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Oktay C. Adiguzel
Anadolu University, Eskisehir, Turkey

Cigdem S. Cardak
Anadolu University, Eskisehir, Turkey

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Cigdem S. Cardak

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Abstract

The purpose of this study was to evaluate the "Computer Technology and Programming" curriculum offered at vocational colleges with a focus on the goals of the curriculum and student thoughts. Document analysis and semi-structured interviews were conducted to gather the data. Results revealed that there were mainly four problematic issues related to the "Computer Technology and Programming" curriculum. These were: poor quality of education, inadequacy of industry-based education, limited areas of specialization, and poor environment and inadequate opportunities. Results were discussed extensively and recommendations were offered regarding the structural problems of vocational colleges and the "Computer Technology and Programming" curriculum.

Background

The main goal of vocational and technical education is to help individuals to become knowledgeable, skillful, practically proficient,

Oktay C. Adiguzel is an Assistant Professor of Curriculum and Development in Education in the Department of Educational Science of Education at Anadolu University in Turkey. He can be reached at ocadiguzel@anadolu.edu.tr.
Cigdem S. Cardak is a research assistant at Anadolu University, Turkey. She can be reached at csbelikusakli@anadolu.edu.tr.

and to carry out essential tasks of the job. Its basic function is to enable individuals to earn money, and thus to contribute to the society in social and economical terms (Alkan, 1999). With this function, vocational and technical education has the power to influence the industrial and economical growth of the country. Therefore, developed countries put special emphasis on vocational and technical education at the secondary and higher education level within their education system. Developing countries spend great efforts to improve vocational and technical education for the purpose of increasing the quality of the workforce which is necessary for the rapid development of the society and for a more powerful economy (Saglam & Adiguzel, 2007).

The struggle of Turkish industry to participate in the global world market has substantially increased the importance of the institutions of vocational higher education. It is of vital importance for the Turkish economy to train the workforce that will keep up with the current developments and that has professional skills and knows the business world well. This trained workforce will help Turkey to follow up the technology which is rapidly-renewed and constantly-developing parallel to the developments in science. It will also enable the Turkish economy to compete with the developed countries in the global world market.

On the other hand, vocational and technical education in Turkey is neither qualitatively nor quantitatively at a desired level in terms of secondary and higher education. In the academic year of 2005–2006, the number of students at the secondary level of vocational and technical education constituted only 32% of the total number of students from all educational institutions (Higher Education Council, 2006).

In Turkey, students graduated from primary school (8 year) attend one of the schools of general education or vocational-technical education at the secondary level. However, they have to choose their school as a result of their success in the Entrance Exam for Secondary Education Schools organized by the Ministry of National Education throughout the country. The duration of secondary education is four years. General education, the basic goal of which is to prepare students for academic higher education, is given in general

high schools and in the foreign-language-based schools, science-oriented schools, social-sciences-oriented schools and fine-arts-oriented schools. Vocational-technical education, the basic goal of which is to prepare students for jobs and for two-year vocational colleges in higher education, is given in vocational high schools and technical high schools. Those who want to attend a higher education institution are required to be successful in the Higher Education Entrance Exam organized in the whole country in June every year. Parallel to their secondary education, students choose one of such areas as Turkish-Mathematics, Mathematics-Science, Social Sciences and Foreign Language in the Higher Education Entrance Exam. According to their score types of the related area, students who succeed in the exam choose a certain number of majors, and then, are placed in one of the higher education programs by the Center for Student Selection and Placement Center according to students' performance on the test and their choice of majors (Saglam, 2006).

Earlier in 2007, seventeen new universities were founded in Turkey, in addition to a total of ninety-nine universities, of which sixty-eight are state universities, twenty-five are foundation universities, and six belong to the Ministry of Internal Affairs and the Ministry of National Defense. Except for the newly-established universities, state universities and those of the foundations currently include 591 faculties that deliver four-year academic and vocational programs. In addition to these faculties 179 teach at four-year colleges and 474 teach at two-year vocational colleges (Higher Education Council, 2006).

