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# Determination of the Factors Affecting High School Students' Preferences of and Satisfaction with Choosing Biology as an Elective Course

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**ABSTRACT** School subjects divided into compulsory and elective courses. Compulsory courses are the basic courses that students must take to graduate, while elective courses give freedom for students. In Turkey, Biology courses taught as compulsory under the required courses in high schools. But, it is also instructed as elective courses called "Advanced Biology" in Anatolian High Schools and "Biology Applications" in Science High Schools at grades eleven and twelve. This new development calls for determining high school students' reasons for choosing and not choosing biology. To elicit their reasons, the sample of the current study consisted of 135 volunteer students drawn from two different schools in northeastern Turkey. An open-ended questionnaire used for data collection. The students' responses to the survey subjected to content analysis. The factors affecting their choices of biology were high due to future-oriented issues and emotional reasons. The factors affecting students' views of declining biology as an elective course were high due to future-oriented issues, psychological reasons, and external resources. They tended to change their decisions because of related-courses and exam-oriented reasons. Future studies should be undertaken with larger samples to identify the role of gender differences in biology preferences.

**Keywords** Biology, Career choice, Elective course, Satisfaction

## 1. INTRODUCTION

Distinctive personality, abilities, and interests of each individual are the starting point of education. For this reason, in schools, which constitute an essential part of the education process, it is necessary to put programs into practice that will reveal the talents of the individuals and form their future careers (Ko, Sammons & Bakkum, 2016). School subjects divided into compulsory and elective courses. Required courses are the basic courses that students must take, while elective courses give freedom for students. Allowing students to choose the courses they want is an appropriate approach to the contemporary democratic understanding (Genç & Kalafat, 2007; Movchan & Zarishniak, 2017), as well as offering alternatives to help students develop positive attitudes towards school.

Elective courses allow students to train in multiple ways (Demir & Ok, 1996). Students may be able to discover their hidden talents with the lessons they will choose by their interests, needs, and abilities, and they can use such knowledge and skills in elective courses to solve problems. Although elective courses give individuals a democratic freedom in terms of discovering their interests and abilities, some researchers have found out that the increase in the number of elective courses leads to decreasing achievement scores in some international tests, so the hours of elective courses have reduced with the influence of families and educators (Hedges, Pacheco, & Webber, 2014; Pascual, 2014). When evaluated in this respect, not only the interests and needs of the students are taken into consideration in the course selection, but also external resources such as families and teachers can be useful in this process. Besides, research has revealed that the selection of elective courses in schools depends on the schools' adequate number of classrooms, a sufficient number of teachers and the required number of the students (at least 10) to offer the course.

The application of elective courses may vary for countries. That is, a compulsory course in a country can teach as an elective course in another country. In Turkey,

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starting from the second stage of elementary school years, there is the possibility to choose courses in high school and undergraduate education (Taş, 2004). The regulations related to elective courses in the Turkish National Education System carried out within the framework of the decisions of the Board of Education. Its foreseen that the teachers' board should determine the elective courses to teach in schools by taking into consideration the conditions of the school and the environment, the interests, wishes and needs of the students and the opinions of the parents at the beginning of the academic year (Dergisi, 2005). It decided to teach various science-based courses such as physics, chemistry, and biology in secondary education as an elective course starting from the 10th or 11th grade on according to the type of school. At the moment, biology is a compulsory school subject in the 9th and 10th grades in Anatolian High schools for three hours a week; but it is renamed as Advanced Biology and put under the Field of Mathematics and Science as a 3-hour elective course for the 11th and 12th grades. In Science High Schools, a three-hour Biology course is compulsory for the 9th, 10th, 11th, and 12th grades, but another three-hour Biology course is elective for the 10th, 11th, and 12th under the Science Applications for students who choose Field of Mathematics and Science.

Few studies have conducted regarding elective courses (Tuncer & Özüt, 2017) at the undergraduate level. For example, program changes in recent years have attracted related research on primary education. Factors influencing the choice of courses include gender, attitude, family, teacher, career choice and personal development mainly (Ekici & Hevedanlı, 2010; Essary, 1998; Khan & Ali, 2012; Osborne, Simon, & Collins, 2003; Pascual, 2014; Toews, 1998; Tuncer & Özüt, 2017; Uçgun, 2012). Early attempts to identify such influential factors are essential since they are the first steps of a long journey of creating a career (Nagy, Trautwein, Baumert, Köller, & Garrett, 2006).

In the secondary education period, students make choices to determine their future professions; therefore, the question of whether they will have professions that will allow them to be hired by an organization immediately (Pascual, 2014). At the undergraduate and higher levels like MBA or Ph.D., as a profession has already decided, social factors are at the forefront while making course choices (Uçgun, 2012). Family factors and the profession of parents can be effective at secondary education course selection (Pascual, 2014); these factors determined as the least effective factors among university students (Tezcan & Gümüş, 2008). One of the common factors that affect the choice of students at both secondary and university levels is a group of friends (Pascual, 2014; Uçgun, 2012).

