

Assessment of supervised industrial attachment of a technical and vocational teacher education program in Ghana

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The Technical and Vocational Teacher Education program of the University of Education, Winneba in Ghana, includes a compulsory supervised industrial attachment (SIA). This gives student teachers the opportunity to relate theory to practice and to be well prepared upon completion to prepare their students for success in further education and the workplace. This paper which is part of a larger study that assessed the SIA program focuses on the attainment of program objectives and program usefulness. Data were collected from 13 lecturers, 90 students and 22 workplace supervisors through a self-completion questionnaire. The reported findings were based on four-point Likert-type items relating to the attainment of program objectives (5 items) and program usefulness (5 items). Descriptive statistics, one-way analysis of variance at 0.05 level of significance and Scheffe's post hoc test were used to analyze the data. The results showed that lecturers, students and workplace supervisors rated highly elements of program usefulness and the attainment of program objectives. Additionally, there was uniform agreement in the responses of respondents as there were no statistically significant differences in their ratings of all the items relating to attainment of program objectives and program usefulness except for their ratings regarding the opportunity for host organizations to reduce recruitment and training costs of workplace staff during attachment (*Asia-Pacific Journal of Cooperative Education*, 10(1), 1-17).

Keywords: Ghana, lecturers, program objectives, program usefulness, students, supervised industrial attachment, technical and vocational education and training, technical and vocational teacher education, workplace supervisors.

Technical and vocational teacher education (TVTE) needs to be responsive to rapidly changing student and workforce needs. Today's pre-tertiary technical/vocational teacher, according to Bottoms and McNally (2008), has a dual mission: to prepare students for the ever increasing workplace requirements and for further study. As a consequence, Bottoms and McNally observe that high schools need qualified teachers who can create and manage learning environments where students prepare for success in their further education and in the workplace. Therefore, TVTE programs need to create the environment where student teachers could relate theory to practice through simulated work environment in schools and industrial attachment at real workplace. The simulated work environment in school, however, differs significantly from that of the real workplace environment in which most students of our technical and vocational institutions will eventually be required to function (Roegge, Wentling & Bragg, 1996).

Technologies keep on changing almost on a daily basis making it difficult for educational institutions to acquire all the necessary machines and equipment required for the training of their students. This is buttressed by Finch and Crunkilton (1999) who acknowledge that it is difficult for individuals and institutions to get all the highly specialized equipment needed to operate quality programs in schools. In the light of the foregoing, the recommendation of Roegge et al. (1996) that TVTE programs should contain workplace experience component is worthy of consideration. Consequently, educational institutions are under increasing pressure to incorporate workplace training into their curriculum to provide workplace experience for learners. Embracing work-integrated learning could also help alleviate the

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effect of educational institutions' inability to acquire specialized equipment needed to prepare their students for the world of work. The foregoing discussions explain why the TVTE program of the University of Education, Winneba (UEW) in Ghana, includes a compulsory *supervised industrial attachment* (SIA). This gives student teachers the opportunity to relate theory to practice and to be well prepared upon completion, to prepare their students for success in further education and the workplace. This paper is part of a larger study that assessed the SIA program and it focuses on issues relating to the attainment of program objectives and program usefulness.

The SIA program of the UEW was introduced for the purpose of attaching students to industries for them to acquire practical skills in their occupational areas and to acquaint themselves with how new technologies, machines and equipment they have heard of and read about in textbooks function. Four years after the introduction of the program, however, no empirical study had been conducted to find out whether the objectives of the program were being achieved or not. It was deemed significant knowing what was happening to the program and how it was being perceived by stakeholders. Accordingly, an assessment of the program, four years after its introduction, was deemed timely and appropriate to examine issues relating to the attainment of objectives, usefulness, adequacy of skills acquired by students, program organization, challenges and attitude of students.

EDUCATIONAL SYSTEM IN GHANA

In September 2007, Ghana launched a new education structure (see Akyeampong, 2007; Ministry of Education, Science & Sports, 2008 for further details). The structure consists of basic education of 2 years kindergarten, 6 years of Primary Education, and 3 years Junior High School (JHS). In an attempt to expose young people to pre-employment skills, basic vocational skills have been incorporated into the JHS curriculum. After JHS, students may choose to enter different streams at Senior High School (SHS), comprising General Education and Technical and Vocational Education and Training (TVET) or enter into an apprenticeship scheme with support from the Government. The new structure envisages industry to play a major role in all aspects of TVET. Additionally, TVET is to be resourced and promoted as a viable alternative to general education. The SHS is for four years and leads to post-secondary education and tertiary education in polytechnics and universities of 3 and 4 years respectively. The education system is supported by a teacher education program (see Adegoke, 2003 for further details) structured to provide a 3-year pre-service Diploma in Basic Education in Colleges of Education and degree programs in education in universities. The University of Cape Coast and UEW are responsible for teacher preparation at the university level.