Vocational Colleges in Turkey have been included into the university system by Higher Education Law published in 1981. The foundational aim of the vocational colleges might be defined as educating vocational and technical secondary school graduates in their study fields; therefore, growing them up as high qualified workforce who could adapt himself/herself to scientific and technological developments work life needs and achieve qualified production. According to the Higher Education Law, the number of vocational colleges has increased noticeably from the administrative, financial, educational perspectives since 1982. The data of 2005-2006 academic

year reveals that, 474 Vocational Colleges in the Higher Education System have been providing vocational education. In vocational colleges, 262 two-year vocational college programs (e.g., science, technical, accounting, finance, management, law, business, tourism, agriculture and health) have been implemented (Higher Education Council, 2006). Approximately 400,000 students have been attending these programs and this corresponds to nearly 28% of the students in the formal higher education system. To increase this ratio, beginning from the 2002-2003 academic year with the help of 4702 Numbered Law, graduates of vocational and technical secondary schools had the opportunity to attend vocational colleges without dealing with the entrance exam. With the help of the "Attendance Project without Examination," it was predicted that the number of vocational college students would increase. However, more students attend four year higher education institutions rather than two year ones. In Turkey, 138 vocational colleges have closed since the request for these schools is not enough (Higher Education Council, 2006). Factors negatively influencing the request for vocational colleges were examined in two main areas (Saglam and Adiguzel, 2007): Absence of teaching staff and environmental and hardware inadequacies.

Absence of teaching staff

Since vocational colleges are units within universities, the absence of teaching staff in universities and the ill-balanced distribution of them within and among the institutions are generally more obvious in vocational colleges. For instance, according to the statistics from the Council of Higher Education, in the education period of 2004-2005, the number of teaching staff working in the schools of vocational colleges was 5,787, and there were 56 students per instructor. This ratio is 5 students per instructor in Germany, 10 in Belgium, 11 in Hungary, 14 in Holland and 20 in England (Higher Education Council, 2005). Qualitative and quantitative deficiencies of teaching staff in vocational colleges cause a decrease in the quality of education and consequently these effects expectations of management, education and economy domains from vocational colleges and the appealing of these colleges negatively.

Environmental and Hardware Inadequacies

Despite the fact that vocational colleges are connected to the universities, most of them are located outside of the university campus. Especially in recent years, due to political reasons, many schools of vocational colleges have been placed in smaller districts of cities where the university campuses are not found. These districts are generally 50-200 kilometers away from the city centers. Since the majority of the university professors live in the city centers where their universities are located, they do not prefer to travel and teach some of the classes in the vocational colleges. For this reason, the need of teaching staff for vocational college is supplied from the teachers working in vocational and technical secondary schools in the region. Another important problem of the vocational colleges in small residential districts is that they don't have enough laboratories, workshops, areas for application, course materials and tools, and technological equipment, all of which are necessary for teaching. Just as in the report of "I. National Vocational Colleges Administrators Meeting", these problems of vocational colleges related to the technological inadequacies were indicated. In this report, it is specified that in most of vocational colleges laboratories were not equipped with modern technologies (Higher Education Council, 2004).

With the "Development of Curriculum of Vocational Colleges Project" prepared by the Ministry of National Education, developmental studies to solve the problems related to legal and organizational and educational dimensions have been started. Accordingly in the direction of the needs of vocational colleges and industry, 15 new curricula of vocational colleges have been developed in six months with the help of 130 experts and have been implemented since 2002. One of these curricula, "Computer Technology and Programming," was planned to be a two-year program consisting of 28 credit hours a week in a semester. Those who graduated from the programs of "Information Processing", "Computer", "Computer Hardware", "Computer Management", "Computer Management Technician" and "Computer Software" at

the vocational and technical high schools can attend this program. The program was intended to train computer technicians who are knowledgeable about software production, (PC, network and the internet), equipment maintenance (hardware) and about the establishment and management of computer networks, yet who are specialized only in one of these areas having more theoretical information than a technician and practically more skillful than an engineer. The "Computer Technology and Programming" curriculum is a combination of the previous curricula of "Computer Operation and Technician", "Computer Programming", "Computer Hardware", "Computer Technology and Programming", and "Computer and Information Systems."

