

Organizational issues and challenges of supervised industrial attachment of a technical and vocational teacher education program in Ghana

FRANCIS DONKOR,* STANISLAUS N. NSOH, STEPHEN J. MITCHUAL

Department of Design & Technology Education, University of Education, Winneba, PO Box 1277, Kumasi, Ghana

The Technical and Vocational Teacher Education program of the University of Education, Winneba in Ghana, includes a compulsory supervised industrial attachment. This gives student teachers the opportunity relate theory to practice and to enable them go out to prepare their students for success in further education and the workplace. This paper which is part of a larger study that assessed the supervised industrial attachment focuses on organizational issues and the program's challenges. Data were collected from 13 lecturers, 90 students and 22 workplace supervisors through self-completion questionnaire. The reported findings were based on four-point Likert-type items relating to organizational issues and challenges. Data were analyzed using descriptive statistics, t-test, ANOVA and Scheffe's post hoc test. The findings revealed dissatisfaction of stakeholders with weightings of assessment components, the practice of students finding their own placements, program duration, and lack of liaison officer. Among the 10 items on organizational issues, only three produced statistically significant differences in respondents' ratings. The perceived challenges were lack of free access to machines and equipment, amount of money spent traveling to and from the workplace, and time spent on finding placement. Among the five items on challenges, only one produced statistically significant differences in respondents' ratings. (*Asia-Pacific Journal of Cooperative Education*, 10(1), 39-56).

KEYWORDS: Supervised industrial attachment, technical and vocational education and training, technical and vocational teacher education, Ghana.

Technical and vocational teacher education 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 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, technical and vocational teacher education 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 highlighted by Finch and Crunkilton (1999) who acknowledged 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 technical and vocational teacher education 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. Besides, work-integrated learning

* Author for correspondence, email: donkorf@yahoo.com

could help alleviate the 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 Technical and Vocational Teacher Education program of the University of Education, Winneba in Ghana, includes a compulsory supervised industrial attachment. This gives student teachers the opportunity to relate theory to practice and to enable them go out to prepare their students for success in further education and the workplace. This paper which was part of a larger study that assessed the supervised industrial attachment program (see Donkor, Nsoh & Mitchual, 2009a, 2009b) focuses on organizational issues and challenges of the program.

EDUCATIONAL SYSTEM IN GHANA

In September 2007, Ghana launched a new education structure (for further details see Akyeampong, 2007; Ministry of Education, Science & Sports, 2008). The structure consists of basic education of two years kindergarten, six years of primary education, and three years Junior High School. In an attempt to expose young people to pre-employment skills, basic vocational skills have been incorporated into the junior high school curriculum. After junior high school, students may choose to enter different streams at senior high school, comprising general education, and technical and vocational education and training 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 technical and vocational education and training. Additionally, technical and vocational education and training is to be resourced and promoted as a viable alternative to general education. The senior high school is for four years and leads to post-secondary education and tertiary education in polytechnics and universities of three and four years respectively. The education system is supported by a teacher education program (for further details see Adegoke, 2003) 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 University of Education, Winneba are responsible for teacher preparation at the university level.

TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING 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 Technical and Vocational Education and Training in Ghana. However, some synopsis of work-integrated learning in respect of Technical and Vocational Education and Training in Ghana have been documented by Afonja, Sraaku-Lartey and Oni (2005), Ministers of Education of the African Union ([MEA],2007) and Ministry of Education, Youth & Sports ([MoEYS], 2003).

One of the most important features of technical and vocational education and training 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 technical and vocational education and training in Ghana. There appears to be low participation in industrial attachment by teaching staff and students of technical and vocational institutes of Ghana. In a cross-country study of engineering education in Ghana,

Nigeria and Zimbabwe, Afonja et al. (2005) reported that approximately 60% of policy-makers surveyed in Ghana subscribe to the opinion that the lack of industrial experience of the average technical teacher is a major handicap to performance. The MoEYS (2003) has also 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 providers of technical and vocational education and training 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 technical and vocational education and training at the tertiary level in Ghana may not be much different from the above. In their 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 technical and vocational education and training strategy document of the MEAU (2007) has also suggested that employers provide opportunities for industrial attachment for trainees and teachers of technical and vocational institutes to regularly update their work experience. The MEAU acknowledges that the quality of technical and vocational education and training 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 technical and vocational teacher education programs incorporate work-based learning into the curriculum.

