Understanding ICT Integration into Instructional Processes within the Scope of Activity System Theory: A Case Study

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Abstract

In this study, the integration of ICT into educational activities by vocational high school teachers was described within the scope of school directors, students and ICT tools. In the study which was designed as a holistic single case one, activity systems theory was used as a unit of analysis. The data was collected through observation, semi-structured interviews and questionnaires in the study which was carried out on four teachers, 106 high school students and 1 school director. The data obtained in this study was analyzed within the framework of affecting factors taken from the activity system. The subject, community and tools were analyzed within the scope of activity system. It was found in the study that teachers implemented the integration of ICT into instructional activities as the only member of the process. It was also found in the study that other stakeholders did not fulfil their roles, and what is worse is that they were not aware of their roles. Besides, it was found that ICT integration practices were found to differ among teachers.

Introduction

The rapid advancements in the field of computer technology in 1970s and the use of this rapidly developing computer technology for educational purposes have attracted researchers and educators (Hew & Brush, 2007). However, it can be suggested that Information and Communication Technologies (ICT) which is also used for computer and other technologies, have been used for educational purposes since 1990s (Coklar, 2014). When all the works carried out during the process are examined, the use of ICT for educational purposes has the potential to transform education and to provide support for students' learning (Hew & Brush, 2007; Sessoms, 2007). When the studies dealing with the integration of ICT into education are considered, it is seen that the integration of ICT into education improves students skills of creative thinking (Chief Executive Officer (CEO) Forum on Education and Technology, 2001), has increased students' motivation and achievements (Bransford, Brown & Cooking, 2000; Grabe and Grabe, 2007; Sessoms, 2007; Sivin-Kachala and Bialo, 2000; Bingimlas, 2009) and has positively influenced student teacher interaction (Daves, 2001). In addition to the studies carried out to investigate the effects of ICT integration into education, there are also some other studies carried out to investigate the actualization and integration of ICT or its sustainability and some other infrastructure works (e.g. FATİH project, 2012; Quality Education Data Report, 2003).

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1984 is the year when computers started to be available at state schools. The computerization of schools, especially vocational high school went on till 1987 (Özar & Aşkar, 1997). "Computer" lessons at high schools were suggested as elective course in the curriculum to teach about computer use and languages of computer programming (Deryakulu, 2008; Özar & Aşkar, 1997). Following these, professional development activities were held for administrators, teachers and teacher trainers in cooperation with universities and Ministry of National Education (MEB, some MEB projects were implemented to generalize technological tools at schools (e.g. Temel Eğitim Projesi I. Faz, Temel Eğitim Projesi II. Faz, Milli Eğitimi Geliştirme Projesi).

In parallel with the purchase of computers for state schools between the years of 1985 and 1987, some courses related to information technologies (IT) were also integrated into curriculum. Training of manpower started in four different fields (network management, web programming, and data base programming and computer technical service) within the score of the Project of Vocational Training and Instructional System Fortification (MEGEP) (Deryakulu, 2008). When the courses were examined with regards to computer Technologies in general and vocational high schools, it is seen that such courses have been continuously parts of school curriculum. In other words, vocational and technical high schools have been provided with computer infrastructure with regards to computer Technologies for about 30 years (1985-2015). Beginning from 2010, FATİH Project (Increasing Opportunities and Improving Technologies Act) started to be implemented to basically improve technological facilities at schools and encouraging active use of ICT tools in teaching-learning process. IT was planned that about 600.000 classrooms would be armed with interactive boards within the scope of this Project (Fatih Projesi, 2012).

This Project consists of sub-projects of infrastructure, hardware, training science net (EBA) and training of teachers. The aim of this project was to offer teachers seminars related to the use of conscious, reliable, manageable and measurable ICT within the scope of in-service training (FATİH Projesi, 2012). Whereas other sub-projects are defined within this Project, the primary focus was to continue the distribution of technological equipment to stakeholders. In other words, arming the classes with technological equipment has been the main aim of the Project (Akgün, Yılmaz & Seferoğlu, 2011).

It can be suggested that the investments in the integration of ICT in Turkey started with the purchase of technological equipment, establishing relevant infrastructure and teaching of ICT (Şahin İzmirli, 2012). With the investments made with this regard, the investigation of application and the interaction of stakeholders are very important to find out if the investments have served the intended purpose. On the other hand, the deficiencies found out as a consequence of the investigations can really help reroute new investments. In other words, there is a need for learning how successful teachers are at integrating ICT into their courses in practice. Within the scope of ICT integration into educational activities, teachers' responsibilities need to be mentioned as well as those of students' and school directors' which are considered to be the other stakeholders of the process. The responsibilities mentioned are the effective ICT use of teachers (Fulton, Glenn & Valdez, 2004), interrelating field knowledge, pedagogy and ICT (Mishra & Koehler, 2006; Okojie, Olinzock & Okojie-Boulder, 2006). Among the students' responsibilities are awareness raising about the ICT use for educational purposes, making requests and creating opportunities for ICT use (Banister & Vannatta, 2006; Chen, 2004; Kay & Knaack, 2005). Finally, there are responsibilities with regards to school directors, such as spreading the use of ICT tools (Surry & Land, 2000), facilitating it (Schiller, 2003) and ICT planning (Semenov, 2005). It is seen that the case of not obtaining ICT tools has negative influences on ICT integration as well as stakeholders' responsibilities affecting the integration of ICT into educational activities (Bingimlas, 2009; Vanderlinde, van Braak & Dexter, 2012). In other words, for the fulfilment of ICT integration, staff and students should not experience any difficulty in access to technological equipment and also they should be able to use this equipment (Tearle, 2004). They should also have relevant pedagogical background necessary for the use of this equipment in teaching-learning process as well as having enough knowledge about how to use these equipment and access to technological

