Evaluation of Turkish Undergraduates' Images of Scientist*

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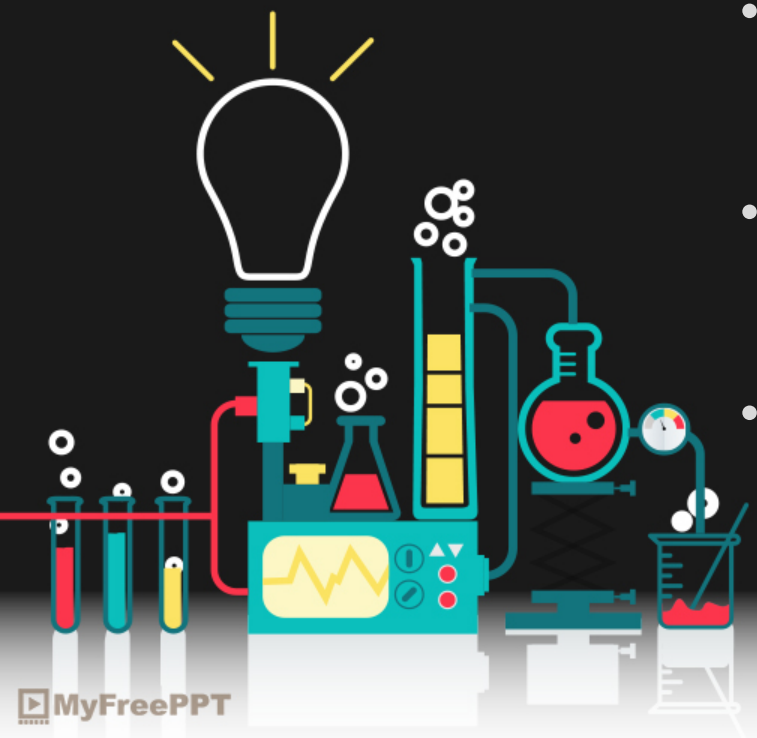
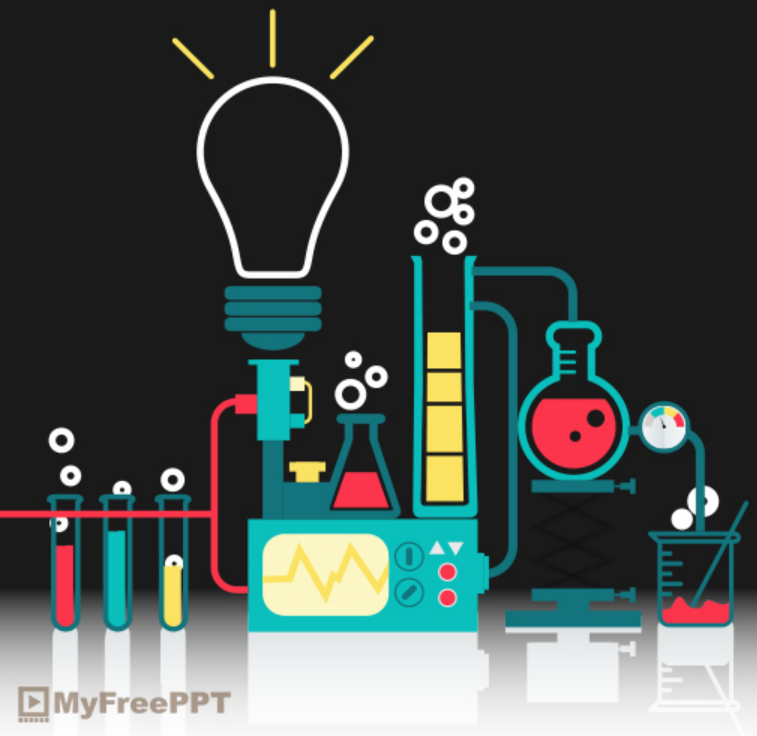
Introduction



- Science is an important part of societies. It effects our lives in a lot of ways.
- Therefore, it is important for every segment of the society to understand the science and the scientists.
- In this context, the aim of this research was to uncover the images of scientists of university students.
- University students are coming from different cities, backgrounds and socio-economic cultures.
- The perception of science and scientists effects individuals' science making behavior.

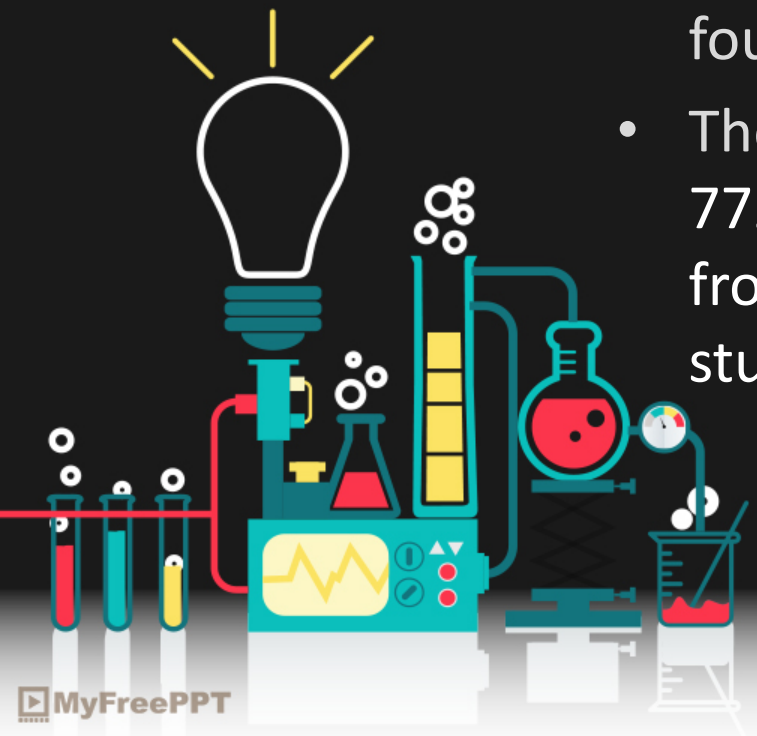
Method



- The study was conducted on a combination of both qualitative and quantitative approaches.
- The quantitative part of the research was conducted in the form of a descriptive survey study by collecting data to determine specific characteristics of a group.
- In the qualitative part of the research, we planned to explore in depth, the thoughts about the image of the scientist, with open-ended questions.