Purpose

The aim of this study was to evaluate the curriculum and function of "Computer Technology and Programming". There are three reasons for choosing this program to evaluate. The first reason is that information and communication technologies have become more widespread. In this fast developing world, it is highly important to educate a qualified workforce in Turkey to reach a dynamic, competitive, and economic structure. Second, this curriculum is one of the curricula developed and implemented within the scope of the curriculum development studies. Therefore, the operation of this curriculum serves as an example for other curricula. Third, because of high demand in the industry for a qualified workforce related to computer technology and programming, the curriculum of "Computer Technology and Programming" is preferred more by students than the other curricula of two-year vocational colleges.

In the scope of this study, the aim was to answer the following questions:

1. Is the curriculum of Computer Technology and Programming consistent with the aims of the curriculum?
2. Do the problems indicated for other vocational colleges apply for the curriculum of Computer Technology and Programming?

3. What are the views of the students regarding the institution they were attending and the curriculum of Computer Technology and Programming?

Method

Participants

The study was carried out on the second year students attending the program of "Computer Technology and Programming" in Porsuk Vocational College of Anadolu University, Eskisehir, in the academic year of 2006–2007. Second year students were selected for the purpose of the study since it was thought that they would have extensive knowledge about the curriculum and be able to evaluate it. Participants were students with different academic achievement levels who signed the consent form and agreed to participate in the study. The students were separated into three groups based on their achievement level (Low level: GPA lower than 2.50; Moderate level: GPA between 2.50 and 3.00; High level: GPA higher than 3.00). Only four students in each academic achievement level agreed to be interviewed voluntarily. Therefore, interviews were done with a total of 12 students totally.

Research Design

A qualitative research method was used. Within the scope of the qualitative research method, the data were gathered through the examination of the written documents and semi-structured interviews.

Data Collection

Document analysis. In order to collect the research data, the curriculum of "Computer Technology and Programming" in vocational colleges was examined with the method of descriptive analysis.

Semi-structured interviews. There are different taxonomies related to the interviews which are a type of data collection technique in qualitative studies. Fielding (1996) defines interviews as "standardized", "semi-standardized" and "non-standardized". Like Fielding (1996), Minichiello, Aroni, Timewell, and Alexander, (1990) also define three types of interviews. The first type, structured interviews, consist of questions and answer choices decided before the interviews. The second type of interview, semi-structured interviews, involve open-ended questions under main topic. Participants are directed to answer the questions freely and then is interviewed deeply. The interviewer previously prepared the questions related to the interview topics, asked these questions during the interview and directed explanatory questions, when necessary, in order to clarify the answers given to the questions. The last type of interview is unstructured interviews in which there is no classification of questions and any other classification (Punch, 2005). According to these taxonomies in this study the semi-structured interview type was chosen to collect data on interview topics decided before the interviews.

The interviews lasted 25-35 minutes on average, and all the interviews were audio-recorded. Prior to the interviews, the participants were asked for oral and written permission. During the interviews, several questions were directed to the issues of "information about the structure and the content of the program of "Computer Technology and Programming". For this issue, the following questions were asked:

Questions Related to the Quality of Education: **"**What are you thinking about the relationship and wholeness between your learning in secondary education schools and in vocational colleges?" "How is the opportunity of practice in courses related with software and hardware?" "What is the ratio of theoretical course hours and applied course hours?"

*Questions Related to the Environment and Facilities: "*What are the difficulties/limitations/problems related to the facilities of the colleges?"

*Questions Related to the Specialization Fields: "*Does the education you have here provide you a specialization in any computer-related fields? Could you please explain this?"

