The usage of the Internet in the development of education programmes: a case study in Turkey

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ABSTRACT: The aim of this study was to develop educational programmes for 15 programmes within two-year colleges in coherence with vocational high schools and industry. An Internet site was utilised to facilitate communication between stakeholders of the curriculum development project. Lecturers, instructors, teachers and specialists from the Ministry of National Education, the Turkish Higher Education Council, two-year colleges and vocational high schools, chambers, unions, education faculties and industrial sectors gave contributions on curriculum development studies by using the project's Web page. Invited curriculum experts from the USA (Minnesota State College and University System) and the UK (Fife College) also contributed to the curriculum development project. Fifteen engineering and technology programmes for Turkish two-year colleges had been developed by means of the Internet within a six-month period in Turkey in 2002. Enrolments in these 15 programmes comprise about 60% of all students in two-year colleges in Turkey. The developed programmes have been applied in 439 two-year colleges for the 2002-2003 education year.

INTRODUCTION

Engineering as a discipline has been taught for centuries. Over the years, a standard engineering curriculum has evolved. While accreditation agencies have provided general guidelines, courses were often created and taught by the instructor most interested in the subject area. Several curriculum design methods have been developed so far. As yet, there is no universal agreement on a methodology for curriculum innovation, renewal or development and, in fact, there is significant variation in opinions as to what constitutes a good curriculum [1].

One reason for this lack of universal methodology is the large number of constraints involved in developing any particular engineering curriculum (eg budget, facilities, identification of employer needs and available faculty time). Further, the effects of these constraints are almost certain to be different from country to country.

Recent rapid advancements require adjustments and improvements of educational programmes. The cyber-world provides effective, efficient and rapid interaction and communication, despite the physical distance.

Many books articles and reports can be found on curriculum renewal or development studies. The American Society for Engineering Education (ASEE) recently issued a project report entitled *Engineering Education for a Changing World*, which emphasised that engineering colleges must accelerate the *reshaping* of their curricula to incorporate the following:

- Team skills, including collaborative and active learning;
- Communication skills;
- Leadership;
- A systems perspective;
- An understanding and appreciation of the diversity of students, faculty and staff;
- An appreciation of different cultures and business practices and the understanding that the practice of engineering is now global;
- Integration of knowledge throughout the curriculum;
- A commitment to quality, timeliness and continuous improvement;
- Undergraduate research and engineering work experience;
- Understanding of the social, economic and environmental impacts of engineering decisions;
- Ethics.

The ASEE report concluded that more must be done to *speed and improve the process* of engineering curriculum reform [2]. Also, Finch and Crunkilton presented the fundamental principals of a project on curriculum development in vocational and technical education [3].

In 1987, the Colombo Plan Staff College issued a book tackling issues concerning aspects of curriculum for technician education. This book described important elements in technician curriculum design, curriculum and subject analysis, teaching methods, evaluation and measurement, curriculum implementation, and others [4].

A Web-based curriculum development project of 15 two-year colleges in Turkey was developed within six months. This was achieved with the collaboration of the Ministry of National Education and the Higher Educational Council.

BACKGROUND INFORMATION

Higher education in Turkey refers to all educational institutions, including two-year colleges, vocational high school faculties (BS degree) and institutes (MS and PH degrees). Two-

year colleges are currently under the responsibility of universities.

Admission to higher education is based on a nationwide examination, except for technical and vocational high schools, which are administrated by the Student Selection and Placement Centre (OSYM).

All universities and higher education institutions are affiliated with the Higher Education Council (YÖK). The Council is an autonomous body with the authority and responsibility to administer the activities of all higher education institutions, including those universities established by some non-profit foundations.

Thus, the number of students in higher education is comprised as follows:

- Formal education: 1,015,151;
- Open learning: 524,457;
- Total: 1,539,608.

Approximately 1,600,000 students take the university placement examination every year, but only 170,000 of them can be placed to faculties and 4-year higher schools, while 180,000 are placed at two-year colleges.

The aim of the development of the curriculum was to equip students with the necessary knowledge and skills required by the industrial sector, enable them to interact better with their colleagues, be active participants of social-cultural activities, and make use of new technologies [5].

Curriculum Renewal Studies in 1986 and 1996

In 1985, a project funded by the World Bank under the direction of the Higher Education Council (YÖK) was initiated to develop 21 engineering technology programmes in 1986 by English, American and Turkish curriculum development specialists. As part of the project, workshop and laboratory equipments and machines were purchased to support the 21 engineering technology programmes, which cost about US$150 million. Technical and vocational education needs to constantly evaluate engineering technology programmes. In 1996, after 10 years of operation, it was apparent that the engineering technology programme required revision against the development of Turkish industry [6][7].