Population and Sample

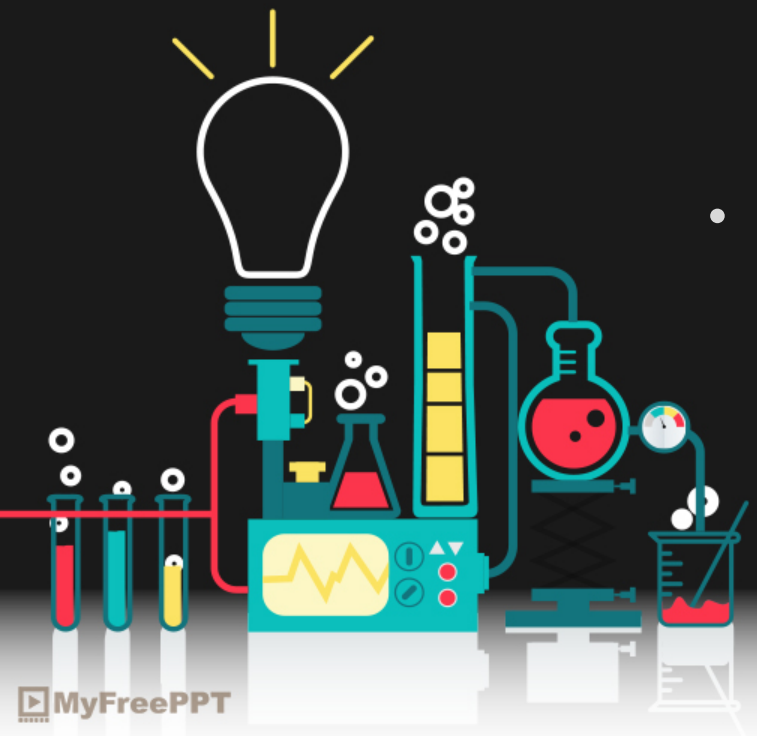
- The population of the study was 17.000 undergraduates who are studying at Gaziosmanpasa University in the 2013-2014 academic year.
- We reached 13 different departments of four different faculties.
- The study was conducted with a total of 772 volunteer undergraduate students from 3rd (junior) and 4th (senior) grade students.



FACULTY		f	%
Faculty of Arts and Sciences		294	38.1
Faculty of Education		260	33.7
Faculty of Natural Sciences and Engineering		152	19.7
Faculty of Economic and Administrative Sciences		66	8.5
DEPARTMENT		f	%
SOCIAL-HUMANITIES	Turkish Language and Literature	145	18.8
	Secondary Social Studies Education	72	9.3
	Primary Education	38	4.9
	Economics	36	4.7
	Public Administration	30	3.9
	Fine Arts Education (Music)	18	2.3
	Fine Arts Education (Arts)	10	1.3
STEM	Secondary Science Education	122	15.8
	Mathematics	99	12.8
	Mechatronics Engineering	62	8.0
	Bioengineering	56	7.3
	Chemistry	50	6.5
	Food Engineering	34	4.4
CLASS YEAR		f	%
	3rd Grade	468	60.6
	4th Grade	304	39.4
GENDER		f	%
	Female	467	61.9
	Male	288	38.1

Data Collection Tool

- We used Draw A Scientist Test (DAST) by Chambers(1983) as the data collection tool.
- This test is a tool that allows people to explain their thoughts about scientists‘ by drawing.
- The advantages of this tool are as follows:
  - It can be applied to illiterate group,
  - The participants reflect their own thoughts freely,
  - It is easy to implement (Öcal, 2007).



Draw A Scientist Test: DAST

Think that, tomorrow you are going to visit a scientist while working. Please draw below what you see in this visiting. And please show the working environment of the scientist as detailed as you could.

After finishing your drawing please answer the below questions:

Faculty:……

Department:……

Class year:……

Gender: ……....

Is the scientist you drew female or male? ……

Is the scientist you drew working inside or outside? ……..

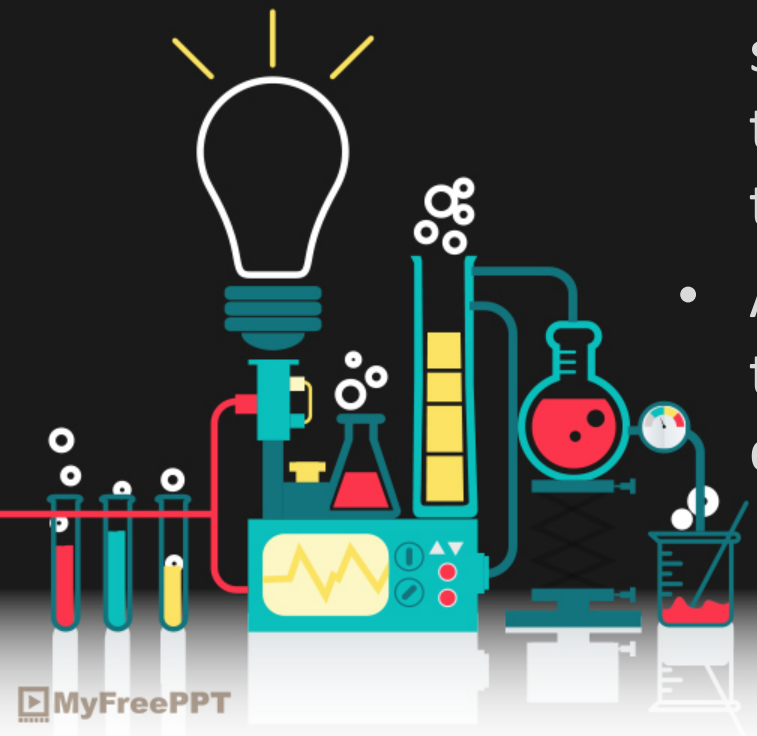
What is the scientist doing in your drawing (working on what?)

……

……

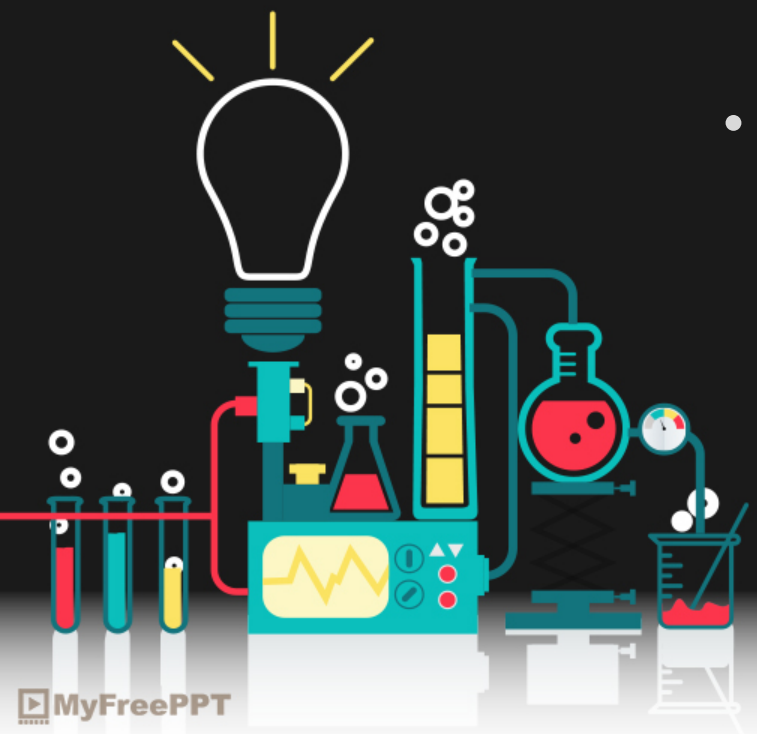
……

Data Collection Process



- The volunteer participants were asked to think that tomorrow they are going to visit a scientist while working and draw her/him: how is s/he working; what is s/he doing; in where..etc. And to draw on the paper of their thoughts as detailed as they could.
- And we added an open ended question to the form as: «What is your scientist doing when you visit her/him?»