RESEARCH CONTEXT: SUPERVISED INDUSTRIAL ATTACHMENT PROGRAM AT UNIVERSITY OF EDUCATION, WINNEBA

The context for the study is the supervised industrial attachment program at the University of Education, Winneba which is an integral part of the technical and vocational teacher education 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 technical and vocational teacher education 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 supervised industrial attachment 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. Apart from the foregoing, the visits are beneficial in respect of building university-industry relationship, developing research opportunities, and keeping lecturers up-to-date with current industry activities.

The supervised industrial attachment 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. 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 supervised industrial attachment 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 supervised industrial attachment 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.

STATEMENT OF THE PROBLEM

As indicated above, the supervised industrial attachment of the technical and vocational teacher education program of the University of Education, Winneba in Ghana was introduced for the purpose of attaching students to industries for them to acquire practical skills in their occupational areas. Furthermore, the attachment program helps students 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 and how stakeholders perceived the program. It was

therefore deemed significant that four years after the introduction of the program, a study be conducted to examine issues relating to the attainment of program objectives, usefulness, adequacy of skills acquired by students, program organization, challenges and attitude of students on the program.

RESEARCH OBJECTIVES

This sub-study of the larger study had three objectives. First, the present study sought the views of stakeholders on some aspects of the program's organization. Second, it aimed at determining the challenges of the program. Finally, the present study aimed at investigating any differences in the perceptions of stakeholders regarding organizational issues and challenges of the program.

RESEARCH QUESTIONS

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 organizational issues of the supervised industrial attachment program?
2. Do the ratings of the lecturers, students and workplace supervisors regarding organizational issues of the program differ?
3. How do lecturers and students rate the challenges the supervised industrial attachment program face?; and
4. Do the ratings of the lecturers and students regarding the challenges of the program 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 third year 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 21 lecturers, all 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 - in line with the suggestion of Nwana (1992) that if the population of a given study is few hundreds, a 40% or more sample size suffices.

[†] A 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.

Instrument

Although a number of instruments for data collection could have been used, a 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 self-completion 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. Some 10 items related to the organizational aspects (Part 5 of the instrument - Appendix) and five items on challenges of the program (Part 6 of the instrument), and these formed the basis of the findings reported in this paper. Among the 10 items relating to organizational issues, five related to assessment, three related to departmental involvement in the program, while timing and duration had one item each. A 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 centre of the scale if an odd number response scale was used (Anderson, 1985; Casley & Kumar, 1988; Downie, 1967). The responses for the four-point scale were, *strongly agree* (4), *agree* (3), *disagree* (2), and *strongly disagree* (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 supervised industrial attachment 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's alpha analysis. The value of alpha for the instrument used in the pilot study was .74. Cronbach's alpha as an estimate of reliability was adequate at .74. Such a reliability value, according to Livingstone (1985), is a fair indication of a good internal consistency, and the researchers thus concluded the instrument was adequately reliable.

Administration of the Instrument

The questionnaires for lecturers were distributed and collected personally. Some 13 lecturers (12 males and 1 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

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

returned their questionnaires through students. The 22 workplace supervisors were all males which reflected male dominance in supervisory roles in the host organizations. All the 90 questionnaires administered to students were returned. The 90 students comprised 76 males and 14 females. In all, a total of 125 out of the 167 questionnaires administered were returned. This represented an overall response rate of 75%.

Data Analysis

The mean rating for each item was computed for each of the three sub-groups of respondents. Thereafter, each computed mean rating was compared with the theoretical mean rating (assuming a normal distribution of responses) of 2.5 to determine whether or not respondents agreed with the statement on the aspect of the program depicted by the questionnaire item. Any computed mean of an item exceeding 2.5 was taken to indicate expression of agreement with the statement, whilst means below 2.5 indicated expression of disagreement with the statement.

