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Motivations and Expectations for Pursuing Graduate Education in Mathematics and Science Education

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ABSTRACT The aim of this study was to reveal the reasons behind the decisions of individuals for pursuing graduate education in mathematics and science education. In this paper, candidates were investigated in terms of their explanations for the necessities of graduate education, their motivational factors for pursuing higher education and their expectations from it. Being qualitative in nature this study was a case study and the case being examined was graduate candidates' motivations for and expectations from graduate education. The sample consisted of 49 graduate candidates (teachers and recent college graduates) applying to a university in Turkey. Among the results of the study were that graduate candidates' explanations for necessities for graduate education were mainly gathered under themes of academic development, professional development and social development; that the same themes were also found in their expectations from graduate education; that motivations were consisted of internal and external motivation factors; and that motivations generally caused academic expectations, especially ISCSR and PAS.

INTRODUCTION

Today in the modern societies, education level is one of the most important factors to decide people's positions in their societies. Education level is accepted as an indicator for personal development. In addition, education level is related to economic success and wealth in the capitalist world. Moreover, according to education level people can find appropriate jobs and survive their life in the society. Therefore, after undergraduate programs some students want to continue their higher education. Higher education has hierarchical order from undergraduate, master, and to doctoral degree, which is the top level a student gets academically.

In literature researchers conducted some studies to reveal the factors behind students' decisions in pursuing master and doctoral degrees. Teowkul et al. (2009) focused on the motivational factors for graduated students. Motivation can be explained as a person requests and needs that influence his/her behaviors. They defined four main areas as motivational categories; these are career enhancement, environmental factors, career switching, and self development. According to literature, these motivational categories included the following:

To fulfill one's personal goals; To fulfill family's expectation; To comply with peer pressure; To act in accordance with social values; To obtain credentials as regulated by the local and state laws; To secure promotional opportunities; To network with professionals in one's area of interest; To earn the respect of one's peers and colleagues; To feel more secure about one's current job; To enhance one's language and communication skills; To secure a position in competitive economies around the world (Teowkul et al. 2009: 33-34).

Studies also showed that "gaining higher status" is another factor since students follow their academic learning (Lin and Tsai 2008).

Some students accepted graduate education as away of career enhancement, because it provides people long-term income and financial support (Marks and Edington 2006). Career enhancement usually associated with more responsibility and more benefits. These benefits included: higher salary, better benefits, more responsi-

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bility, possibilities for training or studies, and improving workplace (Teowkul et al. 2009). Some people want higher education to change or shift their professional career, for instance career switching for some teachers can provide their position as education administration or being a staff in a department of university.

According to most of the Asian cultures, having higher level education is important for students' self-esteem, and students tend to have strongly family values (Mujtaba et al. 2008). Yooyen et al. (2011) investigated 712 Thailand higher education students' experiences. As a result they stressed that there are gaps between students' perceptions and expectations and universities.

Similar studies about graduate students' expectations from their program were investigated in different countries (Canada, Thailand, USA, and Turkey). In Turkey, all of the universities (public and private) include higher institutes such as pure science, applied science, and social science institutes. Under these institutes there are many programs for adult learners, who prefer to follow higher education for different reasons. According to public report a total of 3,817,086 students enrolled a higher education program including undergraduate and graduate programs (OSYM 2011). Only 64,076 students registered doctorate programs including medical science. Totally, 126,368 students following a master program for different programs (OSYM 2011).

Demirbolat (2005) studied 95 Turkish graduate students enrolled in Educational Sciences Institute. Graduate students expressed that they want to earn master or doctorate degree in order to make a career, to complement with the professional obligation, to have a better status, to fulfill personal interest. The researcher investigated graduated students expectations form their graduate program. According to results, generally students want more elective courses, more application than theoretical knowledge, enough information before the program enrollment; enrich instructional environments, and designing course hours according to working students. Moreover, the researcher explored students' expectations from academic staff, first one is about guiding students during their graduate journey, forwarding academic research, using new instruction methods, and lastly providing democratic environment during the class. In addition, graduate students have concerns about evaluation, they thought that evaluation included not only result but also process, and project based evaluation.