Data Analysis

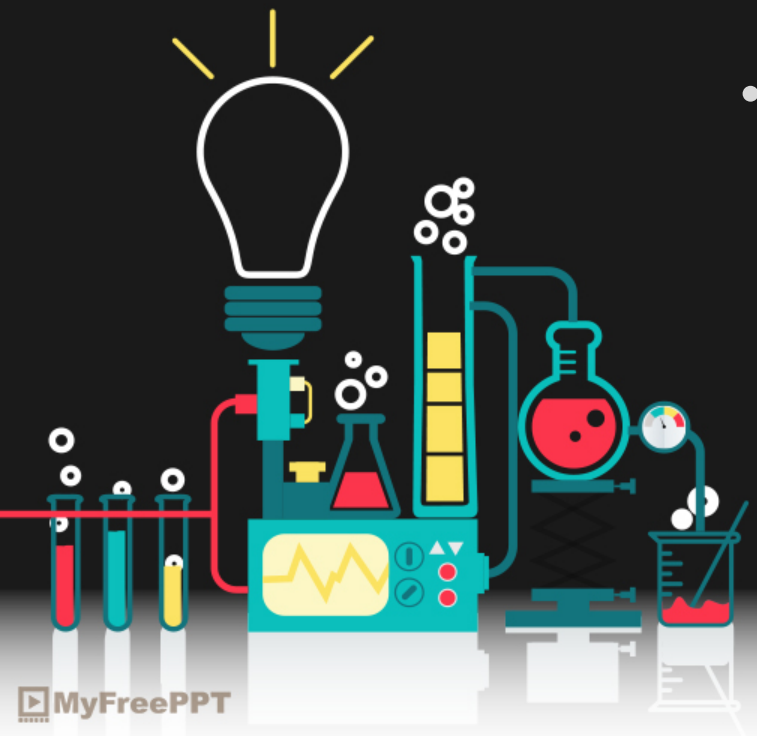


- We used two different tools to analyze the participants' drawings
- The first one is Draw A Scientist Checklist: DAST-C developed by Finson, Beaver ve Cramond (1995)
- DAST-C includes 15 independent variables (attributes) those define a stereotypical scientist. While coding these variables, we should enter «1» for existence, «0» for absence of that attribute.

Data Analysis

- The second one is the checklist developed by Ruiz- Mallen and Escales (2012) and will be called as RME-C.

- While coding these variables, we should enter «1» for existence, «0» for absence of the each 14 attributes of a stereotypical scientist.



Data Analysis

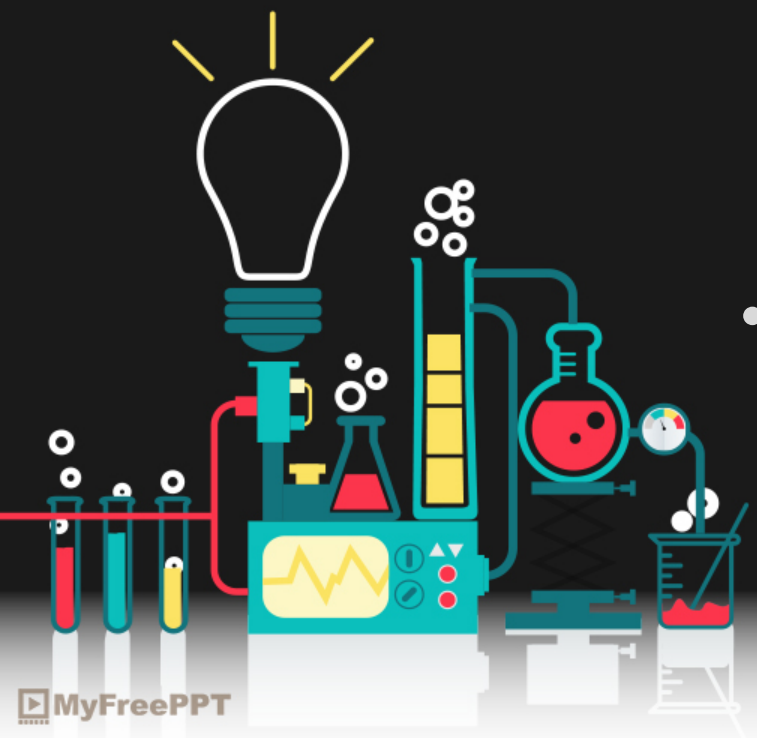
- We used this second checklist to interpret the results more detailed.

The differences between DAST-C and RME-C

Only in DAST-C	Only in RME-C
SYMBOLS OF KNOWLEDGE	UNFRIENDLY- Personality
CAUCASIAN	SOLITARY- Alone or collaborative
INDICATIONS OF DANGER	RESEARCH AREA- biology, chemistry..etc
LIGHT BULBS	STERWORK- Thinking, doing an experiment
INDICATIONS OF SECRECY	

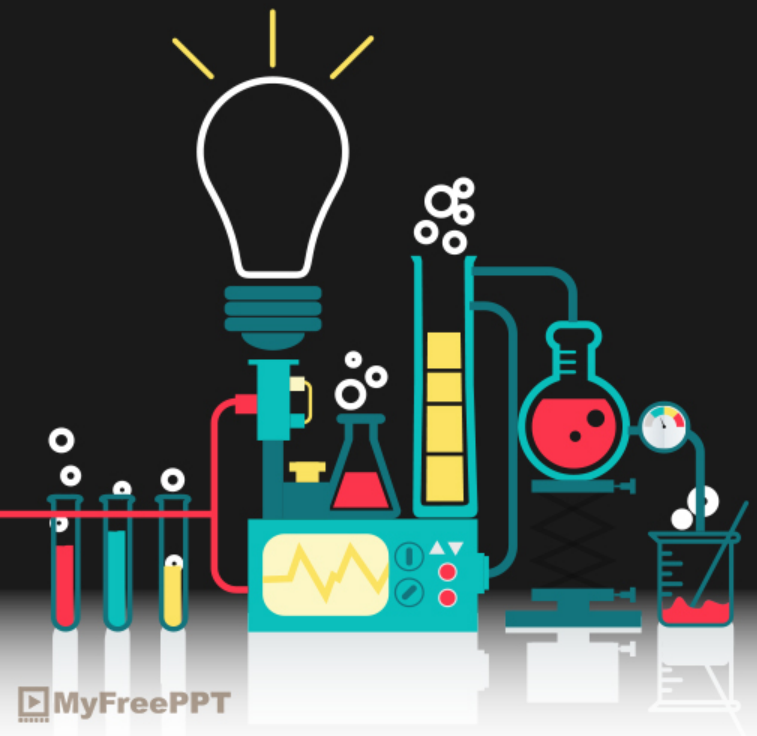
Data Analysis

- We analyzed the images of stereotypical scientist in three steps with two approaches:
- Quantitative approach
  - Analyzing the drawings by using DAST-C (scored between 0-15),
  - Analyzing the drawings by using RME-C (scored between 0-14),
- Qualitative approach
  - Analyzing the replies for the open-ended questions and interesting drawing attributes.



