



FEDERAL UNIVERSITY OF SANTA MARIA
TECHNOLOGY CENTER
DEPARTMENT OF ARCHITECTURE AND URBANISM



ACTIVITY BOOKLET

WOMEN AND OCCUPATIONS IN
SCIENCE, TECHNOLOGY, ENGINEERING,
ARTS AND MATHEMATICS

PROJECT "EMPOWERED GIRLS"
2023



FEDERAL UNIVERSITY OF SANTA MARIA
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EMPOWERED GIRLS PROJECT - UFSM/NO. 058082

SANTA MARIA
2023

Coordination

Prof^ª. Dr^ª. Ísis Portolan dos Santos
(Professor at CAU and PPGAUP - UFSM)

Project Team

Bruna Gabriela Huth Teixeira - (MSc student at PPGAUP/UFSM)
Mariana Janczura di Napoli - (Architect graduated from UFSM)
Joane Iop Rodrigues - (MSc student at PPGAUP/UFSM)
Jenifer Godoy Daltozo - (PhD student at PROPAR/UFRGS)

Visual programming

Bruna Gabriela Huth Teixeira - (MSc student at PPGAUP/UFSM)
Mariana Janczura di Napoli - (Architect graduated in CAU/UFSM)

Logotype

Luana Teloken - (Undergraduate student in Industrial Design - UFSM)
Anna Laura Rech Dias - (Undergraduate student in Industrial Design - UFSM)

Translation

Valéria Stochero (Undergraduate student in Aerospace Engineering - UFSM)

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Introduction

The presence of women in **STEAM (Science, Technology, Engineering, Arts and Mathematics)** careers is still lower than the male counterpart. Several programs worldwide have encouraged women projects on STEAM when still young girls, so they feel more confident on pursuing careers on such fields.

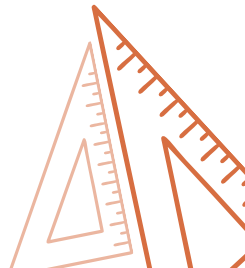
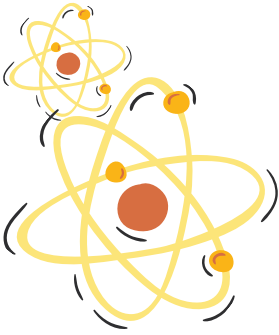
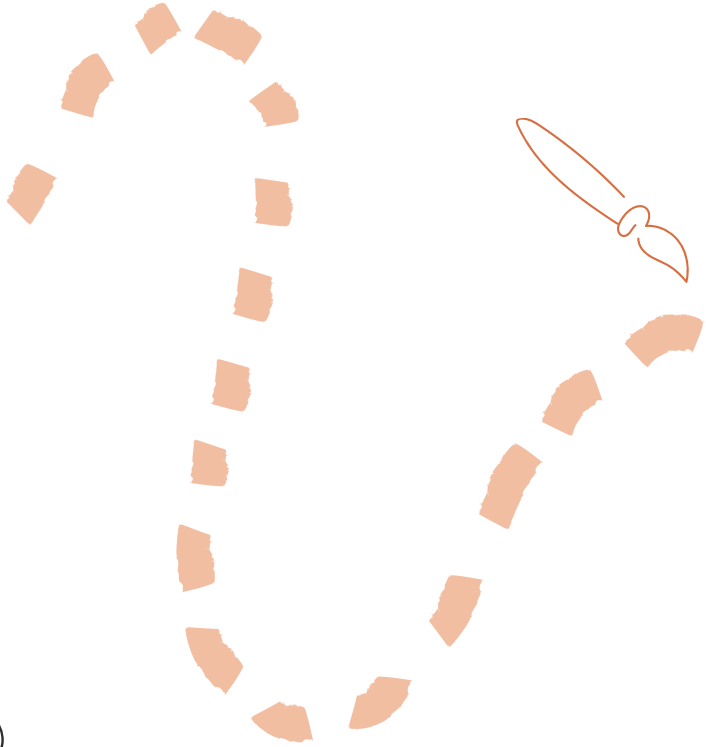
About the Project

The Empowered Girls project was setup by the Architecture and Urbanism Undergraduate course at UFSM in partnership with PROPAR/UFRGS by means of female bachelors in Architecture and Civil Engineering. The Vicente Farencena Elementary School in Santa Maria, RS, was the first institution to embrace the proposed activities in this community project, which aims at developing activities for the early years (1st to 5th grade) that work with themes of Architecture, Urbanism and Landscape Architecture.