An item-by-item t-test analysis for paired means of lecturers and students was run to determine whether there were any statistically significant differences ($p = .05$) in their ratings of challenges of the program. Regarding organizational issues, the computed mean ratings for the three sub-groups were compared using one-way analysis of variance (ANOVA) ($p = .05$ was deemed statistically significant). Where significant differences were established, the Scheffe' post hoc test was used to make pairwise comparisons of the means to determine differences in the ratings of lecturers, students and workplace supervisors. ANOVA assumes that the data are normally distributed and that there is homogeneity of variances. Kinnear and Gray (1992) strongly advise prior verification of the homogeneity assumption and 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 ($n_1=13$, $n_2=90$, $n_3=22$), 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 organizational issues of the supervised industrial attachment program?

The mean rating of each of the three sub-groups for each item were computed. The computed means were then compared with the theoretical mean rating (assuming normal distribution of responses) of 2.5 to determine whether respondents agreed with the issues or not. Among the 10 items relating to organizational issues, five related to assessment (items 1 to 5 - Table 1), three related to departmental involvement in the program (items 6 to 8 in Table 1), while timing and duration had one item each (items 9 and 10 respectively - Table 1).

TABLE 1

Stakeholder rating of organizational issues of the supervised industrial attachment program in technical and vocational education and training from the University of Education Ghana (N=127)

Elements of Organizational Issue	Lecturer Ratings (n ₁ =13)		Student Ratings (n ₂ =90)		Workplace Supervisor Ratings (n ₃ =22)		F
	Mean	SD	Mean	SD	Mean	SD	
1. Workplace supervisors are the right people to assess students on the attachment program	3.23	0.576	3.56	0.519	3.05	0.475	9.450*
2. The competencies on which students are assessed on the program are appropriate	3.46	0.634	3.47	0.686	3.46	0.782	0.003†
3. The three credit hours allotted for the attachment program are enough	3.23	0.421	3.28	0.472	2.73	0.575	10.722*
4. The 60% weighting of students' reports is appropriate	2.08	0.474	2.04	0.419	1.96	0.562	0.409†
5. The 40% weighting of students' workplace experiences assessed by their supervisors is too small	3.46	0.746	3.43	0.651	3.50	0.783	0.084†
6. The practice of students finding their own placements is the best approach	1.62	0.625	1.67	0.471	1.68	0.466	0.078†
7. The lack of industrial attachment liaison officer adversely affects the program	3.15	0.863	3.26	0.754	3.18	0.716	0.028†
8. Visits made by lecturers to see how students fare on the program are necessary	2.08	0.615	2.16	0.514	2.55	0.582	3.469*
9. The months of July and August are appropriate for the attachment program	3.31	0.462	3.44	0.579	3.36	0.643	1.940†
10. The 6 weeks duration for the attachment program is adequate	1.31	0.213	1.48	0.250	1.41	0.242	0.737†

*Statistically significant (p=.05, df=2 for numerator and 122 for denominator, computed $F > F_{.05 (2, 122)}=3.07$);†Not statistically significant (p=.05, df=2 for numerator and 122 for denominator, computed $F \text{ value} < F_{.05 (2, 122)}=3.07$).

For four out of the five items relating to assessment, the mean ratings of all the three sub-groups far exceeded the theoretical mean (Table 1). Thus, the respondents agreed with four items relating to assessment including appropriateness of the competencies on which students are assessed. The mean rating of each of the three sub-groups regarding the statement '60% weighting of students' reports is appropriate' was below the theoretical mean indicating disagreement on the part of respondents ($\bar{x}=2.08$ for lecturers, $\bar{x}=2.04$ for students, and $\bar{x}=1.96$ for workplace supervisors). Thus, respondents perceive as inappropriate the 60% weighting of the department's assessment of reports students submit regarding their workplace experiences. On the contrary, respondents agreed that the 40% weighting of workplace supervisors' assessment of students' workplace experiences was too small. Essentially, these findings suggest that stakeholders would like to see less emphasis being placed on students' reports and more emphasis on students' workplace experiences. The essence of industrial attachment is to a greater extent for the acquisition of practical skills and not necessarily for students to acquire the ability to express themselves in report writing as upheld by Murnane and Levy (1996), and Ryan and Imel (1996). Such an observation could be particularly true for students of the technical and vocational teacher education program for whom report writing may not be so much important as compared to the teaching of practical skills in the school workshop where they will eventually be required to function. In the light of the foregoing, it may be appropriate that much weighting be placed on students' workplace experiences and not on reports that could be unduly influenced by students' communicative skills. An otherwise poor student in practical manipulative skills could write a good report to earn a grade higher than a student who is practically good but unable to present a good report owing to poor communicative skills.

