



## Sustainable and Accessible Science Education

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### Abstract

*This is the project about our experiences and some descriptive statistics from a Massive Online Open Course (MOOC) named Sustainable and Accessible Science Education (SASE). In terms of educational literature, sustainability and accessibility are two important terms. Sustainability highlights the continuity of time. Life-long learning is well known explanation of this continuity. The other word “accessibility” emphasize that what we need to do to make education available “for all”. Out of time (sustainability) and population (accessibility), the third part of title; “science education” underlines the content. In the MOOC we criticize and analyze Technology, Society, and Environment in terms of these three dimensions. The course was in Turkish and from 25 different cities, 111 participant enrolled in SASE. Only ten of them got more than 55 point from 100 point and qualified a certificate. The MOOC is completed within eight weeks. This MOOC from AtademiX platform includes reading articles, YouTube videos, live lessons, some interviews with experts, and Self-evaluation questions. With this project we aim to introduce principles of how to provide and protect a sustainable and accessible science education by the help of completed and mentioned MOOC.*

### 1. Introduction

With the knowledge age, teaching and learning tools are changed and developed for participants' benefits [1]. More participants may attend courses in anytime and anywhere with internet connections. Massive Online Open Course (MOOC) gathered international participation with experiences of high quality universities like Harvard, MIT or Berkeley. Out of watching professors' videos from online video channels, MOOCs allow course designers learn participants' learning characteristics and measure those participants' level in terms of given information though reading materials and course videos. This paper includes some information about a MOOC opened by the author about sustainable and accessible science education.

### 2. Course information

The MOOC designed with 8 weeks. In each week, ten videos about the topic of that week were prepared. Average minute of these videos is eight. The purpose of this research is to discuss science and education through accessibility and sustainability concepts. There were four main phase in this MOOC. Each phases includes 4 or 5 documentary and 2 or 3 articles to read. Online discussions were about these documentaries and articles. First phase constructed to explain who we are in the system and what is system thinking. In short, system is a big picture of interacting parts. To explain what is science and education, we needed to define and explain parts of science education with their interactions. In the second phase, we focused on types of interactions. For instance, war or/and peace are two main interaction types among these parts of system. The other phase was about the results of these interactions; change. We combined all parts of the system as active and passive changers. The last phase asked whether there is a limit of this change, or not. These phases are measured with 40 points totally. Additionally self-evaluation parts give 35 points, Beginning survey gives 10 points and the final video prepared by the participant gives 15 points. These measuring scores and content of the MOOC can be seen in Table 1. To get the certificate, participants needed to collect more than 60 points. The name of the MOOC platform is Atademix which is the first MOOC platform in Turkey. The centre of this MOOC is Erzurum city and there were 111 participants from 25 different cities. From the statistics of watching videos, the most watched video was alive one with Dr Canan. He contributed to the closing course broadcasting and answered our questions. He is neuro-scientist and the topic of last weeks was about imagination. This connection was followed by 500 person (more than course participants). We did not used Skype or Google Hangouts; Atademix platform let us use their own online communication system. All our previous guests shared their wishes, predictions and imaginations about the future.



Table 1. The MOOC's Schedule

Week	Dashboard	Content
1 <sup>st</sup>	Introduction	A video and an awareness questionnaire about sustainability and accessibility (10 p)
	Videos	10 videos about concept of disability
	Evaluation	Self-evaluation with 5 multiple choice questions (5 p)
2 <sup>nd</sup>	Videos	10 videos about concept of sustainability
	Online Discussion	1 <sup>st</sup> phase: Understanding yourself and the system (10 p)
	Guest	Claire ÖZEL, an expert about disability
	Evaluation	Self-evaluation with 5 multiple choice questions (5 p)
3 <sup>rd</sup>	Videos	10 videos about concept of technology
	Guest	Dr. Şakir ERKOÇ, an expert about nanotechnology
	Evaluation	Self-evaluation with 5 multiple choice questions (5 p)
4 <sup>th</sup>	Videos	10 videos about concept of science
	Guest	Dr. Soner YILDIRIM, an expert about Computer Science
	Online discussion	2 <sup>nd</sup> phase: Types of interactions in the system (10 p)
	Evaluation	Self-evaluation with 5 multiple choice questions (5 p)
5 <sup>th</sup>	Videos	10 videos about concept of Society
	Guest	Frogs on Wheels, a couple travelling the world
	Evaluation	Self-evaluation with 5 multiple choice questions (5 p)
6 <sup>th</sup>	Videos	10 videos about concept of environment
	Guest	Dr. Çetin GÖKSU, an expert about solar energy
	Online discussion	3 <sup>rd</sup> phase: Changing, Changer and Change (10 p)
	Evaluation	Self-evaluation with 5 multiple choice questions (5 p)
7 <sup>th</sup>	Videos	10 videos about concept of war and peace
	Guest	Dr. Özgür AKTAŞ, an expert about history education
	Evaluation	Self-evaluation with 5 multiple choice questions (5 p)
8 <sup>th</sup>	Videos	10 videos about concept of interaction
	Guests	All guest talked in previous lessons shared their imaginations about future
	Online discussion	4 <sup>th</sup> phase: The limit of change (10 p)
	Design	Preparing a video (15 p)
	Closing the course	Dr. Sinan CANAN, an expert about brain