In order to investigate undergraduate students' views on graduated programs, Ilhan et al. (2012) collected data from 558 prospective primary teachers. According to results, although undergraduate students had positive attitudes toward graduate education, they were not willing to apply any graduate program. Among the reasons for this undesired situation are foreign language problem and inadequacy in skills about scientific research.

Another study was conducted by Erkilic (2007) to determine some factors for prospective teachers' willingness to continue higher education. The author state four factors, these are education-instruction, physico-social, research-development, and socio-economic (Erkilic 2007). According to results, prospective teachers were highly affected by socio-economic and education-instruction dimensions to pursue graduate education. In addition, other two dimensions (physico-social, research-development) affected moderately prospective teachers' willingness of graduate education (Erkilic 2007).

Under consideration of above literature, the aim of the current study was to explore teachers' and recent college graduates' motivations for and expectations from graduate education in the fields of mathematics education and science education.

METHODOLOGY

In this study, the opinions of graduate applicants were used in order to determine their motivations and expectations from graduate education in the fields of mathematics and science education. Being qualitative in nature, this study was a case study, in which a researcher can examine a situation within its *context*, limited by *time and activity*, and collects *detailed information* (Merriam 1998; Yin 2003). The case that was investigated in the current research involves graduate candidates' motivations for and expectations from graduate education.

Participants

The participants of this study were selected among teachers or recent graduates from college, who were applying to a university in Turkey for graduate education in the fields of math-

ematics and science education. The participants were selected through purposive sampling strategies. Two criteria were taken into account: a) the sampling only included graduate applicants who had not apply any graduate institutions before, and b) candidates should have similar educational backgrounds. The participants of the study were consisted a total of 41 graduate candidates. The demographic information for the candidates is presented in Table 1.

Table1: Demographic information for the graduate candidates

Characteristics	*Sub-categories*	*Frequency*	*Percentage (%)*
Gender	Male	29	63
	Female	17	37
Occupation	Teacher	19	41
	Recent college graduate	27	59
Degree Applied For	M.E. in mathematics education	31	33
	M.E. in science education	15	67

Data Collection

In order to understand the reasons and expectations for pursuing graduate education, an open-ended questionnaire with three questions was used. The questionnaire was developed by researchers and checked by an external expert prior to its administration. Open-ended questionnaires enable respondents to spontaneously and authentically reflect their points of view (Arnon and Reichel 2007). The questions presented in the questionnaire were as follows.

1) Why is graduate education important or necessary?
2) What are your reasons for pursuing graduate education?
3) What do you expect from the graduate education?

The candidates were given adequate time to respond to the questions.

Data Analysis

The data was analyzed using the content analysis and descriptive methods. The analysis focused on determining and classifying the issues encountered and candidates' suggestions. The process is as follows. First, all of the responses provided were listed. Then, the written responses were classified according to similar categories and sub-categories. These categories and sub-categories were determined gradually. The frequencies and percentages of the sub-categories were provided and supported by qualitative data that were quotas from the candidates' views. Two experts from the field of mathematics education and science education independently coded data. Agreement rate between the coders reliability was calculated as 94% according to Miles and Huberman (1994)'s formula.

FINDINGS

The findings from the content analysis of the data were presented under three main headings: Need for graduate education, motivations for pursuing graduate education, and expectations from graduate education.

Need for Graduate Education

The codes gathered from the graduate applicants' answers to the first question were presented in Table 2. Table 2 presents that candidates' perceptions of the need for graduate education were mainly gathered under three themes: Academic improvement, professional development and social development. Among all themes, the most mentioned theme was the theme of academic development represented by five codes, which were RP, ISCSR, PAS, IW, and CS, in decreasing order. Among all academic codes, RP, ISCSR and PAS were highly emphasized by the candidates. RP was seemed as a necessity for graduate education by half of the participants (n=23). One candidate who was included in the RP code mentioned, "… for me graduate education is very important to reveal more my potential." Another candidate declared his opinion about the need for graduate education with the words "Graduate education increases the quality level of one's education and help them reveal the unknown power." ISCSR was the second most emphasized characteristic of graduate education. One candidate mentioned role of graduate education as place for scientific research with the statement, "It [graduate education] is the first step towards conducting scientific research re-

