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Struggles for Integration of the Technologies into Learning Environment in Turkey

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***Abstract*—**Primary studies are being carried out in Turkey for expanding information and communication technologies (ICT) aided instruction activities. Subject of the present study is to identify whether those studies achieved their goals in the application. Information technologies (IT) formative teachers in the primary schools, and academicians in the faculties of education were interviewed to investigate the process and results of implementing computer-aided instruction methods whose basis is strengthened in theory. Analysis of the results gained from two separate surveys demonstrated that capability of the teachers in elementary education institutions for carrying into effect computer-aided instruction and technical infrastructure has not been established for computer-aided instruction practices yet. Prospective teachers must be well-equipped in ICT to duly fulfill requirements of modern education and also must be self-confident. Finally, scope and intensity of the courses given in connection with teaching of the ICT in faculties of education needs to be revised.

***Keywords*—**Information and Communication Technologies, Teacher, Education.

I. Introduction

RAPIDLY increasing technology is changing the vision of the world. While answers given for the question 'What will the future of the world be like?' largely vary, it is important that communities and countries devise their vision for the future in a clear way. Today it seems a sound vision planning to be among individuals, societies and countries changing vision of the world; and it is important to accomplish an effective education planning at this point.

Education is regarded as the most critical point in preparing for the information society [5], [11] & [34] and modern education systems are reshaped in parallel with rapid growth in science and technology [33], [4]. Today children are exposed to the rapidly-developing technology. Such pace of the development makes it even more difficult to analyze what children will need as adults in the future. It is necessary to bring up the young generations in a way to keep pace with and contribute to this change [29].

In the 21st century, education systems all over the world are going under an increasing pressure for using ICT by equipping the students with knowledge and skills they will need in the future. In [38] "ICT in Teacher Education", emphasis is placed on the fact that ICT changes the nature of education and following basic requirements need to be met for efficient use of it:

- Both teachers and students need to access to internet and digital technologies appropriately in classrooms, schools and teacher education institutions.
- High-quality and meaningful digital content with a cultural aspect must be available for teachers and students.
- Teachers must be capable of using new digital instruments to help all students reaching high academic standards.

ICT, which provides sound instruments for learning, will be awarded its deserved value once how it should be used effectively by teachers for supporting instruction. Leaders in education all agree that all new teachers need to have graduated from teacher education programs as equipped with knowledge and skills allowing them to integrate technology into daily teaching easily and effectively in every type of environment [10], [17] & [22]. The world needs higher number of teachers who are educated better [37].

Teachers are key elements for successful ICT practices [5] , [7] and studies on importance of education and bringing up highly-qualified teachers have been commonly carried out in recent years [8] , [13] , [27] , [22] , [28] & [39] .

In March 2000, Lisbon European Council stressed in the council report regarding quality of the teacher education that it is important to invest in human beings in terms of position of Europe in the information economy and that highly-qualified teachers are of utmost importance in accomplishing this objective. The council report states "*Teachers play a crucial role in helping individuals develop their capabilities and bring their potential of development to light, and human beings acquire complex knowledge and skills as citizens or employees. School teachers mediate between rapidly increasing world and the students who are about to be involved in it*" [31].

The European Union Commission, in its Report of August 2007 [11], points out quality of education of teachers which are regarded as key factors for arranging educational

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achievements of young individuals and taking quality of education for granted, and lists relevant precautions to be taken in this area as follows:

- To coordinate teachers' education and professional development
- To help teachers acquire necessary pedagogical knowledge, skills and behaviors
- To help instruction get more professional
- To support reflective practices and the culture of research within teaching activities
- To develop definition of the profession and situations

A survey study was carried out by National Center for Educational Studies (NCES) in 2006 for identifying needs in relation with integration of the technology into teacher education programs. The questionnaire "Educational Technologies in Teacher Education Programs" was developed on how prospective teachers in teacher education programs get prepared for using the education technologies since introduction of them to the field was used to obtain information from educators, managers, researchers and politicians about following subjects:

- What are the subjects and practices linked with education technologies taught in teacher education programs (applying to technology for using the internet resources and communication tools for teaching, forming up or using digital portfolios, and obtaining or skillfully using data for guidance in instruction)
- What is the purpose of teaching prospective teachers how to use technology (such as supporting and enriching instruction in the classroom, assessing individual student progress and devising educational interventions)
- Which practices can prospective teachers do regarding what is learnt during field experiences and what sort of drawbacks might block such opportunities (availability of the technology infrastructure, willingness of the teachers supervising technology integration, and priorities competing in classrooms)
- Results of the program obtained for graduates of the program (skill for building project-based learning courses, using applicable technology for students with special needs, integrating technology into instruction)