Regarding other aspects of assessment, respondents agreed with the appropriateness of the competencies on which students are assessed, the three credit hours allotted for the program, and workplace supervisors being the right assessors of students. The finding that workplace supervisors were the right people to assess students on the attachment program is refreshing. It is the workplace supervisors who give assignments to the students and also monitor their progress in terms of skills acquisition on the program. Accordingly, workplace supervisors are in a better position to assess the students.

Out of the three items relating to the department's involvement in the program, only one item had mean ratings of the three sub-groups exceeding the theoretical mean. The respondents agreed that lack of industrial liaison officer was adversely affecting the program. It is probably time for the department to employ a full-time industrial liaison officer to oversee the program. Surprisingly, students and the lecturers both disagreed with the statement that visits to students by lecturers were necessary ($\bar{x}=2.16$ and 2.08 , respectively). It is, however, interesting that the mean rating of workplace supervisors ($\bar{x}=2.55$) regarding visits by lecturers was just a little above the theoretical mean. Thus, the workplace supervisors found the visits necessary to some extent. It is worth noting that even though the students and lecturers may perceive the visits as not being necessary, in reality that does not mean that such visits are not important. There is the need for further investigation to determine why lecturers and students did not find the visits of lecturers necessary but workplace supervisors did. Any such research should also look into what the lecturer actually does during the visit.

In another finding regarding the department's involvement, the respondents disagreed with the practice whereby students find their own placements ($\bar{x}=1.62$ for lecturers, $\bar{x}=1.67$ for students and $\bar{x}=1.68$ for workplace supervisors). The relatively high level of disagreement with the statement seems to provide further support for the assertion of Dreyfuss (1990) and Lozadea (1999). They have observed that for industrial attachment programs to be effective such that companies are always prepared to take on students for practical work, educational institutions must enter into partnerships with relevant organizations or companies. That way, students can go to such organizations and companies to do their industrial attachment instead of moving round from company to company in search of placement. The present finding should serve as something of a 'wakeup call' for the Department of Design and Technology Education to enter into partnerships with relevant companies. This could ensure that students are easily placed into companies of acceptable standards where they could acquire relevant skills in their areas of specialization.

Each of the three sub-groups rated the item relating to the appropriateness of the timing of the program well above the theoretical mean ($\bar{x}=3.31$ for lecturers, $\bar{x}=3.44$ for students and $\bar{x}=3.36$ for workplace supervisors). On the contrary, the mean ratings of the adequacy of program duration were far below the theoretical mean. As indicated in Table 1, the lowest mean ratings for the 10 items on organizational issues were for 'the 6 weeks duration for the attachment program is adequate'. Whilst the respondents found the timing to be appropriate, they did not find same with the duration. When the respondents were asked to state any two changes they would like to see introduced into the program, 96 (10 lecturers, 78 students and 18 workplace supervisors) out of the 125 mentioned increase in the duration as one of the desired changes. This finding lends support to the view of Grubb and Villeneuve (1995) that industrial attachment programs should last at least 16 weeks.

Research Question 2:

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

An item-by-item one-way analysis of variance (ANOVA) was carried out to determine the items where there were statistically significant differences in the ratings of the respondents regarding the various elements of the organizational issues of the program. 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 the variances of the three sub-groups for each of the ten items were homogeneous. Thus, all the items met the requirements that the three sub-groups were from a homogenous population.

