Review of Curriculum Delivery for
the Libyan Manufacturing Industry

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Abstract

The advancement of technology has greatly influenced the delivery system of technological and, Technical and Vocational Education and Training (TVET) worldwide. The development of curricula has stressed the need for flexibility in structure and modes of delivery of TVET programmes. The aim of this paper is to examine the perceptions of university engineering students and, engineers and technicians to the curriculum delivery. Regarding, the students' perception of curriculum delivery, they agree that their tutors were available to help them and that they used modern technologies in the delivery of their modules. The students thought that their tutorial sessions were appropriately allocated, study materials were available in the library, laboratories were well equipped to deliver the practical part of the course, lecture theatres/rooms were suitable and appropriately equipped, and their school provided support to learners with diverse background. Engineers and technicians, on the other hand, agreed that the delivery methods of the curriculum they studied helped them to be independent learners. They formed the view that part-time study and flexible delivery methods encouraged lifelong learning. They also thought that distance learning or e-learning over the internet could be used to acquire the knowledge and skills required for the manufacturing industry. Work-based learning was said to be an effective way of acquiring the knowledge of employability skills; also, short courses offered by Higher Education institutions were said to be very useful in updating their knowledge and skills.

Index Terms: Curriculum Delivery, Work-Based learning, Lifelong learning, TVET.

Introduction

Technical and Vocational Education and Training (TVET) is one of the key branches of education which produces the manpower resources that make industry more productive. To this effect, Libya has considered TVET colleges as one of the most important factors leading towards the solution of the nation's problems, and its important role in economic and industrial development cannot be easily ignored [1]. However, TVET is an important sub-sector of the public education system in Libya. It has been subjected to an active process of re-designing and has become the focus of the government's strategy in recent years [8] [9]. To address this important issue a network of TVET institutions were introduced in Libya, during 1990s for the purpose of enhancing the supply of skilled manpower needed for the manufacturing industry and the socio-economic transformation plans. The TVET colleges are post-secondary institutions and offer theoretical and practical based curriculum. The main objective of these institutions is to provide highly qualified human resource to fulfil the requirements of the socio-economic development plans [11].

Curriculum Delivery

Providers of TVET should use a wide range of delivery methods including part time, full time, flexible learning, work-based learning, distance and open learning to accommodate the diverse needs of the learners and their learning styles. There have been many significant researches on developing new methods of delivering engineering programmes. These include Work-Based Learning (WBL), [20], Project/Problem Based Learning (PBL), Open/Distance Learning, [5] and Learning Contracts [17]. Problem/Project Based Learning (PBL) is generally regarded as a new method for engineering education [12]. The key assumption of PBL is that learning begins by dealing with problems which happen in the professional environment [22]. In general, they argue that, this method seems to be a

beneficial and promising approach to help students with deep reflection in order to develop process competencies in a PBL setting. The work-based learning specifies work-related learning opportunities unique to the workplace that enables students to apply the academic and occupational knowledge, skills and attitudes they have obtained in the classroom [6]. According to [18], the *"concept of Web-based experiments has revolutionised engineering laboratory and practical work"* (p. 213).

Methodology

Data used in this study were based on a survey data conducted among 9 higher education institutions (Universities/ Institutions) and manufacturing industry in Libya. So as to meet the objectives of this study, quantitative data using a questionnaire was generated to obtain information to examine phenomenon under investigation. The questionnaire aimed to elicit the students' perception of the skills and knowledge they are acquiring during their study in different Libyan Higher Education Institutions (HEIs), and the engineers and technicians working in manufacturing industry about the education and training they received before joining the organisation. The questionnaire used a six-point Likert scale style format. This format allows the students and engineers to place themselves on an attitude continuum for each statement-running from (1=Strongly Disagree to 6= Strongly Agree) [19]. The sample size was 625 and 137 for students and engineers respectively, and this represented a high response rate (85% for students and 61% for engineers). The results of curriculum delivery was analysed and are presented in this paper.