Table 2: Necessities for graduate education

Themes	*Codes*	*Teacher (f)*	*Students (f)*	*Total*
Academic Improvement	Revealing their own potential (RP)	7	16	23
	Improving/providing the skill of conducting scientific research (ISCSR)	8	10	18
	Providing advancements in science (PAS),	5	9	14
	Improving their worldview (IW)	3	5	8
	Contributing to science (CS)	3	4	7
Professional Development	Improving the quality of their profession (IQP)	10	4	14
	Providing more opportunities for career selection (POCS)	-	8	8
	Following the advancements in Professions (FAP)	2	2	4
Social Development	Gaining social status (GSS)	3	5	8
	Contributing to social development (CSD)	2	3	5
	Improving communication skill (ICS)	2	-	2
	Responding to the expectations of the society (RES)	1	1	2

lating my profession." Another graduate candidate who was coded under ISCSR stated "…., [graduate education] is necessary for conducting detailed studies in a specific field."

The theme of professional development included three codes that are IQP, POCS, and FAP. IQP was the most mentioned (n=18) need relating professional development, especially by the teacher graduate candidates. Among the ones who were categorized under IQP code, one teacher stated "Graduate education is really needed for adding the quality of teachers; therefore, teachers should receive graduate education in order to gain expertise in their field of teaching." The graduate candidates who were graduated recently from college and who were seeking for a job mostly provided POCS as necessity for graduate education. One mentioned POCS with the statement "... Nowadays, individuals with better qualifications have more chance to be hired, and graduate education adds on or improves personal qualifications."

The theme of social development was gathered under four codes, namely GSS, CSD, ICS, and RES. As a support for the GSS code, one teacher participant of the study mentioned, "Graduate education is needed for teaching efficacy, and effective teachers will be highly respected by students, administrators, and whole society."

Motivations for Graduate Education

Table 3 presents the codes reached through analysis of the participants' responses indicating their motivations for pursuing graduate edu-

Table 3: Motivating factors for graduate education

Themes	*Sub-themes*	*Codes*	*Teacher (f)*	*Student (f)*	*Total (f)*
Internal Factors	*Social-related*	Contributing to social development (CSD)	7	13	20
		Professional development (PD)	10	10	20
		Keeping up with the era (KE)	7	6	13
		Personal happiness (PH)	3	4	7
		Gaining social status (GSS)	1	4	5
		Escaping monotony of life (EML)	2	1	3
	Science-related	Academic improvement (AI)	11	19	30
		Interested with scientific research (ISR)	9	14	23
		Desire to be an academician (DA)	7	15	22
		Contributing to science (CS)	4	6	10
External Factors		Effect of teachers in college (ETC)	7	10	17
		Effect of family (EF)	1	8	9
		Effect of academic life (EAL)	5	1	6
		Effect of peers (EP)	3	2	5

cation in mathematics and science education. In Table 3, candidates reasons for pursuing graduate education were mainly gathered under two themes, which were internal factors and external factors. The former, the most stated factor, represented the reasons which were directly related the one's own desires or conditions; the latter stands for the factors coming from outside and effecting one's motivations.

Internal factors were divided into two main sub-themes; social- related internal factors and science-related internal factors. The former includes four codes; CSD, PD, KE, PH, GSS, and EML. On the other hand, the latter was represented by four codes; AI, ISR, DA, and CS.

Among the codes for social related internal factors, participants mostly highlighted CSD, PD and KE. One participant, who were included under CSD code, stated, "Graduate education is very important for me. It [graduate education] will help me to gain deeper knowledge in my field, provide the opportunities for me to conduct research in my field of interest and allow me to apply/reflect my gains to the society." From the table, one can conclude that the teachers mostly brought PD and KE codes forward while students mostly mentioned CSD and PD. One candidate confirmed PD with the words "Our age urges people to gain expertise in their field (or work). Graduate education will help me to improve my pedagogical content knowledge." Being in line with KE code, one graduate candidate stated "…I do not want to lack behind of the time." The other emphasized KE, "graduate education is a tool for me to follow improvements."