### 3. Sustainable and Accessible Science Education

According to this MOOC, science education should be accessible and sustainable. It was shown in Figure 1 that accessibility is about how many people were participated and sustainability is about how long it is valid and possible to take the education. If anyone cannot attend the course or become unsuccessful due to his or her disadvantaged conditions, this science education could not be defined as accessible. In the same way, a science education or science and education should be life-long. Any concept you will not use in the future, you resist to learn, so all the concepts should be from real life and all participants should get information whenever they want.



Accessibility

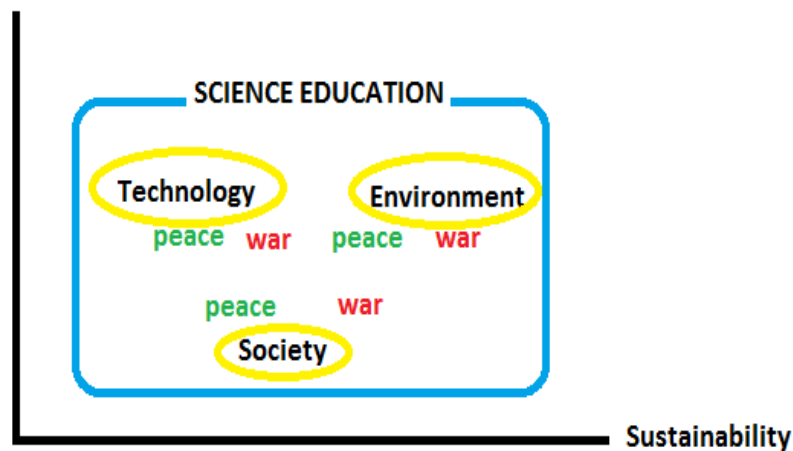


Figure 1. The map of course content

You may discuss any concept in terms of accessibility and sustainability because accessibility highlights the number of participants and sustainability emphasize the time which the concept conserved. If you want to evaluate science and education in terms of sustainability and accessibility, you need to talk about how to make technology accessible and how long you should use that technology (sustainability). Making sustainable and accessible of technology, environment and society depends on the interaction type; war or peace. Peacefully interactions between society and environment may develop the production of healthy food. On the other hand, warrior interactions inner the society describes as discrimination. Warrior interactions between society and environment leads to the depletion of needed foods.

Science investigates the nature and with a complex (not complicated) structure, emergence is a very necessary for complex systems like nature [2]. Different interactions emerge new and developed products which should be interested by science educators due to discuss how to make the concept understandable by all and usable in long time period.

At the beginning of the usage of sustainability emphasize conserving the environment for economic development and sustainable education used to explain how to teach students what to do to sustain the environment with three E formula; **E**cology/environment, **E**conomy/employment and **E**quity/equality [3, 4]. First two 'E' corresponds to environment and society and the last 'E' symbolized with accessibility in our model.

#### 4. Conclusion

In science education, all researchers and educators should be careful for each concept, method or material whether it is accessible for all learners (accessibility) and it will be meaningful in the future (sustainability). According to interaction types (warrior or peacefully) of science education components, accessibility and/or sustainability of that concept, method or material may be change. However, personal or social interactions with other defined sub-systems of science education like technology and/or environment always tightly bounded structure of human brain and imagination ability. Misunderstandings of observed nature is depends on weakness of connections among science education components and observers (human brain). This is why a connectivistic approach is necessary for science teaching.

#### References

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**5<sup>th</sup> Edition**

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