Results of Curriculum Delivery and Discussion

* Students' Perception

(Q1). Timetable Design in Relation to Accommodating Students Needs
The researcher believes that this question (Q.1) is considered an important factor to students since curricula are central to the process of their education. Appropriately designed timetable would serve students' best interest and accommodate their needs in terms of hours of attendance at the course. Furthermore, appropriately designed timetable can lead to increasing students' satisfaction, and also helps sustain high academic and quality standards, as it ensures full attendance by students and motivates them to approach their studies proactively rather than reactively. However, (58.1%) of them expressed their disagreement with the statement; whereas 41.9% of them agreed with the statement. This clearly indicates that the timetable was not adequately designed to cater for accommodating students' needs. It can also be argued that students had no say in designing the timetable, which reflects the top-down bureaucratic approach to designing timetable. From the researcher's own experience, timetables are designed by the departments concerned or in coordination with other departments and given to students without involving them in this practice.

(Q2). Availability of Tutors to Help Students
Students were also asked in Q.2 whether their tutors are available to help them. This is an important issue due to the fact that interaction and aspects of interaction between students and their tutors is well established as an important feature of the learning process [23]. The literature [3] [13] [16] clearly shows that this is one of the key concepts in education as well as in open and distance learning research. The majority of the students (68.2%) agreed with the statement. It can be argued that tutors are available to most students when they need help. Those who disagreed with the statement might, have not interacted with their tutors, possibly due to inappropriate design of the timetable, or even some of them failing to regularly attend their lectures or tutorial sessions. The researcher, from his experience as a student, believes that students require continual tutor support to keep them involved in their studies as well as to help motivate them, which eventually leads to students' satisfaction with the course they study and become more active in classroom discussions and tutorial sessions. The availability of tutors is important in that students can maintain contact with them and ask questions during that contact, whether during a lecture or during tutorial sessions.

(Q3). Appropriate allocation of tutorial sessions
Respondent students were asked (Q.3) whether their tutorial sessions are appropriately allocated. This is an important issue, as it related to timetable design. More students disagreed (37.6%) than agreed (27.7%) with the statement.

Students were also more inclined to strongly disagree than strongly agree with the statement. Data in this question also indicate that more students (34.7% of the sample) were indecisive in their response, either slightly agreeing or slightly disagreeing with the statement. This indicates that tutorial sessions have not been appropriately allocated. This pattern of response is consistent with that relating to improper timetable design (see Q.1 above); whereby more students also indicated their disagreement with proper timetable design to accommodate their needs than those agreeing with that statement. This finding and that analysed in (Q.1) above, clearly indicate that it is necessary to involve students in designing timetables to accommodate their needs.

(Q4). Availability of study materials

Students were also asked whether or not study materials are available in the library (Q.4). The majority (61.9%) of them expressed their disagreement with the statement. This is an important issue for university students to have textbooks, academic and professional journals and other materials relevant to their study available for them. They are required by students to read about the lectures delivered, as well as by academic staff members to prepare their notes and lectures. The pattern of responses clearly indicates that such study materials are not available in quantities that students can have access to them. This is evidence that the library cannot meet the academic needs of most students. It may also point to poor access to the Internet and academic websites to obtain study material needed. The researcher believes that economic transactions imposed against Libya for almost three decades have contributed to this poor availability of study materials. This has resulted in reliance on old, some obsolete literature and denying students and staff to investigate and familiarise themselves with more recent developments in various spheres of knowledge.

(Q5). Use of modern technologies by lecturers to deliver their modules

With regard to their lecturers using modern technologies in the delivery of their modules (Q.5), more than half of students (52.8% of the sample) agreed with the statement, whereas 47.2% of them disagreed with the statement. This may indicate that not all lecturers have access to modern technologies (computers, the Internet, etc.) to help them prepare their lectures and deliver their module, and possibly that lecturers in some of the institutions involved in the study have access to modern technology, whereas others in other institutions may have a limited access, or very poor access to such modern technologies. This might be a factor in lectures not delivered to students up to the standard required; hence not including recent developments concerning some courses. The researcher believes that such modern technologies should be available to both students and academic staff to help them in their study and in preparing lectures using most recent developments in their field of study. The researcher also believes that engineering practical work is currently more geared to using modern technologies to carry out experimental and applied work. It is also due to the UN sanctions that many Libyan educational institutions could not have access to modern technologies.