The survey based on the descriptive analysis and propositions in educational technology was applied to 1439 institutions with teacher education programs. Findings indicated varying teaching of subjects and practices connected with educational technologies in teacher education programs. While nearly half of all these institutions present independent courses with 3 or 4 credits in their curricula, most of them taught educational technologies in method courses (93 %), field experiences (79 %) and content courses (71 %). In addition; majority of the institutions presenting teacher education program reported that they educated prospective teachers on using those programs for a number of purposes ranging from enriching and supporting classroom teaching to understanding individual student learning style, from assessing individual student progressing to devising interventions for individualizing instruction. Most of the institutions reached a consensus on configuring project-based learning courses covering educational technologies in connection with skills and experiences that graduates of their programs are supposed to have achieved for integrating technology into instruction. On the other hand; participative institutions indicated various obstacles in prospective teachers' integrating technology into learning environments and daily instruction activities as well. Most of the institutions placed emphasis on prospective teachers' knowledge, skills and abilities connected with educational technologies during field experiences; and listed obstacles in the following order: competing priorities in the class (74 %), availability of the technology infrastructure (73 %), lack of time (62 %), education or ability (64 %) or willingness (53 %) of teachers for integrating technologies in classrooms [28].

National Survey of Teachers revealed that 80 % of the K-12 teachers in the US generally use computer facilities in connection with the administrative tasks (including e-mailing, registering entries, sending information to the school intranet) and slightly more than half of them integrate computer into the daily curriculum. The survey also showed that focus is placed on administrative practices more than educational practices in teachers' technology education. Moreover; it was understood that nearly one third of the teachers are not equipped about instructional software and technology-aided instructional practices in the course [27].

While rapid developments recorded in the ICT change functionality of the education and instruction programs, Taiwan Government made attempts to monitor and promote such developments. In a report submitted by Ministry of National in 1999, it is stated that activities will gain impetus for changing, liberalization and keeping up with international standards of the school system. It is also stated that curriculum and instruction methods employed in schools at all levels will be modernized by means of outstanding modifications in the education environments. Developing application of the computer technology is described as an educational purpose and emphasis was placed on following items:

- K-12 teachers' being equipped with basic computer technology skills
- Upgrading obsolete software and hardware in all elementary schools
- Providing minimum 1 computer in each K-12 class
- Use of internet in K-12 classes for teaching and learning purposes [13].

[5] suggested as follows in the study they carried out on prospective teachers' attitude towards ICT;

- Prospective teachers must be provided opportunities to prepare and present educational slides (such as films, animation and multimedia including sound)
- Internet and video conference practices must be expanded

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- Online learning opportunities must be expanded
- Curricula must be revised also taking into consideration educational software
- Prospective teachers must be allowed to perform their multimedia presentations using multimedia projectors or power point facilities during instruction practices.

[4], in his study aiming to reveal certain eligible ways of integration of the ICT in a pedagogically appropriate way and reviewing strategies of pre-service teacher preparing for employing new technologies in Turkish teacher education programs; pointed out principal factors to be taken into consideration in the case of using ICT in teacher education. These factors are listed as ICT infrastructure, physical resources, curriculum and plan development, trained teachers and pedagogy education.

Lately, the rapid changes have existed in Turkish Education System [9]. Ministry of National Education has started to carry out the constructivist approach in all parts of the country since 2005-2006 academic year [14]. It is aimed that with the help of constructivist approach that is based on the realization of learning depends on individual effort, modern mentalities replace the traditional mentalities that is temporizing. At this point, the vital importance of ICT-aided learning environments that offer the students flexible, fast and lifelong learning opportunities according as their needs rises once again [20].

Since the 1980s in Turkey, using of ICT in education-instruction institutions is in question [2]. Especially, in final few years Ministry of National Education has carried out many projects for using of computers in education environments and certain changes have been made in education environments as a result. These changes include change of program contents and instruction methods, rearranging physical environments, training teachers on computer literacy and computer-aided education and other linked changes [33] , [19] & [36].

Elementary and secondary education curriculums were restructured by Board of Education and Discipline under Ministry of National Education within the framework of program development activities on the basis of universally-accepted approaches like “life-long learning” and “learning how to learn” in order to upgrade the Turkish National Education System according to the changing facts of the time [24]. To this end; new curricula were developed for Instruction Programs and Mathematics, Science and Technology, Turkish Language, Social Sciences, Information Technologies, Religious Culture and Moral Knowledge, Physical Education, Visual Arts, English Language and Music for the 1st to 8th grades in the elementary education; and Mathematics, Language and Expression, Physics, Chemistry, Biology, Information and Communication Technologies, Religious Culture and Moral Knowledge, Turkish Literature and English Language in the secondary education [25].