The proposed activities are related to the disciplines of mathematics, geography, history, and also the development of civic-related topics, such as the relationship with the city and sustainability. The activities are guided by the presentation of a woman as a prominent professional in the STEAM field.

Project Goals

The purpose of this project was to develop tools and methodologies to encourage girls in STEAM careers. At the same time, it is supposed to raise awareness among boys about female participation in these careers and in leadership positions. Each activity is expected to address some element of environmental sustainability as a basic premise of current architecture and also one of the great global challenges.



SUMMARY

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PROFESSION: MATHEMATICIAN

Who was Hypatia of Alexandria?



Figure 1 - Hypatia of Alexandria

Hypatia of Alexandria is considered to be the first woman mathematician in the WORLD. Born in Egypt during the 4th century, she entered the world of science inspired by her father Theon, an important philosopher, astronomer, and mathematician of the time. Way ahead of her time, Hypatia had a very curious mind by always solving mathematical problems and searching for answers to the unknown. The mathematician studied at the Academy of Alexandria and like her father, she was very knowledgeable in many other areas such as philosophy, astronomy, religion, poetry, and arts.

So... what does a mathematician do?

Mathematicians study numbers and logic, formulating theories and creating models that help solving problems. Mathematicians can work in schools and universities as mathematics teachers and lecturers, and even in large companies like Google and the National Aeronautics and Space Administration (NASA).

Measures and proportions

Measure, with the help of an adult, the parts of your body, such as: your foot, your forearm, your hand, your shin, your fingers... and customize your doll!



Figure 02 - Drawing of the body

At home

Measure something in your house! It can be the toy you like the most, your pet, a dish, a pot, whatever you want!

Draw it below and write down the measurements of what you have chosen:

Go for it!

Measurements of your house

Measure something in your house! It can be the width of the door, the height of the step, your bed, whatever you want!

Draw it below and write down the measurements of what you have chosen:

Go for it!



PROFESSION: URBAN PLANNER

Who was Raquel Rolnik?



Figure 03 - Raquel Rolnik

Raquel Rolnik is a Brazilian architect and urban planner graduated from the University of São Paulo (USP) and currently working there as a professor. She has worked at the United Nations (UN) in the Human Rights department and in the city hall of São Paulo. She has written very important books in the field of architecture, discussing what the city is supposed to be and how to make it safer and more pleasant for those who live in it.

So... what does an urban planner do?

A professional in the field of urban planning studies and designs a city. It is a very important profession to avoid cities growing in a messy way. The urban planner thinks about the streets, sidewalks, and how cars and people will move around, where there will be parks, buildings, houses, commerce and services, among other things. Throughout the urban planning, cities can become organized, safe, comfortable, fun, and accessible for all ages and genders. Overall, the urban planner makes the city a better place for residents to live!

What are the cardinal points?

The sun is considered to be the first point of reference found by men to locate themselves in the world. Thus, the cardinal points were established from the sun and today they are the main reference points for locating ourselves on the earth's surface and for locating objects and people.

There are 4 cardinal points:

North (N): also called northern or boreal;
South (S): also called southern or austral;
East (E): also called eastern;
West (W): also called western.

There are also collateral points: Northeast (NE): between north and east; Northwest (NW): between north and west; Southeast (SE): between south and east; Southwest (SO): between south and west.

This is the Compass rose:



Figure 4: Compass rose

At home

Now it is your turn!

At home, choose the window that has the landscape you like best!

Does this window get sunlight? If yes, is it in the morning or in the afternoon? What is the orientation? North, South, East, or West? **Write on the arrow below!**

And now for the fun part:

Stop in front of this window and draw below what you see through it!

Go for it!