Data Analysis

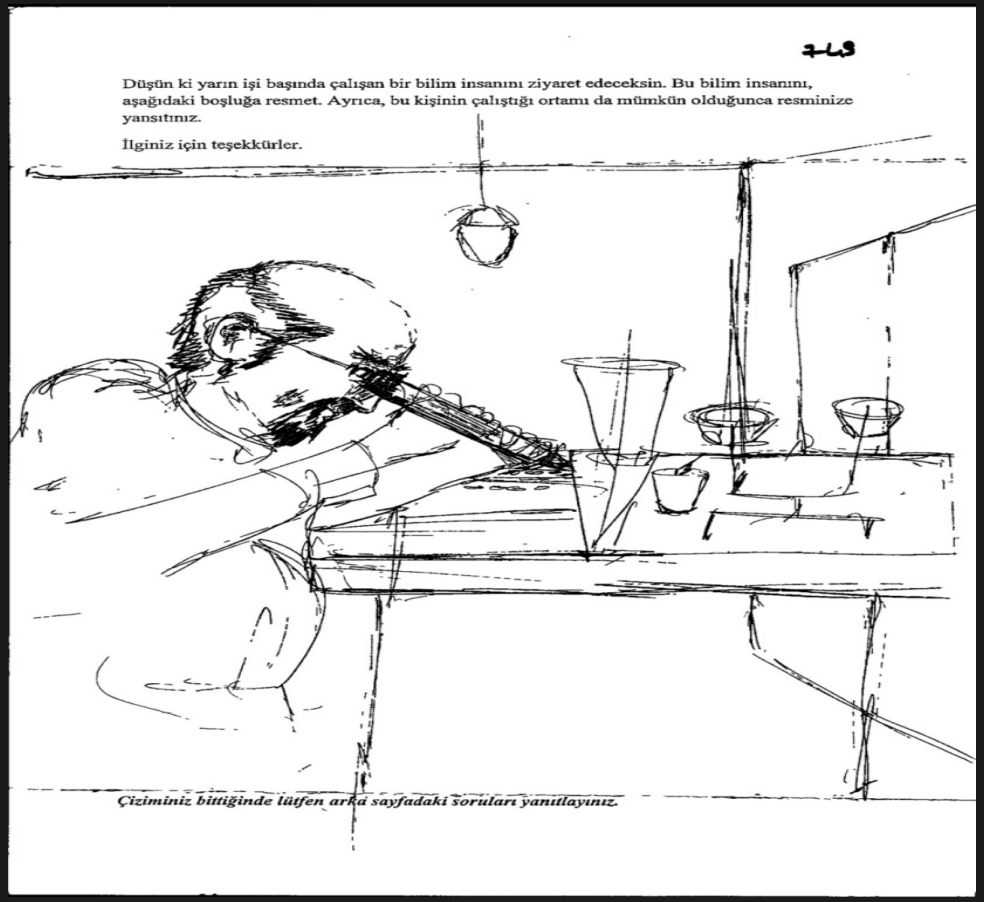
- In quantitative analysis of DAST-C and RME-C; if the scores get higher it means that the drawing is a stereotypical scientist.



A Coding Sample according to DAST-C

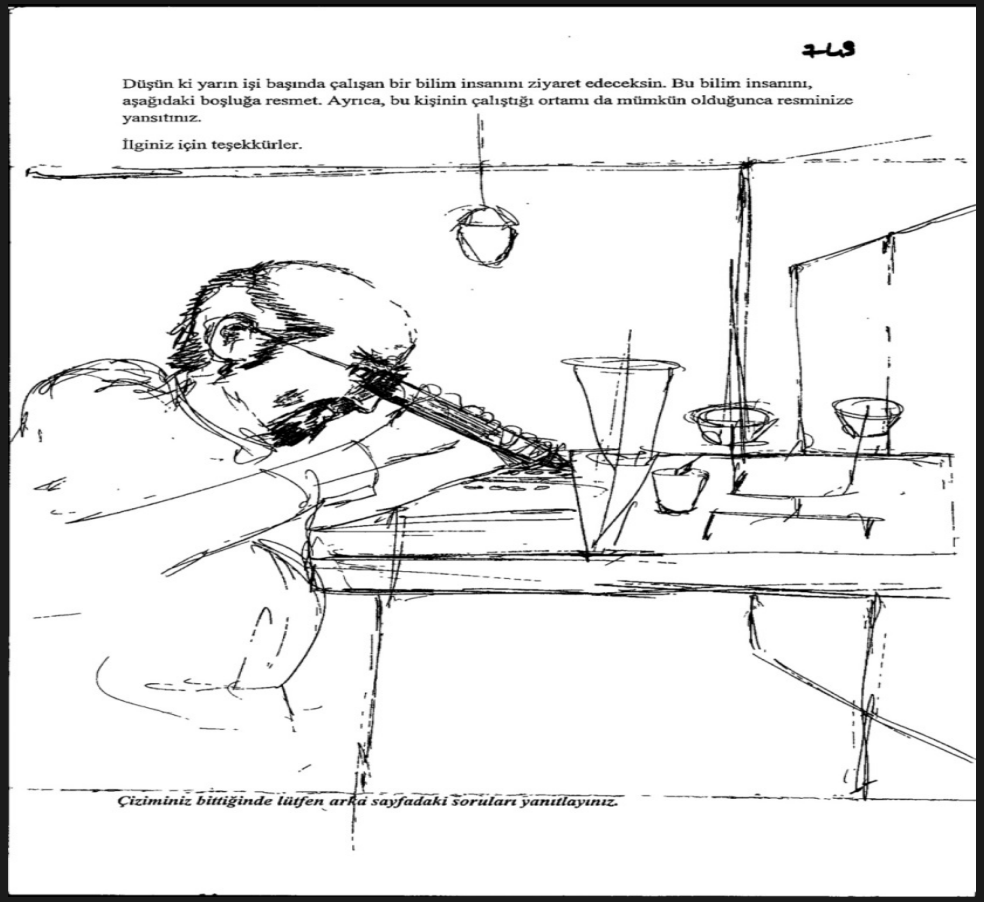
LAB_COAT: 0
EYEGLASSES: 1
FACIAL HAIR: 1
SYMBOLS OF RESEARCH: 1
SYMBOLS OF KNOWLEDGE: 0
TECHNOLOGY: 0
RELEVANT CAPTIONS: 0
MALE GENDER: 1
CAUCASIAN: 1
INDICATIONS OF DANGER: 0
LIGHT BULBS: 0
MYTHIC STEREOTYPE: 0
INDICATIONS OF SECRECY: 0
WORKING INDOOR: 1
MIDDLE-AGE, ELDERLY: 1