There were three main objectives of the curriculum development projects in 1996, namely:

- A core group of *lead* instructors was established to work closely with two-year colleges in order to design and document a system called *Curriculum Development: Monitoring, Evaluating and Renewal* (CDMER).
- Training was designed and provided to equip one *lead* instructor from engineering technology programmes with the knowledge and skills to carry out the tasks related to CDMER.
- The training provided to two-year colleges was linked to leadership in relation to instructor training, an operational introduction to the revised curriculum of engineering technology programmes and the development of a management system to ensure CDMER sustainability.

THE CURRICULUM DEVELOPMENT PROJECT IN 2002

After five years, in 2001, it was necessary to develop the engineering technology programmes of Turkey's two-year colleges. The main aim of curriculum development was to ensure continuation within and among the programmes at vocational high schools and two-year colleges.

Currently, there are approximately 300,000 students studying at 296 diploma programmes at 439 two-year colleges in Turkey. These students were placed at various programmes based on their university entrance examination results. According to the law, Number 4702 made in 2001, vocational high school graduates will be placed at programmes at two-year colleges without having to sit a university entrance examination. The placement decision will be made according to their criteria such as graduation degree, graduation year, etc. Students have been provided with handbooks detailing information about the transition criteria.

The Ministry of National Education and the Turkish Higher Education Council decided to develop the selected 15 two-year college programmes. It should be noted that students enrolled in these 15 programmes comprise 60% of the total number of two-year colleges students in Turkey [8].

Methodology of Curriculum Development

Curriculum development process is generally modelled in three stages, as follows:

- Stage 1, Planning the Curriculum: Preparation and design of Web pages for curriculum development processes, and collection and assessment of two-year colleges and employment related data.
- Stage 2, Establishing Curriculum Content: Analysis of existing curriculum content, identification of curriculum objectives and goals, determination of the content, and setting up of the feedback mechanism.
- Stage 3, Implementing the Curriculum: Writing of the content of courses and assessment of the developed curriculum [3].

The Curriculum Development Committee, Administrative Board, Core Group and Curriculum Development Commission and their job descriptions were identified by the Chair of the curriculum development project. Stakeholders who took part in the development of these programmes included representatives from two-year colleges, vocational high schools, graduates of two-year colleges, chambers, unions, the Ministry of National Education, the Higher Educational Council and non-governmental educational organisations dealing with technical and vocational educational issues, as well as employees and employers of the related sectors. The organisational structure of the curriculum development project is shown in Figure 1.

RESPONSIBILITIES AND ROLES OF THE BOARD, COMMITTEE, GROUP AND COMMISSION

Administrative Board

The Board consisted of five members, one of whom was the Chair, while the other four members were representatives of the Ministry of Education, the Turkish Higher Education Council, the heads of two-year colleges and specialist commissions.

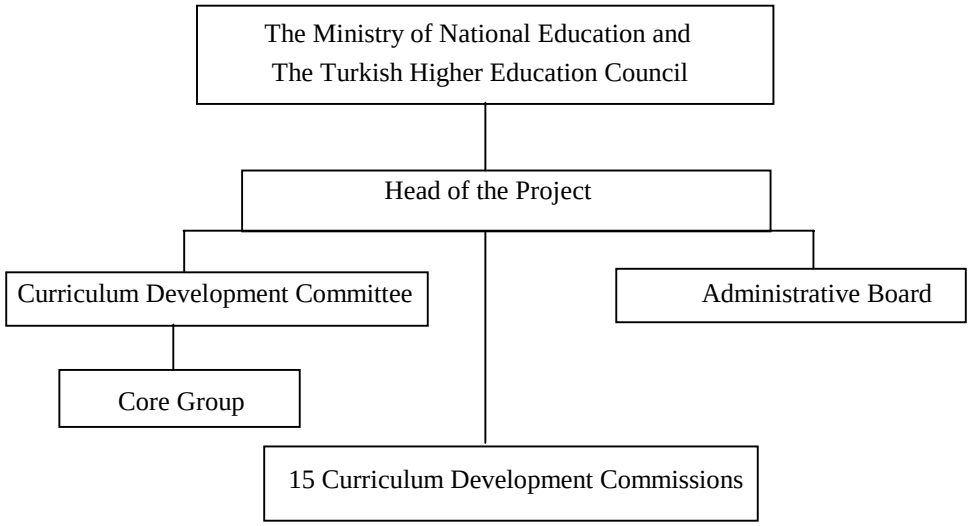

Figure 1: Organisational structure of curriculum development project.