equipment (Mishra & Koehler, 2006; Okojie, Olinzock & Okojie-Boulder, 2006; Roblyer & Doering, 2010; Tearle, 2004). The studies carried out in the field of ICT integration into education reveal that teachers do not use ICT tools in their educational practices as they do not know how to integrate ICT into educational activities whereas they can basically use computers (Demiraslan, Koçak Usluel, 2005). Some studies reveal that teachers have started to integrate ICT into their courses (Tearle, 2004), but their willingness to integrate ICT and their ICT use approaches significantly differ from one another (Tondeur, Van Keer, van Braak & Valcke 2008; Tondeur, Devos, Van Houtte, van Braak & Valcke, 2009). In other words, the investments made in the field of technological infrastructure have helped reach some standards. However, the insufficiency of the trainings offered with regards to ICT use and ICT pedagogy is an obstacle for ICT integration (Göktaş, Yıldırım & Yıldırım, 2009; Teaching and Learning Research Program [TLRP], 2006). It is suggested that these differences significantly result from the school culture (Tearle, 2004; Tondeur et al., 2009; Tondeur et al. 2008).

We cannot consider ICT integration as a simple process with clear descriptions and procedural steps (Hew Brush, 2007, O'Dwyer, Russell & Bebell, 2004). Just opposite, it is a complex process requiring technological hardware based on interrelated social facts, professional development activities. When the relevant literature is investigated, it is seen that the investigations related to the natural systematics of ICT integration are not enough (Hayes, 2007; Tondeur et al. 2009). In other words, there is a need for the detailed investigation of some interrelated factors such as teacher training activities within the natural systematics of ICT integration into education, teacher motivation, administrative supports, and stakeholders' responsibilities, school administrators' attitudes (Hayes, 2007; Jimoyiannis, 2008; Lai & Pratt 2004). Otherwise, as it gets difficult to find out the deficiencies of ICT integration into education, the new investments to be made, might be misrouted. Activity System Theory helps researchers to analyze the relationship between the these situations mentioned. With these researches, there is a need for determining the routes of new investments as well as determining the effectiveness of new investments to be made, what contribution they will make to the new process. This study investigates how much achievement teachers have made in the integration of ICT into their courses within the scope of technological infrastructure and teacher training carried out in the ICT integration process in Turkey. Relevant analysis was carried out in the study based on activity model to understand the link and interaction among the other people and objects which possibly have effects on the integration of ICT into courses. The purpose of this study is to analyze the theory and practice dimensions of ICT integration process blending them following the analysis of the ICT integration process carried out by teachers within the scope of activity theory.

Activity System Theory

Activity theory within the scope of the investigation of human activity system helps understand the background of factors, cultural structure and other complex processes (Yamagata-Lynch, 2010). Within this framework, individuals' activities, cognition and environmental context that they interact with, need to be investigated (Jonassen & Rohrer-Murphy, 1999). Within the framework of these investigations, tools, subject, rules, community, labour division, target and outcomes are investigated in-depth. Activity system is a process in which a context and the components of that context interact with one another. There is also a need for carrying out the investigations within the framework of this process under the light of activity theory and for an investigation of actions and operations covered within this process (Roth & Lee, 2007). Besides, a comparison of activity units is also made as a whole (Engeström, 2001).
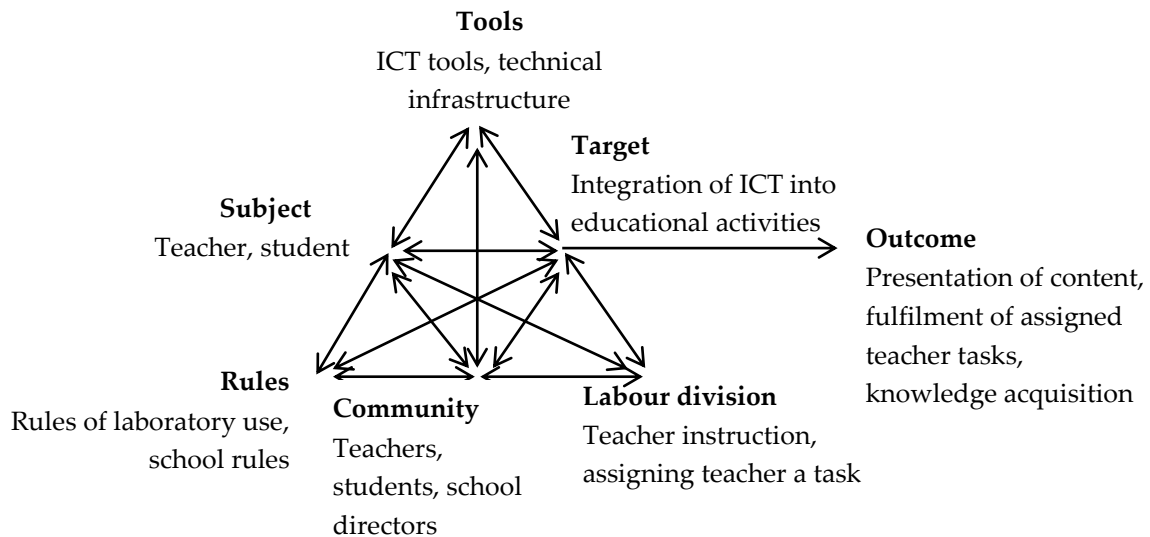
Figure 1. ICT integration activity system