TOTAL SCORE: 7



A Coding Sample according to RME-C

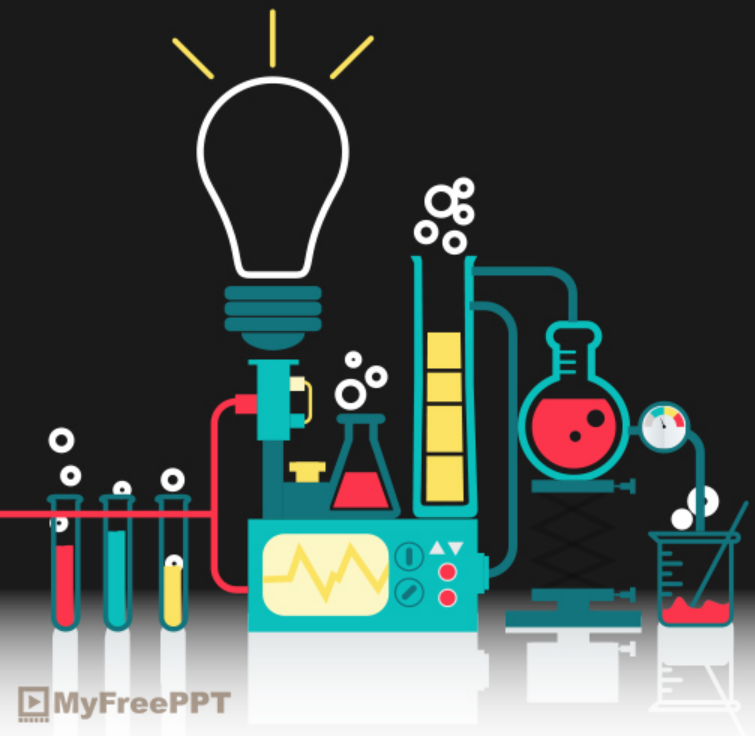
SCMAN: 1
SCAGE:1
WHITECOAT:0
GLASSES: 1
DISHEVELLED:1
MYTHIC STEREOTYPE:0
UNFRIENDLY: 1
SOLITARY:1
RESEARCH AREA: 1
FORMULA: 0
LABTOOL: 1
TECHTOOL: 0
LOCATION: 1
STERWORK: 1
TOTAL SCORE: 10



Findings

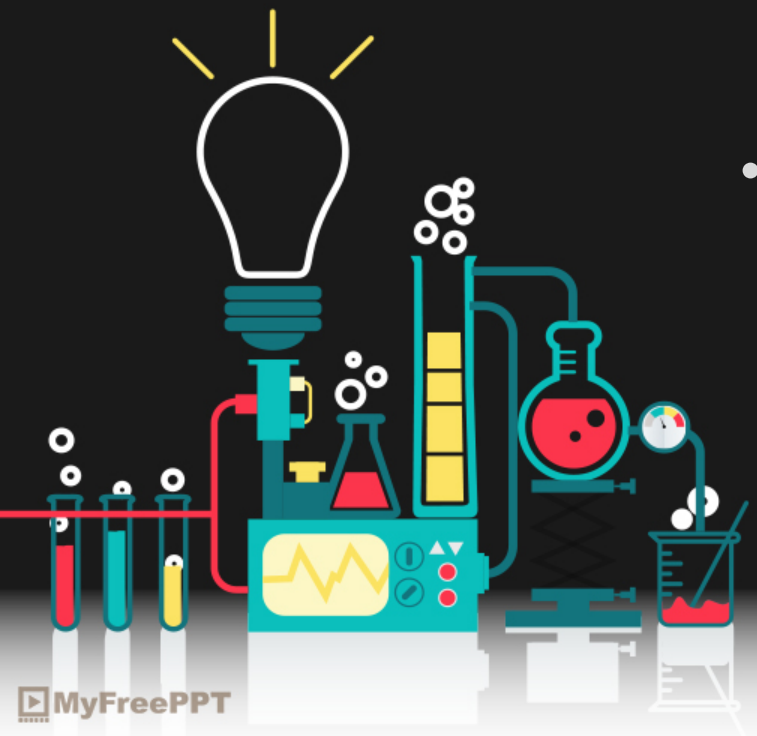
- We calculated mean scores according to both checklists:
  - DAST-C mean score is 5.90, over 15 points
  - RME-C mean score is 6.14, over 14 points

- It can be said that the perception of scientists are far from being stereotypical for undergraduates.



Findings

- We compared the images of scientist according to participants' gender.
- We found that the total scores were differed significantly according to gender of participants in DAST-C total scores.
- Male undergraduates are significantly different from females according to perception of a scientist.

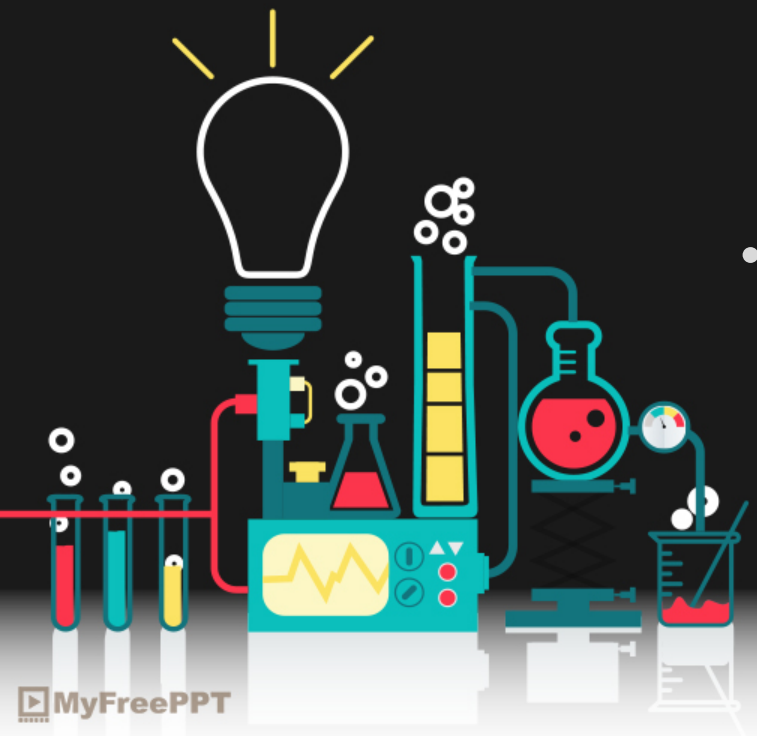


Participants' total score of images of scientist according to their gender

DAST-C								
	Female (N=463)		**Male (N=286)**					
	M	SD	M	SD	t	df	p	Significant difference
Score	5.79	1.79	6.07	1.71	2.102*	747	.036	M>F
RME-C								
	Female (N=463)		**Male (N=286)**					
	M	SD	M	SD	t	df	p	Significant difference
Score	6.77	2.17	7.04	2.09	1.652	743	.099	-

* p<.05

Findings



- We compared the images of scientist according to participants' study area/department (social-humanities vs STEM)
- It can be said that this is the first study that compares the perception of scientists between social-humanities and STEM group.
- We found that the total scores are very smilar and close and it can be said that there is no significant difference according to study area of participants.

