Respecting others, co-operating, negotiating, persuading, contributing to discussions.   |
| 7.  | Self-management                | Readiness to accept responsibility, flexibility, time management, readiness to improve own performance.  |
| 8.  | Planning and organizing skills | Preparing for and coordinating task for self and others, taking initiation and making decisions, being resourceful.  |
| 9.  | Creativity/innovation          | Devising new and better ways to handle tasks, bringing creative, innovative ideas/products, brainstorming and thinking outside the box.                      |
| 10. | Time management                | Time consciousness, time management and prioritizing, meeting work deadlines.  |