The activity system theory which is taken as the analysis unit of the research considers the process as a big crystallic structure. Stevenson (2008) created an equivalent of the same structure which is presented in Figure 1. What is meant with the expression of "affecting factors" is the interpretation of activity theory from a different aspect. This sample model was recommended to help understand the target section in a clear way. In this model, the target is placed in the middle of the shape, and the relevant units were then played side by side. The fact that the elements of other activity system out of the affecting factors is taken as interaction unit, is taken as the research context. As seen in the Figure 2, the interaction among the variables studied in the research in the facets of the system is highlighted in bold as seen in Figure 2.
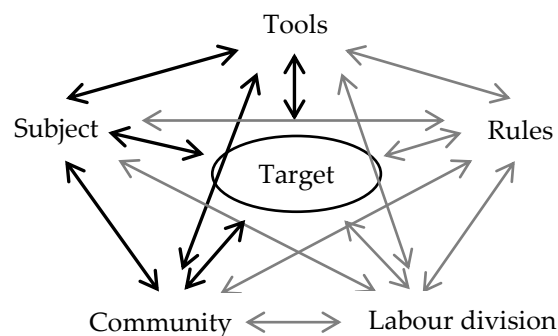

Figure 2. Presentation of the same elements of activity system in the activity pentagon (Stevenson, 2008)

This study aimed to describe the integration of ICT into educational activities by vocational school teachers within the scope of school directors, students and ICT tools. Answers are looked for the following research questions in this study.

1. How do teachers evaluate ICT as educational tools?
2. How do students and school directors evaluate ICT tools as educational tools?
3. How is the teacher-student and teacher-school director interaction within the framework of ICT integration?
4. How do teachers integrate ICT into education within the framework of school directors, students and ICT tools?

Method

Within the scope of the study, the ICT tools used in the process of ICT integration into educational activities by the teachers from Vocational and Technical high Schools in Çanakkale province were in-depth investigated within the framework of students and school directors. Schools were taken as a whole together with their stakeholder variables, and multiple data collection method was used, and the changes were examined. The study was designed as a holistic single case study (Yin, 2003).

Participants

Preliminary interviews were conducted with vocational high schools in Çanakkale province within the scope of the study, and informal chats were organized with teachers and school directors. Besides, the researchers carrying out similar studies in the field were called, and they were requested to deliver their experiences to be able to sustain a long-running case study. Thus, a vocational and technical state high school were determined as the research schools of the study. 106 students, 4 teachers (Hakan, Samet, Ufuk and Azra) and one school director (Fatma) were determined as the participants of the study. 44 of the students were male, and 62 of them were female. They are aged between 14-18 ($\overline{X}$ = 16,12; Ss= 1,06) and they were 9.,10.,11. and 12. grade students. 34 of the students were 9. Grade students, 28 of them were 10. Grade students, 33 of them 11.grade students and 11 of them were 12. grade students. The other research participants are presented in Table 1.

Table 1. Demographic Features of Teachers and School Director (Fatma)

	Gender	Branch	Educational Statues	Professional seniority (year)	Administrative Seniority (year)	Duration of working at the relevant corporate (year)
Hakan	Male	Information Technologies	Post graduate	10	--	4
Samet	Male	Electronic	Graduate	10	--	5
Ufuk	Male	Information Technologies	PhD	13	Department Chief/ 6	6
Azra	Female	Information Technologies	Graduate	7	--	5
Fatma	Female	Office Management	Graduate	16	1	9

Operation

Following the interviews and idea exchanging sessions conducted to determine the research schools, relevant verbal approvals were taken from the volunteer teachers and school director. Then, official permissions were also completed from the Provincial Directorate for National Education. Routine or almost routine observations were made for 12 weeks on different days and at different times. The aim of the first two weeks was to determine the hardware infrastructure of the target schools which are under observation. Then, the main focus of the observation the following weeks was on ICT use of teachers, ICT use of other stakeholders, and the interaction of ICT use of stakeholders with one another. At the end of the process, semi-conducted interviews were conducted with teachers. Students were delivered questionnaires. The school director participated in the study filling in a questionnaire with open-ended items.

Context

There are 42 teachers and 470 students at the school where this study was carried out. The school provides education in four different fields (information Technologies, accounting and financing, Office management, marketing and retail). There is one school director and 4 assistant managers at the school. There are 3 computer laboratories and 24 classrooms at the school. Every classroom at the school is not armed with the same hardware facilities. Classrooms are generally

divided into two as those with enough technological hardware and those without enough technological hardware. The classrooms which are classified as those with enough technological hardware are armed with computer cabinets and projections. The other classrooms do not have such hardware facilities. The computer laboratories are used by the teachers of information technologies and electronic. The information Technology laboratories own a desktop for teachers, monitors, speakers, headphones and multifunctional printer as well as a shared whiteboard, desktops for students, projection and projection screens. 4 teachers who regularly use the relevant laboratories volunteered to be participants of the study. These four teachers also teach in the classes as well as their laboratory hours. The equipment, the classrooms and technological hardware that teachers benefit as they are teaching in the classrooms are presented in Table 2.

Table 2. The Technological Hardware and Classrooms and Laboratories are Armed with and The Teachers That Use Them.

Lab/classroom	Those available in the classroom	Teachers using them
Lab 01	- projection and projection screen - whiteboard, board markers, - teachers' desk, desktops for teachers and monitors - teachers' cabinet, - students' computers (21) - a big table on which students can work on jointly - Climate	Samet
Lab 02	- projection and projection screen, - Whiteboard and board marker - Teachers' desk, desktops for teachers and monitors - Students' computers (17) - Climate	Hakan
Lab 03	- projection and projection screen - Teachers' desk, desktops for teachers and monitors - Students' computers (24) - Climate	Ufuk, Azra
class 01	- Teachers' desk, - Student desk - At the back of the classroom, student's hardware and studying desk - Board	Samet, Ufuk
class 02	- Teachers' desk - Students' desk - projection and projection screen - board	Azra, Ufuk
class 03	- teachers' desk - students' desk - board	Hakan

The researcher participated in the study as an observer out of institution. Thus, the researcher had the opportunity to make a bias-free at the institution and treated the participants accordingly. As the researcher is participant observer out the institution, especially from a university, everybody volunteered to provide help and to facilitate the procedure as much as possible. Besides, no trouble arouse for the researcher to interfere. Thus, the researcher could observe the whole process without having to interfere it.

