



How to be productive in PhD Level: A needs assessment study for doctoral students' research productivity*

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Abstract

The aim of the study is to conduct a needs assessment study to determine research productivity needs of doctoral students. A mixed method approach and fully mixed con-current dominant status design is used in the current study. The participants of the study included doctoral students, professors, and deans of (graduate schools) at a university in Turkey from the various Social and Natural Sciences Departments so that the needs of doctoral students from different disciplines could be examined. 'Needs assessment questionnaires' were administered to 35 doctoral students, 35 professors, and 4 deans; interviews were conducted with 7 doctoral students, 4 professors and 4 deans to collect the data. Findings of the study showed that academic writing skills were the most frequently mentioned skill that the doctoral students need to improve for their research productivity. In interviews, needs of the participants divided into personal factors like interest and positive attitudes towards research, intrinsic motivation, critical thinking and writing skills, scientific method and foreign language knowledge; institutional factors like support of advisor/professors, taking part in collaborative and interdisciplinary studies, joining the research projects, accessing easily to resources, elimination of bureaucratic obstacles, and environmental factors like support of individuals in immediate surroundings of doctoral students.

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1. Introduction

Doctoral education is considered to be one of the most important steps in educational processes. Nerad, Trzyna and Heggelund (2008) indicate that doctoral education is in the center of universities' research capacity and has an important place in global economy in

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the aspect of development of research productivity and innovation; therefore, doctoral students are seen as one of the sources for innovation, research, and development, and doctoral education plays a critical role in the generation of knowledge. Knowledge and skills obtained during the doctoral education is accepted as highly influential in the research productivity of the individuals even after the graduation. As a result, the countries around the world have been increasing their capacities on doctoral education and evaluating their current doctoral programs with a critical point of view.

Research productivity refers to research outcomes by evaluating the research performance in terms of effect, quality, significance, and quantity (Harris, 1990). As is the case in all fields, individuals who grow up in the academic field are expected to be productive, and the term, research productivity, becomes an important notion. According to David (1994), individuals who are knowledgeable and specialized in certain fields prefer being productive with their publications. One of the most important reasons for this is that it allows people to present their findings in the field. Recent findings and the presentation of these findings through publications increase the accuracy, applicability, and spread of the knowledge. Accordingly, recognition by academic community is considered as one of the greatest awards for a scientist. In addition, financial support and promotion opportunities were also provided to productive academics.

Investigating the factors related to research productivity has been among the objectives of many researchers. For example, in one of these studies, Bland, Center, Finstad, Risbey, and Staples (2005) describe the factors affecting research productivity. The authors divided these factors into three groups as 'individual, institutional, and administrative factors' that facilitate research productivity, and they listed individual factors as socialization, motivation, content knowledge, basic and advanced research skills, project participation, orientation, autonomy, commitment, and work habits. Institutional factors were election and assignment, clear objectives, research priority, culture, positive team environment, counseling, communication with professional people, resources, adequate work time, size/experience/expertise, communication, awards, professional development opportunities, decentralized organization, and positive participant experience. Administrative factors, on the other hand, were described as wisdom, being research-oriented, having critical leadership roles, and participatory leadership. In another study, Turner and Mairesse (2003) mention personal variables that affect research productivity and the variables that encourage individuals to conduct studies. While personal variables were listed as age, group support, gender, and education; variables that encourage individuals to conduct studies were defined as employment status, rank, and laboratory use. Similarly, in their study investigating the productivity of university students studying at research universities, Kuh and Hu (2001) stated that the statuses of students relating to studying, writing, communication with peers, and using the library, information technologies, and cultural and artistic fields were among the factors affecting productivity. In summary, the factors related to

research productivity can be classified in three groups: individual characteristics such as gender, age, educational level, attitude towards research, and the personal characteristics of the researcher (Marie, 2008; McAlpine and Amundsen, 2011; Zainab, 1999); institutional and departmental features such as relations with counselor/professors, characteristics of the institution, faculty size, technology, and equipment efficiency (Lee and Bozeman, 2005; Sinclair, et al. 2014; Ynalvez, Garza-Gongora, Ynalvez and Hara, 2014); and environmental factors such as working policy, general and private funding, and students who will support the research (Abramo, D'Angelo and DiCosta, 2009; Bland et al., 2005; Gaughan and Ponomariov, 2008).