TVET AND THE STATE OF WORK-INTEGRATED LEARNING IN GHANA

A thorough search of the literature reveals that there is no major documented work on work-integrated learning in respect of TVET in Ghana. However, some highlights of work-integrated learning in respect of TVET in Ghana have been documented by Afonja, Sraku-Lartey and Oni (2005), Ministers of Education of the African Union [MEAU] (2007) and Ministry of Education, Youth and Sports [MoEYS] (2003).

One of the most important features of TVET is its orientation towards the world of work and the inclusion of work-integrated learning in the curriculum to prepare students for the work environment. Whilst some skills could be obtained in the classrooms on campus, Coll,

Zegwaard and Hodges (2002) are of the view that some skills are best developed in the workplace via the work-based learning. This notwithstanding, not much attention is being given to work-integrated learning in respect of TVET in Ghana. There appears to be low participation in industrial attachment by teaching staff and students of technical and vocational institutes of Ghana. The MoEYS (2003) has reported that in 2002, the proportion of teaching staff and students of technical and vocational institutes on industrial attachment stood at 18%. As one of the strategies to increase participation, the MoEYS has recommended to TVET providers to arrange for work-experience in collaboration with the private sector, industry and commerce. By 2015, the participation in industrial attachment by teaching staff and students of technical and vocational institutes is being projected by the MoEYS to reach 40%.

The state of industrial attachment in respect of TVET at the tertiary level in Ghana may not be much different from the above. In a cross-country study of engineering education in three countries, Afonja et al. (2005) concluded that placement of students for industrial work experience is problematic, the situation being less serious in Zimbabwe than in Nigeria and Ghana as employers are reluctant to take on students. Given the importance of employers in work-based learning, it is difficult to imagine how any successful program can function without the support of employers (Coll et al., 2002).

Afonja et al. (2005) further contend that even when students are accepted by employers for industrial attachment, they are often not well supervised or assessed. To strengthen industrial attachment, they suggest faculty-employer involvement in the design and supervision, establishment of strong industrial placement units by faculties and a way of compensating employers for providing placement for students on industrial training. In recognition of the reluctance of employers to take on students, a TVET strategy document of the MEAU (2007) has also suggested that employers provide opportunities for industrial attachment for trainees and for TVET teachers to regularly update their work experience. The MEAU acknowledges that the quality of TVET is dependent on the competence of the teacher which is partly measured by being abreast with new technologies in the workplace. Hence, it is important that TVTE programs incorporate work-based learning into the curriculum.

RESEARCH CONTEXT: SUPERVISED INDUSTRIAL ATTACHMENT PROGRAM AT UEW

The context for the study is the SIA program at UEW which is an integral part of the TVTE program. The Department of Design and Technology Education which is charged with the responsibility of training technical and vocational teachers for both basic and second cycle schools throughout Ghana runs the TVTE program. In 1997, the department introduced industrial attachment as a credit bearing but non-supervised course. Although the industrial attachment was supervised and assessed by staff of host organizations at the time, lecturers of the department did not visit the students during the attachment period. The SIA started in 2000 after a decision was made for lecturers to visit students on industrial attachment. The decision arose out of recommendations made in 1999 by the National Accreditation Board for Tertiary Education of Ghana. The visits are for the purpose of ensuring that students are engaged in various aspects of work that are relevant to their occupational areas. Thus, the visits could minimize the chance that students are taken advantage of and used as cheap labor. Additionally, the visits offer lecturers the opportunity to monitor students' progress

and to meet with students and workplace staff, especially supervisors, to discuss any problems of concern to any of the stakeholders.

The SIA lasts for a minimum of six weeks and takes place during long vacation (July to August). The program is undertaken by only students who have completed three years of study (Level 300). However, other students of the department can embark on non-credit bearing and non-supervised attachment on their own. The students have to find their own placements convenient to them but must be of acceptable standards. During the attachment period, students follow the normal eight working hours of the host organization on a five-day week basis. The SIA is assessed so that student teachers earn academic credit for industrial work experience. The assessment of students is of two components. One is based on reports submitted by students to the department regarding their workplace experiences. The reports, which must document students' weekly activities at the workplace, are assessed by lecturers of the department and weighted as 60%. The other assessment component which is weighted 40% is on students' work performance during the attachment period as assessed by workplace supervisors. The host organization is required to assign a supervisor, preferably a professional in the student's occupational area, to mentor, supervise and assess him or her. There is a member of staff of the department (Industrial Attachment Coordinator) responsible for pre-attachment orientation of students, record keeping, general communication, and contact with students and host organizations.