Data Collection Instruments

The instruments used in the data collection procedure of this study are observation forms, semi-structured interview forms (teacher), open-ended questionnaire form (school director) and questionnaire form (students).

Observation form: It is one of the live examples for data collection at first hand (Patton, 2002). The study used an observation form which was designed in a semi-structured form to serve the purposes of the study and which consists of six basic focus points. The final version of the observation form was delivered to an expert in the field of integration of ICT into educational activities and qualitative research method at post-graduate level, and feedbacks were gathered from them, and the observation form was finalised. The first two weeks of the process was spent on physical observations. The other 10 weeks were spent for social observation between the date of 13-10-2014 and 02-01-2015. Each teacher was observed for 12 times and each of the observation period lasted for about two hours. The observation report is about 122 pages. Within the scope of the physical observation, the question addressed to the participants is "what are the ICT tools that the institution has?" within the scope of social observation, "for what purposes are the ICT tools used in the classes? (Motivation, teaching content, interaction, classroom management, reinforcement.). The observations made with this regard are presented in Table 3 in detail.

Table 3. Observation Procedure

Observation Weeks	Observed Teacher	Observed Classroom	Time/ Duration	Observation report page number
1. Week	Ufuk, Azra	Lab, Lab	13.10.2014/ 4 hours	6
	Hakan, Samet, Azra	Classroom, Lab, Classroom	14.10.2014/ 6 hours	10
2. Week	Azra	Lab	20.10.2014/ 2 Hours	2
	Hakan, Samet	Lab, Classroom	22.10.2014/ 4 hours	3
	Ufuk	Lab	23.10.2014/ 2 hours	1
3. Week	Samet, Ufuk	Classroom, Lab	27.10.2014/ 4 hours	5
	Hakan, Azra	Lab, Classroom	30.10.2014/ 4 hours	4
4. Week	Samet, Azra	Lab, Lab	4.11.2014/ 4 hours	4
	Ufuk	Classroom	5.11.2014/ 2 hours	1
	Hakan	Lab	7.11.2014/ 2 hours	1
5. Week	Hakan, Ufuk	Classroom, Lab	11.11.2014/ 4 hours	7
	Samet, Azra	Lab, Lab	13.11.2014/ 4 hours	6
6. Week	Ufuk, Azra	Lab, Lab	17.11.2014/ 4 hours	4
	Hakan, Samet	Lab, Classroom	19.11.2014/ 4 hours	3
7. Week	Samet, Azra	Lab, Lab	26.11.2014/ 4 hours	7
	Hakan, Ufuk	Lab, Lab	27.11.2014/ 4 hours	5
8. Week	Samet, Azra	Lab, Lab	2.12.2014/ 4 hours	4
	Ufuk	Classroom	3.12.2014/ 2 hours	1
	Hakan	Lab	5.12.2014/ 2 hours	2
9. Week	Hakan, Ufuk	Classroom, Lab	9.12.2014/ 4 hours	4
	Samet, Azra	Lab, Lab	11.12.2014/ 4 hours	4
10. Week	Azra	Lab	15.12.2014/ 2 hours	3
	Hakan, Samet	Lab, Classroom	17.12.2014/ 4 hours	4
	Ufuk	Lab	18.12.2014/ 2 hours	3
11. Week	Samet, Azra	Lab, Lab	24.12.2014/ 4 hours	7
	Hakan, Ufuk	Lab, Lab	25.12.2014/ 4 hours	8
12. Week	Samet, Azra	Lab, Lab	30.12.2014/ 4 hours	7
	Ufuk	Lab	29.12.2014/ 2 hours	3
	Hakan	Lab	02.01.2015/ 2 hours	3
Total				**122 pages**

Semi-Structured Observation Form: semi-structured observation forms were used for teachers considering the aims of the research and the relevant literature. Reliability studies were carried out with one expert from the fields of ICT integration and qualitative research method, and their opinions were received. With the use of the latest revised version of the data collection instrument which consisted of 8 items, interviews were conducted with four teachers (Hakan: 58 minutes, 05.01.2015; Samet: 35 minutes, 16.01.2015; Ufuk: 44 minutes, 19.01.2015; Azra: 25 minutes, 20.01.2015), and the interviews were recorded. The semi-structured interviews were conducted after the completion of the observation process. The semi-structured interviews which were conducted with four teachers were completed in two weeks. The interview forms include such questions "what is the expectation of your institution about the use of ICT in your teaching activities.

Questionnaire Form: The questionnaire used in the study was prepared with some items in parallel with the aim of the study. The questionnaire which was prepared specifically for the school director consisted of open-ended questions. This form consisted of 7 items. During the preparation phase of the forms, reliability studies were carried out with one expert from the field of ICT integration and qualitative research methods. The questionnaire was submitted to the school director by hand, and he was briefed about the expectations of the research. The school director delivered the questionnaire through e-mail to the researcher. There were some items in the questionnaire form such as "what kind of role do you think you have about information and communication technologies at your institution?"

The questionnaire which was developed for students contained two open-ended and 6 closed-end items. Open-ended and closed-ended items are all given on one form. Questionnaires were delivered to the students during their class hours, and they were explained how important it was for them to write their actual opinions, the aim of the research, and significance of their contribution to the study. The questionnaire forms completed during the class hour were collected from the students. 120 questionnaire forms were distributed within the scope of the study, but 106 of them returned back to the researchers. There were some items on the forms such as "how do you benefit from information and communication technologies for educational purposes."