Many factors can influence the course selection of students at the university level. Some of these are students' views about the faculty members, the method of the course, the instructor's grading system, the personal skills, the course and the academic factors focusing on the characteristics of the instructor, personal/contextual factors related to the student who chose the course, familiar instructors, being in the same class with friends, creating a program that fits the working hours, being flexible in absenteeism and being able to find the instructor in office hours (Babad & Tayeb, 2003; Pass, Mehta, Mehta, 2012; Tezcan & Gümüş, 2008; Uçgun, 2012).

The factors affecting the course choices can be studied generally for a single course or a single section, and the results can use for the improvement of the course or section (Toews, 1998). In a study conducted for physics lesson, it stated that there were internal and external factors such as difficulty and lack of necessity at the beginning of the students' not choosing physics course, and the reasons for choosing were plans for the future due to the need for physics courses in their future education and careers (Toews, 1998). As for the students studying press and broadcasting, the factors influencing the course choices were found to be as criteria such as personal development, leisure time and graduation, and suggested that different departments should put forward these needs (Yüksel, İspir & Adıyaman, 2016).

Attitude, which argued to affect many areas, is one of the essential factors affecting course selection. Negative attitude towards a course adversely affects the selection of the course (Essary, 1998; Rogers & Ford, 1997). Therefore, each course can be considered one by one to reveal the factors affecting course selection more effectively.

The factors that affect the course selection vary according to the nature of the course (Ekici & Hevedanli, 2010; Osborne, Simon, & Collins, 2003; Özel, 2016; Şeker, 2013; Toews, 1998). Therefore, it considered essential to find out the factors that affect the choice of each course individually. This study aimed to reveal the factors that affect the preference of biology as an elective course. Because biology, despite being divided into sub-branches to make its learning more accessible and more meaningful for students, is still seen one of the memorization-based and most painful lessons (Bahar, 2003; Çimer, 2004; Maskiewicz, 2006; Özatlı, 2006; Öztap, Özay & Öztap, 2003; Saygın, Atiboz, & Salman, 2006; Tekkaya & Balcı, 2003; Tekkaya, Özkan, & Sungur, 2001). Although there is a negative attitude towards biology in general, it revealed that positive attitudes towards sub-branches exhibited and it reported that the attitudes of girls towards biology are more favorable than boys (Kurnaz & Alev, 2009; Tezcan & Gümüş, 2008; Uçgun, 2012).; Nasr, Soltani, and Asghar, 2011) have

revealed that only students who find biology fun prove a relationship between biology knowledge and course achievement.

The relevant literature in which the factors affecting the selection of the courses examined reveals that research focus more on undergraduate and graduate samples, especially in the national dimension (Kurnaz & Alev, 2009, Uçgun, 2012; Yüksel, İspir & Adıyaman, 2016) and some of them, have recently observed in primary education level (Tuncer & Özüt, 2017). Unfortunately, none of the studies at primary education level contain students. The number of studies investigating the factors affecting the selection of students at high school level is quite low, and even no Turkish literature is available in this context while there is only a little English research at the undergraduate degree (Nagy, Trautwein, Baumert, Köller, & Garrett, 2006). For this reason, this research expected to determine at first the factors affecting the course choices before the university entrance exam, which will guide students' future. Besides; the study can help guide the students properly according to the influential factors, help them make well-informed decisions on courses in the light of their personality and insufficiencies, and effectively use decision-making skills to solve their problems in everyday life through the 21st-century skills, which is one of the main aims of curricula.

Moreover, the study will light the way for the course teachers to see what criteria the students consider while improving themselves and informing parents about their children's decisions at the same time. Also, this study thought to be important in terms of providing information about vocational training in Science, Technology, Engineering, and Mathematics (STEM) branches and helping to determine effective strategies. The last but not least, it is expected to contribute to the literature studying the high school level, which has been overshadowed by the graduate and undergraduate levels. The fact that course selection stands as a new topic to discover after selection of the branch of study at high school has made it obligatory to conduct this research.

In this study, it's aimed to find out reasons for high school students' choosing or not choosing biology course as an elective course and whether they are content with their choices as a step which will affect their career choices directly and their lives indirectly. For this purpose, the answer sought for the following research questions.

1. What are the factors that affect eleventh and twelfth-grade students' choices of biology courses as an elective course?
2. What are the factors that influence eleventh and twelfth-grade students' not choosing biology as an elective course?
3. What are their reasons for changing their decisions after choosing biology as an elective course?
4. What are their reasons for changing their decisions after rejecting biology as an elective course?