The objectives of the SIA program among others are to:

1. Expose students to new scientific and technological equipment and how to manipulate them;
2. Enable students reinforce theoretical instruction through the use of applied learning facilities;
3. Enable students interact and share experiences and ideas with those in industry on issues relating to safety precautions, industrial health, environmental pollution and culture of work in industry;
4. Enable students acquire new practical skills and sharpen old ones by trying their hands on machines and equipment related to their courses of study;
5. Enable students know of the problems and contributions of industry to national development; and
6. Enable the department to identify problems associated with its curriculum and review it to meet current and future workplace requirements.

RESEARCH OBJECTIVES AND QUESTIONS

This sub-study of the larger study had three objectives. First, the present study sought to find out whether or not the program objectives were being achieved. Second, it focused on the extent to which stakeholders find the SIA useful. Finally, the present study aimed at investigating any differences in the perceptions of stakeholders regarding the usefulness and the attainment of the objectives of the program.

This sub-study of two selected aspects of the larger study was guided by the following research questions:

1. How do lecturers, students and workplace supervisors rate the attainment of the objectives of the SIA?
2. Do the ratings of the lecturers, students and workplace supervisors regarding the attainment of program objectives differ?
3. How do lecturers, students and workplace supervisors rate the usefulness of the SIA?; and
4. Do the ratings of the lecturers, students and workplace supervisors regarding program usefulness differ?

METHODOLOGY

Research Design

The study employed cross-sectional descriptive survey[†] with a researcher-designed questionnaire for data collection to provide answers to the research questions. Since the study sought to assess an on-going program, the survey research method was deemed appropriate. In the view of Osuala (1993), the survey method is appropriate for conducting a study into an on-going process. The choice of the survey method was also informed by the views of Cohen and Manion (1995) who have indicated that the survey approach was useful in comparing conditions of an on-going activity against pre-determined standards.

Population and Sample

The population for the study comprised 275 subjects. It included 21 lecturers and 198 Level 300 students of the Department of Design and Technology Education who embarked on the attachment program in 2004. The population also included 56 workplace supervisors of both public and private host organizations throughout Ghana where the students went for the attachment program. The sample for the study consisted of 167 subjects. It included all the 21 lecturers, all the 56 workplace supervisors and 90 students randomly selected from the student population of 198. Thus, 45.5% of the students were selected for the study. This is in line with the suggestion of Nwana (1992) that if the population is few hundreds, a 40% or more sample size will suffice.

Instrument

Although a number of instruments for data collection could have been used, the self-completion questionnaire[‡] was deemed most appropriate for the study. Questionnaires are easy to administer, friendly to complete and fast to score and therefore take relatively very little time of researchers and respondents. Additionally, review of literature on studies that evaluated work-integrated learning programs showed that similar studies (e.g., Aleisa & Alabdulahfez, 2002; Coll & Chapman, 2000; Spowart, 2006) made the most use of researcher-designed questionnaires for data collection.

A self-completion questionnaire of seven parts consisting of two items on respondents' background, 41 Likert-type items and one open-ended item, was employed for the larger study. The questionnaire as shown in the Appendix, elicited demographic data, and data on aspects of the attachment program relating to the attainment of objectives, usefulness, adequacy of skills acquired by students, program organization, challenges and attitude of students. Five (5) items on the attainment of the program objectives (Part 2 of the Appendix) and five (5) items on program usefulness (Part 3 of the Appendix) formed the basis of the findings reported in this paper. The four-point scale was used for the study as against the traditional five-point scale due to the tendency for individuals to select responses in the

[†] Survey based on observations representing a single point in time with data collected on only one occasion with the same subjects rather than on the same subjects at several points in time.

[‡] Paper-and-pencil instrument designed to gather data from a respondent that is completed alone without the researcher's involvement.

center of the scale if an odd number response scale was used (Anderson, 1985; Casley & Kumar, 1988; Downie, 1967). For the items relating to the attainment of the program objectives, the responses for the four-point scale were: To a great extent (4), to some extent (3), little (2), and virtually nothing (1). For the items on usefulness of the program, the responses for the four-point scale were: Extremely useful (4), useful (3), of little use (2), and not useful (1).