Data Analysis

The data gathered through the questionnaire from students (Quantitative data) were submitted for analysis through descriptive statistics. All qualitative data were submitted for content analysis based on activity theory. Thus, the intense data collected through multiple data collection instruments were analyzed in some ways to make easier to obtain relevant results. The qualitative data collected through observation, interviews and open-ended questionnaires were primarily regulated, admitted by NVivo programme and voice recordings were dumped. In the following phases, the coding of qualitative data within the framework of activity theory components was carried out. The obtained data was used to explain the context and to come up with answers to the research questions. As the data was analysed, the elements of activity factors were handled. Within this framework, the roles of subject and implementations were analyzed, the community participants were determined, and then the elements were determined to be tools and the targets were made clear. Activity, action and operations were analyzed based on the determined elements.

Then, the relationships among components and how relationships affect the process were investigated. The focus of the study in the analysis of the activity factors was on their roles, and the outcomes and how community affected the subject within the framework of the study. The target oriented activities performed by the subject and the events occurring within the activity were investigated in the analysis of the activity, action and operations. To be able to reach the target successfully, community was focused to understand them better and interrelations were examined in the analysis of inter-component relationships. The data of this research were collected through observation, semi-structured interviews and questionnaire forms. As direct quotes are cited from data source in the findings section, teacher code and date were used for observation. Teacher code and voice recording, the beginning and end of the relevant speech were used for interviews. School

director and open-ended questionnaire were used for open-ended questionnaire. If there is no direct quotation from the data collection tools; in other words, if the data is reported through the author's own writing, "e.g." is added to the beginning.

Reliability Validity

For validity purposes, the participants were informed that only the real cases could really help the study achieve its goal and help draw accurate conclusions. The observations made as parts of the study were scheduled on different days and time slots to make it easy to accurately understand the process, and observation points were verified not to cause any data loss in the study. Highly convincing (Lincoln & Guba, 1985) and mutually complementary (Morse, 1991) data were gathered by extending the data collection process through observation process and by diversifying data collection tools. Researchers performed the observation task as a neutral observer without interfering the procedure (Bailey, 1982). The procedure was managed not to allow any time difference between the semi-structured interviews conducted with different people. Thus, similar interview environments were prepared for the participants. The student questionnaire form which was delivered to a large group of people was prepared in a form with the least item to serve the purpose of the study with regards to usability. Participants were told that questionnaire was not a means of evaluation, and that it did not contain any item aiming to display their identities to help the participants feel secure. The consistency of the study was tested through multiple data collection tools for the internal consistency of the study (observation, interview-questionnaire).

Findings

The primary focus of the study was on the components of activity system, action and operations to be able to investigate the responses to the research questions.

Activity System Factor

Subject: The subject is the one who performs the activity. Four teachers participating in the study are the subjects of the ICT integration process into educational activities. Teachers were expected to carry out the integration of ICT into educational activities with this regard.

Target: The integration of ICT into educational activities was investigated in this study. With this regard, the integration of ICT into educational activities is the target component in the activity system.

Community: It was found in this study that students and school directors established communities for ICT integration into educational activities. Learners take courses in small groups (8-17 people). There are four assistant directors and one head director. However, the school director is the key person for the integration of ICT into educational activities at institutions.

Tools: It involves all the tools through which educational activities are organized such as learners' getting knowledge, being motivated and attracting their attention. The tools that teachers use change depending on the fact that they perform their educational activity in a class or a computer laboratory. Teacher used computer and whiteboard in their activities carried out in the classroom environment. They used whiteboards as both projection screen and board to write on. In the class hours which they performed in laboratories, they used desktop computers, projections, laptop computers, flash memory, multifunctional printers, photocopier, white board and smart phones.

Outcome: It was found in the study that every teacher's ICT integration into educational activities differ from one another. Hakan was found to have targeted ICT integration into educational activities and to have used ICT tools to serve that purpose (Figure 3).
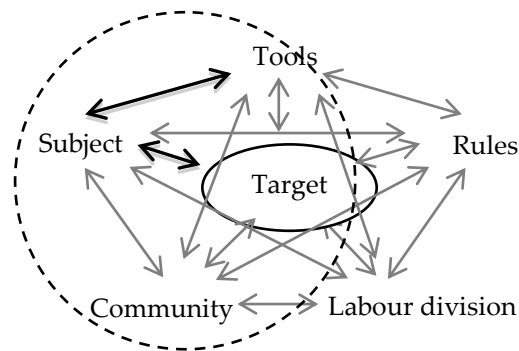
Figure 3. ICT integration of Hakan

It was found that Hakan was interested in ICT tools, preferred ICT tools in his personal affairs and educational activities. As seen in Figure 3, Hakan uses ICT tools in his educational activities. With this regard, it is seen that he integrated ICT into his courses as suggested "*he asked learners to visit the page http://www.css3maker.com/ and examine some pages on that webpage. Before the teacher started teaching, he showed learners what they were going to learn*" (Hakan, *observation on 11.11.2014*). Hakan's relationships with students and school directors who are members of the target community were not found out in the study. It is seen that Hakan sustains ICT integration independently from his co-workers. Samet and Ufuk were found to have interaction with ICT tools and community as part of their goals (Figure 4).
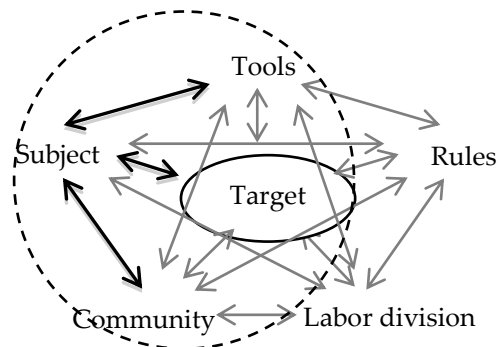

Figure 4. ICT integration of Samet and Ufuk

Samet and Ufuk were found to be in interaction with students, school director and ICT tools in their educational activities. It was also observed that teachers guided students who are members of community to using ICT tools for educational purposes as part of ICT integration (e.g. Samet, *observation on* 11.12.2014). There is no clue to suggest that students interact with their teachers as part of ICT integration. Teachers also suggested that they could get permission from their school directors when they want to participate in professional development activities for ICT integration. This is the only interaction between teacher and school director within the framework of ICT integration. The following case can be given as an example for that "*I often participate in professional development activities for ICT use to be able to catch up with the latest ICT technologies or to understand the trend in ICT use. The biggest support that I receive from my school director is that he permits me to participate*" " (Samet, *voice record, 12:02- 12:25*). Ufuk was found to have practically performed the operations related to preparation of the classroom for ICT integration at the beginning of the educational activities. This can be given as an example for this "*as happens every week, differently from the other teachers, he connected his laptop to the projection, set the projection screen and switched on the projection with his remote control rather than demanding the tallest of the class to do it, and he drew the curtains. Besides, he asked all students if their computers were running appropriately*"(Ufuk, *observation on 18.12.2014*).