(Q6). Promoting student-centred learning

Data shows that (Q.6) whether the delivery strategy gives them enough confidence to manage their study. Slightly less than two-fifths of the students (38.1%) agreed with the statement. A slightly more (39.4%), however, were not decisive in their responses, being either slightly disagreeing or slightly agreeing with the statement, and almost one-quarter of them (22.6%) expressed their disagreement. This indicates that a large percentage of students were not sure whether or not the delivery strategy has given them enough confidence to manage their study. This is a serious problem that should be tackled by the departments concerned to boost the confidence of a large number of students to help them manage their studies. The researcher, from his experience, believes that the delivery strategy depends basically on dictating lectures by their tutors, mainly due to the shortage in the availability of study materials. This means that students depend on their tutors in providing lecture notes, and the delivery strategy is far from being a student-centred learning strategy. Again, this pattern is consistent with the limited or poor access of students to modern technologies and that many of their lecturers experience such limited or poor access to such technologies, as explained in (Q.5) above. Authors of [2] argue that the idea of independent learning or student-centred learning has little place in the Libyan system. In the context of life-long learning, this is a matter of concern and reflects the 'spoon-feeding' approach where students merely memorise the information provided by the teachers.

(Q7). Delivery of practical (laboratory) classes

Respondent students were also asked (Q.7) whether the laboratories are well equipped to deliver the practical part of the course. Practical (laboratory) work is vital for engineering students where students can apply theory in practice and prepare them for their future career. It seems that there had been more disagreement (39.4%) than agreement (30.0%) with this statement. Data illustrated in also indicate that more students (30.7% of the sample) were indecisive in their response, being either slightly agreeing or slightly disagreeing with the statement. This is evidence that the laboratories are poorly equipped and do not meet students' needs and requirements of practical lessons. This pattern of response clearly indicates that the study is more theory than practice. This poor delivery of practical lessons does not help students develop their practical skills and adequately qualify for future work.

According to [2] in general there is no enough equipment and facilities in some institutions (such as computers and laboratories, etc.) also he found clear evidence of the reported feeling that educational technology was not well integrated into classroom instruction. Authors of [15] suggests that laboratory work in engineering education can certainly influence students' learning skills and can also help in understanding important concepts in the course. However, laboratory procedures are vital learning tools in engineering and technology education that can be used to increase experimental instruction in engineering courses. As a result, laboratory accreditation is a very important and essential factor in the quality of engineering education [21]. Authors of [21] also add that engineering students need to be prepared for the increasing use of advanced and appropriate technology in their future workplaces. Moreover, the education system lacked adequate facilities, such as libraries and laboratories, especially in the science sections [4].

(Q8). Availability of suitably and appropriately equipped lecture theatres/room

When asked whether their lecture theatres/rooms are suitable and appropriately equipped (Q.8), most students (44.0% of the sample) disagreed with the statement, whereas one-quarter of them agreed with it. A slightly more (30.4%), however, were not decisive in their responses, being either slightly disagreeing or slightly agreeing with the statement. Here again, there had been more strong disagreement than strong agreement. This statement ties up with the statement above (Q.7). It seems that higher educational institutions involved in the study are poorly equipped with lecture theatres/rooms, as well as poorly equipped with laboratories. This poor availability of such vital facilities would reflect negatively on students' attainment and preparation for employment. Lecture theatres/rooms, for example, are not properly equipped with Overhead Projectors (OHPs), or linked to the Internet; simply put, they are not fitted with the basic modern technologies to facilitate the delivery of lectures to students.

(Q9). School Support to learners with diverse backgrounds

Students were finally asked (Q.9) whether their school provides support to learners with diverse background. Most respondent student (62.1%) expressed their disagreement with the statement. This is a clear indication that schools failed to support learners with diverse backgrounds. This pattern is consistent with previous questions that expressed concerning (Q.6), whereby the delivery strategy did not give many students enough confidence to manage their study. For example, there are no special arrangements for disabled students to use the school facilities, or the library; this would discourage people with certain physical disability to join higher education.

* Engineers' and Technicians' Perception about the Delivery of Education and Training--

(Q10). Delivery methods of curriculum studies

Engineers were asked whether the delivery methods of the curriculum they studied helped them to be independent learners, 46% of them agreed with this statement (Q.10). A slightly more (34.2%), however, were not decisive in their responses, being either slightly disagreeing or slightly agreeing with the statement. This might be attributed to the fact that lectures as 'spoon-fed' to students rather than leaving it to students to study and investigate on their own, mainly due to the lack of adequate and enough teaching materials, such as text-books, journals, etc. in libraries and learning centres.