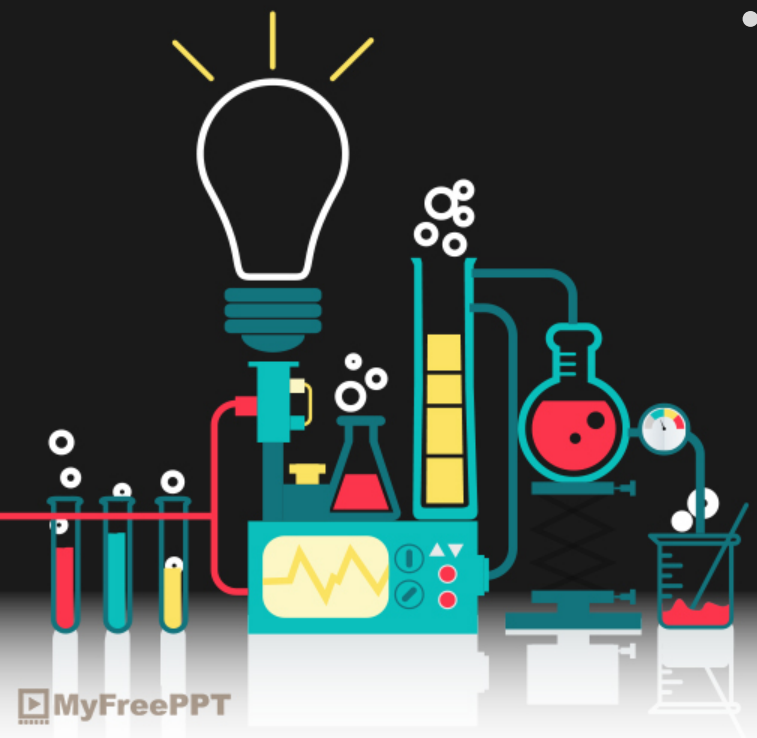
Participants' total score of images of scientist according to their study area (department)

DAST-C								
	Social Humanities (N=432)		**STEM (N=334)**					
	M	SD	M	SD	t	df	p	Significant difference
Score	5.89	1.77	5.90	1.75	.013	764	.989	-
RME-C								
	Social Humanities (N=432)		**STEM (N=334)**					
	M	SD	M	SD	t	df	p	Significant difference
Score	6.81	2.20	6.98	2.05	1.076	760	.282	-

Findings

- We compared the images of scientist according to participants' class years (3^{rd} vs 4^{th})

- We found that the total scores are very smilar and close and it can be said that there is no significant difference according to class years of participants.

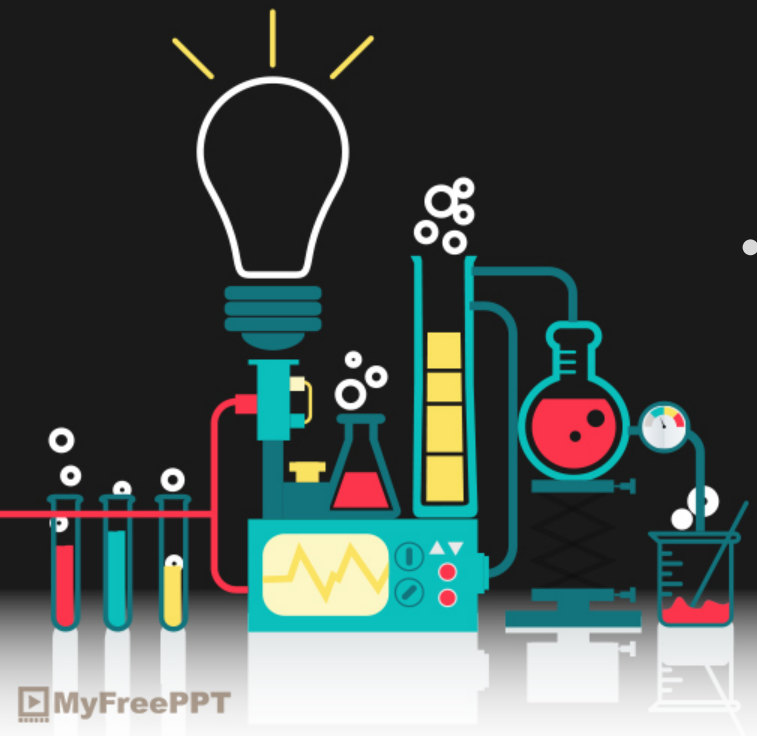


Participants' total score of images of scientist according to their class year

DAST-C								
	3rd Grade (N=465)		**4th Grade (N=301)**					
	M	SD	M	SD	t	df	p	Significant difference
Score	5.88	1.75	5.91	1.77	.245	764	.807	-
RME-C								
	3rd Grade (N=465)		**4th Grade (N=301)**					
	M	SD	M	SD	t	df	p	Significant difference
Score	6.94	2.12	6.79	2.16	.904	760	.366	-

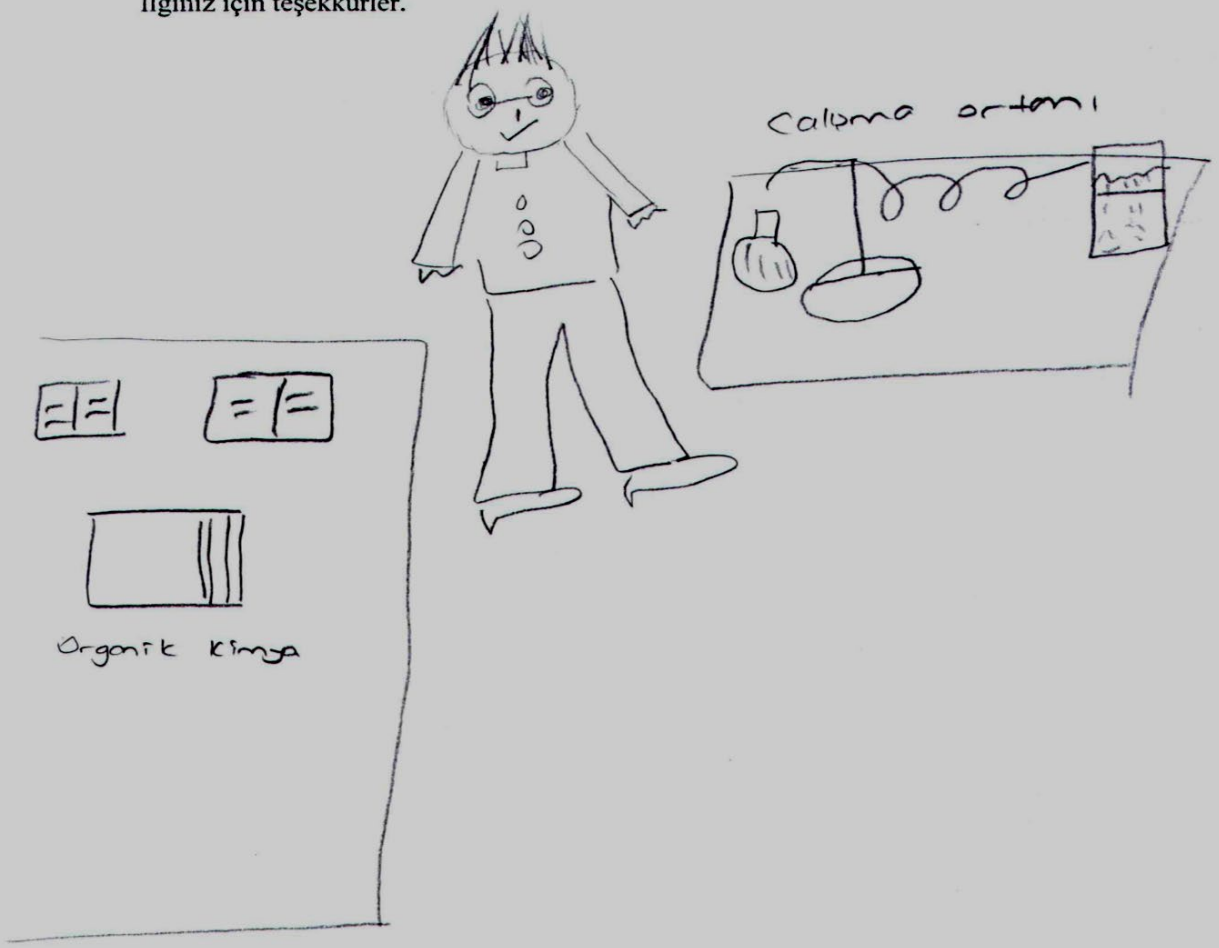
Findings

- We analyzed the replies of open-ended questions in the data collection form.
- According to these replies it can be said that most of the participants drew their faculty/departmant staff as scientists.
- For example Chemistry students drew chemists, the students in Math drew mathematicians.