Azra was found to use ICT tools as a goal in his educational activities. Azra uses ICT tools in his educational activities; however, he does not aim to integrate ICT (Figure 5).
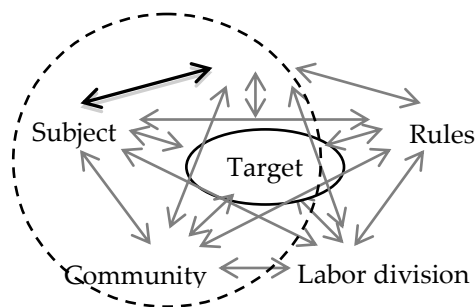
Figure 5. ICT integration of Azra

Azra was found to have taught how to use ICT in educational activities (e.g. Azra, *observation on 11.12.2014*). What Azra thinks about ICT integration with this regard is "*I try to stay away from technology as much as possible after school… I do not know how to get support from ICT in my courses. I do not think it is so necessary*"(Azra, *voice record, 08:27- 08:54*).

Activity System Action and Operations

Three actions and their operations were determined within the score of ICT integration into educational activities in this research. It was found that teachers performed actions to attract students' attention, to assign homework/check homework, to transfer content as part of integration of ICT into educational activities. The operations which are performed within the framework of these actions are presented in Table 4 in turn.

Table 4. Activity System ICT integration into Educational Activities.

Actions	Operations
Activities related to content transfer	• Teacher's switching on the laptop he brought with. • Connecting the laptop to the projection • Showing appropriate pictures related to the applications that students are going to perform. • Reflecting the phases of operation in the relevant field through the projection • Keeping the reflected course subject on the projection screen to allow students follow the relevant operational phases. • Downloading data sources related to course content from the internet (http://www.megep.meb.gov.tr) • Teacher's asking students to download relevant data sources • His using the downloaded source files in his instruction in the classroom. • Reflecting important points of the studied topic at the end of the instruction through "Not Pad" programme
Assigning /checking homework	• Assigning homework on a Learning Management System (LMS) • Demanding students to upload their homework to the LMS till the following class hour • Teacher's grading students' homework on LMS • Exhibiting some chosen student homework on LMS at the end of the term.
Activities aiming to arouse the distracted interest	• Getting students to view ready to watch videos related to the course subject on his laptop • Getting students to watch YouTube videos about the course subject • Getting students to watch videos on laptop which are not related to what was taught on that day.

Interaction among Activity System Elements

The subject, tools and interaction among community which were treated as activity system elements in ICT integration into educational activities are presented in Table 5.

Table 5. Interaction among Activity System Elements related to ICT Integration into Educational Activities.

1. Research Question: Subject-tool relationships	Technology Planning Developing teaching material Participating in Professional development activities.
2. Research Question: Community-tool relationship	*Student-ICT tool* Research within the scope of their field of interest *School Director-ICT tool* Meeting hardware related needs Verify setup of the newly purchased technical devices
3. Research question: Subject-community relationship	*Student-teacher* Teacher's relieving students about ICT use Executing joint project Informal chats about ICT tools *Teacher-school director* School director's support to teacher for Professional development plans.
4. Research Question: Subject-community-tool relationship	*Teacher-student-ICT tool* Negative cases Teacher's ICT tools getting monotonous for students Teacher's using personal computer causes waste of time Positive Cases Web-based supporting to the course on File sharing Summarizing the course.

When Table 5 is examined, it is seen that teachers determined both hardware related and software related needs of the school and school laboratory, that they determined the appropriate places of the devices in the classroom and they also decided on laboratory typologies (e.g. Ufuk, *observation on 23.10.2014*). Besides, it was also found that teachers produced some of the materials that they used in their educational activities by themselves. One of the teachers summarizes that as follows, *"… I may not always find the video or example that I need… moreover, I often produce my own material. Creating your own material is sometimes easier. I do not have any problem with technology. It is a good spare time activity at school."* (Samet, *voice record*, *08:34- 08:47*). Teachers claimed that they participated in some professional development activities to learn how to use some programmes or devices that I was interested. One of the teachers claims suggesting *"I have participated in many Professional development activities about programme use. Most of them came true with my own efforts… I can say that I did not reuse the tool that I used after each activity…I realized that my frequency of use increased as well as its productivity"* (Hakan, *voice record, 34:45 35:14*).

When the community-tool relationship was examined, two sub-units emerged as student's and school director's relationship with tools. In student-tool relationship, students were found to have used ICT tools and news sources independently from educational activities (f=36, *student's questionnaire*), to have used as a means of communication (f=22, *student's questionnaire*) to have played games (f=18, student's questionnaire) (e.g. Samet, *observation on 04.11.2014*). Some students were found to have used ICT making researches in the fields of interest within the framework of educational activities (f=12, *student's questionnaire*). With regards to school director-tool relationship, school director was found to have met the hardware related needs of the institution considering the institutional budget. School director explains what he has been doing as follows; *"… smart boards have come within the scope of Fatih Project. New computers have been purchased."* (School director, *open-ended questionnaire*). One of the teachers suggests as *"… we deliver the list of requirements to him (school director).. When the time comes, our needs are also met"* (Ufuk, *voice record, 06:00 06:12*). Besides, it was also found that school directors check installation and placement of newly delivered materials to the institution and also request stakeholders to deliver their ideas (e.g. Azra, *observation on 02.12.2014*).