*Questions Related to the Organizational Structure and Content of the Industrial Education: "*Related to industry-based education (internship), what are the problems you came across before the internship, during the internship and after the internship?"

Data analysis

Document analysis. For the analysis of the education program, evaluations were made regarding such issues as the description of the profession, the goals of the program, the distribution of the credits of the compulsory and elective courses and the classification of the elective courses according to the specialization areas.

Analysis of the semi-structured interviews. Descriptive analysis of data gathered through semi-structured interviews was run as follows (Blanchet & Gotman, 2001; Yıldırım & Şimşek, 2005): (1) all the interviews were transcribed into texts; (2) depending on the data obtained and considering the related literature and the conceptual framework, a thematic frame was formed and the themes determined were given codes; (3) in line with the thematic frame, data were read and the frequencies of the themes were found. The themes determined were classified under main headings. In this phase, for the reliability of the thematic frame formed of the data, two researchers work independently on the whole data set and produced themes individually, then they worked together and came to consensus on the themes and frequencies of data; (4) the results were supported by direct quotations.

Results

In order to find answers to the question of "Is the Computer Technology and Programming consistent with its goals?" the relationship between the goals of the curriculum and the distribution of the courses were examined. Results of document analysis

depending on the description stated in the curriculum about a computer technician that, "She or he has more theoretical information than a technician and more experience in practice than an engineer", the course hours allocated to the applied and theoretical courses in the program were examined. In addition to this, considering the objective stated in the curriculum that "training computer technicians who are knowledgeable about software (PC, network and the internet), equipment maintenance (hardware) and about the establishment and management of computer networks, yet who are specialized only in one of these areas," analysis was made regarding the alternative specialization areas students were provided with. The results of this analysis are presented in Table 1.

Table 1 shows that 69% of the curriculum was found to be allocated to theoretical courses and 31% to applied courses. Therefore, although experience in practice is quite significant in vocational colleges and this significance is frequently stated in the curriculum, it was revealed that the applied courses have a very small proportion in the curriculum. Moreover, according to Table 1, 72 hours of the total course hours were allocated to the compulsory courses and 36 hours to the elective courses. When the distribution of the compulsory and elective courses in the curriculum were examined, it was observed that there were not enough alternatives for specialization in different computer-related areas and that specialization in an area tended to be achieved through elective courses. When the elective courses given in the curriculum for the purpose of specialization in a computer related area were examined, it was seen that 60% of the elective courses were in the specialization area of software, 70% was found to be theoretical courses and 30% were allocated to the applied courses. Hence, it was concluded that there was not a wide range of elective courses in the curriculum and students were mostly encouraged to be specialized in the area of software via software related compulsory and elective courses which were mostly theoretical.

In order to better understand these results obtained through the examination of the curriculum, the data collected via semi-structured interviews held with the students were analyzed to reveal how they perceived the curriculum and how their education processes were

influenced. The views of the students retrieved from the semi-structured interviews with the students were analyzed. During the interviews, perspectives of participants focused on four main themes by stating a total of 71 statements pointing out these themes. Of 71 statements, 38 (54%) statements were regarding the poor quality of education while 15 (21%) were related to the inadequacy of internships and 13(18%) were regarding limited areas of specialization. Only 5 (7%) of the statements were associated with issues of poor environment and inadequate opportunities.

Poor quality of education: The analysis of the interviews held with students demonstrated that most of the statements of the students were on the problems related to the quality of education. Out of 71 statements, 38 (54%) statements were regarding this issue. Further analysis of this issue based on statements made by participants was conducted to explore this issue in depth. Four main sub-issues were identified (see Table 2).

The curriculum of "Computer Technology and Programming" of Two-Year Vocational Colleges enrolls the students who graduated from computer technology-related programs of vocational and technical secondary schools and entered vocational college without the entrance examination in addition to the students who graduated from general secondary schools and entered entrance examination. It was identified that students whose educational backgrounds and levels of readiness were different viewed this as a problem. One of the views stated by the participants was as follows:

> [S7-"*In fact, we didn't take education on computer at all. As we were in vocational high school, we took courses like electronic and electric. And in our third grade of the school, we as the department of computer were on probation. Actually, it wasn't consistent with the education given here*."]