It is aimed to bring up students as individuals who can express themselves, communicate, cooperate, solve problems, think scientifically, understand, research, investigate, criticize, question and interpret, are entrepreneur, have well-developed personality, aware of their rights and responsibilities, compatible with their vicinity, can use ICT, produce knowledge and direct their future once such curriculums are put into use as one of the prerequisites for education to fulfill its functions as following:

- To ensure every individual be introduced to the education system and sustain developing himself
- To ensure individuals to socialize by means of school and establishing relationship between education and democracy
- To harmonize labor force demand of the economy with the education system
- Functioning of it as a channel ensuring equality of opportunities as a means of vertical mobility in the society.

In achieving these objectives, it is regarded as another prerequisite to elevate qualifications of the teachers both in pre-service period and during the service period, and focus is placed on necessity of addressing abovementioned prerequisites with an interactive approach concurrently [24].

In Turkey, on one hand, in-service training events are arranged; on the other hand, courses such as Computer, Instruction Technologies and Material Development were included as mandatory courses in curricula of all teaching departments in faculties of education within scope of restructuring of the Faculties of Education in 1998 in order to bring up individuals equipped with abovementioned qualifications as required by contemporary time. Moreover; Department of *Computer* Education & Instructional Technology was opened in universities in order to bring up computer teachers for elementary schools [33]. In elapsed time; proficiency of the teacher education programs implemented in today’s education faculties in terms of contemporary knowledge and skill requirements became debatable in symposiums, panels, workshops, open sessions and conferences held by universities, Ministry of National Education and non-governmental organizations; proposals were put forward towards analyzing problems related with the programs on the basis of the data collected from scientific research and comments of the discipline experts. In this framework; The Higher Education Board launched activities in cooperation with administrative staff and members of the education faculties in order to improve and upgrade undergraduate curricula. The goal is to equip prospective teachers with intellectual characteristics by means of teacher education programs which were put in implementation since the academic year 2006-2007. It is thought that all-rounder prospective teachers who are equipped with general culture as well as knowledge and skills in information technologies at a certain level, can undertake scientific studies and benefit from those researches would perform more satisfactorily in fulfilling requirements of modern education [26]. Along with these changes, Ministry of National Education established *IT Class* infrastructure in schools in order to ensure integration of IT instruments into the educational practices. Optimum use of the mentioned investments can be achieved by means of

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effective, efficient, conscious and intensive use of the information technologies in classrooms. To this end; *"IT Formator Teachers"* are employed in schools in order to ensure optimum use of computer-aided instruction in educational activities, to expand computer-aided instruction in school, guide teachers and students in this area, undertake teaching needed in IT area, ensure sustainable functioning of those classes and so on [23].

Factors such as technical infrastructure and teacher education play an important role in accomplishment of ICT-aided instruction practices; and leading studies have been carried out in Turkey to this end. Subject matter of this study is to identify whether activities carried out by Ministry of National Education, affiliated institutions and the other authorities in the Turkish Educational System carried out for expanding computer-aided educational activities reached their goal or not. As a part of this study; IT formative teachers and academicians in the faculties of education were interviewed to investigate the process and results of implementing computer-aided instruction methods whose basis is strengthened in theory.

II. METHODOLOGY

A lot of studies are being carried out in Turkey regarding transferring constructivist learning approach into practice. It was found out that more importance is attached to ICT and both ICT and computers, as an integral part of it, have become an indispensable element of the learning environments. Computer-aided learning environments reflect today's education approach in Turkey and studies regarding building infrastructure to this end are being carried on efficiently. Departing from those findings; in this study, the extent at which computer-aided instruction practices are involved in education-instruction process in Turkey is investigated. It is aimed to seek an answer for questions like '*what is the current situation like'* and '*at what stage are we'* [12]. Thus survey method was applied and questionnaires were used in order to reach a large sample group.

A. Means of Collecting Data

Two different questionnaires were used in the survey. Preparation of the questionnaires include steps such as reviewing education technologies literature on teacher education programs, diagnosing and closely examining existing questionnaires about the subject matter, writing new questions to identify key challenges in the field and adaptation, consulting with the academicians, pilot activities, reviewing and arranging the questionnaires.