## 2. METHOD

### 2.1. Study Design

This research is a descriptive case study, which aims to reveal eleventh and twelfth-grade students' reasons for choosing or discarding biology as an elective course. In descriptive studies, it is generally necessary to clarify a given situation, to make evaluations following standards, and to describe and explain the situation thoroughly without any changes in the environment (Cohen & Manion, 1994). To make a general judgment about the universe composed of many numbers within the scope of this research, a case study carried out by describing the selected sample according to the world (Creswell, 1998).

### 2.2. Sample

In choosing what case to study, there is an array of possibilities available for purposeful sampling (Creswell, 1998). In this study, the sampling determined by using typical case sampling. According to this sampling method, if its desire to introduce a new application or an innovation, one or more most typical of such situations can study in particular (Yıldırım & Şimşek, 2008). This research held in a medium-sized city in the northeast of Turkey. Two schools selected from this province. These schools are Anatolian High School and Science High School. To be able to register at these schools, students have to be successful in the nationwide test applied at the end of the 8th-grade semester. Successful students then choose a school according to their scores. Those students were included in the study sample because they experienced in selecting a school and how to make a conscious choice. Thus, it assumed that these students have at least a selection experience, they have criteria according to their preferences, they are critical of their choices with good and bad sides not only by themselves but also with people around them.

The total number of students is 135. They are in the 11th and 12th grades. The sample included 98 (72%) students in the eleventh grade and 37 (28%) students in the twelfth grade. Of the students in the 11th grade, 52 were girls (53.06%), and 46 were boys (46.9 %). Of the students in the twelfth grade, 17 were girls (45.9%), and 20 were boys (54.05%). The average biology grade point of all students in the previous year was 62.13. 64 (47.4%) of the students preferred biology as an elective course, while 71 (52.5) did not take the electoral subject. The detailed distribution of the students shown in Table 1.

### 2.3. Data Collection

An open-ended questionnaire used to collect data. The questions prepared according to the opinions of two experts studying biology and science education. The final form gives as a result of the corrections obtained from the applications with a class excluded from the sample. In the

first part of the structure, students asked about their gender, class, and biology grades in the previous year. In the second part, the students were asked questions in two columns. Both columns have four questions. In column one, the items included *"What are the factors that convinced you to choose biology as an elective course?", "Are you glad to have chosen biology as an elective course? Indicate your reasons.", "I chose biology, but I would like to change my decision because…."* and *"I chose biology and I would not like to change my decision, because…"* The second column included such items as *"What are the factors that convinced you not to choose biology as an elective course?", "Are you glad not to have chosen biology as an elective course? Indicate your reasons.", "I did not choose biology, but I would like to change my decision because…",* and *"I did not choose biology and I would not like to change my decision, because…"* The questions made logically similar so that the respondents could choose their column easily, and data loss could prevent because of the students' confusion on missing the meaning of the questions. Students' names not asked because of repercussions. Questionnaires numbered.

### 2.4. Data Analysis

All answers of the students analyzed by the researchers with content analysis and descriptive analysis methods. The responses individually coded with words or phrases that reflect the generality of the descriptions. Then those codes which serve the same purpose were grouped under common categories. Each question in the form identified as themes such as choosing the course, not choosing the course, and changing their decisions. The following steps followed throughout the analysis procedures;

1. Coding of the data gathered from students,
2. Collection of the codes under common categories
3. Establishing themes based on the codes,
4. Arranging the codes and themes,
5. Describing and interpreting the findings (Yıldırım & Şimşek, 2008).

As some student responses corresponded to multiple themes, only the frequencies of the respective codes and themes provided in the result tables and percentages omitted.

### 2.5. Validity and Reliability Studies

The formula proposed by Miles & Huberman (1994) uses to calculate coding reliability for content analysis. According to this formula, the compliance of the codes elicited by the authors separately checked. Coding reliability found to be 93. Since this value was above 70, it concludes that the encoding was reliable. After the finalization of the codes, the categories were formed and then finalized by two experts in the field. The findings include frequencies and sample quotations of these codes.

## 3. RESULT AND DISCUSSION

According to the data obtained, the results examined under three headings. These are the factors affecting students' preferences of biology as an elective course, the factors that affect students' views of declining biology as an elective course, and students' satisfaction with their preferences.

### 3.1. The Factors Affecting Students' Choices of Biology as an Elective Course

Sixty-four of the students chose biology as an elective course. The factors affecting the students' preference of biology as an elective course expressed with 16 codes, and these codes collected under six categories (Table 2). According to this, the factors are (a) future-oriented issues, (b) course relevance, (c) emotional reasons, (d) obligation, (e) external sources, and (f) individual reasons.

Among these, "future-oriented-issues" and "emotional factors" are the categories with the closest frequencies. They followed by "obligation" and "course relevance," whose rates are equal to each other. The least frequency categories are "external sources" and "individual reasons."