Düşün ki yarın işi başında çalışan bir bilim insanını ziyaret edeceksin. Bu bilim insanını, aşağıdaki boşluğa resmet. Ayrıca, bu kişinin çalıştığı ortamı da mümkün olduğunca resminize yansıtınız.

İlginiz için teşekkürler.



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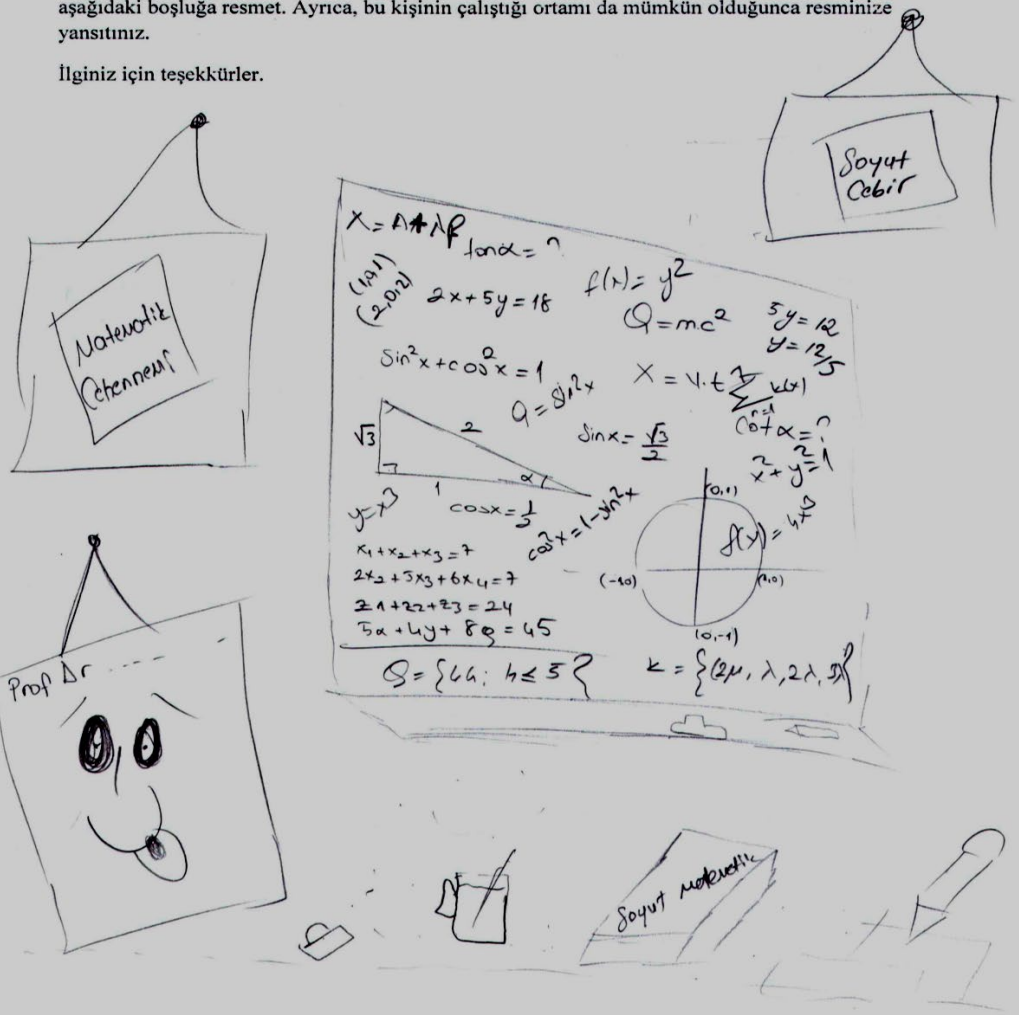

Çiziminiz bittiğinde lütfen arka sayfadaki soruları yanıtlayınız.

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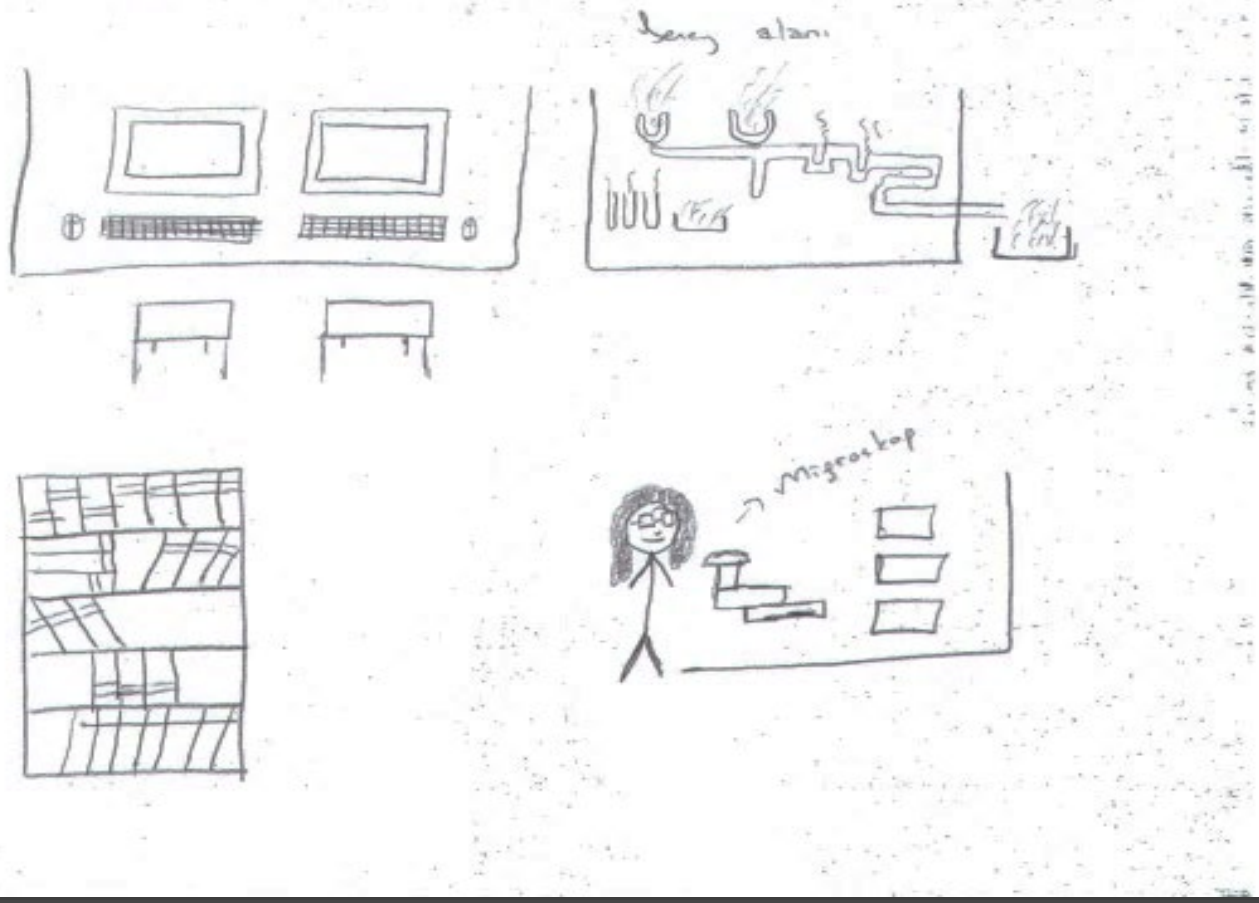