A questionnaire was developed in order to identify views of the IT formator teachers in the elementary schools about practices regarding computer-aided instruction and material use; and the form was presented to the formator teachers for their ideas. The reliability coefficient of the questionnaire including the 5 different questions was 0.85.

Another questionnaire was developed in order to identify views of the academicians in Faculties of Education regarding designing of computer-aided learning environments, and the form was presented to the academicians for their ideas. Reliability coefficient of the questionnaire including the 9 different questions was 0.84.

Both of the questionnaires include an open-ended question item.

B. Sample

Study sample is composed of 28 IT formator teachers in elementary schools and 67 academicians from faculties of education.

C. Activity

Each of the questions in the forms was assessed separately. In assessment of the research data, frequency, percentage and arithmetic mean values were calculated for each item. The degrees such as I Totally Agree (5), I Agree (4), I Partially Agree (3), I Disagree (2) I Completely Disagree (1) were used to determine actualization level of each item in the data collection means. Assuming that the intervals are equal, point interval coefficient was found to be 0.80 for arithmetical averages. Conclusions were drawn in line with the values calculated.

Point Interval = (Maximum Value –Minimum Value)/5 = 0.80

TABLE I ASSESSMENT RANGE OF ARITHMETIC MEANS

Range	Option	Value of the Range
1.00–1.80	I Completely Disagree	I Completely Disagree
1.81–2.60	I Disagree	I Disagree
2.61–3.40	I Partially Agree	I Partially Agree
3.41–4.20	I Agree	I Agree
4.21–5.00	I Totally Agree	I Totally Agree

III. FINDINGS

A. Findings Obtained from Questionnaires Applied to the Information technologies Formator Teachers

The curricula developed within framework of the constructivist learning approach increased the need for computer-aided learning environments. Job description of the information technologies formator teachers appears as "To ensure efficient functioning of the computer-aided instruction in schools". Views regarding computer-aided instruction activities were collected by means of the questionnaire items, data were obtained by applying statistical analysis and assessment was made separately for each item. Frequency and Percentage (%) values as per each item are given in Table II.

TABLE II FREQUENCY AND PERCENTAGE (%) VALUES FOR EACH ITEM IN THE QUESTIONNAIRES APPLIED TO THE INFORMATION TECHNOLOGIES FORMATOR TEACHERS

Item No	I completely disagree		I disagree		I partially agree		I agree		I totally agree	
	Frequency	*%*	*Frequency*	*%*	*Frequency*	*%*	*Frequency*	*%*	*Frequency*	*%*
1	5	17,86	10	35,71	11	39,29	2	7,14	0	0,00
2	4	14,29	10	35,71	12	42,86	2	7,14	0	0,00
3	3	10,71	15	53,57	8	28,57	2	7,14	0	0,00
4	0	0,00	0	0,00	4	14,29	5	17,86	19	67,86
5	0	0,00	0	0,00	0	0,00	6	21,43	22	78,57

TABLE III ARITHMETIC MEAN AND VALUE RANGE OF ARITHMETIC MEAN CALCULATED FOR EACH ITEM IN THE QUESTIONNAIRE APPLIED TO THE INFORMATION TECHNOLOGIES FORMATOR TEACHERS

Item No	Item	Arithmetic Mean	Assessment Range
1	Branch teachers are proficient in forming up Computer-Aided Learning environments suitable for students' level, age and experiences within scope of the constructivist learning approach.	2,36	I Disagree
2	Different courses are being carried on at an intensive pace by applying Computer-Aided Learning practices in parallel with the new curricula.	2,43	I Disagree
3	Branch teachers can easily access to the computer-aided instruction materials they can use in parallel with the new curriculum and they are proficient in using these materials in classes.	2,32	I Disagree
4	Computer-aided learning materials need to be developed and presented to the education institutions by competent institutions and organizations for effective continuation of the classes in parallel with the new curriculum.	4,54	I Totally Agree
5	Scope of the technology-based educational practices carried out in order to equip prospective teachers with computer literacy skill needs to be enlarged.	4,79	I Totally Agree

Arithmetic means and value ranges were calculated by addressing numerical value of views of the teachers regarding the items. Arithmetic mean and value range of the arithmetic mean calculated for each item are given in Table III.

Views and recommendations of the information technologies formator teachers are addressed and described within context of alternative solutions for the generic problem.