As seen in Table 2, the most significant factor influencing the students' biology course selection constituted by their plans. The sub-themes of future-oriented issues were career choice and program choice, and their respective frequencies were 24 and 16. The students stated that they needed to know biology to achieve their future career goals and that they selected biology because it was among the fundamental courses of their high school program. Furthermore, the students rarely mentioned personal reasons, such as closing their knowledge gap and improving their knowledge base.

**Table 1** Distribution of students who chose and not choose biology as an elective course

| Gender | Students, who choose biology | | | Students, who did not choose biology | | |
|---|---|---|---|---|---|---|
| | Grade | f | % | Grade | f | % |
| Girl | 11 | 18 | 28,12 | 11 | 34 | 47,88 |
| | 12 | 10 | 15,62 | 12 | 7 | 9,85 |
| Boy | 11 | 25 | 39,06 | 11 | 21 | 29,57 |
| | 12 | 11 | 17,18 | 12 | 9 | 12,67 |
| Total | | 64 (%47,4) | 100 | | 71 (%52,5) | 100 |

**Table 2** Factors affecting students' choices of biology as an elective course

| Categories | Codes | f | Sample Quotations | Total |
|---|---|---|---|---|
| Future-oriented-issues | Career choice | 24 | *I chose it (Biology) because it is more relevant form my career plans (S38).* | 40 |
| | Program choice | 16 | *I am in the quantitative-based program and biology was listed as a field course (S37).* | |
| Emotional reasons | Loving the course | 17 | *Because I liked biology. The half of it belongs to the teacher and the other half to me, but I like biology and, therefore, choose it (S 45).* | 37 |
| | To be interested | 13 | *I like biology. The topics are of my interest, so I will keep taking it. (S58)* | |
| | Curiosity | 7 | *First of all, it is curiosity. Especially, getting to know myself as a human being. My interest in and willingness to learn about the lives and biological structures of the other living organisms (S99).* | |
| Obligations | To be obliged | 12 | *In general, I had been willing to choose the quantitative-based program, but biology was of no interest to me. When I chose the quantitative-based program, biology was mandated to me (S103).* | 12 |
| Course related | Having Interesting topics | 8 | *I chose it because I am interested in the field of biology. The topics are interesting. I find the topics interesting especially when they are from daily life. (S98).* | 12 |
| | Quantitative-based content | 2 | *For being in quantitative-based section (S46).* | |
| | Requiring memorization | 1 | *For me, 70% of biology is a lesson based on memorization, and I chose biology lesson because I trusted myself (S101).* | |
| | Having fun in class | 1 | *I'm interested in biology; the lessons are fun (S33).* | |
| External sources | The teacher | 3 | *I like the lesson and X teacher (S43).* | 6 |
| | The teacher's effort | 1 | *I love the biology teacher. Also, the teacher is working hard for us. (S42)* | |
| | Love of mathematics | 1 | *I preferred biology as I was interested in mathematics (S126)* | |
| | Broad range of career choices available to quantitative majors | 1 | *Because I had the widest course areas in the quantitative-based section. I didn't have an occupation goal, I thought more kind of lesson means wide choice of profession (S117).* | |
| Personal reasons | Closing the knowledge gap | 2 | *Because I am a quantitative-based section student and I have biology subject deficiencies (S60).* | 3 |
| | Improving one's knowledge base | 1 | *I wanted to improve upon the things I learned in 9th and 10th grades (S125).* | |

Another important reason for selecting biology was emotional reasons (37), which includes the codes of loving the course (17), interest (13), and curiosity (7). Moreover, the least mentioned theme was external reasons (6) that cover teacher (3), teacher's efforts (1), love of mathematics (1), and the broad range of career choices available to quantitative majors (1). The external reasons theme followed by the least prominent issue titled personal reasons (3) and comprised of closing the knowledge gap (2) and improving one's knowledge base (1).

### 3.2. The factors that affect students' views of declining biology as an elective course

Another essential side of the study was the identifications of the reasons behind the students' decisions for not choosing biology. The data regarding this branch of inquiry were also analyzed using the content analysis method, and the findings indicated similar as well as different themes to the previous section. Of the 135 students participating in the study, 71 did not choose biology as an elective course. Hence, the students' reasons for not selecting biology fallen under five themes named: (a) future-oriented issues, (b) emotional reasons, (c) external sources, (d) failure, and (e) course relevance. As before, each theme consisted of multiple codes. A detailed table of frequencies for the themes and the codes provided in Table 3.

Future-oriented issues, similar to the reasons for selecting biology, were the most prevalent theme (27) for not choosing biology. While career choice was a remarkable factor in choosing biology, its prevalence was somewhat lower as a reason for not selecting biology (9), where program choice (18) became a stronger factor. Another factor leading the students to decide not to choose biology was emotional reasons (26), in which dislike of the course (13) was a significant reason.