Countries that aim to develop their country and have high-quality manpower in higher education undoubtedly need scientists with high research productivity. Doctoral education is considered to be one of the most important steps in which research productivity could be increased. Accordingly, carrying out a needs analysis study to identify the research productivity needs of doctoral students is important in terms of increasing the research productivity of them. Needs analysis refers to the comparison of the current state of affairs with the acceptable norms to determine the needs and the current state of the situations (Tyler, 2014). Determining the research productivity needs of doctoral students can spearhead the training programs that can be structured based on these needs. Hilda Taba, Francis Hunkins, and Daniel Stufflebeam, the pioneers in the field of curriculum development, stated that curriculum should be developed bottom-up, not top-down; and needs of individuals, society, and subject area should guide the determination and assessment of the objectives of the curriculum (Ornstein and Hunkins, 2009). Therefore, this study aimed to conduct a needs assessment study to determine the primary research productivity needs of the doctoral students studying at various Social (Social and Educational Sciences) and Natural Sciences (Natural and Health Sciences) Departments at a university in Turkey. In line with this purpose, answers of the following questions were examined under the basic question, 'What are the research productivity needs in doctoral education?'

1. What kind of skills do professors, deans (of the graduate schools), and doctoral students think doctoral students primarily need to increase their research productivity?
2. What are the views of doctoral students on their research productivity needs?
3. What are the views of the professors about the research productivity needs of doctoral students?
4. What are the views of the deans (of the graduate schools) about the research productivity needs of doctoral students?

2. Method

2.1. Study Design

In this study, qualitative and quantitative methods were used together. The mixed method is defined as ‘a research method in which quantitative and qualitative data or techniques are combined or mixed in a single study or in a closely related study sequence’ (Christensen, Johnson, and Turner, 2015, p. 423). The fully mixed concurrent dominant status design, which is one of the mixed method designs, was used as the research design. In this design, qualitative and quantitative stages are used as a combination in one or more components of the study. Giving more emphasis to one of the quantitative or qualitative stages is the most outstanding characteristic of the design (Leech and Onwuegbuzie, 2009). In this study, the qualitative and quantitative data were collected concurrently. Since predominantly qualitative data were used and quantitative data were structured to support the qualitative data, this design used in the study

2.2. Study Group

The study was conducted at a university in Turkey. As of the February 7, 2017, the total number of doctoral students in this university was 387, 118 of whom were enrolled at the Institute of Social Sciences, 28 at the Institute of Educational Sciences, 53 at the Institute of Health Sciences, and 188 at the Institute of Natural Sciences. There were a total of 4 deans, one in each institution. The total number of professors who gave Ph.D. courses at the university was 174, 45 of whom were at the Institute of Social Sciences, 118 at the Institute of Natural Sciences, 6 at the Institute of Educational Sciences, and 5 at the Institute of Health Sciences.

The study group consisted of students who attended doctoral education in the field of Social Sciences (Institutes of Social Sciences and Educational Sciences) and in the field of Natural Sciences (Institutes of Natural Sciences and Health Sciences) during the 2016-2017 academic year and volunteered to participating in the study, professors who gave doctoral courses, and deans who had a doctorate program in their institute.

The data were collected in two stages in the study. ‘The Needs Analysis Questionnaires’ were administered to 35 doctoral students, 35 professors, and 4 deans of the graduate schools. The distribution of the participants by Graduate School is presented in Table 1.

Table 1. Questionnaire Participants by Graduate School

	Graduate School	Participants	Total
Deans of Graduate Schools	Social Sciences	1	4
	Educational Sciences	1	
	Natural Sciences	1	
	Health Sciences	1	
Professors	Social Sciences	11	35
	Educational Sciences	5	
	Natural Sciences	17	
	Health Sciences	2	
Doctoral Students	Social Sciences	14	35
	Educational Sciences	10	
	Natural Sciences	9	
	Health Sciences	2	

The face-to-face interviews were conducted through ‘Needs Analysis Interview Forms’. Interviews were carried out with 7 doctoral students, 4 professors, and 4 deans. The distribution of the participants by Graduate School is presented in Table 2.