Table 1.

Course Distributions of Curriculum "Computer Technology and Programming"

COURSES		Weekly Course Hours		
		Total	Theoretical	Applied
	COMPULSORY COURSES			
I.	Programming			
	a. Algorithm	4	3	1
	b. Data Structures	4	3	1
	c. Visual Programming	8	6	2
	d. Microcomputer Systems	4	3	1
TOTAL		20	15	5
II.	Operating Systems and Hardware			
	a. Basic Electronic	4	3	1
	b. Computer Hardware	4	2	2
	c. Integrated Office	4	3	1
	d. Computer Network Systems	6	3	3
	e. Operating Systems	4	3	1
TOTAL		22	14	8
III.	Internet			
	a. Internet Programming	8	6	2
	b. Graphic and Animation	4	3	1
TOTAL		12	9	3

Table 1 continued

Table 1 (continued)

IV. Database			
a. Database Management Systems	8	6	2
TOTAL	8	6	2
V. Management and Organization			
a. Quality Assurance and Standards	2	1	1
b. Business Management	2	1	1
c. General and Technical Communication	2	1	1
d. Technology and Scientific Principles	4	3	1
TOTAL	10	6	4
COMPULSORY COURSES GENERAL TOTAL (CCT)	72	50 (69%)	22 (31%)
ELECTIVE COURSES			
e. Delphi Programming	8	6	2
f. C-Programming	8	6	2
g. Visual Basic Programming	8	6	2
h. Computer Aided Design and Modeling	4	3	1
i. Entrepreneurship	2	1	1
j. Accounting and Commercial Software	4	2	2
k. Research Techniques	2	1	1
ELECTIVE COURSES GENERAL TOTAL (ECT)	36	25 (70%)	11 (30%)
GENERAL TOTAL ((CCT+ECT)/2)	54	37.5 (69%)	16.5 (31%)

Table 2.
Distribution of sub-themes according to theme "Poor Quality of Education"

Sub-themes according to theme "Poor Quality of Education	Frequency of statements	%
Differences between the levels of student readiness	12	32
Insufficiency of applied courses	11	29
Limited follow-up of the current developments	8	21
Limited duration of education	7	18

During the interviews, the students mentioned the inadequacy of applied courses and pointed out that the courses were mostly theoretical in content and emphasized that they did not have enough opportunities for practice to reinforce their theoretical knowledge during their education. They also noted that even the courses related to hardware and network systems—which were shown as applied courses in the curriculum—were given on theoretical basis. These views stated by the students are compatible with the results derived from the analysis of the curriculum of "Computer Technology and Programming," that is, "courses are mostly theoretical". Some of these views are presented below:

> [*S2- "We took a course for computer hardware here, too, and it is always the same: the teacher tells us about course-related subject, and we write them down on our notebooks. There wasn't any practice, that is, we never turned on a computer and we didn't do anything …"*]

[S8-"*Our teachers teach the computer programs quite well. They help us but theoretically, this shouldn't be enough. That is, we should practice, because we only make an introduction to all the programming languages. We write down all the codes, but that isn't enough*…"]

The students believed that the curriculum did not cover the recent developments thoroughly. The students also stated that the courses given in the college were far from the developments in business life and that this situation decreased their level of motivation. Two of the views stated by the participants were as follow:

[S1-"*They don't talk about up-to-date issues at college, that is, we only learn what is taught by the curriculum. They don't inform us about recent developments* …"]

[S11- *"There are things that our teachers are interested in or they wonder about. They tell us about the new things, for example. If it is time for it, they spend five or ten minutes telling us about the developments. That's all* …"]