"*Constructivist learning approach was enforced by Ministry of National Education since the education-instruction year 2005-2006. Commissions were formed to prepare curricula and course books, and an attempt was made to harmonize constructivist learning approach with the education-instruction process. In parallel; Computer-Aided Learning practices gained importance and Information Technologies Formator Teachers were employed in all schools. Job description of the information technologies formator teachers appears as "To ensure efficient functioning of the computer-aided instruction in schools*". *IT formator teachers are supposed to carry on Computer-Aided Learning activities in cooperation with the other branch teachers. However; shortage of infrastructure, technical knowledge and skill, software developed according to the constructivist approach affect the process in a negative way. Themes and sub-themes were formed according to the answers given by teachers for question "What challenges do you face in this aspect and what alternative solutions can be proposed for these problems?"* These themes are shown with direct citations in Table IV. Descriptions summarize views of 20 participants in total.

B. Infrastructure

Three of the participants pointed the infrastructure problems and expressed views as "Capacity of the computers in the technology class allows using of prepared materials".

C. Material

Five of the participants pointed the shortage of materials and expressed views as "Main challenge met in CAL is shortage of materials".

TABLE IV SOLUTION PROPOSALS OF THE IT FORMATOR TEACHERS REGARDING EXPANSION OF COMPUTER-AIDED INSTRUCTION

Themes	**Views of Participants**	**Number of Participants**
Infrastructure	*-capacity of the computers is not enough*	3
Material	*-shortage of materials* *-not appropriate experimentation* *-producing practical and efficient materials* *-supplementary budget and resources*	20
Education	*-faculties of education are not proficient in computer literacy* *-training for preparing course materials* *-making teacher conscious of the expectations from teachers in the scope of education* *-in-service education activities*	20
Formator Teacher	*- extra tasks that hinder main tasks*	4

Five of the participants pointed out appropriate experimentation and expressed views as "Formator teachers in schools are not involved in computer-aided instruction or do not help implementation of it now. They just help students gain knowledge from the internet and prepare homework by using the computers in IT class. In this case, students usually

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focus on title of the subject without checking the content and collect information from homework sites or other web sites randomly designed by ordinary people. Both teachers (assigning homework) and the parents advise students to use the internet for preparing the projects. Students always take this option since it is the easiest one. However; web sites for education designed by Ministry of National Education or governmental institutions are not in use yet".

Four of the participants pointed out producing practical and efficient materials and expressed views as "CAL means assigning duty of the teacher partially to the computer in teaching of a subject by using necessary materials also. Students learn necessary information and try to access to the accurate information by interacting with the software while using the CAL material. Preparing a presentation by means of a suitable program and having students present it in the classroom does not correspond to computer-aided instruction. In computer-aided instruction, books and notebooks are generally replaced by computer. Ministry must produce computer-aided instruction materials that will produce practical and efficient outcomes as it works in a planned way for developing curricula and books".

Three of the participants pointed supplementary budget and resources and expressed views as "Supplementary budget and resources should be allocated for the materials to be used in schools."

D. Education

Five of the participants pointed faculties of education are not proficient in computer literacy education and expressed views as *"Faculties of Education are not proficient in computer literacy education though we are living the information era"*.

Five of the participants pointed training for preparing course materials and expressed views as *"Branch teachers must be given specific training for preparing course materials"*.

Three of the participants pointed out making teachers conscious of the expectations from teachers in the scope of education and expressed views as *"The teacher needs to acquire a function that will force her/him to develop her/himself. If teachers are not aware of the expectations from teachers in the scope of education..."*

Seven of the participants pointed in-service education activities and expressed views as *"In-service education activities must be expanded and their quality must be improved"*.

E. Formator Teacher

Four of the participants pointed extra tasks that hinder main tasks and expressed views as "Formator teachers in schools should not be assigned tasks in school's administrative sphere. Such verbal or written assignments prevent formator from fulfilling their main tasks".

F. Findings Obtained from Questionnaires Applied to the Academicians

The questionnaire developed in order to identify views of regarding design of computer-aided learning environments use was answered by 67 academicians in various departments in Faculties of Education of several universities. From the perspective of technology literacy, ideas were obtained regarding current teacher education, target teacher education and designing of instruction materials; and data were obtained by means of statistical analysis; also separate assessments were made for each item. Frequency and Percentage (%) values as per each item are given in Table V.