A pilot study was conducted to ensure validity and reliability of the questionnaire and to identify any needs for revisions. The pilot study involved administration of the questionnaire to 21 students, one retired lecturer, and eight workplace supervisors (all of whom were not included in the sample for the study) who had participated in previous SIA programs and could readily be reached. Participants of the pilot study were asked to complete the instrument and to provide comments or suggestions for revising any ambiguous items. The final instrument for the study (see Appendix) was produced after analysis of the pilot data and subsequent revisions in the wording of a few items. The reliability of the instrument was determined using Cronbach-Alpha analysis. The value of Cronbach-Alpha for the instrument used in the pilot study was 0.74. The Cronbach-Alpha as an estimate of reliability was adequate at 0.74. Such a reliability value, according to Livingstone (1985), was a fair indication of a good internal consistency and that the instrument was fairly reliable.

Administration of the Instrument

The questionnaires for lecturers were distributed and collected personally. Thirteen lecturers (representing 59.1% response rate) comprising 12 (92.3%) males and one (7.7%) female returned their questionnaires. The questionnaires for students and workplace supervisors were distributed through lecturers who visited the host organizations where the students went for the attachment program. Twenty-two workplace supervisors (representing 39.3% response rate) returned their questionnaires through students. The 22 workplace supervisors were all males which reflected on the male dominance in supervisory roles in the host organizations. There was a full response for the students ($n = 90$). The 90 students comprised 76 (84.4%) males and 14 (15.6%) females. In all, a total of 125 out of the 167 questionnaires administered were returned. This represented an overall response rate of 74.9%.

Data Analysis

The mean rating for each item was computed for each of the three sub-groups of respondents. The resultant mean rating for each item was also computed. Thereafter, the computed mean ratings were compared with the theoretical mean rating (assuming normal distribution of responses) of 2.50 to determine the attainment or otherwise of the aspect of the program objective, and the usefulness or otherwise of the aspect of the program depicted by the questionnaire item. Any computed mean of an item relating to program objectives exceeding 2.50 indicated attainment of that aspect of the program objective, while values below 2.50 indicated non-attainment of the objectives. Similarly, any computed mean of an item relating to program usefulness exceeding 2.50 indicated that respondents found that aspect of the program useful; mean values below 2.50 indicated respondents' expression of not finding those aspects of the program useful.

The computed mean ratings for the three sub-groups were compared using one-way analysis of variance (ANOVA) at 0.05 level of significance. Where statistically significant differences were established, the Scheffe' post hoc test was used to make pair wise comparisons of the

means to determine differences in the ratings of lecturers, students and workplace supervisors on the attainment of the program objectives, and the usefulness of the SIA. ANOVA assumes that the data are normally distributed and that there is homogeneity of variances. Kinnear and Gray (1992) strongly advise for the prior verification of the homogeneity assumption and further suggest the use of non-parametric tests when there is marked heterogeneity of variances. Owing to the large disparity in the sample sizes of the three sub-groups ($n_1 = 13$, $n_2 = 90$, $n_3 = 22$), the ANOVA was preceded by a test of homogeneity of variances to verify the homogeneity assumption.

RESULTS AND DISCUSSION

The research findings are presented into four sections according to the four research questions posed above.

Research Question 1:

How do lecturers, students and workplace supervisors rate the attainment of the objectives of the SIA?

The mean rating of each of the three sub-groups for each item and the corresponding resultant mean rating were computed. The computed means were then compared with the theoretical mean rating (assuming normal distribution of responses) of 2.50 to determine whether the objectives had been achieved or not. All the five items relating to the attainment of the program objectives had mean ratings and resultant mean ratings that far exceeded the theoretical mean (Table 1). As indicated in Table 1, the program objective of enabling students to apply and sharpen old manipulative skills already acquired in their area of study had the highest resultant mean rating of 3.77. The lowest resultant mean rating of 3.14 was for the objective of acquiring interpersonal skills that promote personal growth and development.

The results of the study suggest that lecturers, students and workplace supervisors rated highly elements of the program objectives indicating satisfactory attainment of the program objectives. Thus, all three stakeholders felt that the program had achieved its set objectives. The findings are similar to those of Aleisa and Alabdulahfez (2002) who found that the cooperative education (attachment program) at Riyadh College of Technology had achieved its aims. In the present study, the objective of developing positive attitude towards work appears to have been attained. Similarly, Aleisa et al. reported that the program at Riyadh College of Technology enabled students to acquire positive attitude towards work. They also found that the program provided students the needed workplace skills similar to the findings of the present study.