The item-by-item ANOVA results are presented in the last column of Table 1. As indicated in Table 1, of the 10 items dealing with organizational issues, only three produced statistically significant differences in the ratings of the respondents. For three out of the five items on assessment, there was uniformity in the responses of the respondents as there were no statistically significant differences in the ratings of lecturers, students and workplace supervisors. However, for two of the items relating to assessment, the respondents markedly differed in their ratings. To determine which sub-groups significantly differed in their ratings of the two items, Scheffe's post hoc test ($p=.05$) was used to make pairwise comparisons of the mean ratings of the three sub-groups. Though all the three sub-groups agreed that workplace supervisors are the right people to assess students on the attachment

program, the pairwise comparisons showed that students' ratings ($\bar{x}=3.56$) were statistically significantly higher than that of lecturers ($\bar{x}=3.23$) and workplace supervisors ($\bar{x}=3.43$). Also, the ratings of lecturers ($\bar{x}=3.23$) and students ($\bar{x}=3.28$) were higher than that of workplace supervisors ($\bar{x}=3.18$) regarding the adequacy of the three credit hours allotted for the attachment program. The item-by-item ANOVA results in Table 1 also show that of the three items on the department's involvement in the program, there was uniformity in the responses of the respondents in two as there were no statistically significant differences in the ratings of lecturers, students and workplace supervisors. However, the respondents differed in their ratings regarding the need for visits by lecturers. To determine which sub-groups significantly differed in their ratings, Scheffe's post hoc test was used to make pairwise comparisons of the mean ratings of the three sub-groups. The pairwise comparisons revealed that the mean rating of workplace supervisors ($\bar{x}=2.55$) was higher than that of lecturers ($\bar{x}=2.08$) and students ($\bar{x}=2.16$). Whilst workplace supervisors felt that visits by lecturers were necessary, the lecturers and students felt otherwise. Aleisa and Alabdulahfez (2002), in their study of the cooperative education at Riyadh College of Technology, reported that college supervisors had difficulties balancing their teaching duties and supervision. The lecturers of the Department of Design and Technology Education could find themselves in similar circumstances making them feel that their visits to students on industrial attachment were not necessary. The Department runs a sandwich program and post-internship seminar for graduating students during the months of July and August. Thus, lecturers have intensive teaching duties during the same period as the supervised industrial attachment, making it difficult for them to balance teaching duties and supervision. It is interesting that in the face of heavy teaching duties of lecturers in the months of July and August, staff still found the timing of the program appropriate. In the circumstances, an empirical study needs to be undertaken to scientifically establish the reasons why lecturers and students did not find the visit of lecturers necessary.

Regarding the timing and duration of the program, there was uniformity in the responses of the three sub-groups as there were no statistically significant differences in their ratings. Thus, lecturers, students and workplace supervisors were unanimous in agreeing that the timing (July to August) was appropriate. They were also unanimous in agreeing that the six weeks duration was inadequate and would prefer a longer duration as already indicated above. In summary, it was the shared view of the stakeholders that the timing of the program was appropriate but its duration was inadequate.

Research Question 3:

How do lecturers and students rate the challenges the supervised industrial attachment program face?

The mean rating of each of the two sub-groups for each item were computed as presented in Table 2. The computed means were then compared with the theoretical mean rating (assuming a normal distribution of responses) of 2.5 to determine whether respondents agreed with the stated challenges or not. Among the five items dealing with challenges of the program, only one item was rated below the theoretical mean. Both lecturers and students rated the item 'firms/industries are suspicious of students on the attachment program' well below the theoretical mean of 2.5 ($\bar{x}=1.46$ and 2.31 respectively).

TABLE 2

Stakeholders' ratings of the challenges faced for the supervised industrial attachment program in technical and vocational education and training from the University of Education Ghana (N=127)

Elements of Challenges	Lecturer Ratings (n ₁ =13)		Student Ratings (n ₂ =90)		t
	Mean	SD	Mean	SD	
1. Students do not have free access to machines and equipment to work with	3.08	0.730	2.73	0.929	1.276 [†]
2. Students spend a lot of money in traveling from their homes to the workplace	3.08	0.730	2.94	0.780	0.577 [†]
3. Firms/industries are suspicious of students on the attachment program	1.46	0.499	2.31	0.812	3.687 [*]
4. Students spend a lot of time in finding placement for the industrial attachment	3.54	0.634	3.46	0.635	0.440 [†]
5. Supervision from workplace supervisors was effective	3.08	0.730	3.00	0.856	0.308 [†]