Table 2. Interview Participants by Graduate Schools

	Graduate School	Participants	Total
Deans of Graduate School	Social Sciences	1	4
	Educational Sciences	1	
	Natural Sciences	1	
	Health Sciences	1	
Professors	Social Sciences	1	4
	Educational Sciences	1	
	Natural Sciences	1	
	Health Sciences	1	
Doctoral Students	Social Sciences Educational Sciences	3	7
	Natural Sciences	1	
	Health Sciences	2	

2.3. Data Collection Tools

2.3.1. Needs Assessment Questionnaires

In order to develop the needs assessment questionnaire; first, 9 topics which were found to affect the research productivity of students were chosen based on the related literature. Next, a questionnaire form involving these topics were handed out to the students, professors, and deans, and finally, the participants were asked to rate the items from the most important to the least.

2.3.2. Needs Assessment Interview Forms

During the needs assessment, face-to-face interviews were held with the participants using semi-structured interview forms. In these interviews, students, professors, and deans were asked questions such as the efficiency of doctoral students in academic publication process, factors affecting research productivity, positive and negative situations encountered during research, the causes of and solutions to the problems; and overall, needs to increase productivity. The purpose of the interview forms was to describe the current status of doctoral students' research productivity, compare the questionnaire results with the interviews, and to reveal the issues that were not appeared in the needs analysis questionnaires.

2.3.3. Validity of the Data Collection Tools

Expert opinion was consulted to ensure the content validity of the data collection tools. The total number of experts was 5, 3 of whom were specialized in Curriculum and Instruction, 1 in Educational Measurement and Evaluation, and 1 in Turkish Language field. The Curriculum and Instruction experts were asked to examine the scope of the questions to be asked in the needs analysis stage; the measurement and evaluation expert was asked to express their opinions about whether the questions measured the desired feature; and the Turkish Language expert was asked to assess the suitability of the items in terms of Turkish language. The questions prepared by the researcher were placed in the 'Expert Opinion Form', where there were three options for each item such as 'appropriate', 'should be corrected' and 'must be removed'. A statement warning the experts, such as 'Please, write your explanations and suggestions here for the statements which you don't find appropriate', was written at the bottom of the form; and therefore, the opinions and recommendations of the experts were taken. The questions that the majority of the experts considered appropriate remained in the data collection tool; the questions advised to be corrected were arranged in line with the recommendations, and the questions which were not approved by the majority were removed from the data collection tool. Additionally, with regard to the clarity of the form, the opinions of three students who attended doctoral programs at different universities (rather than the university where the study was conducted) were taken.

2.4. Data Analysis

Descriptive statistics were used to analyze the quantitative data by using SPSS 22 package program. Frequencies were used to determine doctoral students' primary training needs that aim to improve their research productivity. The qualitative data were analyzed using descriptive analysis method by using MaxQda program. Various methods were employed in the study to increase the evidences for validity and reliability of the results of the study. One of these methods is the data triangulation. In this study, triangulation was ensured by using data obtained from different participant groups

through various data collection methods such as the questionnaires and interview forms. Another method that was employed in the study was detailed descriptions. In this study, voice recorders were used to record the interviews, and the tone, gestures and mimics of the participants were also noted and included in the analysis. Transcriptions of the interviews were documented to provide a depth-oriented data collection. Additionally, semi-structured interview forms were used in the study 4 for depth-oriented data collection, and the in-depth responses of the participants were collected without any limitation. The pattern exhibited in terms of the meaning in relation to the research questions, the relationship of the questions with each other, and the pattern emerging out of the responses as a whole were taken into consideration. In addition, a consistency analysis was performed in the study by getting the experts opinion to ensure the validity of questionnaires and interview forms and continuous control of the coding by one of the researcher conducted in qualitative part. Finally, the participant confirmation was carried out. At this stage, we selected two participants and showed them our interpretations of the data they provided. Participants confirmed that we had a shared meaning and understanding.

3. Results

3.1. Findings Related to the Needs Assessment Questionnaire

The needs assessment questionnaire included a question asking the primary needs of the doctoral students to improve their research productivity. Findings of the study showed that academic writing skills was the most frequently mentioned skill that the doctoral students need to improve for their research productivity. Secondly, development of thinking skills including critical thinking, reflective thinking, creative thinking, and problem solving skills are determined as needs for doctoral students. Study strategies including time and stress management were reported in the third place. The other needs were listed in table 3 and participants added foreign language skills to the questionnaires 'other needs' part.

