

# 4-year Astrobiology Teaching Experience in an Astronomy Department

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**Abstract.** Astrobiology is a multidisciplinary field related to the sciences of Astronomy, Chemistry, Biology and Geology. An optional Astrobiology course has been taught in the Astronomy department of Ege University (Turkey) since 2013. The main objectives of this introductory course are to introduce and familiarize the astronomy students to the fundamentals of astrobiology. In this study, 4-year teaching experience of Astrobiology course has been examined. Course objectives, teaching methods, learning activities and evaluation methods were discussed. To evaluate the students' learning experiences and knowledge gains anonymous surveys and knowledge assessments were used. Furthermore, additional surveys were made to understand the interests and tendencies of the students in choosing this optional course.

## 1 Introduction

Astrobiology is a continually evolving field and it has become very important to develop new courses and programs for the future astrobiologists. Besides, it is necessary to follow up the learning experiences and progress of the students taking these astrobiology courses.

Astrobiology is a very new discipline in Turkey and no astrobiology course had been taught until 2013 in either the Astronomy or the related departments. At Ege University, a new astrobiology course was developed as a 4th year elective course for the undergraduate education plan of the Astronomy and Space Sciences Department in 2013. It has been the only astrobiology course taught at Turkish universities since then.

## 2 Individual course description

One of the main objectives of this course is to inform the students about the activities in the field of Astrobiology which is multidisciplinary. Other purposes are to make them understand the origin and evolution of life in the universal sense, comprehend the transition from atoms to molecules and cellular life from since the formation of the universe, know the different forms and conditions for life, follow the studies on extraterrestrial planets and the developments in Astrobiology field. Face-to-face teaching is used in this course that is taught in English. The Astrobiology Primer V1([1]) was used as a reference guide to develop this course. In 2016 the second version of the Astrobiology Primer ([2]) was released and it is also a useful tool for developing astrobiology courses. The Revised edition of

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**Table 1.** The assessment methods and criteria for Astrobiology course.

Term (or Year)	Learning Activities	Quantity	Weight (%)
Mid-term examination		1	50
Quiz		2	25
Working on a scientific paper		1	25

Passing Grade = 40% of Term Learning Activities +60% of Final Examination

**Table 2.** The four-year numerical data about Astrobiology course.

Academic year	Number of student	Number of succesful student	Succes rate(%)
2013–2014	24*	18	75
2014–2015	52	35	67
2015–2016	26	15	58
2016–2017	26	19	73

\*The number of student was limited to 25 in this year.

the book “An Introduction to Astrobiology” edited by [3] has been used as a main source during the course.

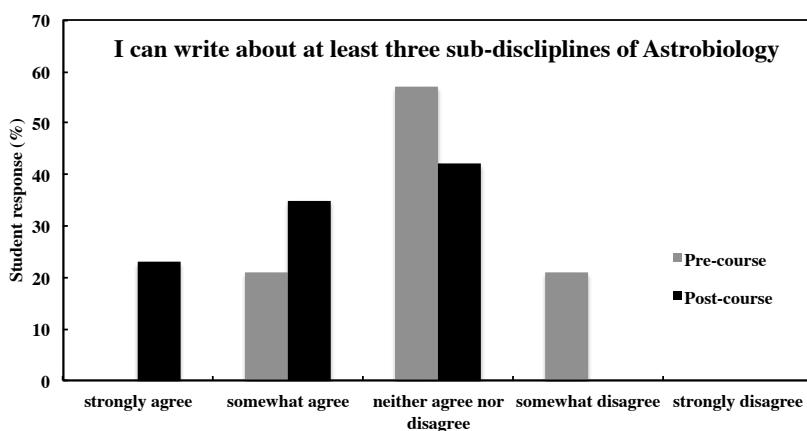
To assess the success of students two quizzes and one mid-term examinations are used as term learning activities. Quiz, mid-term and final exam questions consist of two parts. Half of the questions are multiple choice tests and the other half consists of classical written questions. The first quiz is applied before midterm and the second one between midterm and final exams. Another activity used as an assessment method is the analysis of a scientific article. In this activity, students choose a scientific Astrobiology paper, they read the article and prepare a presentation about this article. They give a 10-15 minute oral talk at the end of the semester. In Table 1, the assessment methods and criteria of the Astrobiology course are given. Four years of numerical data showing the number of the students and success rates in each semester are presented in Table 2.