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

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

As indicated in Table 2, the item that related to the time students spend on finding placement had the highest mean ratings (\bar{x} =3.54 for lecturers and \bar{x} =3.46 for students). The results of the study showed that among the five items dealing with challenges of the program that were presented to lecturers and students to rate, they found three to be real. They saw as challenges the lack of free access to machines and equipment, the amount of money spent traveling to and from the workplace, and time spent on finding placement. On the contrary, the respondents did not see as challenges effectiveness of supervision from workplace supervisors, and firms/industries being suspicious of students. The finding that supervision from workplace supervisors was effective, however, contradicts that of Kazis and Goldberger (1995) who noted that most employers would not commit their employees to take students through their practical work during the whole attachment period. The present finding has probably come about because the supervised industrial attachment program lasted only six weeks and therefore took relatively little time of supervisors.

In the study of Aleisa and Alabdulahfez (2002) students faced problem with availability of transport. Additionally, they reported that students were not compensated for transport to and from the training place. Thus, the problem those students faced regarding the amount of money spent on transport was similar to that faced by the students of the present study. The concern expressed by stakeholders about time spent by students in finding placement has also been reported by Coll and Chapman (2000). In their study of science and technology cooperative education program at Waikato University in New Zealand, placement support emerged as the area of greatest dissatisfaction among stakeholders.

The lack of free access to machines and equipment is quite disturbing. Skills development which is an integral feature of work-based learning programs can hardly take place when

students are not having free access to machines and equipment. However, firms/industries are sometimes reluctant to grant free access to their machines and equipment for fear of damage due to improper usage, accidents and possible decrease in productivity. These fears notwithstanding, some measures could be put in place to encourage firms/industries to freely make equipment and machines available to students on attachment. Such measures could include tax relief/rebate, insurance policies, and training institutions forming partnerships with industry. In general, Afonja et al. (2005) acknowledge that there should be a way of compensating firms/industries for providing placement for students on industrial attachment.

Research Question 4:

Do the ratings of the lecturers and students regarding the challenges of the program differ?

An item-by-item t-test analysis was carried out for paired means in order to determine whether there were statistically significant differences in the ratings of lecturers and students regarding challenges of the program. The results of the t-test analysis appear in the last column of Table 2. Among the five items dealing with challenges of the program, only one item produced statistically significant differences between lecturers and students in their ratings. Specifically, the two sub-groups differed in their ratings of the statement that firms/industries are suspicious of students on the attachment program.

Though both sub-groups disagreed that firms/industries are suspicious of students on the attachment program, lecturers exhibited a significantly higher level of disagreement than the students. Lecturers visit the host institutions for brief periods and thus are less likely to encounter situations that could give them cause to have the slightest doubt that firms/industries are suspicious of students on the attachment program. On the contrary, some students might have encountered some isolated incidents that could heighten their belief that firms/industries are suspicious of students on the attachment program.

CONCLUSIONS

The Technical and Vocational Teacher Education program of the University of Education, Winneba in Ghana, has included a compulsory supervised industrial attachment. This gives student teachers the opportunity to relate theory to practice and to enable them go out to prepare their students for success in further education and the workplace. This paper which was part of a larger study that assessed the supervised industrial attachment program focused on organizational issues and challenges of the program. From the findings of the study, it could be concluded that stakeholders of the program are satisfied with workplace supervisors assessing students, the three credit hours allotted for the program, appropriateness of the competencies on which students are assessed, and the timing of the program. However, there was dissatisfaction with the weightings of the assessment components, the practice of students finding their own placements, program duration, and the lack of industrial attachment liaison officer. The perceived challenges of the program included lack of free access to machines and equipment, the amount of money spent traveling to and from the workplace, and time spent on finding placement.