TABLE V FREQUENCY AND PERCENTAGE (%) VALUES FOR EACH ITEM IN THE QUESTIONNAIRES APPLIED TO THE ACADEMICIANS

Item No	I Completely Disagree		I Disagree		I Partially Agree		I Agree		I Totally Agree	
	frequency	*%*	*frequency*	*%*	*frequency*	*%*	*frequency*	*%*	*frequency*	*%*
1	1	1,49	6	8,96	5	7,46	15	22,39	40	59,70
2	1	1,49	5	7,46	4	5,97	13	19,40	44	65,67
3	0	0,00	1	1,49	1	1,49	10	14,93	55	82,09
4	1	1,49	4	5,97	5	7,46	13	19,40	44	65,67
5	1	1,49	2	2,99	5	7,46	20	29,85	39	58,21
6	1	1,49	5	7,46	10	14,93	21	31,34	30	44,78
7	0	0,00	4	5,97	14	20,90	36	53,73	13	19,40
8	1	1,49	1	1,49	2	2,99	18	26,87	45	67,16
9	1	1,49	0	0,00	5	7,46	17	25,37	44	65,67

Academicians' views regarding target teacher education and designing of instruction materials were collected by using 9 items in total. Arithmetic means and value intervals were calculated by addressing numerical value of views of the academicians regarding the items. Arithmetic mean and value interval of the arithmetic mean calculated for the items regarding target teacher education and designing of instruction materials are given in Table VI and Table VII.

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TABLE VI ARITHMETIC MEAN AND VALUE RANGE OF ARITHMETIC MEAN CALCULATED FOR ITEMS REGARDING TARGET TEACHER EDUCATION IN THE QUESTIONNAIRE APPLIED TO THE ACADEMICIANS

Item No	Item	Arithmetic Mean	Assessment Range
1	Prospective teachers/academicians must be properly equipped with technical infrastructure necessary for designing computer-aided learning materials.	4,30	I Totally Agree
2	Prospective teachers/academicians need to learn how to prepare computer-aided learning materials in their respective fields.	4,40	I Totally Agree
3	Prospective teachers/academicians need to be trained in effectively using technology.	4,78	I Totally Agree
4	Undergraduate classes run for increasing computer literacy of prospective teachers must be more frequent.	4,42	I Totally Agree

TABLE VII ARITHMETIC MEAN AND VALUE RANGE OF ARITHMETIC MEAN CALCULATED FOR ITEMS REGARDING DESIGNING INSTRUCTION MATERIALS IN THE QUESTIONNAIRE APPLIED TO THE ACADEMICIANS

Item No	Item	Arithmetic Mean	Assessment Range
5	Computer-aided learning materials need to be produced in coordination of specialists and education technologists.	4,40	I Totally Agree
6	Prospective teachers/academicians should able to develop learning materials they will use in their professional life.	4,10	I Agree
7	The materials developed by prospective teachers/academicians and proved to be useful cannot be commonly used by students in formal education environments.	3,87	I Agree
8	The materials developed throughout undergraduate, postgraduate and Ph D education must be stored in certain platforms and presented to students' use.	4,57	I Totally Agree
9	Teams of specialists must be formed for developing learning materials that will contribute to the Turkish National Education System and will be used all across Turkey.	4,54	I Totally Agree

Participant academicians' views, opinions and recommendations are described by *addressing within context of alternative solutions for the generic problem.*

"Constructivist learning approach was enforced by Ministry of National Education since the education-instruction year 2005-2006. Commissions were formed to prepare curricula and course books, and an attempt was made to harmonize constructivist learning approach with the education-instruction process. In parallel; Computer-Aided Learning practices gained importance. However; shortage of infrastructure, technical knowledge and skill, software developed according to the constructivist approach affect the process in a negative way. Themes were formed according to the answers given by teachers for question "What type of alternative solutions can be proposed for these problems?" These themes and sub-themes are shown with direct citations in Table VIII. Descriptions summarize views of 56 participants in total.

TABLE VIII SOLUTIONS PROPOSED BY ACADEMICIANS REGARDING EXPANSION OF COMPUTER-AIDED INSTRUCTION

Themes	Views of Participants	Number of Participants
Resource	*-allocation of more resources for education*	3
Infrastructure	*-complete and perfect technical hardware* *-internet connection and projection facilities in every classroom*	10
Constructivism	*-lapsed aims* *-model teachers*	7
Education	*-prospective teachers equipped with ICT skills* *-teachers planning the class environment suitable for philosophy and vision of the curriculum* *-in-service courses* *-computer and instructional technology teachers*	42
Economic Level	*-improving economic level of teachers*	1
Material	*-developing materials by teams of specialist* *-materials developed by top level authorities according to one certain level* *-materials are collected at organized competitions by Ministry of National Education*	16

G. Resource

Three of the participants pointed allocation of more resources for education and expressed views as *"Constructivism requires allocation of more resources for education due to its being project-based".*

H. Resource

Ten of the participants pointed out complete and perfect technical hardware and internet connection and projection facilities in every classroom and expressed views as *"First of all; complete and perfect technical hardware is needed to carry out computer-aided instruction in classrooms. There is only one computer laboratory in many schools and it is used for carrying on computer classes only. Computer-aided learning activities are carried out in intervals remaining after computer lessons. Initially internet connection and projection facilities are needed in every classroom".*

İ. Resource

Three of the participants pointed allocation of more resources for education and expressed views as "Constructivism requires allocation of more resources for education due to its being project-based".