### 3 Anonymous surveys

In this study, anonymous surveys composed of three parts were conducted with two student groups: Pre-course (14 students) and Post-course (26 students). The first part was prepared to find out the reasons for choosing the course and students were asked to select three of the seven options (interest in biology, astrobiology and searching for extraterrestrial life, language of course, lecturer, intention to pursue a career in astrobiology field, there is no reason) that would be effective in choosing this course. Most of the students (77%) choose this course because of their interest in searching for extraterrestrial life. The second reason (73%) is interest in astrobiology and the third one is the lecturer of the course (46%).

In the second part, students were asked to rate whether they agreed or disagreed with a particular statement by way of Likert scaling [4]. This scale is ranged from: strongly agree (5), somewhat agree (4), neither agree nor disagree (3), somewhat disagree (2), and strongly disagree (1). The similar statements with [5] were used to see the students' self-assessment of their knowledge of astrobiology. Here as examples we give the results of four statements related to Astrobiology. These statetmens are (1) describing three subdisciplines of astrobiology, (2) understanding Darwin evolution, (3) describing solar and planetary formation and (4) knowing the faint young sun paradox. In Figure 1, 2, 3 and 4 the results of this survey are seen.

From the figures, in all statements post-course students clearly seem to be more successful. Although pre-course students can give the correct answers to these statetments, we can conclude that the astrobiology course reinforces the knowledge given in Astronomy courses (statements 3 and 4).

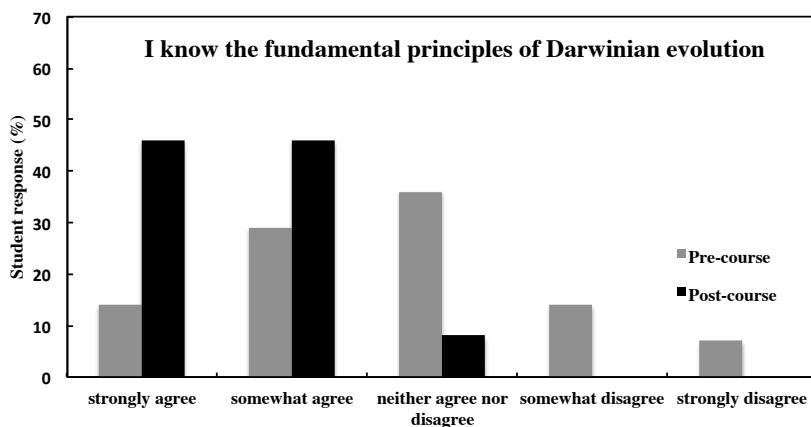


**Figure 1.** Describing three subdisciplines of astrobiology.

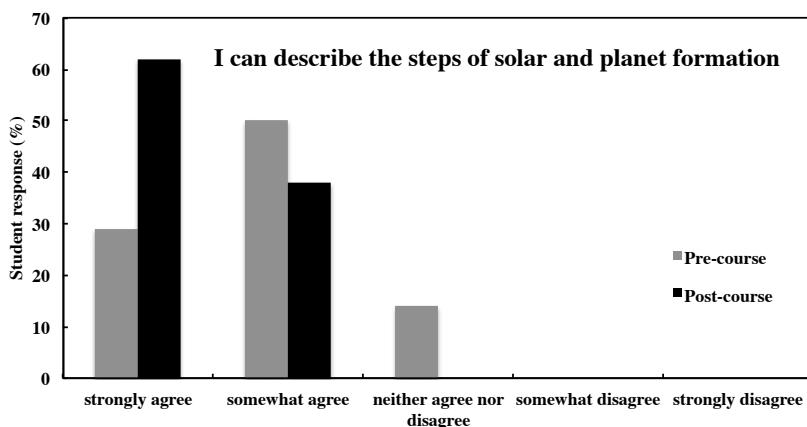
In the last part of the survey study we tried to determine the degree of satisfaction of the students with the course. For this purpose students were asked to rate their thoughts for the statements seen in Table 3. In all cases students seem to be satisfied with the Astrobiology course.