Despite its relatively lower frequency, misguidance/lack of knowledge on availability (7) was a noteworthy reason for students' not selecting biology. The code falls under the theme of external sources (21). It

**Table 3** Factors affecting students' not choosing biology as an elective course

| Categories | Codes | f | Sample Quotations | Total |
|---|---|---|---|---|
| Future-oriented issues | Program choice | 18 | *I did not choose it due to my program, I am a TM [Turkish-Mathematics: i.e.; Equally weighted program] student (S5).* | 27 |
| | Career choice | 9 | *I did not choose it since my future profession will be an equally-weighted major (S29).* | |
| Emotional reasons | Dislike of the course | 13 | *[because] I don't like the course (S24).* | 26 |
| | Disinterest | 9 | *I have no interest in biology (S9).* | |
| | Preference for verbal courses | 2 | *I like verbal courses more. I will not answer the 11th and 12th-grade biology questions in the higher education entrance exam (HEE: YGS in Turkish) (S75).* | |
| | Finding it boring | 1 | *Biology was boring to me and I had difficulty of understanding the lesson. (S20).* | |
| | Finding it unnecessary | 1 | *I did not feel any urges to choose since I am in the equally-weighted program (S85).* | |
| External sources | Teacher | 7 | *Because of the course teacher (S66).* | 21 |
| | Misguidance/lack of knowledge on course availability | 7 | *Misguidance of the teacher (S82).*<br>*I am a TM student and I did not know I could choose it (S95).* | |
| | Not liking physics and chemistry | 3 | *I did not choose because biology is a branch of science courses and I do not like physics and chemistry (S11).* | |
| | Classroom | 1 | *Because of the teacher and the course's classroom (S13).* | |
| | Peer influence | 1 | *I did not choose because my friend didn't choose, either (S64).* | |
| | Confidence in self-study skills | 1 | *It was not related to the university major I would study. Since HEE biology questions require memorization, I can handle them by restudying (S21).* | |
| | Lack of quantitative logic | 1 | *My quantitative logic is not quite good (S86).* | |
| Failure | Learning difficulty | 11 | *I have difficulty (a hard time?) in learning biology (S92).* | 20 |
| | Failure to succeed | 6 | *I am not quite successful in that course (S94).* | |
| | Failure to pass the course | 1 | *I had a hard time understanding, also had difficulty in passing the exams (S3).* | |
| | Negative prior experiences. | 1 | *I had a low score in the 9th grade (previous grade). (S69).* | |
| | Lack of knowledge | 1 | *I'm not knowledgeable in biology (S8).* | |
| Course related | Memorization | 7 | *Because it is based on memorization and there are many foreign words (S17).* | 16 |
| | Being a quantitative-based content | 4 | *Biology is one of the quantitative-based course and the program I want is equally-weighted (S19).* | |
| | Complexity | 2 | *I think it is hard and complex (S86).* | |
| | Foreign words | 2 | *It requires a lot of memorization and there are lots of foreign words. I have difficulty in that course so I did not choose (S16).* | |
| | Being a verbal content | 1 | *I did not choose it because of its verbal emphasis and my difficulty in memorizing (S7).* | |

found out that the respondents were not informed about the new course selection system, so they did not know they could choose various courses, including biology.

The students also stated that they did not choose biology because of failure (20) and course-related reasons (16). These two themes are the least frequent ones. It seen that the students did not choose biology because they thought that they would not be able to understand the course (11), could not succeed (6), and would not be able to pass the exams. Besides, they mentioned some features inherent in the very nature of biology as reasons for not selecting, such as being a course of memorization (7), being quantitative (4), being complex (2), and being a course including foreign words (2).

### 3.3. Students' Satisfaction with Their Preferences

Another aspect of the study examines whether the students feel content about their course selection decisions. In this respect, all of the students answered the question, "Are you pleased with YOUR DECISION TO HAVE\NOT TO HAVE CHOSEN biology as an elective? Please explain the reasons for your answer." The findings from this line of inquiry provided in two different tables.

Among the 64 students who have chosen biology, 13 reported discontents about their decisions, and they

related this to the themes of course relevance, personal reasons, and career choice — the topics and codes about the reasons leading the students to change their decision given in Table 4.

The categories and codes the reasons for changing the preferences of the students detailed in the table below.

Students who prefer the course want to change their decisions because of several reasons. Those reasons categorized into three categories. The most influential factor for the students who wish to improve their selections is memorization (4) code organized under the theme of course relevance (10). The students also stated other reasons for regret, such as finding it hard (3), finding it annoying (1), failure to understand its logic (1), and not regarding it as quantitative (1). The theme of personal reasons also influences the students' desire to replace the course. Under this theme, the students mentioned the feeling of not feeling of belonging (2), liking other courses more (1), realizing the lack of interest (1), and change of interest (1). As to the career choice theme, it is the least often mentioned theme in this student group.