The study has identified some organizational deficiencies and challenges of the supervised industrial attachment program. The Department of Design and Technology Education that runs the supervised industrial attachment program needs to institute some measures as a matter of urgency to address the identified deficiencies and challenges. Such measures could

include review of the weightings of the assessment components, appointment of industrial attachment liaison officer, and the establishment of partnerships with industry. Apart from the identified deficiencies and challenges of the program, it is equally worrisome to learn that lecturers and students did not find visits of lecturers necessary. The present study could not investigate why lecturers and students did not find such visits necessary. However, this is a legitimate area for future investigation.

REFERENCES

- Adegoke, K.A. (2003). Capacity building of lead teacher training institutions in Sub-Saharan Africa: Ghana. Paris: UNESCO. ED/HED/TED/2003/PI/II. Retrieved December 2, 2008, from <http://unesdoc.unesco.org/images/0014/001434/143483E.pdf>
- Afonja, A.A., Sraku-Lartey, K., & Oni, S.A. (2005). Engineering education for industrial development: Case studies of Nigeria, Ghana and Zimbabwe. ATPS Working Paper No. 42. Nairobi, Kenya: The African Technology Policy Studies Network Retrieved December 2, 2008, from <http://www.atpsnet.org/pubs/workingpaper/working%20paper%20series%2042.pdf>
- Akyeampong, K. (2007). Educational expansion and access in Ghana: 50 years of educational challenge and progress. London: Parliament Offices. Retrieved December 2, 2008, from http://www.create-rpc.org/pdf_documents/50%20Years%20of%20Educational_Progress_%20in_Ghana.pdf
- Aleisa, A.M., & Alabdulahfez, M.A. (2002). Cooperative education at Riyadh College of Technology: Successes and challenges. *Asia-Pacific Journal of Cooperative Education*, 3 (2), 1-7.
- Anderson, L.W. (1985). Likert scales. In *International Encyclopaedia of Education* (vol. 5, pp. 3082-3084). Oxford, UK: Pergamon.
- Bottoms, G., & McNally, K. (2008). Actions states can take to place a highly qualified career/technical teacher in every classroom. Atlanta, GA: Southern Regional Education Board. Retrieved 1 September 2008 from http://www.sreb.org/programs/hstw/publications/2005Pubs/05V73_career_tech_state_actions.pdf
- Casley, D., & Kumar, K. (1988). The collection, analysis, and use of monitoring and evaluation data. New York: The John Hopkins University Press.
- Cohen, L., & Manion, L. (1995). *Research methods in education* (4th ed.). London: Routledge.
- Coll, R.K., & Chapman, R. (2000). Evaluating service quality for cooperative education programs. *Asia-Pacific Journal of Cooperative Education*, 1(2), 1-12.
- Coll, R.K., Zegwaard, K., & Hodges, D. (2002). Science and Technology stakeholders' ranking of graduate competencies Part 1: Employer perspective. *Asia-Pacific Journal of Cooperative Education*, 3(2), 19-28.
- Donkor, F., Nsoh, S.N., & Mitchual, S.J. (2009a). Assessment of supervised industrial attachment of a technical and vocational teacher education program in Ghana. *Asia-Pacific Journal of Cooperative Education*, 10(1), 1-17.
- Donkor, F., Nsoh, S.N., & Mitchual, S.J. (January, 2009b). Supervised industrial attachment of a technical and vocational teacher education program in Ghana: Adequacy of skills acquired and student attitude. *Ghana Journal of Education and Teaching*, 1(7), 147-158.
- Downie, N.M. (1967). *Fundamentals of measurements: Techniques and practices* (2nd ed.). London: Oxford University Press.
- Dreyfuss, J. (1990). The three Rs on the shop floor. *Fortune*, 121(12), 86-89.
- Finch, C.R., & Crunkilton, J.R. (1999). *Curriculum development in vocational and technical education: Planning, content, and implementation* (5th ed.). Boston: Allyn & Bacon.
- Grubb, W.N., & Villeneuve, J.C. (1995). Cooperative education in Cincinnati. *Vocational Education*, 3, 7-10.
- Kazis, R., & Goldberger, S. (1995). *The challenges of implementing curriculum integration*. New York: Teachers College Press.
- Kinnear, P.R., & Gray, C. D. (1992). *SPSS/PC+ made simple*. Hove: Lawrence Erlbaum.
- Livingstone, S.A. (1985). Reliability of test results. *International Encyclopedia of Education* (vol. 7, pp. 201-210). Oxford, UK: Pergamon.
- Lozadea, M. (1999). School friend or foe? *Techniques*, 74(3), 18-20.
- Ministers of Education of the African Union. (2007). Strategy to revitalize technical and vocational education and training (TVET) in Africa. Report of the Meeting of the Bureau of the Conference of Ministers of Education of the African Union (COMEDAF II+), 29-31 May 2007. Addis Ababa, Ethiopia. Retrieved December 2, 2008, from http://www.africa-union.org/root/AU/Conferences/2007/May/HRST/29-31/TVET_Strategy_english.doc
- Ministry of Education, Science and Sports. (2008). Education reform 2007 at a glance: Major highlights. Accra, Ghana: Author. Retrieved December 2, 2008, from <http://www.moess.gov.gh/educreform.htm>
- Ministry of Education, Youth and Sports. (2003). National action plan education for all: Ghana 2003-2015. Accra, Ghana: Author. Retrieved December 2, 2008, from <http://planipolis.iiep.unesco.org/upload/Ghana/Ghana%20EFA%20NAP%20Finalised%20Version.pdf>