Table 3. Frequencies of Primary Needs for Doctoral Students' Research Productivity

Factors	Doctoral students	Professors	Deans of Graduate Schools	Total
	Frequency	Frequency	Frequency	
Academic writing skills	24	24	2	50
Development of thinking skills (critical thinking, creativity etc.)	17	25	3	45
Study strategies including time/stress management	13	12	3	28
Being knowledgeable about publication process	12	10	-	22
Being knowledgeable about financial resources	13	7	1	21
Cooperation strategies	5	13	1	19
Communication skills	8	9	2	19
Having knowledge and skills about the usage of library, information technology and cultural/artistic features	8	10	-	18
Gaining effective presentation skills	5	6	-	11
Foreign language skills	1	4	-	5

3.2. Findings Related to the Needs Analysis Interviews

As a result of the interviews, the findings obtained for the needs of doctoral students were given under the headings of personal, institutional and environmental factors.

3.2.1. Personal factors

The data obtained from the interviews showed that there were different opinions about the adequacy of the number of publications. Generally, although students were found to feel comfortable about the number of their publications, professors were observed to think the number of students' publications was unsatisfactory.

When asked about the factors that made the publications sufficient, first of all, the participants stated that personal interest towards research was a need for increase of research productivity. In addition to interest, intrinsic motivation, positive attitude towards research and thinking and questioning skills were indicated among the factors affecting research productivity. In addition, it is thought that doing the doctoral study at the institute where the student worked and age of the doctoral student also had an effect on research productivity.

I'm 45 years old. I'm doing a doctoral degree at this age. It's not easy at this age. A 45-year-old can't do a doctoral degree. I'm doing, but I'm having a lot of difficulties because I have many responsibilities. In my opinion, this is a process that must be completed until the age of 30. (student1, social sciences)

The participants who thought that the publications of students are not satisfactory were asked about the reasons of this situation and negative factors that hindered research productivity. The participants stated that inadequate academic writing skills and lack of foreign language skills were negatively affected the research productivity. Apart from this, the participants mentioned that lack of knowledge about scientific study steps or lack of field knowledge, starting to do research without fully understanding the importance of the study, lack of knowledge about the subject to be investigated, and not being able to find the appropriate methods for data analysis were also found to have negative impacts. It was also reported that students' inability to grasp the purpose of doctoral education, seeing the doctoral education as a step that provides employment instead of seeing it as a research focused job, or doing a doctoral degree just for a diploma or title were among factors that hindered research productivity. It was also stated that the unwillingness of the student also negatively affected productivity. In addition, it is thought that students' timid attitudes for making publications and their expectations for external motivation and orientation instead of planning their own research also had a negative effect on their productivity.

Some of the students want me to write their thesis. Why? Because they do not know anything about how to write... They do not write anything. (professor, health sciences)

(.) I have no courage to send an article to a journal. (student, educational sciences)

In summary, the results of the interview showed that the personal factors needed by the doctoral students to increase the research productivity were personal interest towards research, desire, positive attitudes, intrinsic motivation, courage, having thinking, questioning and writing skills, being knowledgeable about scientific research methods, field knowledge, foreign language, and being aware of the purpose of doctoral education. In addition, it was stated by the participants that the age of the doctoral student should not be too high and they need to work in the places that they also conducted their doctoral education.

3.2.2. Institutional factors

The participants stated that one of the most important need for doctoral students to increase their research productivity and publication number was support of advisor/professors. Participants indicated that the relations with the advisor/professors and the productivity of them affect research productivity of the doctoral students. Also, it was stated that the advisor/professors' competence in their field, their attitudes towards students and being able to guide the students were among the factors affecting the

research productivity of the students. Participants indicated that in some departments, students were considered to be ineligible to make single-author publications by the advisor/professors and this affected the research productivity negatively.

[Are there people or occasions that encourage your research productivity?] Our professors... They generally support us. (student2, social sciences)

The most important factor in this regard is the professors/advisor and student relationship. If there is a good relationship between them, problems can be solved easily through consultation. (dean, health sciences)

I don't think that [my publications] are enough at the moment but I'm still in the doctoral course phase. (Laughing) I take part in studies as much as my professors gave permission. Apart from that, I can't do any studies on my own. It's not ethical, either. (student, natural sciences)

One of the participants mentioned the significance of interdisciplinary studies and stated that to increase research productivity, interdisciplinary studies were also needed. Furthermore, it is indicated that activities providing collaboration and interaction and taking part in team work/research projects were needed to increase productivity.

