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Space Tree without Barriers

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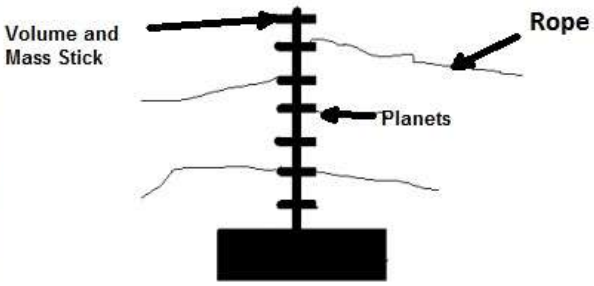
Abstract
Space education is important part of science education but not appropriate enough for students with special needs (SSN). This project is aimed to generate and adapt some materials and methods to close this gap. At the beginning of the project we classified topics from the space education/cosmology and prepared some braille documents, videos, materials and assessment tools. By this project we intend to prepare a Massive Online Open Course (MOOC) about basic concepts of cosmology for SSN. This MOOC project is different from others in terms of two reasons; Participants will use 3D materials and become peer educators for their friends. In other words, new participants should be friends of previous participants. This is why we used "tree" for the name of project. During the project, some branches of the MOOC will be rich according to the some participants whose social abilities are strong and unfortunately some branches will be poor due to characteristics of participants or other unknown reasons. The content of this project will be in two language at the beginning; English and Turkish.

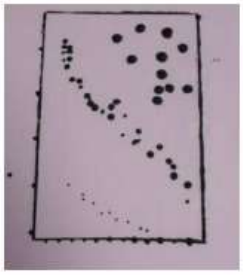
1. Introduction
If you have a question or interest about any subject, you may ask someone, buy a book or go to a library/course but distance education changed these alternatives by connecting distance sources and experts via internet connection. Open courses generally static which means one way directional courses; However, MOOCs are dynamic which means two way directional courses. It includes discussions, assignments and peer evaluations. With this study, we focused on basic astronomy concepts and how to teach these concepts for Students with Special Needs (SSN) with a new designed model of MOOCs; tMOOC.

2. Astronomy Education
Studies about astronomy education generally includes views of students, teachers or visitors in museums about solar/lunar system, day-night concept or modern concepts like stars [1]. Although most of the studies collected data with qualitative method, Astronomy Diagnostic Test helped researchers to gather huge data about student understanding. It is amazing that about observable near space like Sun-Moon and Earth, mental models of students may totally vary from student to student [2]. Moreover, among university students there may be some understanding difficulties about phase diagrams of Moon [3, 4].

3. Astronomy Education for Blinds
When we search astronomy education studies with SSN, three source is standing in front of us [5, 6, 7]. These sources suggest different materials for blinds. For instance, an umbrella may use to introduce the sky and tactile images or volume and mass stick to demonstrate planets in Solar system can be seen in Fig 1. These materials in the literature will used in tMOOC study. Other materials and related topics in Astronomy field are given with Table 1.

Umbrella





Tactile images

Fig. 1 Materials for blind learners

With umbrella, teacher may guide learner to touch the stars with his or her own hand. Little tactile dots according to real sky positions may help the blind learner to understand what is in the sky. The length of ropes on volume and mass stick demonstrates and let learner to compare some values belong to planets. Owing to astronomy is full of images, in tMOOC we plan to use more tactile images like HR diagram in Fig 1.

Table 1. Content of tMOOC with related materials

Lesson Number	Astronomy Topics	Material + Notes+ Videos
1	Introduction	History of astronomy
2	Sky	Umbrella
3	Nebulae	Cotton
4	Stars	Ball
5	Solar system	Volume and Mass Stick
6	Black Holes	Sheets
7	Day and Night	Tactile images
8	Galaxies	Tactile images
9	Observable Universe	Analogies
10	Telescope and rocket	Bottle and box

Prepared tMOOC called Space tree without barriers, includes ten main lessons with tactile notes and video files. Each concept has a special material for different students with special needs. For instance, history of astronomy and analogies prepared with just video files.

4. Astronomy Education for Blinds with MOOCs

In our tMOOC model we suggest tactile materials which participants may use. However, how a participant will use this materials? The answer of this question is in the name of course “tree” (Fig 2). This type of MOOC will collect its participants with snowboard sampling methodology; from hand to hand. In this course first training will educate primary users and these users will educate secondary users with online and tactile materials. In this method, some brunches will grow fast due to the characteristics of user but some of users will stop teaching due to different reasons. This project is the first one on astronomy education for blinds with MOOCs.The certification of MOOCs is very important, tMOOC will certificate by the center of course designers. Previous user may inform the certification exam but to create standard we need to central exams.

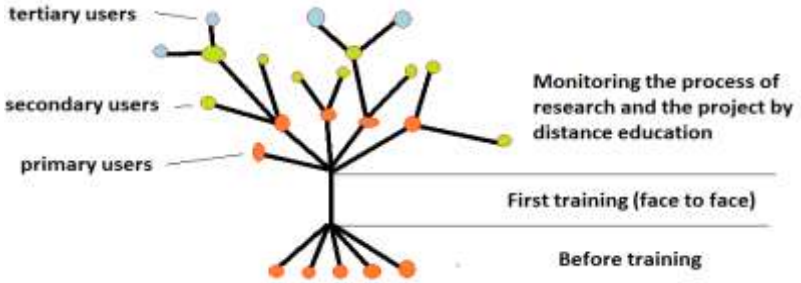


Fig 2. Model of Space Tree without Barriers

5. Types of MOOCS

The main important difference of MOOC is about being event. In open courses, you may download files in anytime but to learn through MOOCs you need to register. Therefore, tMOOC starts when you meet with tMOOC users (Fig 3). The other important difference of tMOOC is about tactile material. Others MOOCs newer give 3D materials.

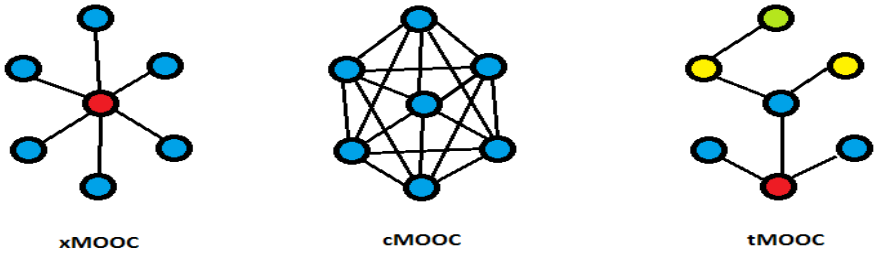


Fig 3. Types of MOOCs

Among cMOOCs and xMOOCs the most flexible one are cMOOCs due to “c” which refers to “connective”[8]. In cMOOCs you create a network and network decides what and how to learn but in xMOOCs you find high quality content (Table 2)[9]. In tMOOCs you decide the content but it will change from user to user.

Table 2. Comparing MOOCs

Cluster	cMOOC	xMOOC	Face to Face	tMOOC
Blended Learning	*	*	*	**
Flexibility	**	*		**
High Quality Content		**		**
Instructional Designs and Learning Methodologies		**	**	**
Life Long Learning	**	**	*	**
Network Learning	**	*		**
Openness	**	*		**
Student Centred Learning	**			**

**Strong, *Weak

6. Conclusion

Training huge number of participants is doing with MOOCs today but for SSN we need face to face interaction due to two reasons; teaching difficulty and reaching the participants (small number of percentage). Additionally for SSN, we need to use materials. Therefore, we develop tMOOC for basic astronomy concepts although it is not an ongoing project.

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