The Administrative Board's responsibilities were to ensure that the project was developed in accordance with the aims and goals of the project and within the identified timeframe.

Curriculum Development Committee

The Curriculum Development Committee consisted of the Chair of the project, the head of specialist commissions, members of two-year colleges who had full experience in curriculum development and effective and efficient interaction with the industrial sector, two representatives from the business world, plus curriculum specialists. The Committee met when requested by the Chair to discuss issues on the agenda, as well as monitor the developmental process of the project and ensure coordination among and between commissions.

Curriculum Development Core Group

The Curriculum Development Core Group consisted of two academics, two representatives of chambers, one from the Ministry of National Education (Vocational and Technical Education Development Center: METARGEM) and three from specialist commissions.

This group's responsibilities were to ensure coordination between specialist commissions during the process of curriculum development, as well as make recommendations to the Chair of the project.

Curriculum Development Specialist Commission

The Curriculum Development Specialist Commission consisted of six specialists, four of whom were from two-year colleges and two from vocational high schools. Representatives of relevant sectors attended the meetings when approved or requested by the Chair of the project. The head of specialist commissions was appointed by the project's Chair to determine opinions from the Commission's members.

The Commission's roles and responsibilities were as follows:

- To develop the timetable based on the work schedule of the project.
- To coordinate with the other specialist groups to ensure unity of format.
- To present the programme, which would be developed in compliance with the goals and objectives of the project, to the Curriculum Development Committee.
- To obtain necessary documents and resources and contact the Curriculum Development Committee when necessary.
- To ensure effective and efficient interaction with the Curriculum Development Committee.

Appointment of Committee and Commission Members

The Turkish Higher Education Council (YÖK) carried the responsibility to ensure a proper flow of information, as well as the appointment of the project's members.

Progression

The curriculum was initiated in January 2002 and completed on 30 May 2002. It was developed by the Curriculum Development Committee in accordance with the agenda. Principles and legislative constraints of the curriculum development process were presented by the Administrative Board to members of the Curriculum Development Committee and commissions. The Internet was utilised in order to share ideas and receive contributions from outsiders and between members. Two-year college instructors, vocational high school teachers, industry representatives and curriculum specialists also had the opportunity to review the studies carried out at any time.

Decisions Taken by the Curriculum Development Administrative Board

The Curriculum Development Administrative Board made several decisions to maintain harmony and order between programmes. These include:

- The basic skills and knowledge to be acquired by students should be identified.
- There should be continuity and contingency within and among the content of each subject area.
- Questionnaire results and recommendations should be analysed and adjustments should be made accordingly.
- The curricula of two-year colleges, as approved by international quality and accreditation councils or boards,

should be reviewed and common features of these curricula should be identified.
- Weekly class hours should be 24 at minimum and 28 at maximum.
- A minimum of four hours and a maximum of eight hours should be allocated to elective courses during the 3rd and 4th semesters. The number of elective courses should consist of a minimum of two and a maximum of four in the second year.
- Class hours should be two hours at a minimum and four at a maximum.
- The theoretical component of each course should form 30-40%, whereas the practice element should comprise 60-70%.
- Mathematics, basic science, information technology, communication, management knowledge, sports-arts, music and cultural courses should also be integrated into the curriculum.
- The goals and objectives of each course should be clearly identified in the course outline.
- Recommendations regarding the methodology, evaluation and assessment should also be identified in the course outline.

The developed curriculum programmes are as follows:

- Electrical Engineering Technology;
- Industrial Electronics Technology;
- Telecommunications Technology;
- Process Control and Instrumentation Technology;
- Mechanical Engineering Technology;
- Automotive Technology;
- Computer Technology;
- Air Conditioning and Refrigeration Technology;
- Civil Engineering Technology;
- Textile Technology;
- Office Administration;
- Tourism and Hotel Management;
- Financial Administration;
- Accounting;
- Marketing.

Advantages of Web-based Curriculum Development

A special Web page was designed for fast and interactive communication between members of the curriculum development project [9]. Representatives from the curriculum development project were selected from two-year colleges, graduates of two-year colleges from industry chambers, union and non-governmental organisations. Everybody observed the progression of studies and sent their opinions and suggestions to the Commission's members. Five meetings were held to discuss and assess curriculum development on a mutual basis.

Some distinct advantages of utilising a Web-based curriculum development process include the following:

- Technology-based team study;
- The least amount of bureaucracy;
- Interactivity;
- Study within a virtual environment;
- The ability to reach the information resources easily and continually;
- Horizontal, vertical and diagonal communication;
- Flexibility;
- Transparency;
- Parallel study;
- e-administration, e-observation and e-supervision;
- Being economical [8].