Similarly, among the 71 students who have not chosen biology, 30 students expressed their feeling of discontent. They wish to choose biology as an elective course. The themes derived from their responses include *exam orientation, emotional reasons, personal development, teacher-related, course relevance,* and *external sources*. Table 5 below showcases the themes and codes about the students' reasons for discontent.

For the students who have not chosen the course and did not feel content with that decision, exam orientation (14) is the most common reason for wishing for a change, and it followed by emotional reasons (11). Some other reasons the student mentioned include finding biology easy to succeed if one studies (3), the belief that it contributes to common knowledge (1), and contributing to personal development (1). These reasons organized within the theme of personal growth. Also, other issues, such as teacher-related, course-related, and external sources, were the least frequent ones with two occurrences for each indicated in Table 5.

### 3.3 Discussion

Students who attend high school education have to attend all courses in the 9th and 10th grades. Starting from the 11th grade, they choose a section and continue to study with the courses required by this section. Selecting this section is usually closely related to the profession students want to study at university. While these areas generally divided into quantitative-based, verbal- based, and equally-weighted (qualitative/quantitative-based), some of them may vary depending on the school's conditions, including physical education, music, and English-based sections. Each section teaches compulsory courses. Besides, students can choose some basic subjects as elective courses. With the updated teaching programs, apart from social activity-based courses, some required courses like biology, chemistry, mathematics, and physics can be elected, too. For this reason, this study aimed to determine the extent to which students prefer biology course and what kind of factors are influential in their decision-making process.

According to the findings of the study, 47.4% of the participants preferred biology as an elective course, while

**Table 4** Students' reasons for changing the decisions for selecting biology as an elective course

| Category | Codes | f | Sample Quotations | Total |
|---|---|---|---|---|
| Course related | Finding it memorization-based | 4 | *It is a memorization-based lesson, I don't think it is quantitative-based (S56).* | 10 |
| | Finding the lesson hard | 3 | *Because it is hard (S49).* | |
| | Finding it boring | 1 | *It is full of memorization and boring (S51). (S51).* | |
| | Failure to understand its logic | 1 | *I find it hard and I have a hard time grasping its logic (S36).* | |
| | Biology is not quantitative-based | 1 | *I don't think it is a quantitative-based lesson. (S56).* | |
| Personal reasons | Do not belonging here | 2 | *I would like to change it because I don't think I belong here (S99).* | 5 |
| | Liking physics much more | 1 | *Instead of biology, I would choose physics as a quantitative course because I like it more than biology (S102).* | |
| | Realizing the lack of interest | 1 | *I wanted to pursue quantitative studies, and biology was a must-have course. But then I realized I do not like biology (S102).* | |
| | Change of interest | 1 | *I realized that I am more inclined to the equally-weighted program (S117).* | |
| Career choice | Career plans | 1 | *I had no interest in biology. I considered transferring to the equally-weighted class for a while but due to my career choices, I remained in the quantitative program (S103)).* | 2 |
| | Career plans in other fields | 1 | *My future career plan is more closely related to the fields of mathematics and physics (S38).* | |

**Table 5** Students' reasons for changing their decisions

| Themes | Codes | f | Sample Quotations | Total |
|---|---|---|---|---|
| Exam-orientation | Useful for HEE | 6 | *I am not pleased (because of my decision); because, I will need this course at the HEE exam and that's why I am not pleased (S78).* | 14 |
| | Classes covering HEE topics | 2 | *I would like to choose it if HEE topics will be covered (S85).* | |
| | Answering extra questions at HEE | 2 | *It could have helped me answer a couple more questions in HEE (S6).* | |
| | Included in HEE | 1 | *I will need it in college entrance exams (S88).* | |
| | Future usability | 1 | *It may become useful in the future (S5).* | |
| | Surpassing other students | 1 | *Because I need more science courses to surpass other students of the equal-weighted majors. Therefore, I would have liked to take it (S78).* | |
| | Feeling the necessity | 1 | *I need that course (S82).* | |
| Emotional reasons | Loving the course | 6 | *I am not [pleased]. I like biology, but I could not choose it (S91).* | 11 |
| | Finding the course enjoyable | 4 | *It was an enjoyable course (S69).* | |
| | Being interested in | 1 | *I'd like to change my decision because the topics for the 9th and 10th grades are different. Maybe the 11th and 12th grade biology subjects would have attracted my interest (S94).* | |
| Individual development | Easy to succeed if one studies | 3 | *I'm not satisfied because it is an doable course if one studies (S89).* | 5 |
| | Contributing to common knowledge | 1 | *I think biology lesson will contribute to my common knowledge (S62).* | |
| | Personal development | 1 | *I think biology is a perfect science for personal development and understanding life, living organisms, and myself better. (S135).* | |
| Teacher-based | Liking the teacher | 1 | *I like the biology course and the teacher, I find it enjoyable as well. So, I would want to change my choice (S1).* | 2 |
| | Changes in temperament | 1 | *Mr./Ms. X has become nicer, and good-natured (S65).* | |
| Course-related | Learning about living organisms | 2 | *It would be nice to learn about living organisms as well (S23).* | 2 |
| External sources | Misguidance | 1 | *I didn't know I could. Otherwise, of course, I would have selected the course (S83).* | 2 |
| | Employment opportunities | 1 | *There are more employment opportunities for quantitative majors (S22).* | |