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J. Infrastructure

Ten of the participants pointed out complete and perfect technical hardware and internet connection and projection facilities in every classroom and expressed views as *"First of all; complete and perfect technical hardware is needed to carry out computer-aided instruction in classrooms. There is only one computer laboratory in many schools and it is used for carrying on computer classes only. Computer-aided learning activities are carried out in intervals remaining after computer lessons. Initially internet connection and projection facilities are needed in every classroom".*

K. Constructivism

Four of the participants pointed out lapsed aims and expressed views as "Constructivism is realized as the process of accessing to made-up and common information without known resources in internet cafe".

Three of the participants pointed model teachers and expressed views as "Faculty members must employ this approach in their class first and hold discussions with students regarding benefits of it. Prospective teachers must also see that lecturers use the same. A prospective teacher can believe it only if s/he goes through such a constructivist approach".

L. Education

Twelve of the participants pointed prospective teachers equipped with ICT skills and expressed views as "Great importance should be attached to technology literacy in education faculties. Beyond computer literacy, actual information and communication technologies should be introduced to the prospective teachers and they should be taught relevant software in their respective fields. In this way; prospective teachers are trained as equipped with information and communication technology skills; and they will be able to propose more constructive proposals for problems in the real learning environment in schools if they realize how they can carry on classes as computer-aided or what type of achievements they can attain".

Ten of the participants pointed out teachers planning the class environment suitable for philosophy and vision of the curriculum and expressed views as "Teachers need to gain proficiency regarding planning the class environment suitable for philosophy and vision of the curriculum".

Fifteen of the participants pointed out in-service courses and expressed views as "Courses must be held to improve teachers' using of technology during service period".

Five of the participants pointed out computer and instructional technology teachers and expressed views as "It is not sufficient to bring up computer and instructional technology teachers for supporting that country's education with technology. All branch teachers must be using the technology in an effective way".

M. Economic Level

One of the participants pointed improving economic level of teachers and expressed views as *"Economic level of teachers must be improved so that they can keenly own their own profession".*

N. Material

Eight of the participants pointed out developing materials by teams of specialist and expressed views as "Only teams of specialist must be responsible for developing materials suitable for the curriculum. Such teams must be composed of academicians, teachers and education technologists. The teachers must determine current problems, academicians must propose solutions thanks to their literature knowledge in the area, and education technologists must decided how to prepare the most suitable material and develop them".

Three of the participants pointed out materials developed by top level authorities according to one certain level and expressed views as "Proper results can be obtained in certain schools only with software and materials developed by top level authorities according to one certain level".

Five of the participants pointed materials are collected at organized competitions by Ministry of National Education and expressed views as "Ministry of National Education must hold competition at several levels and collect materials developed. Prospective teachers, teachers and academicians must send their designing into a pool and the specialists must assess them and then open those regarded eligible for use of the schools and students in a way that can be searched with key words or limited with filtering system".

IV. CONCLUSIONS AND DISCUSSION

Information era requires the individuals not only accessing and using the information but also producing and solving the problems with it. According to this, individuals who are going to constitute the information society must have the high qualities of creativity, critical, productivity, problem solving and sophistication [32]. In this sense, constructivism, which asserts that the new conditions can give sense by using foreknowledge and fore experiences, ensures students to be active and gains an established status among modern approaches, has been fairly influential recently [20].

In this study, which was carried out in order to highlight practices on computer-aided instruction that is accepted as materiality of constructivism coming into prominence in new curricula and basing on researches of many philosophers, psychologists and educationists [14] in Turkey as a prerequisite for modern education approaches, teachers in elementary schools as well as academicians in education faculties were interviewed for their ideas. Two different questionnaires were used for 95 participants in total to learn acceptable conditions for "*ICT-aided instruction activities"*. All analysis showed that infrastructure needed for carrying out computer-aided instruction activities is not at required level yet. Teachers are not knowledgeable in creating learning environments suitable for philosophy of the new curriculum and computer-aided instruction activities are not widespread yet. Moreover; it was found out that prospective teachers are not trained in faculties of education in a way they can adopt computer to their learning environments within the framework

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of the new curriculums. It was determined that courses run for technology literacy in faculties of education do not meet these needs.