Among the internal factors relating science, highly emphasized ones were AI, ISR, and DA. Moreover, more than two-third of the candidates (n=30) were gathered under AI code. One candidate who was coded under AI expressed his motivation as "Graduate education will give me the chance of supporting my career in teaching profession on a scientific basis." Another candidate with ISR motivation stated "I am really excited doing scientific research and graduate education is the only way to get through it." Another candidate stated his interest in conducting scientific research, "This program will allow me to reach the truth through scientific inquiries, provide the skills for evaluation and discussion of the results." Being in line with DA code, one teacher applicant brought his ideas forward with the statement, "I want to share my experiences with the college students and for this, I need to have an academic career." Another participant also stated his desire for an academic career, "People should always try to seek ways to improve themselves. Getting a job in a college will help to this end."

External motivation factors were coded into five categories, namely ETC, EF, EAL and EP, among all of which ETC was brought forward by the graduate candidates. One teacher applicant expressed her affection, "My friends who are teaching in colleges put a lot of pressure on me to pursue graduate education, and here I am to apply for it." Another candidate mentioned ETC with the words, "If it was not for the support of my teachers in college, I have never been applying." An interesting result from Table 2 was that EAL was mostly stated by the teacher applicants while EF was highlighted by the students.

Expectations from Graduate Education

The codes reached through analysis of graduate candidates' expectations from graduate education were provided in Table 4. Table 4 reveals that the candidates' expectations from graduate education were mainly gathered under three

Table 4: Candidates' expectations from graduate education

Themes	*Codes*	*Teacher (f)*	*Students (f)*	*Total*
Academic Expectations	Improving/providing the skill of conducting scientific research (ISCSR)	9	21	30
	Providing advancements in science (PAS)	5	14	19
	Desire to be an academician (DA)	4	12	16
	Revealing their own potential (RP)	2	3	5
Professional Expectations	Improving the quality of their profession (IQP)	7	8	15
	Career enhancement (CH)	2	2	4
Social Expectations	Contributing to social development (CSD)	5	5	10
	Improving their worldview (IW)	2	7	9
	Improving their problem solving skills (IPSS)	1	4	5
	Gaining social status (GSS)	1	1	2

themes which are academic expectations, professional expectations and social expectations. The most emphasized theme, academic expectations, was gathered under four codes, namely ISCSR, PAS, DA, and RP. Among all academic expectation codes, ISCR, the most mentioned (n=30) academic expectation, PAS and DA were brought forward by the candidates (especially by the students).

One student who were included under ISCSR code stated his expectations as "…to be included in a research environment and to gain deeper knowledge by conducting studies in my interest areas." One other candidate sharing a similar point of view mentioned she carried expectations for "…being actively involved in a scientific research." One candidate was coded in PAS with the statement, "Graduate education will provide me the opportunities to follow national and international studies conducted in my field." Similarly, another contribution to PAS was made by candidate who mentioned, "I want to follow improvements in the field." DA code included a participant who stated, "My expectation is to see myself as an academician with expertise in the field of science education." Another candidate, who also included in DA, declared his expectation as "to have one more step to get an academic profession."

The theme of professional expectations was divided into codes; IQP and CH. The most mentioned code, IQP, included statements, "I expect graduate education to strength my teaching efficacy." Another candidate mentioned her expectancy as "to improve her pedagogical content knowledge through graduate courses." CH code included expectations relating "getting promoted to a higher position" and "switching from current career path to a new one."

Social expectations theme was gathered under four codes; CSD, IW, IPSS and GSS. Among all the codes for social expectations, CSD and IW were generally mentioned by the graduate candidates. One teacher who was coded in CSD stated, "Graduate education should provide me the chances for conducting researches and contributing on science education." IW code was supported by the statements, "thanks to graduate education, I will have a chance to meet with experts in my field and to gain deeper knowledge of life from different aspects" and "it [graduate education] should provide me the skills for looking at the events from different angles and wider perspectives."