Since we constantly have our own projects, we are engaging our students in these projects. In this way, our students are learning techniques, [and] what they should do. When these projects finish, our students usually have publications. (dean, health sciences)

(...) If you want to be fast, it is useful to do teamwork even when writing an academic paper. (student1, social sciences)

Necessary legal permissions, bureaucratic obstacles and length of doctoral education process were mentioned among the negative situations encountered among the institutional factors. Also the fact that students could not apply for scientific research projects without a supervisor was among the academic problems affecting the productivity of the students. It was found that the biggest problem encountered during studies was access to 6 resources. It was mentioned that while they conducting their research, students had difficulty accessing to sources such as articles, books, and journals about the subjects on which they wanted to do research. It is thought that the lack of an academic office that students could consult for the solution of the problems they experience caused these problems to continue and for this reason, they need an academic office to consult. Furthermore, it was stated that lessons/courses such as scientific research methods, statistics, and data analysis were needed in order to eliminate deficiencies in scientific research steps.

The lack of an academic office in our institute (...) For example, when a student experiences a problem, s/he can consult the academic office. (...) When the student says "we have a problem, how can we solve it together?", great possibly, institution can solve those problems

easily. The obstacles that I usually see are bureaucratic obstacles. (professor, educational sciences)

As a summary of interview results; it could be said that support of advisors and professors, taking part in collaborative and interdisciplinary studies, joining the research projects and being able to be coordinator of projects, easy access of resources, elimination of bureaucratic obstacles, establishment of academic offices, participation in courses about scientific research methods, statistics and data analysis were among the institutional factors needed for research productivity of doctoral students.

3.2.3. Environmental factors

Interviews showed that family members and friends were among the people who encouraged research productivity. In addition, the positive attitudes of the individuals who participated in studies during data collection, and the productivity of other academicians or academician candidates were also mentioned as other occasions that encouraged research productivity. One student stated that competition with other doctoral students had a negative impact on productivity, and another student stated that unproductive individuals in the circles of the doctoral student decreased the productivity of him/her. Moreover, some of the participants stated that the biggest problem that hindered productivity was the financial problems arising during the research and the economic problems that the doctoral student experienced during maintaining his/her own life.

(...) No one had the habit or intention of writing an article. You stay with those people for so long that you become one of them. You are starting to pass your time by going in and out of class without producing anything anymore. (student1, social sciences)

If there isn't a budget for what you're doing, it's not really easy to work on that. Especially because agriculture is an applied science, you need a minimum of 5000 Turkish liras if you plan a study in the field. (student, natural sciences)

Most of our students cannot handle their normal lives. Some of them cannot even pay their rent or bills. Of course first of all they have to take care of this situation. (dean, social sciences)

Another problem was the loss/shortage of data. Participants reported that sometimes individuals who were volunteer to participate in research in the beginning quitted studies before they supply sufficient data, unexpected reactions might occur in materials used in studies, and accessing necessary data became difficult or impossible in some cases, and sometimes obtaining the necessary data required a certain budget. In addition to these, responsibilities of the students to their family/environment apart from their doctoral education, being married or having children, and the workload of students who worked in another job were among the factors that hindered research productivity.

We usually search on rare diseases, not very prevalent diseases. [For example] We plan a study with 60 patients. The project is planned to take a year. A year passes and only 20 patients are available. There must be 60 patients, but you can only find 20. Then, problems start to arise. (professor, health sciences)

Being married is a thing that has already set a lady back in business. Having a child also slows down. (student1, health sciences)

As a result, among the environmental factors affecting research productivity of students were thought as the individuals in immediate surroundings of doctoral students, students' responsibilities towards these individuals and their environment, working and research conditions. Students stated that they need to improve these conditions in order to increase their research productivity.