The students think that the duration of education in vocational college was not enough. The students believe that the limited duration of education was the reason that there were not an adequate number of elective courses, that the courses were not planned as to follow up the recent developments and that the number of applied courses was low. These views which were set forth by the students were matched up with the "inadequate number of elective courses and encouraging students to specialize mainly on software" which was the result of the curriculum analysis. Some of the participants discussed these issues as follows:

[S12-*"The duration is not enough of course. It is only two years. We must certainly take more education, but if not, we should in a way sit in front of a computer and develop ourselves and find a*

place in business life. The duration is short, for example, if it is a one-term course, there are at most thirteen or fourteen weeks or so, but we don't learn much though. That is, we don't learn the subject well. It is not enough..."]

[S4- *"In fact, the time is not enough. All is given only in two years, there are many hard subjects to learn in two years. It could at least be three years, for example. Some courses are really difficult at times..."*]

Inadequacy of internships. The analysis of the interviews held with students demonstrated the problems related to the quality of internships. Out of 71 statements, 15 (21%) statements were regarding this issue. Further analysis of this issue based on statements made by participants was conducted to explore this issue in depth. Three main sub-issues were identified (see Table 3).

Table 3.

Distribution of sub-themes according to theme "Inadequacy of Internship"

Sub-themes according to theme "Inadequacy of Internship"	Frequency of statements	%
Lack of guidance and formative assessment	6	40
Discordance of studies carried out during internship with the study field in vocational college	5	33
Inadequate summative assessment of internship	4	27

According to the analysis of interviews, the students stated that they did not receive enough guidance during the period prior to their internships or adequate assistance while choosing the workplaces where they were going to do their internships. Moreover, they mentioned that the educational conditions in workplaces were not inspected during their internships. The students, for these reasons, reported that the areas of education and studies they carried out in their workplaces were generally discordant with the fields of education in their school. Moreover, the students mentioned that there were not enough summative assessments of their internships. Some of the participants discussed these issues as follows:

> [S4-"*…to be honest, to tell the truth. You try to choose a work-place where you have a relative or an acquaintance. It could be a computer shop, either software or a hardware one…*]
> [S9-"*We didn't share. They didn't ask, nor did I tell anything*." (a response given about the assessment of the internship process at school following the internship)]

It is thought that among the causes of the problems put forward by the students related to internship, design of curriculum as predominantly academic education, and inadequacy of legitimate organization of internship are of the essence.

Limited areas of specialization. The analysis of the interviews held with students demonstrated that limited numbers of specialization areas are offered to the students. Out of 71 statements, 13 (18%) statements were regarding this issue. Further analysis of this issue based on statements made by participants was conducted to explore this issue in depth. Two main sub-issues were identified (see Table 4).

Table 4.

Distribution of sub-themes according to theme "Limited Areas of Specialization"

Sub-themes according to theme "Limited Areas of Specialization"	Frequency of statements	%
Areas of specialization being provided mostly in software	9	69
Limitation of elective courses	4	31

The students stated that the alternatives for specialization provided in the curriculum were limited. They also reported that the compulsory and elective courses were mostly related to software and that they could not find an opportunity to specialize in other areas through elective courses. This result is consistent with the result of the analysis of the curriculum. Therefore, following the examination of the curriculum, it was confirmed through student interviews that the alternatives for elective courses were limited and that the elective courses were mostly related to software. Some of the participants discussed these issues as follows:

> [S12- *"We can't choose both of them. We have to choose only one course. In fact, if we could choose more, it would be better, but this is not enough. Therefore, we can't choose all of them at the same time. We have to develop ourselves and learn the things in a way."*]
>
> [S8-"*If we consider what we have learnt here, it is enough. That is, I am specialist on software. There is no guidance in this respect, but the courses are enough. We learnt a lot of*

programming languages. I know all of them. But I can't say so for design or hardware…"]

Although there are mostly software-related courses in the curriculum, most of the students stated that they felt they were at an average level in this area. Two of the views stated by the participants were as follow:

[S6- *"Well, about the use of software's, well I can't do well. Not bad, not good, well I can do very simple things"*]
[S8- "*I don't feel myself competent in any area*" (the response of the student to the question of "In what computer areas do you feel you developed yourself?)]