Relation of Motivating Factors with Expectations

This part of the study explains the relationship between graduate candidates' motivations for graduate education and their expectation from it. As explained earlier, the motivating factors for pursuing graduate education were gathered under two themes: Internal factors for motivation and external factors for motivation. Figure 1 presents the paths drawn from the internal factors for motivation to the themes for expectations.

In general social- based internal factors mostly matched with the academic expectations (with 6 arrows) and social expectations (5 arrows). However, when the density of the matching (the loads on the arrows) was considered, one may conclude from Figure 1 that social-based inter-

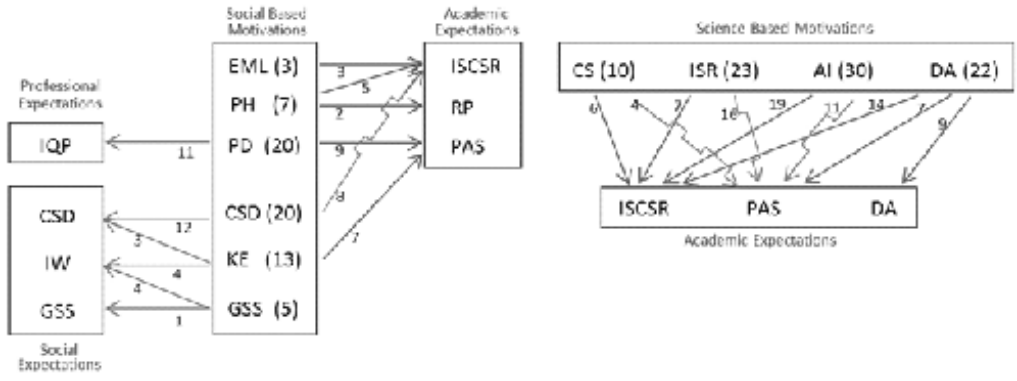


Fig. 1. Mapping between internal motivations and expectations

nal factors were more tended towards academic expectations. The applicants matched internal factors with social background with the corresponding expectations codes as following. All of candidates matched the motivating factor of KE with the expectation codes of PAS, CSD and IW. The motivation code of CSD matched with the same expectation (CSD) and ISCSR. All candidates matched the internal motivation factor of PD with the expectation codes of PAS and IQP. GSS was the only social-based internal motivation that did not match with an academic expectation. Among the all applicants having the expectation of GSS, only a few changed their motivation to expectation of GSS whereas most of them had the expectation of IW. Similarly, for almost all of the applicants with the motivation of PH, it did not account for the expectation of RP. The motivation of EML produced the academic expectation of ISCSR in turn.

Figure 1 clearly presents that all internal factors based on academic motivations matched with the academic expectations, which means that graduate applicants who had academic reasons for pursuing graduate education expected graduate education to remedy their academic/scientific necessities. All candidates with internal, academic motivation codes, that were CS, ISR, AI and DA, also carried the expectations of ISCSR and PAS. DA was the only academic-related internal motivation code for which the candidates also carried the expectation of DA.

Crossings of external motivating factors with the codes for expectation themes were presented in Figure 2. In general, candidates with external motivations mostly carried academic expectations while some of them also had social and/or professional expectations. All candidates who were being motivated by their peers (EP) carried academic (ISCSR, PAS, DA), social (IPSS, CSD) and/or professional expectations (IQP). Candidates who were motivated by their teachers in college (EFTC) only carried academic expectations of ISCSR and PAS from graduate education. Similarly, all participants who were being motivated by their parents (*EF)* had academic expectations of ISCSR (by almost all) and DA (by one candidate). All of the candidates who were being motivated by academic environment (EAL) stated their academic expectations (ISCSR, RP, PAS, DA) and/or social expectations (CSD, IW).