4. Discussion and Conclusion

In the study, participants listed their primary training needs as developing academic writing skills, developing thinking skills (creativity, critical thinking etc.), study strategies including time/stress management, being knowledgeable about publication process, being knowledgeable about financial resources, cooperation strategies, communication skills, having knowledge and skills about the usage of library, information technology and 7 cultural/artistic features, gaining effective presentation skills, and foreign language skills. Some of the needs reported in the questionnaires were also mentioned in the interviews. For example, participants addressed developing writing skills by stating that one of the most important personal factors that negatively affected productivity was inadequate writing skills of the students. Also, different studies have revealed that writing skills were crucial in the process of doctoral education. In one of these studies, McAlpine and Amundsen (2011) stated that in many doctoral programs, the writing skills of a doctoral student were presumed to have already been developed and for that reason, there were few or no courses to develop this skill in doctoral process. Consequently, students graduated with little knowledge about academic writing. The lack of writing skills adversely affected the productivity of the students in the doctoral process, as well as their performance and productivity after graduation (Ynalvez, et al. 2014). Kamler and Thomson (2006) stated that more attention should be paid to the development of writing skills in doctoral education and published a book intended to help doctoral students with the writing process. Likewise, there are many books aiming for the development of graduate students' and researchers' writing skills (i.e., Cantor, 1993; Dunleavy, 2003; Lunenburg and Irby, 2008).

The participants stated the other personal factors as interest and positive attitudes towards research, internal motivation, and courage. It was also emphasized that productivity also required thinking and questioning skills. Likewise, it was stated in Marie's (2008) study that implicit knowledge and thinking styles of individuals would

facilitate identifying problems, limiting solutions and solving problems. Wang and Gou (2011) concluded in their studies that there was a highly strong relationship between research productivity and attitudes towards research. In another study, Austin and McDaniel (2006a) stated that for original studies, students should have interest and willingness in the topic to be studied, be creative, have critical thinking skills, perseverance, and skills to pay attention to details.

In the study, lack of field knowledge and scientific study procedures (finding appropriate methods/approaches, data analysis etc.), and the lack of foreign language skills were listed among the factors that hindered research productivity. Therefore, knowledge about scientific research steps, field knowledge, foreign language knowledge and awareness of the purpose of doctorate were included in personal needs. Also, some of the participants stated that lessons/courses such as scientific research methods and statistics and data analysis were also needed in order to eliminate deficiencies in scientific research steps. Similarly, Tortumluoğlu and Özyazıcıoğlu (2004) stated that academicians frequently experienced problems in data collection and statistical analysis of data. Likewise, Büyüköztürk and Köklü (1999) interviewed the professors who were advisors of the postgraduate students and reported that students and advisors experienced problems in research and statistics during the dissertation writing phase. Keskinılıç and Ertürk (2009) determined that students doing their doctoral degree in the field of educational sciences needed statistical training. In fact, according to the Turkey Higher Education Qualifications Framework, doctoral students are expected to have high level skills of using research methods in studies they conduct in their fields (Higher Education, 2011). However, based on the findings and results obtained from this study and literature, it is possible to say that some of the doctoral students do not have these skills in satisfactory levels and that they need courses about these subjects.

According to the participants, communication between professors and students were crucial in terms of increasing research productivity, and having good relations with the professors and advisors was conferred to be an institutional need. It was emphasized that professors and advisors' support was important in increasing the number of students' publications and encouraging research productivity. In particular, it was stated that the relationship with the advisor had a big role and that the productivity, competence, and attitudes of advisors/professors were effective on the student productivity. Bair and Haworth (1999) reported in their metasynthesis study that in all quantitative, qualitative, and mixed studies, student-advisor/professor communication was the most important factor ensuring the perseverance of doctoral students. Similarly, Golde (2005) stated that when there was not a well-structured and satisfactory interaction between advisors/professors and the student, this could lead to problems and even cause student to quit the doctoral education. Author, McAlpine, and Amundsen (2017) reported that the efforts of professors/advisors to make a doctoral student feel important had a great role to make the student feel himself/herself as an academician. Barnes and Austin (2009)

stated that in the process of doctoral education, advisors and professors had some responsibilities such as helping students to succeed, helping them grow up as researchers and professionals. In addition, they also asserted that apart from being an advisor, advisors/professors should also take on the tasks of friendship, guidance, being supportive/advocacy and correcting the mistakes. To carry out doctoral education in a positive way, facilitate students' adaptation to their departments, and help them become socialized in their fields, it was important for advisors/professors to approach students in a friendly and at the same time professional way and to be reasonable, supportive, accessible, and honest (Barnes and Austin, 2009; McAlpine et al., 2012). Also, Sinclair, et al. (2014) stated that the strongest finding from the literature on research productivity was the impact of a productive advisor. According to these researchers, an active and productive advisor brings up active and productive researchers. All these findings show that the communication and interaction between 8 professors/advisors and the student is a need for both in conducting the doctoral process in a sound manner and in increasing the research productivity of the student.