Subject-community relationship was examined, teachers were found to have connection related to ICT integration in two sub-units with student and school director. Teachers demand students to present their activities on teacher's computer as part of educational activities. It was observed that students looked anxious as they were walking to the teacher's computer. It can be stated that when such cases arise, teachers help students calm down. The following case can be given as an example for that "… teacher asked a female student to use teacher's computer and present her activity. She was also requested to calm down. Then, the teacher helped the student suppress her excitement saying "we spend more time here in front of computer screen during the day than you do with your parents, calm down. (Samet, *observation on 4.11.2014*). It was observed that joint projects of teachers and students also increased the duration students spent on ICT, and teachers routed students about ICT integration (e.g. Ufuk, *observation on 05.11.2014*). Another finding was that teachers directed students between breaks through informal chats about ICT integration, that students started to create expectations from their teachers about ICT integration (e.g. Azra, *observation on 11.12.2014*). The fact that teachers' demands for participation in professional development activities are approved by the school director was found to be the only connection between teacher and school director. One of the teachers declared opinion as "… I found out all the activities related to ICT integration. Nobody told me about them, or nobody inspired me to participate. My school director permitted me for all professional development activities that I wanted.." (Hakan, *voice record, 17:18 17:34*).

When the subject-tool relationship was examined, the only relationship found out in the study was teacher-student-ICT tool. These triple relationship was found to have connections in two sub-units as positive and negative cases. As an example for negative cases, it can be suggested that teachers do not often change the teaching methods and educational materials that they have adopted. Teachers use educational materials, but they always use similar types of materials. The monotony in the use of educational materials leads to loss of motivation in the long term. With this regard, the following case can be given as an example *"..teachers often sustain their course through the use of display books. However, these tools used in the class are not attention-grabbing. It is also noteworthy that teachers' presentations included too much text, they did not pay attention to the shape-ground relationship, and the writings were hardly illegible."* (Ufuk, *observation on 25.12.2014*). Teachers use their personal computers in their course for various reasons. It was found in this study that the first 10 minutes of the class hour was not effectively used because of some operational phases, such as taking laptop out of the notebook case, switching it on, plugging the laptop in power, connecting the computer to the projection (e.g. Ufuk, *observation on 3.12.2014*). One of the teachers explains that as ".. we do not have access to some web pages or social networking sites.. or it is easier to bring the source I studied at home to the classroom in this way.." (*Hakan, voice record, 4:09- 4:37*). In contrast to these, teachers were found to provide support to students through web sources by assigning homework, accepting homework on LMS. The following case can be given as an example for that "..*I continuously used a learning management system we agreed on with friends. I realized that that really helped increase my interaction*

with students extending the learning out of classroom environment" (Hakan, *voice record, 25:46- 27:04*). It was also found that teachers concretized teaching using ICT tools as part of educational activities. This can be given as an example for that "when the relevant tools were not available in the classroom, teacher wrote its name on the search engine on the internet to show students what kind of thing it was, what shape it was and what function it had. The teacher then reflected the visual with the highest pixels on the projection screen (Azra, *observation on 11.12.2014*). It was also another finding that teachers used ICT tools (flash memory) to share files as well as educational activities. This is an example for that *"… teacher delivered students the source of information which is about the subject of the day through a flash memory. Students copied the relevant file passing the flash memory from hand to hand. This lasted for about 15 minutes."* (Azra, *observation on 15.12.2014*). Finally, teachers were found to have summarized the course as part of complementary activity. During this summary session, the summary notes were written on the computer so that all students could take notes, and then the teacher reflected the notes on the projection screen. Students were asked to write down the notes on the screen in their notebooks. This can be given as an example for that *"once everybody has done the application, notepad programme was opened as usual, and the descriptions mentioned in the subject were written down on the notepad and then the students were asked to put them into their notebooks"*(Ufuk, *observation on 23.10.2014*).

Discussion

As the outcome of the activity system, teachers' ICT integration applications were found to differ from one another. Hakan, Samet and Ufuk were found to have aimed ICT integration into their educational activities, but Azra did not. The teachers who participated in professional development activities in subject-tool relationship were found to be attentive to the use of ICT tools in their courses and to development of educational materials. It is very eye-catching that the teachers who aimed ICT integration into their educational activities were found to have actively participated in professional develop activities. It can be concluded here that teachers participated in educational activities within the scope of ICT integration to professionally develop themselves. It was found that the strongest relationship with regards to ICT integration into educational activities was found to be between subject and tool. It can be suggested that community members are not aware of their responsibilities related to ICT integration; therefore, subject-community relationship often functions like one way arrow. In other words, it was also seen that community used ICT for some other non-educational purposes. Besides, teachers were found to have no expectations related to ICT integration. This can be suggested to be an obstacle in the actualization of ICT integration. When the actions and operations around the target, it was seen that teachers performed operations to interact with the tool. Similarly, the action planning aims to interact with community members. This reveals that there is a break-down between teacher-student, teacher-school director in the integration of ICT into educational activities. It was also found that there was not any community-tool relationship at all. With this regard, teachers were found to have come to a certain point in ICT integration through pre-service and in-service trainings. However, it can be suggested that the other stakeholders of the process need to be informed about this issue. But we should remember that they are teachers of information technologies and that they are already in interaction with ICT tools. However, Azra, who is also a teacher of information technologies, do not participate in professional development activities and is not interested in ICT integration. This indicates that teachers do not know how to integrate ICT into their educational activities whereas they are users of technology (Demiraslan, Koçak Usluel, 2005). Besides, it can be suggested that professional development activities related to ICT integration into education, support teachers within the scope of ICT integration into educational activities (Göktaş, Yıldırım & Yıldırım, 2009; Teaching and Learning Research Program [TLRP], 2006). Hakan, Samet and Ufuk who try to integrate ICT into their educational activities, differed in how they integrate ICT, in their purposes of integrating ICT. As stated in the relevant literature, the differences of teachers in the use of ICT (Tondeur et al. 2008; Tondeur et al. 2009) may result from the scope of the professional development activities that teachers participated or from the differences in applications.