Questionnaire Feedback

A database was developed to contain all of the data obtained from questionnaires that were distributed and to avoid conducting data queries manually, which would be a complex process considering the large amount of data involved. A spreadsheet was used to generate a series of tables and figures to examine the basic features of variables.

In the survey questionnaire, two-year colleges and industrial sectors and graduates of engineering technology programmes stated those subjects that were thought to be part of their programme and production field [10][11]. Results from the survey questionnaire are detailed below.

The results of the questionnaire administered to engineering technology graduates from the last five years are as follows:

- Greater emphasis should be placed on practice in laboratories and workshops.
- The number of hours allocated to information technology, Computer-Aided Design (CAD), testing, planning, control and production, should be increased.
- Lack of knowledge in quality control, measurement and engineering material testing and analysis should be overcome.

The results of the questionnaires administered to employers are as follows:

- Students should be equipped with the basic knowledge and skills required by the profession.
- Students should undertake responsibility and obey ethical rules.
- Students should be able to use a computer at the basic level, at a minimum.
- Students should be able to work cooperatively.
- Students should keep up-to-date with technological improvements.
- Students should have the knowledge about engineering materials, quality control and standards.
- Students should speak, write and understand English or any other international language at a basic level.
- Students should be furnished with the necessary vocational knowledge and skills about computer technology.

The results of the questionnaire administered to two-year college instructors are as follows:

- Existing engineering technology curriculum should comply with the needs of Turkish industry.
- The curriculum should be revised in accordance with technological improvements.
- Responses to the query, *would you like to contribute to the engineering technology curriculum development studies?*, were as follows: Yes (75%); No (12%); and N/A (3%).

- Responses to the query, *what is your opinion about the Web-based engineering technology curriculum development process?*, were as follows: Perfect (97%); Disagree (1%); and N/A (2%).

CONCLUSIONS

The Internet has become an inseparable part of today's world. Curriculum design and development procedures have to be carried out based on technological developments. Programmes have to be revised or abandoned, dependent on customer demand. The importance of ensuring coordination between and among educational institutions, industrial employers, government offices that dealing with training, educational foundations, unions and chambers of commerce has become an internally recognised fact. However, it would be quite expensive and infeasible to have all parties meet frequently.

The level of discussion and interaction among the parties involved was easily achieved through facilitating a Web-based curriculum development project. Nevertheless, the Administrative Board, the Curriculum Development Committee and the Curriculum Development Core Group were still able to meet three times, while the Curriculum Development Commission managed to meet five times. During the curriculum development process, employers, graduates of two-year colleges and academicians were contacted. Furthermore, the curricula of two-year colleges in the USA (the Accreditation Board for Engineering and Technology (ABET)) and Scotland (the Scottish Qualifications Authority (SQA)), which have been accredited by quality assurance boards or centres, were reviewed.

The documents produced were delivered in both print and CD formats for use by two-year colleges. The developed curriculum includes a list of laboratories, resources and course materials for each branch.

Approximately 300 programmes of two-year colleges will be revised and updated in accordance with the needs of the industrial sector over the next few years. It has been decided to have 50-60 main programmes and branches relevant to them. It is strongly believed that these programmes can be implemented successfully if the necessary resources are obtained. The curriculum developed can fulfil the needs of Turkish and global industries in the near future. The curriculum developed should be revised or renewed within three years.

Two-year colleges should have the necessary workshops and laboratories for the engineering technology programme to be effective and efficient. The Curriculum Development Commission has identified the necessary workshops-laboratories, equipment and machines to be placed in these workshops-laboratories. However, the most important element of educational programmes is the instructor. Instructors should improve themselves based on technological advancements and move towards professional competency.

All students enrolling in two-year colleges are vocational high school graduates. A level of continuity and contingency between the programmes of the stated instructions were almost achieved.

Employers sought two-year vocational school graduates who were furnished with basic knowledge and skills, capable of using computers, had an elementary level of knowledge of a foreign language, ready to take on responsibility, could work cooperatively, well-informed of developments in the field, and valued work ethics.

Students, on the other hand, wanted programmes to be more practice-centred than theory-centred, be trained to be able to use the latest technologies, incorporate vocational standards, include administrative entrepreneurship in the content, and involve extensive training in a foreign language and computers.

Furthermore, the majority of students preferred to continue their study at four-year faculties. Due to limited student quota of state universities, students continued their further studies at foundation universities in the USA, UK and other countries.

Necessary agreements were almost reached in terms of student transition from two-year colleges to faculties of Minnesota State Universities and Colleges Systems (MnSCU) and some English universities and colleges. It can be said that the curriculum development is a movement from the national to the international arena.

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