According to the participants, taking part in teamwork and research projects, being project coordinator and carrying out collaborative and joint studies encourage research productivity of students. Similarly, Sinclair, et al. (2014) concluded that researchers who were inclined to collaborate and conduct joint studies were more productive than those who had independent study habits. In a different study, Lariviere (2011) found that the number of publications of the researchers in the fields of natural sciences and medicine was higher than that of the researchers in social sciences. This was thought to stem from the fact that researchers in the field of social sciences had limited relationships and cooperation both with their advisors and other individuals, whereas in the fields of natural sciences and medicine, the researchers had increased relationship and cooperation as a result of constantly working in laboratories and interacting with other individuals. Boud and Lee (2005) emphasized the importance of cooperation in providing a quality research environment and asserted that collaborative learning in doctoral education should be handled as a pedagogical discourse. As a matter of fact, the review of the related literature indicated that there were studies on cooperative learning in various education levels from pre-school to undergraduate level (i.e. Gillies, 2019; Slavin, 2015), but studies on increasing the level of cooperation at doctoral level were rare. Given how important collaboration and teamwork at doctoral level, it is possible to say that collaborative learning should be dealt with separately and investigated at doctoral level and the number of studies on collaborative learning at doctoral level should be increased.

The participants stated that to increase research productivity, interdisciplinary studies were also needed. According to Jacobson and Wilensky (2006), multidisciplinary studies in natural and social sciences in the last quarter brought new conceptual perspectives and methodologies. One of these concepts is the interdisciplinary study. Austin and McDaniels (2006b) reported that these new perspectives were also reflected in

doctoral studies and asserted that doctoral students needed to be socialized and develop interdisciplinary thinking skills in order to carry out interdisciplinary studies. With this idea in mind, Spelt, Biemans, Tobi, Luning and Mulder (2009) put forward the concept of 'interdisciplinary higher education'. The interdisciplinary higher education aims to improve interdisciplinary thinking, referred to the ability to use the knowledge of two or more disciplines in situations where progress is not possible through a single discipline. The findings of the these studies suggest that in order for doctoral students to increase their research productivity by carrying out interdisciplinary studies, first, academic socialization should be provided, and the development of interdisciplinary thinking skills should be improved. However, it was found in our study that the rivalry between students affected productivity negatively, which also prevented the socialization and collaboration among doctoral students. Bair and Haworth (1999) reported that there were research findings indicating that student communication and social interaction had an impact on completing the doctoral program. According to this study, the interest and support of doctoral students to each other was seen as an important factor and doctoral students who were in contact with academic peers were observed to complete their doctorate more easily. Based on these findings, it is possible to conclude that creating environments for students which will help them carry out interdisciplinary studies is a need for doctoral students, and encouraging them to support each other, rather than creating a competitive environment, will be effective in increasing research productivity.

According to other findings of the study, problems in accessing to resources such as articles, journals, books etc., data losses and shortages, problems arising in obtaining legal permissions, bureaucratic obstacles, and the lack of an office that provides academic support constitute adverse situations. Students need to solve such problems in order to increase their research productivity. Similarly, Author, McAlpine, and Amundsen (2017) stated that bureaucratic obstacles negatively affected doctoral students. McAlpine et al. (2012) found that institutional support was generally carried out in a personalized and unplanned way rather than relying on well-structured policies and practices, and suggested that an academic office where complaints are listened and which provides academic development should be established. Similarly, DiPierro (2007) asserted that if institutional policies and procedures are well structured, this will further strengthen the doctoral education process. As a conclusion, an academic office which can help the deal with mentioned problems should be established for increasing the research productivity of doctoral students.