Poor environment and inadequate opportunities: The analysis of the interviews held with students demonstrated poor environment and inadequate opportunities. Out of 71 statements, 5 (7%) statements were regarding this issue. Further analysis of this issue based on statements made by participants was conducted to explore this issue in depth. Two main sub-issues were identified (see Table 5).

Students noted that they could use computer laboratories only in working hours, and they complained about the distance of the vocational college to the main campus of the Anadolu University. Two of the views stated by the participants were as follows:

[S1-*"There is only one laboratory open for our use. All the college students can use it. We can use it in working hours, but after this, all the laboratories are closed…"*]

[S8-*"The facilities of the college are somehow limited, the college is rather distant from the university, the facilities in the campus are a bit better…"*]

Table 5.

Distribution of sub-themes according to theme "Poor Environment and Inadequate Opportunities"

Sub-themes according to theme "Poor Environment and Inadequate Opportunities"	Frequency of statements	%
Limited study opportunity in the computer laboratories	3	60
Distance of the vocational college from the university campus	2	40

Limitations

The results of the current study should be interpreted by considering the following limitation. In the scope of the study, the fact that the qualitative data gathered through the interviews held with a limited number of students from the same university. However, the issues revealed in the result of this study are supported by the findings of studies conducted in the literature. It is believed that this qualitative study can be considered a base study for further both qualitative and quantitative studies to be conducted with more participants, different settings and various data collection methods. This will help to extend the knowledge-base of the topic covered in the present study.

Conclusion & Recommendations

The results of the research reveal that the curriculum of "Computer Technology and Programming" was influenced by the structural problems of vocational colleges. In addition to this, some problems related to content and the teaching-learning process of the curriculum including, quality of teaching, managements of

internship, and limitations of the specialization choices provided by the curriculum were identified. Therefore, this case study reached its aim in terms of focusing attention on the problems of vocational higher education system in Turkey. It is hoped that evaluation results would be an example for future research on developing or evaluating curricula of vocational colleges.

Based on the results of the current study, some issues regarding industry-based education (internships), alternatives for the areas of specialization, and improving overall the quality of education in vocational colleges need to be considered. To cover these issues, the following recommendations were offered related to the results.

Precautions should be taken to improve the quality of education.

The students who attend the program of **"**Computer Technology and Programming" should take preparatory courses. This way, the students with different backgrounds of field-knowledge can develop fundamentals of the field and reach the same level of knowledge. The course hours of applied courses could be increased, which could help to reinforce the knowledge of students. Recent developments in the area of computer technology and programming can be transferred to the curriculum, and the applied courses can be re-planned in line with the real-life problems. These recommendations towards the improvement of the quality of education are directly related to the duration of the education program. It was observed that a two-year education period within the current system might not be enough to train the qualified workforce. With structural reforms, the programs of vocational colleges should be re-organized, and the education period should at least be increased to three years.

Industry-based education (internships) should be redesigned.

Although it is specified that one of the important aims of the curriculum of "Computer Technology and Programming" is to educate the workforce who have more theoretical knowledge than secondary vocational school graduates and more practical skills than engineers, it is observed that this curriculum is designed as academic

education and relationships with industry are very limited. Due to the fact that contributions of enterprises to the finance of the vocational education are very limited, all the load of the vocational education is on the government (Alkan, Dogan & Sezgin, 2001; Alkan & Sezgin, 1980; Cetin, 2002). In this context, developing curricula of vocational colleges as a project-based, business-based education model should be considered with the business world assisting with the financing of vocational higher education.

Alternatives for the areas of specialization should be increased.

Within the curriculum of "Computer Technology and Programming," alternatives for specialization could be increased. Elective courses should be planned to include software, design and equipment equally. Students can be guided through different areas of specialization according to their success, interests and future expectations.

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