52.5% did not. The percentage of female students who preferred the elective course is 43.74%, and the percentage of others is 57.73%. When considered for male students, the percentage of males who preferred the course is 56.24%; the others constitute 42.24%. When we look at the selection rates of the course, it can say that there is a balanced distribution both in terms of total students and genders. In other words, approximately half of the students participating in the study chose the course, and the other half did not.

Furthermore, it found out that male students prefer biology more than their female peers. However, a significance test not performed based on gender. Although equality of opportunity in education in recent years has improved more than in previous years, it stated that gender still plays a role in the choice of some courses, socialization mechanisms, and rational preference motivations shown as reasons (Gabay-Egozi, Shavit, & Yaish, 2014). In the studies on gender preferences, Nagy, Trautwein, Baumert, Köller, & Garrett (2006) revealed a meaningful difference, and female students mostly prefer biology, where Gabay-Egozi, Shavit, & Yaish, (2014) found out no significant difference in the context of a biology course. When examined in terms of attitude; studies are showing that there are no meaningful differences (Pehlivan & Köseoğlu, 2010; Prokop, Prokop, & Tunnicliffe, 2007) despite studies which show that female students exhibit more positive attitudes towards biology than males (Atik & Erkoç, 2015; Erkol & Uğulu, 2013). Although there is no statistical analysis in terms of gender within the scope of this study, there are many studies in which there are different situations by gender in the current literature.

In the present study, which intended to identify the reasons that affect the students' course choices, it found out that the students prefer biology course mostly for future-oriented reasons (see Table 2). This category also ranks first among reasons for not choosing the course, which covers field professions and professional choices of students. It thought to be cultural because Medicine, Engineering, and Mathematics considered prestigious jobs in Turkey, and more students guided to these areas for this reason. These areas also are seen as indicators of success. This situation is consistent with international studies. Pascual (2014) stated in his research that the students reported course selection with the motivation of

future employment potentials. Besides, remember that the studies in the national literature are of the undergraduate and master's degree levels, it may not be surprising not to explore such a factor in the national research since they have already completed their professional choices. For this reason, professional choice, which includes plans for the future, can be the most crucial reason affecting secondary school students' motivation for course selections.

Emotional reasons, course-related reasons, external sources, and personal reasons (see Table 2), which are the categories that affect the course selection of the students, showed results consistent with the literature. In his study with undergraduate students, Uçgun (2012) found out reasons for students' course choices as the enjoyment of qualitative-based and quantitative-based courses and possessing talents for qualitative-based or quantitative-based courses. Likewise, secondary education students emphasized the quantitative-based nature of the subject under the course-related category and love for the course in the emotional reasons category.

As another category that affects the students' course choices found in this study, obligation/imperative not repeated in the literature. Although this category has its place under the factors affecting decisions of biology and is seemingly the desired situation, it has negative implications. As noted in the category of future-oriented issues, it found out that some of the respondents chose the course as an investment in their future profession, some necessarily chose it as a part of the section of the study, and some others had to take the course — those who directly stated the obligation covered in this category. Also, the frequency of 12 seems too important to ignore.
In a study with undergraduate students, Yüksel, İspir, & Adıyaman (2016) defined one of the factors affecting the course choices of students as personal development. A similar category emerged in this study in which the category is under the factors that change students' minds after rejecting biology as a chosen subject (Table 5). It can infer from this category that the students wanted to change their preferences expecting contribution to their general knowledge and personal development as a result.
The course-related category is related to both groups of the factors influential on preferring and discarding biology as elective. Under this category, students suggested that biology is both quantitative-based and memorization-based. Similarly, students who did not choose the course specify the same factors in higher frequencies as the reason why they did not choose. These two are different codes. However, the sum of the frequencies in both groups indicates that biology is seen memorization-based (f=8) and quantitative-based (f=6) by students. The former is one of the most often problems in the literature (Ursavaş, 2014; Özatlı, 2006; Maskiewicz, 2006; Bahar, 2003; Öztap, Özay, & Öztap, 2003). That raises the question of whether biology lessons are taught by the approach that will fulfill the requirements of the program.
One of the essential codes which belong to the external sources category is the teacher. Although the factor of teacher did not have much effect on students' course choice, it is repeated seven times on the opposite side. That means that the teacher factor is essential for students to exhibit a negative attitude towards a lesson. In similar studies, it stated that the teaching staff was competent in the course selection (Babad & Tayeb, 2003; Pass, Mehta, Mehta, 2012; Tezcan & Gümüş, 2008;). It is one of the categories that affect the students in their wish for changing their decision of not choosing the course as elective. Çalik and Cobern (2017) concluded in their intercultural studies that one of the authors who taught chemistry changed their students' views on chemistry courses and chemists positively. That may be due to the attributions to teachers in a society made up of emotional individuals.