Figure 05 - Window



PROFESSION: LANDSCAPE PLANNER

Who was Rosa Kliass?



Figure 6 - Rosa Grena Kliass

Rosa Grena Kliass (currently 90 years old) is a Brazilian landscape designer considered one of the most important professionals in the area. She graduated from the University of São Paulo (USP) in 1955 and was a pioneer in the study of landscape design in Brazil at the time the profession was very new in the country. Her work marked important Brazilian cities and she was responsible for the projects of many parks and urban spaces.

So... what does a landscape designer do?

A professional in landscaping designs green areas according to the needs of each space. From a garden inside a house to large parks, it is a very important profession for connecting people to nature. The landscape designer thinks about the species, colors, sizes of vegetation within the city and how it relates to the buildings and other elements around it. More and more our cities will need public green spaces for leisure, recreation, sports activities, rest, shade, among others, and it is up to the landscape designer to think and design all this!

The Environment

The concept of Environment is very complex, but in a general way, it can be defined, according to article 3 of the National Environmental Policy Law, as the "set of conditions, laws, influences and interactions of physical, chemical and biological order that allows, shelters and rules life in all its forms. Thus, preserving the environment is fundamental. After all, the natural resources necessary for our survival, such as water, food, and raw materials come from it.

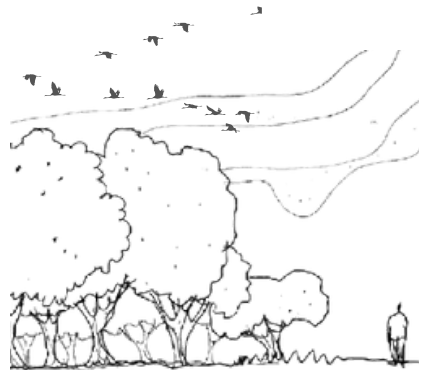


Figure 7 - Drawing of the environment

The plants are largely responsible for the balance of the environment! They generate oxygen, are a source of food, fiber, fuel, and even serve as medicine. Plants enable the existence of humans and other forms of life, and are essential for controlling the Earth's temperature and the balance and dynamics of water on the planet.

At home

Now it's your turn!

Choose any plant you like. It can be from home or even one that you saw in a park in your city!

Identify its common name, the scientific name, and draw this plant you have chosen!

Go for it!



PROFESSION: AGRICULTURAL ENGINEER

Who was Ana Maria Primavesi?



Figure 08 - Ana Maria Primavesi

Anna Maria Primavesi was an Austro-Brazilian agronomist responsible for important researches in the field of agroecology and organic agriculture. She was one of the pioneers in the issue of soil preservation and the recuperation of degraded areas. She also defended an agriculture that was integrated with the environment. Anna Maria Primavesi was a professor at the Federal University of Santa Maria for many years.

So... what does an agricultural engineer do?

The agricultural engineer is responsible for planning, organizing, and maintaining agricultural and livestock processes. The profession uses knowledge from the fields of biology, physics, geography, mathematics, chemistry, and engineering to make the best use of resources and improve agricultural production. The agricultural engineer can work on farms, slaughterhouses, agricultural cooperatives, in food industries, research institutes, as a professor and/or researcher at universities.

Parts of a plant

In the previous activity we have already learned that plants are largely responsible for balancing the environment as they are a source of oxygen, food, fiber, fuel, and even serve as medicine. Now we will understand more about the parts that make up plants and their functions:

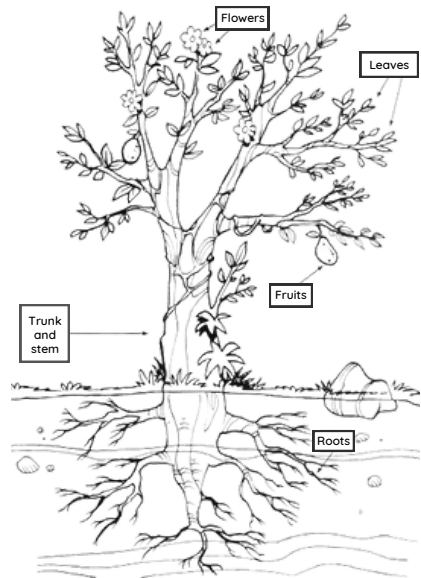


Figure 09 - Drawing of the plant parts

LEAVES: responsible for feeding, respiration and transpiration.