People think that high-quality learning and instruction equipping young individuals for the information society can be achieved by means of using the ICT. However; such expectations require meeting of certain factors [30]. While many world countries seek probable ways for successful integration of the ICT with the learning environments, Turkey has made significant attempts with an eye to increase quality of education by means of enriching the learning environments with ICT [19]. This process, which is considered as integration of the ICT into the formal education environments in Turkey, has been spread across the years since 1980s.

Integration of the ICT with learning environments depends on successful designing and implementation of it, and such designs and practices include a complex process [2]. In this process; studies were carried out in order to put forward pedagogical, social, technical challenges met and probable precautions to be taken [7] , [1] , [15] , [16] , [18] , [6] , [21] & [35] . In these studies; the points to be considered in the ICT integration process as follows;

- Shortage of infrastructure
- Attitudes of teachers and students
- Curricula that are not flexible
- Management and inspection
- Cooperation between teachers
- Role of the ICT coordinators

In Turkey, the process of integration of ICT into the learning environments is being done and developed rapidly. On the basis of the relevant literature, answers were searched for questions "At what stage is Turkey in the ICT practices today?", "What are the aspects that go wrong?" and "What are the solutions proposed by participants regarding making the ICT widespread?"

Answers obtained from 28 IT formator teachers showed that teachers are not able to develop learning environments supported with ICT suitable for philosophy of the new curriculum. They lack of technical background and skills necessary for developing computer-aided learning materials by referring to their experiences in their respective fields. Furthermore; formator teachers reported that infrastructure facilities needed for carrying on computer-aided educational activities are not sufficient. They placed particular emphasis on the fact that the instruction material to be used in parallel with the new curriculum is too short, computer-aided instruction practices are not carried out properly; computer-aided learning materials must be developed and provided for education institutions by competent institutions and organizations in order to ensure effective operation of the classes. Besides; they reported that the scope of the technology-based educational activities run in education faculties for equipping prospective teachers with computer literacy skills needs to be expanded, and seminars must be held more frequently in order to improve in-service teachers' ability to use instructional technologies and their computer literacy.

Answers given by the 67 academicians participated in the research revealed that the courses held in education faculties for use of the technology in education are not satisfactory. Prospective teachers are not trained in a way to use technology effectively for their needs and design learning materials they can use in the education-instruction activities in their respective fields before they graduate. Academicians stressed that prospective teachers must be capable of achieving these objectives and undergraduate courses held for prospective teachers in faculty must be made more frequent for increasing their technology literacy. Moreover; It was understood that the learning materials developed by prospective teachers and academicians throughout the undergraduate, postgraduate and Ph D studies are generally used for carrying on researches and not provided for students' use in formal education environments. The proposal saying that the materials proved to be useful must be collected and provided for students' use in formal education environments was justified. On the other hand; it was suggested that teams of specialists must be formed for developing learning materials that will contribute to the Turkish National Education System and will be used all across Turkey.

As formators and academicians' views, opinions and recommendations are addressed within context of alternative solutions for the general problem; constructivist learning approach taken as a basis in the new curricula is not duly perceived/implemented and technical infrastructure (software-hardware) necessary for meeting this need in schools is not satisfactory. Alternative solutions are presented below;

- *More resources should be allocated for education*
- *Designing of ICT learning materials (such as pre-service and in-service teachers' designs, designs of the specialist teams formed by Ministry of National Education, designs exhibited in the competitions arranged by Ministry of National Education)*
- *Expanding qualified in-service education activities*
- *Teachers' acquiring a function that forces them to do something*
- *Faculty members who can take role-model in education faculties*
- *Acquisition of actual information and communication technologies-orientation for respective branches beside computer literacy in education faculties*
- *Increasing economic level of teachers*

On the basis of the data collected; following recommendations are proposed; proficiency of in-service teachers should be increased for implementing computer-aided instruction. Number and utility area of technology-aided materials and equipment in schools needs to be enlarged. Besides; effective and job-oriented seminars must be held in the area of teacher education. Prospective teachers should be

brought up as self-confident individuals equipped with ICT in a way to duly fulfill requirements of modern education system. Intensity and scope of the courses held in faculties of education for teaching of ICT should be revised. Results of the academic studies carried out by prospective teachers and academicians in faculties of education should be reflected onto the formal education environments beyond remaining as theories.

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