As environmental factors, the support of friends and family is considered as a need for increasing the research productivity of doctoral students. In addition, the participants stated that during the research process, they need the positive attitudes of the people who participate in their research and also they need the productivity and support of other doctoral students or colleagues. Environmental effect in productivity was raised in various studies, too. For example, Sweitzer (2009) stated that friends are among the

people who encouraged students in doctoral process, while Gardner and Gopaul (2012) referred to family influence. Liechty, Liao and Schull (2009), who discussed the situations that encouraged and prevented doctoral students during the dissertation writing process from the viewpoint of socio-cultural development theory of Vygotsky, mentioned the effect and importance of communication on the writing process at personal, interpersonal, and institutional level. In a 9 different study, Rennie and Brewer (1987) found that doctoral students needed emotional support during their studies. Janta, Lugosi, and Brown (2014) mentioned that doctoral students might experience feelings of anxiety, uncertainty, loneliness, and isolation during the process and the feelings of loneliness and isolation even had a great impact on the psychological health and well-being of the student. In order to ensure the healthy communication between students and the environment; faculty members, institute managers and employees, families and friends should be made aware of the needs of doctoral students.

The participants mentioned factors such as working in a different job and heavy workload are among the factors that hinder research productivity. Some participants stated that the availability of a doctoral program in their workplace (like working as a research assistant etc.) contributed to productivity. Based on these findings, it is possible to say that the work life of a doctoral student has a role on their productivity. Similarly, Gardner and Gopaul (2012) found in their study that the location of workplace was a supportive factor for students who both study and get a doctoral degree. Also, Alkan (2018) reported that workload had an effect on the completion of the dissertations. Other findings show that department or professors not allowing students to conduct single author studies are seen as the other causes of the inadequate number of publications. To solve this problem, researchers should have a certain degree of autonomy.

The participants stated that being married and having children and responsibilities to the family and environment are among social responsibilities preventing research productivity. The advanced age of the doctoral student and long durations of doctoral process are also considered to affect productivity negatively. Similarly, McAlpine et al. (2012) stated that student's health status, familial changes (motherhood, separation, death etc.) and financial difficulties (work in two jobs, full-time work, etc.) could affect academic studies. Given that doctoral education process covers at least 3-4 years and the average age of completing doctoral education is 32-33 (TURKSTAT, 2010), students can be seen to take part in various roles such as having a job, starting a family, or having children in this period, and private life of doctoral students has an important role on their research productivity.

The participants indicated that the lack of research budget or the economic problems experienced by the student are among the factors affecting productivity, and mentioned financial resources among the needs. Similarly, McAlpine, et al. (2012) reported that financial difficulties affected academic studies. Bair and Haworth (1999) stated that

financial problems were one of the reasons urging students to drop their doctoral education and that institutions should support students financially. Dundar and Lewis (1998) obtained findings supporting these results and stated that as financial support increased, the research productivity of doctoral students increased as well. Gardner and Holley (2011) stated that the financial problems experienced by doctoral students caused them to work in additional jobs or to borrow loans. According to the study, this situation caused students to delay the completion of the doctoral degree and result in decreased resilience. Gardner and Holley (2011) also found that students see the doctoral degree as a way to create financial opportunities for financial stability and avoid financial difficulties. However, this situation is seen as a negative situation according the participant in our study. The participants stated that students' not being able to fully understand the purpose of the doctoral education, focusing solely on the result such as having a title, diploma or employment, were negatively reflected in the research productivity.

The findings obtained as result of the study supported the view that various personal, environmental and institutional factors play a role in supporting research productivity of doctoral students (Abramo, D'Angelo and DiCosta, 2009; Bland, et al., 2005; Gaughan and Ponomariov, 2008; Lee and Bozeman, 2005; Marie,2008; McAlpine and Amundsen, 2011; Sinclair, et al. 2014; Ynalvez, et al. 2014; Zainab, 1999). In this respect, the study also supported the Deci and Ryan's (1980, 2000) self-determination theory, which aims to explain the internal, external and non-motivation on behaviors. According to this theory, it is necessary to take into consideration the requirements relating to competence, social relations, and independence/autonomy that determine human behavior. Competence means being aware of how to attain internal and external outcomes in the realization of the action, whereas social relations mean the development of socially reliable and satisfactory connections by the individual. Autonomy means that the individual initiates and maintains a behavior in line with his/her desires independent of external factors. In theory, the decrease in the motivation of a person causes a fall in performance when these needs are not taken into account (Deci, Vallerand, Pelletier and Ryan, 1991). Based on the findings of the study, in order to increase the research productivity of doctoral students, it is suggested that personal, environmental and institutional factors that play a role in research productivity of students should be provided to meet the needs of students regarding competence, social relations and autonomy.

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