The reported attainment of the objective of acquiring new manipulative practical skills during the SIA is in agreement with the observation of Ryan and Imel (1996) that industrial attachment is one of the useful methods of imparting knowledge to students. This finding could be attributed to the fact that the attachment program afforded students the unique opportunity to engage in practical work of eight hours a day on a five-day week basis on some specialized equipment and machinery which are not available in their school's workshops. Stone (1991) found that industrial attachment enabled students to improve upon their knowledge and skills in their fields of study. Aleisa et al. (2002) also found that the cooperative education of Riyadh College of Technology gave students the needed workplace skills. These findings compare favorably with the finding of the present study that industrial

TABLE 1
Stakeholders' ratings of the attainment of the objectives of the SIA

Elements of Program Objectives	Lecturer Ratings (n ₁ = 13)		Student Ratings (n ₂ = 90)		Workplace Supervisor Ratings (n ₃ = 22)		Resultant Mean	F Value
	Mean	SD	Mean	SD	Mean	SD		
1. Acquisition of new manipulative practical skills during the industrial attachment period	3.54	0.499	3.61	0.678	3.55	0.656	3.59	0.133 [†]
2. The program enabling students to apply and sharpen old manipulative skills already acquired in their area of study	3.85	0.738	3.77	0.473	3.73	0.445	3.77	0.271 [†]
3. Acquaintance with how new technologies, machines and equipment heard of and read about in textbooks function	3.57	0.982	3.66	0.599	3.59	0.651	3.64	0.113 [†]
4. Acquisition of interpersonal skills that promote personal growth and development	3.23	0.697	3.12	0.534	3.14	0.091	3.14	0.183 [†]
5. Developing positive attitude towards work	3.46	0.499	3.44	0.598	3.41	0.577	3.44	0.041 [†]
Mean for all elements of program objectives	3.54	0.557	3.52	0.622	3.48	0.600		

[†] Not statistically significant at .05 level, df = 2 for numerator and 122 for denominator (computed F value < F_{0.05 (2, 122)} = 3.07).

attachment enabled students to apply and sharpen old manipulative skills already acquired in their areas of study. The objective of getting students acquainted with how new technologies, machines and equipment function also appears to have been attained. Schools and individuals find it very difficult to get specialized equipment to run quality education programs (Finch et al., 1999). It is in this light that the attainment of the objective of getting students acquainted with new technologies is very refreshing.

Research Question 2:

Do the ratings of the lecturers, students and workplace supervisors regarding the attainment of program objectives differ?

Notwithstanding the high level and closeness of the mean ratings of the five elements of the program objectives among the three sub-groups, it was deemed appropriate to determine whether there were any statistically significant differences among the respondents in their ratings using one-way analysis of variance (ANOVA) at the 0.05 level of significance. Due to the large disparity in the sample sizes of the three sub-groups ($n_1 = 13$, $n_2 = 90$, $n_3 = 22$), the ANOVA was preceded by a test of homogeneity of variances. The results indicated that all the items met the requirements that the three sub-groups were from a homogenous population.

The item-by-item ANOVA results which appear in Table 1 (last column) show that there was uniform agreement in the responses of the respondents as there were no statistically significant differences in the ratings of lecturers, students and workplace supervisors for all the items relating to the attainment of the objectives of the program. The ratings of the respondents regarding all the items relating to the attainment of the program objectives showed a high degree of similarity. Thus, lecturers, students and workplace supervisors were unanimous in rating highly the attainment of the program objectives and that they perceive the program as meeting its objectives.

Research Question 3:

How do lecturers, students and workplace supervisors rate the usefulness of the SIA?

The mean rating of each of the three sub-groups for each item and the corresponding resultant mean rating were computed. The computed means were then compared with the theoretical mean rating (assuming normal distribution of responses) of 2.50 to determine whether the program had been useful or not. The results which appear in Table 2 indicate that all the five items relating to the usefulness of the program had mean ratings that far exceeded the theoretical mean. As indicated in Table 2, the 'opportunity to understand many things learnt in abstract in one's area of study at the University' had the highest resultant mean rating of 3.68. The lowest resultant mean rating of 3.22 related to the 'opportunity for firms/industries to reduce recruitment and training costs of workplace staff during attachment'. The results of the study thus showed that lecturers, students and workplace supervisors rated highly elements of the usefulness of the program.