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İlginiz için teşekkürler.

Findings

- Some participants drew well known scientists

Famous scientists seen on the participants' drawings

Characters	frequency
Albert Einstein	9
Isaac Newton	5
Thomas Alva Edison	2
Ahmet Mete Işıkara (Turkish seismologist)	1
Alexander GrahamBell	1
İlber Ortaylı (Turkish historiographer)	1
James Watson and Francis Crick	1
Nikola Tesla	1
Otto Ludwig Hölder	1
Stephen Hawking	1

521

Düşün ki yarın işi başında çalışan bir bilim insanını ziyaret edeceksin. Bu bilim insanını, aşağıdaki boşluğa resmet. Ayrıca, bu kişinin çalıştığı ortamı da mümkün olduğunca resminize yansıtınız.

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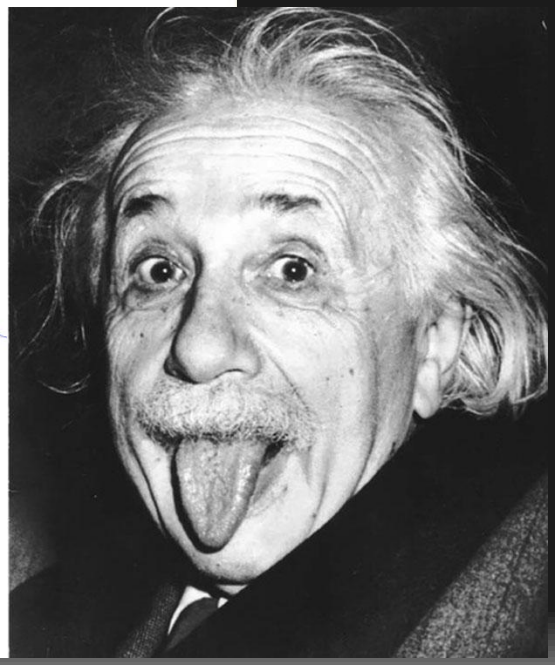


Findings

- In some drawings the scientists had an extraordinary and crazy looking. Even in some of them have funnel hat, light bulb over their head, under eye bag and looking messy and sluttish.

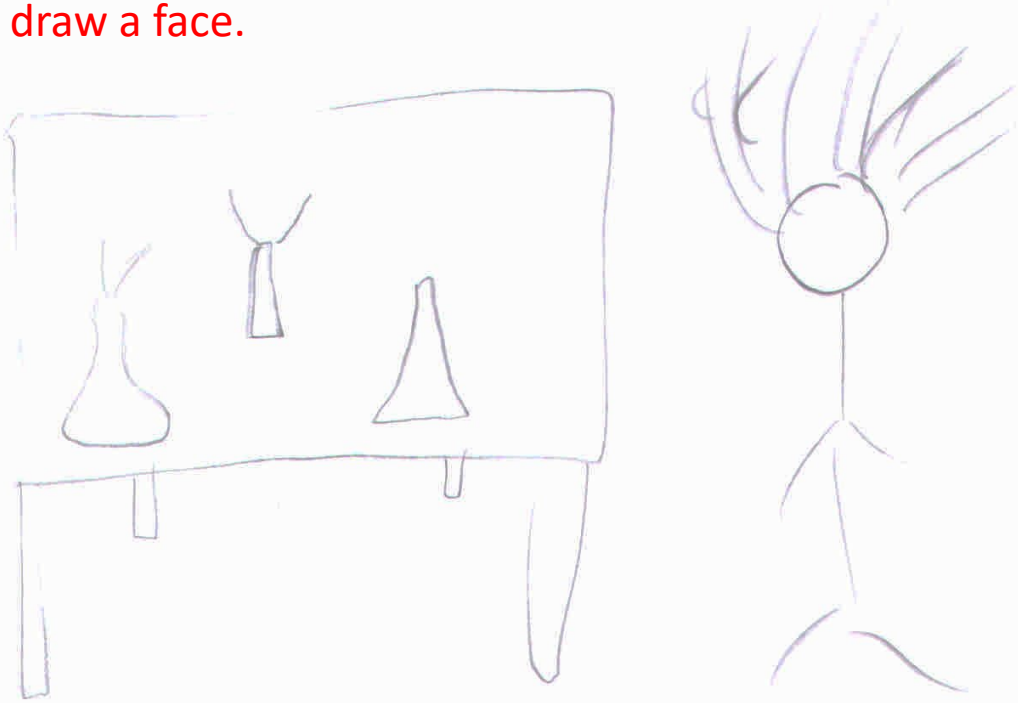
- Some participants prefer not to mention to any gender. They wrote that; «I believe that a scientist is just a scientist beyond their gender. So, I did not draw a face.»

- Another detail in drawings was «the brain drain» concept, and financial worries of scientists. Some participants mentioned that the scientists earn not too much, and they have financial problems to support their projects. Because of these situations they prefer to go other countries.

Düşün ki yarın işi başında çalışan bir bilim insanını ziyaret edeceksin. Bu bilim insanını, aşağıdaki boşluğa resmet. Ayrıca, bu kişinin çalıştığı ortamı da mümkün olduğunca resminize yansıtınız.

İlginiz için teşekkürler.

I believe that a scientist is just a scientist beyond their gender. So, I did not draw a face.



Discussion

- When we examine the mean scores of both DAST-C and RME-C, the scientists were far from being stereotypical.
- The participants were undergraduates who are very familiar to scientists and interact with them almost every day in the campus. This interaction may affect their images of scientists.
- The findings of this study many of the participants drew male scientists. The female scientists were mostly drawn by girls.

Discussion

- In this study participants' total score of images of scientist did not significantly differ according to their department (study area), gender and class year.
- Some of the participants drew well known scientists. Einstein, Newton and Edison were seen most frequently.
- Some of the drawings were popular characters of movie or tv series. It can be said that television and other media have an effect on the images of scientists. The participants developed their scientist figure based on these channels.

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Any question/recommendation?

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