FLOWERS: responsible for forming the fruit and seeds.

FRUITS: responsible for protecting the seeds.

TRUNK and STEM: responsible for sustaining the plant, besides carrying minerals and water, through the root, to the other parts of the plant.

ROOTS: responsible for promoting the absorption of water and nutrients present in the external environment.

At home

Now it's your turn!

Choose some plant, it can be a flower, a tree... whatever you want!

It can be from home, school, or even one you saw in your local park!

Draw it and identify the flower, the leaves, the fruits, the trunk/stem and if possible, the roots, just like we identified the species on the side!

Go for it!



PROFESSION: SCIENTIST

Who was Maria Telkes?



Figure 10 - Maria Telkes

Maria Telkes was a Hungarian-American scientist and inventor. She was considered to be one of the people responsible for the invention of the solar energy technology. During World War II, Mária was recruited by the United States government to create a water filtration device. This helped countless soldiers to obtain clean drinking water in tricky situations.

So... what does a scientist do?

A professional in Science is responsible for developing research based on a scientific method. The scientist conducts test and hypotheses to arrive at results in many areas of knowledge... that is, he or she is very important for the evolution of society and for improving people's lives! A scientist can work in laboratories, in institutes such as the Butantan and the National Institute for Space Research (INPE), in companies such as the Brazilian Agricultural Research Corporation (EMBRAPA), universities, and others.

Solar Energy

Solar energy can be used by means of 3 technologies:

- Through **bioclimatic architecture** by planning buildings according to insolation and hence using the sun to illuminate and heat environments;
- Through **Solar Thermal Energy** by mean of solar heat collectors that heat the water for use in bathing, for example;
- Through **Photovoltaic Solar Energy**, by means photovoltaic modules that absorb the sunlight and generate electricity for electric appliances.

In this scheme it is possible to understand how a photovoltaic system works, for example:

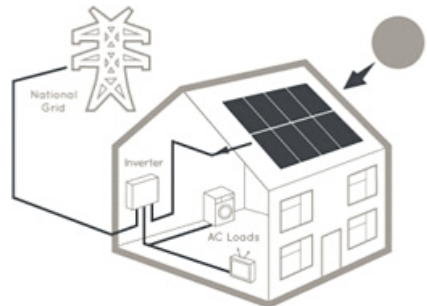


Figure 11 - Diagram of a photovoltaic energy system

These technologies are directly related to **SUSTAINABILITY** and renewable energy sources. The effective use of Solar Energy helps to reduce the environmental impacts caused by human activities.

At home

Now it's your turn!
Let's play scientist?

Research some **renewable energy source** other than the sun. If necessary, ask an adult for help.

Then, explain how the source works and the method you have chosen!
Oh, remember to illustrate this renewable energy source!

Go for it!



PROFESSION: ARCHITECT

Who was Lina Bo Bardi?



Figure 12 - Lina Bo Bardi

Lina Bo Bardi was a great architect of the Brazilian modernist movement. Born in Italy, she moved to Brazil after the Second World War and became well known in the country. Lina had a great admiration for the Brazilian popular culture and designed houses, theaters, cultural centers, museums, etc. She is considered one of the greatest architects of all times!

So... what does an architect do?

Architecture professionals design everything from houses to large buildings! During their training, architects study how to organize spaces and make them comfortable for the people who will use them. It is also important to point out that architects are increasingly looking to design buildings that respect the place where they are located and the surrounding nature.

Drawing in Architecture

Architecture professionals express themselves through drawings, whether they are in two or three dimensions. These drawings express the design ideas for a certain space and help in the execution, which can be a piece of furniture, a large building, or even a landscape or urban proposal. These drawings obey proportions and measures. So, to start a project of any kind, measuring instruments are used, such as rulers and tape measures. Thus, it is possible to know what area is available for the project and also how much space a piece of furniture takes, for example.