- Murnane, R.J., & Levy, F. (1996). *Principles for educating children to thrive in a changing economy*. New York: Free Press.
- Nwana, O.C. (1992). *Introduction to educational research*. Ibadan: Heinemann Educational Books (Nigeria) PLC.
- Osuala, E.C. (1993). *Introduction to research methodology*. Onitsha: Africana-Fep Publishers.
- Roegge, C.A., Wentling, T.L., & Bragg, D.D. (1996). Using Tech Prep Principles to improve teacher education. *Journal of Vocational and Technical Education*, 13(1). Retrieved 1 September 2008 from <http://scholar.lib.vt.edu/ejournals/JVTE/v13n1/roegge.html>
- Ryan, R.D., & Imel, S. (1996). School-to-work transition: Genuine reform or the latest fad? *Educational Resources Information*, 4, 2-11.
- Spowart, J. (2006). Hotel school students' views of their preparation for work-integrated learning: An exploratory study. *Asia-Pacific Journal of Cooperative Education*, 7 (2), 10-15.

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

Element 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.

EDITORIAL BOARD

Editor-in-Chief

Assoc. Prof. Richard K. Coll

University of Waikato, New Zealand

Editorial Board Members

Mr. Alan Cadwallader

UCOL, New Zealand

Mr. James Cannan

UNITEC Institute of Technology, New Zealand

Dr. Richard Chapman

Soil & Land Evaluation Ltd, New Zealand

Prof. Leigh Deves

Charles Darwin University, Australia

Dr. Chris Eames

University of Waikato, New Zealand

Dr. Gawie Engelbrecht

Technikon Pretoria, South Africa

Ms. Jenny Fleming

Auckland University of Technology, New Zealand

Dr. Thomas Groenewald

Technikon Southern Africa, Johannesburg, South Africa

Ms. Katharine Hoskyn

Auckland University of Technology, New Zealand

Ms. Sharleen Howison

Otago Polytechnic, New Zealand

Mr. Rezaul Islam

University of Dhaka, Bangladesh

Ms. Eve Kawana-Brown

Western Institute of Technology at Taranaki, New Zealand

Ms. Nancy Johnston

Simon Fraser University, Canada

Prof. Stephen F. Johnston

UTS Sydney, Australia

Assoc. Prof. David Jorgensen

Central Queensland University, Australia

Ms. Norah McRae

University of Victoria, Canada

Dr. T. Anthony Pickles

University of Bradford, England

Ms. Susanne Taylor

Technikon Witwatersrand, South Africa

Dr. Neil Taylor

University of New England, Australia

Dr. Neil Ward

University of Surrey, England

Dr. Miriam Weisz

RMIT University, Australia

Mr. Nick Wempe

Whitireia Community Polytechnic, New Zealand

Dr. Karsten Zegwaard

University of Waikato, New Zealand