## 4 Conclusion

In this study, the first teaching experiences of a new Astrobiolgy course taught in Astronomy Department of Ege University have been examined. Since it has been only taught for four years, there is very little data for this kind of study. Nevertheless, some useful results have been obtained to improve the future teaching activities. One of the main purposes of this new optional course was to introduce undergraduate astronomy students to a growing and expanding research area. Pre-and post-course surveys were used to evaluate the students' learning experiences and knowledge gains. Additionally, two more surveys were conducted with only post-course students to find out their interests and reasons for chosing an astrobiology course and to see the degree of their satisfaction. Here, we should mention that the number of students (14 pre-course and 26 post-course) reached for surveys was small when we take into account the total number of students taking this course (Table 2). This study was



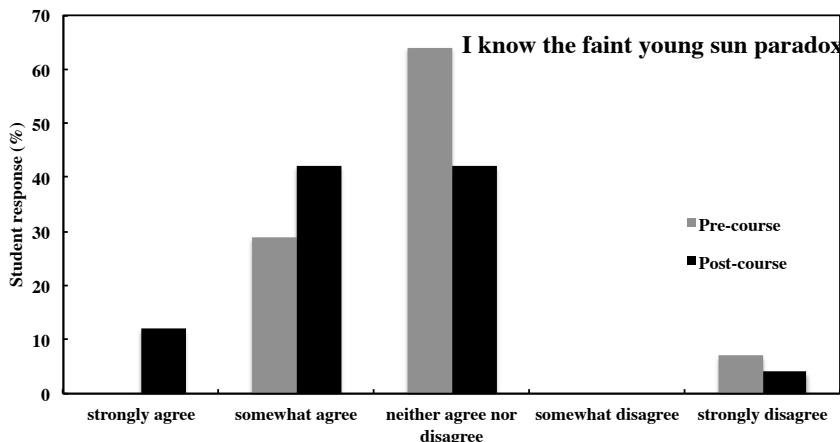
**Figure 2.** Understanding Darwin evolution.



**Figure 3.** Describing the steps of solar and planet formation.

not previously planned, we decided to make this kind of research in the 2016-2017 teaching year so the students reached for surveys took the course in the last two years.

According to the four years of teaching and the surveys made in this study, astrobiology is a popular elective course in our program and preferred by Astronomy students. Their interest in ex-traterrestrial life is the main reason for this preference (77%). Within the scope of this course they meet for the first time in their university education with some biology, chemistry and geology-based knowledge which are not mentioned in astronomy courses. Students who took the course seem to be very satisfied with this (Table 3). Surveys in the statements which contain subjects on the field other than Astronomy (like the principles of Darwinian evolution) clearly show that post-course students



**Figure 4.** Knowing the faint young sun paradox.

are more successful (Figure 1 and 2). During the course some information given in astronomy courses like planet formation, stellar evolution, interstellar medium, meteorite etc. are revisited. Surveys for some statements (Figure 3 and 4) in this study show that astrobiology course reinforces knowledge given in astronomy courses.

This study is a first step for the future researches that would be made on Astrobiology teaching activities in Turkey. To improve and expand the course regular and comprehensive surveys studies are needed.

## Acknowledgments

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**Table 3.** The degree of satisfaction of the students with the Astrobiology course.

Statements	%Response				
	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I am glad to have chosen this course	46	50	4	–	–
I am satisfied with the information I have learned	42	58	–	–	–
I think that quizzes made us learn better	38	27	23	4	8
The number of exams taking within the course is sufficient	42	31	19	4	4
I am satisfied with the question type	69	15	8	4	4
Making a presentation about an article has increased my interest in astrobiology	27	27	27	8	12
Presentations made the course enjoyable	35	23	23	8	12
Presentations made learn better	27	15	35	12	12
My desire to do research on astrobiology has increased	–	54	23	19	4
I suggest this lesson to my friends	35	62	4	–	–

[5] Foster, J.S., Drew, J.C., Astrobiology, **V9, N3**, 1 – 9 (2009)