What is a floor plan?

A floor plan is a technical drawing that shows the walls and rooms of an architectural project as if seen from above! It can be of a house, an entire building, or just one room, such as a bedroom. The picture below is a floor plan of an apartment with entrance hall, living room, dining room, bedroom and bathroom.



Figure 13 - Drawing of a floor plan

At home

Now it's your turn!
Let's play with architecture?

Choose a room in your house that you like or even would like to be different! Once chosen, you will draw it in floor plan, that is, seeing it from above, just like in technical architectural drawings!

You can design the room as it is, with the current arrangement, or you can use your creativity to propose a new arrangement. You lead!

Go for it!



Now you can create your own activity!

PROFESSION: _____

Choose a profession you like and research a woman who has worked in this field to tell her story:

Write about some subject that this professional has worked on:

Who was

_____?

What did

_____ do?

Create an activity to do at home, just like we did in all the previous activities!

Then, you can propose this activity to your colleagues and friends to do!

At home

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Mária Telkes.

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Profession: Scientist.

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Lina Bo Bardi.

<https://portal.institutobardi.org/>

Profession: Architect.

<https://querobolsa.com.br/carreiras-e-profissoes/arquiteto>

What is a floor plant.

<https://entendaantes.com.br/o-que-e-planta-baixa/>

FIGURES LEGENDS AND REFERENCES

Figure 1 - Hypatia from Alexandria

<https://i.pinimg.com/originals/5f/96/d9/5f96d9cbd6718fc36d85b49d70e9b5a5.jpg>

Figure 02 - Drawing of the body

Canva collection

Figure 03 - Raquel Rolnik

https://portal.sescsp.org.br/online/artigo/15892_CIDADE+PELA+VIDA

Figure 04 - Wind Rose

Adapted from https://static6.depositphotos.com/1074930/618/i/600/depositphotos_6182052-stock-photo-wind-rose.jpg

Figure 05 - Window

<https://img1.gratispng.com/20171220/uhw/open-window-png-5a3a53d2583807.85023604151377198636142551.jpg>

Figure 06 - Rosa Grena Kliass

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Figure 07 - Drawing of the environment

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Figure 08 - Ana Maria Primavesi

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Figure 09 - Drawing of the plant parts

<http://www.todoestudo.com.br/wp-content/uploads/2016/11/PARTES-DA-PLANTA.jpg>

Figure 10 - Mária Telkes

https://upload.wikimedia.org/wikipedia/commons/thumb/3/31/Maria_Telkes_NYWTS.jpg/200px-Maria_Telkes_NYWTS.jpg

Figure 11 - Diagram of a photovoltaic energy system

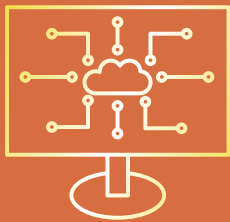
<https://pbs.twimg.com/media/EZjp911UcAlWkMG.jpg>

Figure 12 - Lina Bo Bardi

https://s2.glbimg.com/2hB4Dgk86aeVrgXSK0PdaBD1eto=/600x900/smart/e.glbimg.com/og/e/d/f/original/2021/05/21/quem-e-lina-bo-bardi-livros-sobre-lina-bo-bardi_2_jNg9l8U.jpg

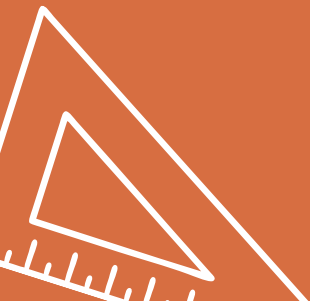
Figure 13 - Drawing of a floor plan

<https://i.pinimg.com/564x/ef/7a/35/ef7a35d78c31114be454d5b5a382dca6.jpg>



About the booklet

This booklet was developed in the Empowered Girls project and brings together activities that promote the knowledge of STEAM areas (Science, Technology, Engineering, Arts and Mathematics) and examples of professional women. The goal of the project is to engage children in tasks as they learn new professions!



SANTA MARIA
2023