The results of the study are consistent with the findings of Bailey and Merritt (1997) who reported that industrial attachment increases the learning power of students by enabling them to get job experiences and reinforce academic instruction through the

use of applied learning opportunities. The finding that students had opportunity to apply theories and principles learnt in their areas of study is supported by Cullen (2005), Furco (1996) and Spowart (2006). In the evaluation of a cooperative education program for environmental science students at Southern Cross University, Cullen established that students were able to use skills learned or acquired from their study, similar to the present findings. Furco also observed that industrial attachment provides “learning opportunities beyond the classroom walls” (p. 9) and that it enables students to see, feel and work with tools and machines to give practical meaning to what they have learnt in theory. Students in South Africa who completed their work-integrated learning semester reported that they had learnt “the application of theory to practice” (Spowart, p. 14). Regarding cost savings to host organizations, the present finding compares favorably with the observation of the National Employer Leadership Council (1999) that during attachment periods, productivity of companies rose high and recruitment of staff reduced leading to huge savings. The finding on cost savings is also similar to that of Cullen who identified one of the benefits to host organizations as “reducing costs of employment and training” (p.5).

Research Question 4:

Do the ratings of the lecturers, students and workplace supervisors regarding program usefulness differ?

Notwithstanding the high level and closeness of the mean ratings of the five elements of the program usefulness among the three sub-groups, it was deemed appropriate to determine whether there were any statistically significant differences among the respondents in their ratings using one-way analysis of variance (ANOVA) at the 0.05 level of significance. Again, due to the large disparity in the sample sizes of the three sub-groups ($n_1 = 13$, $n_2 = 90$, $n_3 = 22$), the ANOVA was preceded by a test of homogeneity of variances. The results indicated that all the items met the requirements that the three sub-groups were from a homogenous population.

The item-by-item ANOVA results which also appear in Table 2 (last column) show that there was uniform agreement in the responses of the respondents for four items as there were no statistically significant differences in the ratings of lecturers, students and workplace supervisors regarding those elements of program usefulness. Thus, the ratings of the respondents regarding the four items showed a high degree of similarity. However, the respondents differed in their ratings regarding the opportunity for host organizations to reduce recruitment and training costs of workplace staff during attachment ($F = 16.973$ which exceeds $F(2, 122) = 3.07$ required for significance at the 0.05 level). To determine which sub-groups significantly differed, Scheffe's post hoc test (at 0.05 level of significance) was used to make pair wise comparisons of the mean ratings of the three stakeholders. The results indicated that the ratings of both lecturers and workplace supervisors were significantly higher than that of students. The differences perhaps lay in the fact that workplace supervisors and lecturers are better informed about the operations of industry and the implications of staff recruitment and training on the finances of organizations than the students.

TABLE 2
Stakeholders' ratings of usefulness of the SIA

Elements of Program Usefulness	Lecturer Ratings (n ₁ = 13)		Student Ratings (n ₂ = 90)		Workplace Supervisor Ratings (n ₃ = 22)		Resultant Mean	F Value
	Mean	SD	Mean	SD	Mean	SD		
1. Opportunity to apply theories and principles learnt in one's area of study at the University	3.62	0.487	3.67	0.622	3.55	0.383	3.64	0.404 [†]
2. Opportunity to understand many things learnt in abstract in one's area of study at the University	3.46	0.499	3.67	0.471	3.68	0.466	3.65	1.108 [*]
3. Opportunity to interact and share experiences and problems with industry staff	3.69	0.462	3.50	0.500	3.50	0.500	3.52	0.007 [†]
4. Opportunity to know of the contribution of industry to national development	3.46	0.499	3.50	0.500	3.50	0.500	3.50	0.034 [†]
5. Opportunity for firms/industries to reduce recruitment and training costs of workplace staff during attachment	3.08	0.730	2.88	0.693	3.14	0.757	3.22	16.973 [*]
Mean for all elements of program usefulness	3.46	0.584	3.44	0.649	3.47	0.583		

*Statistically significant at .05 level, df = 2 for numerator and 122 for denominator (computed F value > F_{0.05 (2, 122)} = 3.07).

[†]Not statistically significant at .05 level, df = 2 for numerator and 122 for denominator (computed F value < F_{0.05 (2, 122)} = 3.07).

CONCLUSION

The Technical and Vocational Teacher Education (TVTE) program of the University of Education, Winneba in Ghana has included a compulsory supervised industrial attachment (SIA). This gives student teachers the opportunity to relate theory to practice and to be well prepared upon completion to prepare their students for success in further education and the workplace. This paper which was part of a larger study, focused on the attainment of the objectives of the SIA and its usefulness. Studies of industrial attachment in a TVTE setting are not much reported. The present study thus adds a different dimension to the literature on work-integrated learning.