In spite of its low frequency in course selection, misguiding/not knowing of the possibility to choose under the category of external sources seems to be significant considering the only recent introduction of the selection procedure. That shows that problems faced in the gradual transition from the status of compulsory to the elective courses and implies that proper guidance has not ensured so far. Pamuk and Kiraz (2016) found that 53.4% of school principals do not guide students, while 33.3% do the opposite in this process. This process is essential for the future of the students. It is necessary to take into consideration how the students will be affected while making the changes and informing them in advance so that they can evaluate the process thoroughly. The information could spread by school administrators or responsible teachers as well as guidance teachers to reduce the workload of the stakeholders. In this process, it is also possible to enlighten parents so that they can help their children with a professional approach in the decision-making process.

Apart from all those categories and codes, there is another category that is expected to be in external sources but is not expressed by any of the students: family/parent factor, which is frequently mentioned in the literature and reported with varying effects in different studies. It is surprising that these students, who are not still of full age, point out that they are not influenced by their parents, even better to say that they do not count it as a factor for choosing courses. That may be the result of the situation mentioned in the previous paragraph. In other words, the fact that the procedure is recent yet, that even the students themselves are not informed by the authorities, implying that they do not even fully know the process, there may be parents who are unaware of this process and thus, the students may have given decisions by themselves. Therefore, the need arises to provide

adequate information in the triangle of school-family and students since the current practice will affect the future preferences of the students).

## 4. CONCLUSION

In this study, the factors affecting students' elective course choices examined under two headings as choosing and not choosing the course. Similar categories found in both groups. In other words, one category may be the reason why the student wants biology as elective, while it hinders another one from choosing it. The reasons why students choose Bilogi as their elective courses are future orientation, emotional reasons, obligations/obligations, course relevance, external sources, and personal reasons. Meanwhile, the reasons why students do not choose biology as an elective course are future-oriented issues, emotional reasons, external sources, failure, and course relevance.

The most popular category affecting students' preferences for elective courses seems to be their plans. Considering that the students are in the 11th and 12th grades, this category expected to be a factor as an essential step in opting for the section and future occupations at university.

External sources seem more effective when discarding biology as an elective course compared to the opposite decision. The effect of the teacher as a code under the external sources category is also significant because the teacher seems to be more effective in refusing biology than choosing it as an elective course. This situation partly shows the effect of teachers on the choice of course and the success in the course eventually. For this reason, the results of teachers should take into consideration, and the interaction should build on this effect.

One of the most relevant categories that affect students' choices is obligation/imperative. It found out that students chose biology not for the sake of their interests but due to obligation. That implies that students ignore their interests in informing their future, which leads to bringing up unsuccessful individuals. To eliminate this situation, especially families should give importance to the individual interests of students. In this way, individuals who qualified in their respective fields of work, love their jobs, and appreciate what they do and what they can do better, and gradually the country can develop.

Although family influence is available in the relevant literature but not existing among our findings, the fact that the family factor not revealed in the course selection of the students in our study suggests that the families do not have enough knowledge about the process and thus, they are not active enough in this process. It must remember that elective courses have just introduced to secondary education, and parents may not know much about it. For this reason, parents can interview to explain this situation, and the main reasons for their absence in this process can reveal. Since this process is a new practice, it can ensure that a vital stakeholder such as family becomes aware of this process as well as all the other stakeholders before making the course choices. For this purpose, school management can hold information meetings, and the stakeholders can warn to make the students choose their interests and needs at the forefront.

In conclusion, this study thought to be important for determining the reasons affecting course selection of students, who start growing interest in academic and career prospects, to present the findings to their teachers, educational managers, guidance counselors, and families so that the stakeholders can guide students reasonably and effectively in this process. In future research, the effects of the factors can examine in larger samples, and the differences in the factors can be examined by gender. Similar studies can carry out through different courses, or the main reasons affecting the selection of various classes can put forward.

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