When community-tool relationship was examined, it can be suggested that teachers do not often use ICT tools in their educational activities. However, it was seen that some teachers used it for their personal affairs, communication or personal interests. The study has also come up with that students were not aware that they could use ICT for educational purposes, that they should look for opportunities to use ICT, that they could be a real team with their teachers with the help of ICT integration. In other words, students are not aware that they have some responsibilities within the framework of ICT integration (Banister & Vannatta, 2006; Chen, 2004; Kay & Knaack, 2005). Opposed to the students, the school director was found to be aware that he had some responsibilities in the integration of ICT into educational activities. However, the responsibilities that the school director claimed to have fulfilled about ICT integration are, differently from what is claimed in the relevant literature, applying the procedure and meeting hardware related needs of the institution (Schiller, 2003; Surry and Land, 2000). This may also reveal that school directors are also unaware of some responsibilities or do not fulfil some of their responsibilities.

It was also found, within the framework of ICT integration, the direction of the arrow representing teacher-student relationship is one way to student from teacher. With the help of the activities teachers jointly carried out with students as part of ICT integration, students' motivation can be suggested to improve (Bingimlas, 2009; Bransford et al. 2000; Daves, 2001; Grabe and Grabe, 2007; Sessoms, 2007; Sivin-Kachala & Bialo, 2000). When the "V" shape student-ICT tool and teacher-student relationship was examined, teachers were also found out not be aware of their responsibilities related to the integration of ICT. Teachers' unawareness of this issue may be hindering students from developing sense of responsibility. Teachers' being in communication with students within the scope of ICT can be suggested to help students realize their responsibilities about ICT integration. Teacher-school director relationship was found to be weak within the scope of ICT integration. In other words, teachers undertake the process of ICT integration on their own independently from school directors.

When the triangle shape subject-community-tool relationship was examined, the ICT tool that teachers used in their courses did not attract students' attention whereas ICT tools were expected to speak to more sense organs. Opposed to the materials designed to speak to more sense organs of students, the use of new materials that they were not familiar with was found to be more attention grabbing. This may result from the fact that teachers did not design the course materials considering the principles of material design. This defect which results from teachers, is a consequence of teachers' preference for a more troublesome and time-consuming way of file sharing in the classroom. It can be suggested that these two factors negatively affected the process of ICT integration. Whereas teachers have a command of technology, they were found to have experienced problems in ICT integration (Demiraslan, Koçak Usluel, 2005).

Results and Suggestion

The findings of the study aim to investigate the integration of ICT into educational activities and to observe the roles of stakeholders in practice. For this purpose, the stakeholders of ICT integration process were made clear under the light of the relevant literature, and then the roles acted out and their mutual relationships were made clear. The findings of this study are very significant for practitioners and researchers to reveal the roles which go wrong or function properly, to plan ICT integration and to organize professional development activities. In the findings of the study, it is clearly seen that teachers are the only stakeholders in the process of ICT integration. Within the scope of ICT integration, teachers were found not to have a strong relationship with other stakeholders. Besides, other stakeholders do not have a command of their roles (Figure 6).
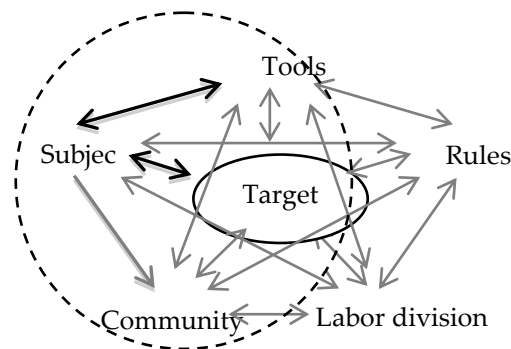

Figure 6. Overall Status in Interaction among Factors

As seen in Figure 6, community is not aware of their aim of ICT integration. The teacher, who is aware of the aim, is always in contact with community members. When the hardware facilities of the learning environment are examined, it can be suggested that technical, infrastructure capacity has reached to a certain point. Teachers are in interaction with students within the scope of ICT integration. Whereas students have command of the use of ICT tools, they still need some professional development activities on What ICT integration is, what the roles of stakeholders are and how to sustain the process. It was also found that the school director needed some professional development activities on the use of ICT tools, what the integration of ICT is, how the integration is sustained, and the roles of stakeholders for ICT integration. When student stakeholders are considered, teachers and school directors can be provided help for raising students' awareness about ICT integration. In the professional development activities on ICT integration, which will be held for teachers and school directors, the roles and responsibilities of the third parties may be clarified and relevant plans can be done to help students gain them.

In on-going researches, professional development activities can be organized for teachers and school directors who are the stakeholders of ICT integration. Appropriate example can be introduced in these activities mentioning about what ICT integration is, the introduction of the roles of stakeholders, how the ICT integration will be fulfilled and ICT integration. Advice can be offered to make clear how students, who the third stakeholders of the process are, could be guided. The following advice can also be offered as well as advices on application. Similar studies in the literature can be examined with teachers from other fields. More detailed studies can be carried out extending the study to cover more regions and schools. Besides, the data collection instruments investigating the ICT integration of teacher-student and school director who are stakeholders of ICT integration can be improved. With these improved instruments, larger samplings can be subject to similar studies.

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