From the findings of the study, it could be concluded that stakeholders of the program expressed high satisfaction with the attainment of the program objectives and its usefulness. The attained program objectives include helping students to acquire new manipulative skills and sharpening old ones, getting students acquainted with technologies new to them, students being able to acquire interpersonal skills, and developing positive attitude towards work. The program's usefulness lies in the opportunity offered students to apply theories and principles learnt in school, to understand things learnt in abstract, to interact and share experiences with industry staff, and to know of the contribution of industry to national development. For the host organizations, the program's usefulness lies in the opportunity to reduce recruitment and training costs.

The findings suggest that the SIA is achieving its objectives and that stakeholders have found it useful. Thus, the program appears promising and the Department of Design and Technology Education that runs it would undoubtedly feel encouraged by the findings which could act as a morale booster for its staff. That notwithstanding, the department needs to reflect on the findings, identify the possible causes of the program's success, and thereafter, institute measures to maintain the identified success factors so that the expressed high attainment of the objectives of the program and usefulness would not slip.

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APPENDIX

Survey Instrument Used in the Study

PART 1: PERSONAL DATA

Listed in this section are two items on biographical information. For each item, kindly put a check (✓) in the appropriate box as applicable to you.

1. Gender: Male Female
 2. Status: Lecturer Workplace Supervisor Student

PART 2: ATTAINMENT OF PROGRAM OBJECTIVES

This section seeks to find out the extent you perceive the program objectives to have been attained.

Please, put a check (✓) in the appropriate cell that most adequately reflects your view in relation to the given statement.

Element of Program Objectives	To a great extent	To some extent	Little	Virtually nothing
3. Acquisition of new manipulative practical skills during the industrial attachment period				
4. The program enabling students to apply and sharpen old manipulative skills already acquired in their area of study				
5. Acquaintance with how new technologies, machines and equipment heard of and read about in textbooks function				
6. Acquisition of interpersonal skills that promote personal growth and development				
7. Developing positive attitude towards work				

PART 3: USEFULNESS OF ATTACHMENT PROGRAM

This section seeks to find out the extent you perceive the usefulness of the program. Please, put a check (✓) in the appropriate cell that most adequately reflects your view in relation to the given statement.

Element of Program Usefulness	Extremely useful	Useful	Of little use	Not useful
8. Opportunity to apply theories and principles learnt in one's area of study at the University				
9. Opportunity to understand many things learnt in abstract in one's area of study at the University				
10. Opportunity to interact and share experiences and problems with industry staff				
11. Opportunity to know of the contribution of industry to national development				
12. Opportunity for firms/industries to reduce recruitment and training costs of workplace staff during attachment				

PART 4: ADEQUACY OF SKILLS ACQUIRED BY STUDENTS

This section seeks to find out the extent you perceive the skills acquired by students to be adequate. Please, put a check (✓) in the appropriate cell that most adequately reflects your view in relation to the given statement.

Elements of Adequacy of Skills	To a great extent	To some extent	Little	Virtually nothing
13. Operate machines and equipment heard of and read about in textbooks				
14. Acquisition of new skills relating to area of study				
15. Sharpening of old skills already acquired in area of study				
16. Correctly accomplishing practical assignments given by the workplace supervisors				
17. Effectively teach the practical component of courses in student teacher's occupational area				

PART 5: ORGANIZATIONAL ISSUES

This section seeks to find out your views on some organizational issues regarding the program. Please, put a check (✓) in the appropriate cell that most adequately reflects the extent to which you agree or disagree with the statement.

Element of Organizational Issue	Strongly agree	Agree	Disagree	Strongly disagree
18. Workplace supervisors are the right people to assess students on the attachment program				
19. The competencies on which students are assessed on the program are appropriate				
20. The three credit hours allotted for the attachment program are enough				
21. The 60% weighting of students' reports is appropriate				
22. The 40% weighting of students' workplace experiences assessed by their supervisors is too small				
23. The practice of students finding their own placements is the best approach				
24. The lack of industrial attachment liaison officer adversely affects the program				
25. Visits made by lecturers to see how students fare on the program are necessary				

26.	The months of July and August are appropriate for the attachment program				
27.	The 6 weeks duration for the attachment program is adequate				

PART 6: CHALLENGES OF THE PROGRAM

(This part is to be completed by lecturers and students *only*)

This section seeks to find out your views on some challenges of the program. Please, put a check (✓) in the appropriate cell that most adequately reflects the extent to which you agree or disagree with the statement.