(Q11). Part-time study and flexible delivery

With regard to whether part-time study and flexible delivery will encourage staff to continue studying, the majority

of respondent engineers (76.6%) agreed that their part time study and flexible delivery will encourage more staff to continue studying to gain new knowledge and skills (Q.11). Offering staff the opportunity to embark on part-time study will certainly motivate them to study further, broaden their knowledge of recent developments in their field of work and enhance their career and promotion. The researcher thinks that offering staff flexible work arrangement can help them join higher education institutions on a part-time study basis and encourage staff to further their knowledge and skills. Without such arrangements it is very difficult to reconcile work with staff aspiration to study further.

(Q12). Distance learning or e-learning over the Internet

When asked whether distance learning or e-learning over the Internet could be used to acquire the knowledge and skills required for the manufacturing industry (Q.12), the majority of respondent engineers (78.1%) agreed with the statement. E-learning can increase the efficacy and quality of education, including job-based education and training. This issue has been recently addressed by the [10]. Engineering experiments can also be carried out using the Web and the Internet. According to [18] the idea is to perform real experiments in real time on real equipment, but over the Internet. The researcher believes that staff can join a course using distance learning institutions or e-learning centres over the Internet and study further without the necessity of leaving their jobs or homes to attend lectures and tutorials.

(Q13). Work-based learning

When asked whether work-based learning is an effective way of acquiring the knowledge and skills relevant to their job (Q.13), the majority of respondent engineers (71.5%) agreed with the statement. The pattern of these responses to this statement is consistent with those reported for the previous statement, since distance learning and e-learning are also effective ways of acquiring skills and knowledge relevant to the respondents' job. On-the-job training or learning is a major way to improve the quality of knowledge and skills of staff while they remain at work. The researcher believes that this type of learning is most effective and beneficial both for the organisation and the staff members concerned. [14] argues that company-based training makes a major contribution to the whole investment in human capital stock and that large amounts of capital are spent on company training annually.

(Q14). Usefulness of industrial placement for acquiring employability skills

In terms of whether their industrial placement is very useful for acquiring the employability skills (Q.14), the majority of respondent engineers (84.7%) agreed with the statement. The remaining 3.6% of them only slightly disagreed. Interestingly, none of the respondent engineers strongly disagreed and slightly disagreed with the statement. Industrial placement helps engineers to acquire further knowledge and skills relating to the nature of their jobs, and hence those who have industrial placement would be more productive and more efficient in carrying out their jobs upon return to their places of work. Off-the-job learning is vital for the staff as it takes them away from their workplace and places them into a learning place where facilities are available to be provided for them. This type of learning, according to [7], *"enables the trainee to study theoretical information or be exposed to new and innovative ideas"* (p. 389).

(Q15). Short courses offered by Higher Education institutions

When engineers were asked whether the short courses offered by higher education institutions are very useful in updating their knowledge and skills (Q.15), the majority of respondent engineers (73.7%) agreed with the statement. Short courses offered by higher education institutions provide engineers with more recent developments in their field and boost their knowledge and enhance their skills, since such institutions have the equipment and teaching materials required for updating staff knowledge and improving their skills. These institutions have the professional personnel who can cater for the needs of the learners and can design courses to match the needs of the organisations concerned. This type of learning can also be considered as a type of off-the-job-training or learning.

Conclusion

Based on the above findings and discussion, it can also be concluded from the students' responses to items relating to curriculum delivery that most students agreed that their tutors were available to help them, and that lecturers use

modern technologies in the delivery of their modules, whereas only some of them agreed that the delivery strategy gives them enough confidence to manage their study; more were not decisive in their responses. However, most of students disagreed that the timetable's design was not accommodating their needs; their tutorial sessions were appropriately allocated; study materials are available in the library; the laboratories are well equipped to deliver the practical part of the course; the lecture theatres/rooms are suitable and appropriately equipped; and their school provides support to learners with diverse background.

With regards to the engineers and technicians' perceptions of the delivery of education and training, it can be concluded that most of them agreed that the delivery methods of the curriculum they studied helped them to be independent learners. Part-time study and flexible delivery will encourage staff to continue studying. Also distance learning or e-learning over the Internet could be used to acquire the knowledge and skills required for the manufacturing industry. Work-based learning is an effective way of acquiring the knowledge and skills relevant to their job. The industrial placement is very useful for acquiring the employability skills and the short courses offered by higher education institutions are very useful in updating their knowledge and skills.

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