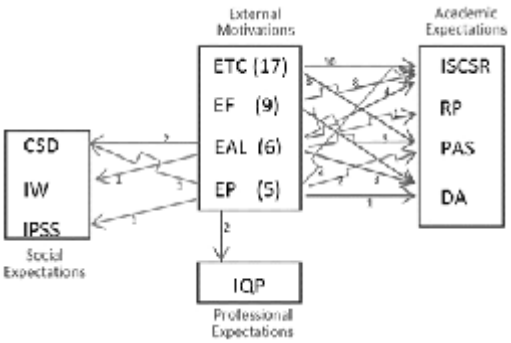


Fig. 2. Mapping between external motivations and expectations

DISCUSSION

This study was conducted to investigate teachers' and recent college graduates' motivations and expectations for pursuing graduate education in the fields of mathematics and science education. The results of the current study was only associated with the study group and limited with the questions that were being asked. This study focused on three factors that could affect one's desire for pursuing graduate education; necessity, motivation and expectation.

Graduate candidates' explanations for necessities for graduate education in mathematics and science education were mainly gathered under three themes; Academic development, professional development and social development. In his master's thesis, Alhas (2006) also mentioned that graduate education was a necessity for teachers to satisfy personal (academic and professional) and social needs. According to responses obtained from the participants, the most mentioned necessity theme for following graduate education in science and mathematics education was the theme of academic development. Among all codes for academic themes, RP, ISCSR and PAS were highly emphasized by the candidates. On the other hand, among all professional development themes, IQF was the most stressed code by graduate candidates, especially by the teachers. Among all social development codes, the most mentioned one was GSS. In their studies, Lin and Tsai (2008) also highlighted GSS but as a motivating factor for graduate education GSS. Although this study also included GSS code in the motivation themes, the

more emphasis on this code was given in the themes of necessity.

According to the results of the current study, motivations for following graduate education were explained by two themes; internal motivations and external motivations. The former also included two sub-themes that were science-related internal motivations and social-related internal motivations. Internal motivation theme was stressed more than the external one.

Among the social related internal factors, participants mostly highlighted CSD, PD and KE. The code PD was also mentioned by some other studies (for example, Lin and Tsai 2008; Sayan and Aksu 2005; Teowkul et al. 2009). Teowkul et al. (2009) highly mentioned graduate candidates' beliefs that graduate education would be beneficiary to get promoted to a higher position in their profession. On the other hand, among the internal motivation factors relating science, highly emphasized ones were AI, ISR, and DA. DA code was also stressed by other studies (Savas and Topak 2005; Sayan and Aksu 2005). Pursuing academic career without having an academic position (such as teacher assistant or research assistant) may cause a delay in getting of the degree (Sayan and Aksu 2005). Graduate candidates' external motivations were mainly focused on the code of etc.

The results of the study also explained expectations from graduate education under three themes; academic expectations, professional expectations, and social expectations. The most emphasized theme was academic expectation theme. ISCR, the most mentioned academic expectation, PAS and DA codes were brought forward by the candidates (especially by the students) among all codes while the most mentioned professional expectations code was IQP. In a study conducted with teachers, Baser et al. (2005) indicated that teachers' expectation from graduate education was mainly about improving quality of their teaching rather than switching career or getting promoted to a higher position in their profession. On the other hand, among all the codes for social expectations, CSD and IW were generally mentioned by the candidates. The results relating PAS, DA, CSD and IW codes were in line with the results of Alhas (2006)'s study conducted with graduate students. These results may allow us to generate a conclusion that graduate candidates and students posses similar expectations from graduate education.

The current study also indicated that social-related internal factors mostly matched with the academic expectations and social expectations (Table 5). However, social-based internal factors were more leaned (with a total of 34 match) towards academic expectations. Moreover, gaining social status (GSS) was the only social-based internal motivation that did not match with an academic expectation. Having similar tendency with the social-related internal factors, internal factors relating science only matched with the academic expectations. This means that graduate applicants who had academic reasons for pursuing graduate education expected graduate education to remedy their academic/scientific necessities. In general, candidates with external motivations mostly carried academic expectations while few of them also had social and/or professional expectations.

Table 5: Total loads of matches from motivations to expectations

Motivations		*Expectations*		
	Social	*Professional*		*Academic*
Internal	Social related	34	24	11
	Science related	93	-	-
External		43	5	2

Upon consideration of results above, one can conclude that motivations generally caused academic expectations, especially ISCSR and PAS. The most highlighted professional and social expectations that were associated with a motivation were IQP and CSD, respectively.

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