Element of Challenges	Strongly agree	Agree	Disagree	Strongly disagree
28. Students do not have free access to machines and equipment to work with				
29. Students spend a lot of money in traveling from their homes to the workplace				
30. Firms/industries are suspicious of students on the attachment program				
31. Students spend a lot of time in finding placement for the industrial attachment				
32. Supervision from workplace supervisors was effective				

PART 7: ATTITUDE OF STUDENTS

(This part is to be completed by workplace supervisors *only*)

This section seeks to find out how you perceive the attitude of the students. Please, put a check (✓) in the appropriate cell that most adequately reflects the extent to which you agree or disagree with the statement.

Element of Student Attitude	Strongly agree	Agree	Disagree	Strongly disagree
33. Students felt too big to take instructions from supervisors				
34. Students reported in good time each day for work				
35. Students usually closed before the official closing time				
36. Students were regular at work				
37. Students showed willingness to accept new ideas				
38. Students were curious in learning new skills				

39. Students adhered to rules and regulations of the organization				
40. Students observed workplace safety regulations each time they were working				
41. Students had good relationship with colleagues				
42. Students showed respect towards senior officers of the organization				
43. Students had good emotional control				

44. State any **two (2)** changes you would like to see introduced into the program.

ABOUT THE JOURNAL

The Asia-Pacific Journal of Cooperative education (APJCE) arose from a desire to produce an international forum for discussion of cooperative education issues for practitioners in the Asia-Pacific region and is intended to provide a mechanism for the dissemination of research, best practice and innovation in work-integrated learning. The journal maintains close links to the biennial Asia-Pacific regional conferences conducted by the World Association for Cooperative Education. In recognition of international trends in information technology, APJCE is produced solely in electronic form. Published papers are available as PDF files from the website, and manuscript submission, reviewing and publication is electronically based.

Cooperative education in the journal is taken to be work-based learning in which the time spent in the workplace forms an integrated part of an academic program of study. Essentially, cooperative education is a partnership between education and work, in which enhancement of student learning is a key outcome. More specifically, cooperative education can be described as a strategy of applied learning which is a structured program, developed and supervised either by an educational institution in collaboration with an employer or industry grouping, or by an employer or industry grouping in collaboration with an educational institution. An essential feature is that relevant, productive work is conducted as an integral part of a student's regular program, and the final assessment contains a work-based component. Cooperative education programs are commonly highly structured and possess formal (academic and employer) supervision and assessment. The work is productive, in that the student undertakes meaningful work that has economic value or definable benefit to the employer. The work should have clear linkages with, or add to, the knowledge and skill base of the academic program.

INSTRUCTIONS FOR CONTRIBUTORS

The editorial board welcomes contributions from authors with an interest in cooperative education. Manuscripts should comprise reports of relevant research, or essays that discuss innovative programs, reviews of literature, or other matters of interest to researchers or practitioners. Manuscripts should be written in a formal, scholarly manner and avoid the use of sexist or other terminology that reinforces stereotypes. The excessive use of abbreviations and acronyms should be avoided. All manuscripts are reviewed by two members of the editorial board. APJCE is produced in web-only form and published articles are available as PDF files accessible from the website <http://www.apjce.org>.

Research reports should contain; an introduction that describes relevant literature and sets the context of the inquiry, a description and justification for the methodology employed, a description of the research findings-tabulated as appropriate, a discussion of the importance of the findings including their significance for practitioners, and a conclusion preferably incorporating suggestions for further research. Essays should contain a clear statement of the topic or issue under discussion, reference to, and discussion of, relevant literature, and a discussion of the importance of the topic for other researchers and practitioners. The final manuscript for both research reports and essay articles should include an abstract (word limit 300 words), and a list of keywords, one of which should be the national context for the study.

Manuscripts and cover sheets (available from the website) should be forwarded electronically to the Editor-in-Chief directly from the website. In order to ensure integrity of the review process authors' names should not appear on manuscripts. Manuscripts should include pagination, be double-spaced with ample margins in times new-roman 12-point font and follow the style of the Publication Manual of the American Psychological Association in citations, referencing, tables and figures (see also, <http://www.apa.org/journals/faq.html>). The intended location of figures and diagrams, provided separately as high-quality files (e.g., JPG, TIFF or PICT), should be indicated in the manuscript. Figure and table captions, listed on a separate page at the end of the document, should be clear and concise and be understood without reference to the text.

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