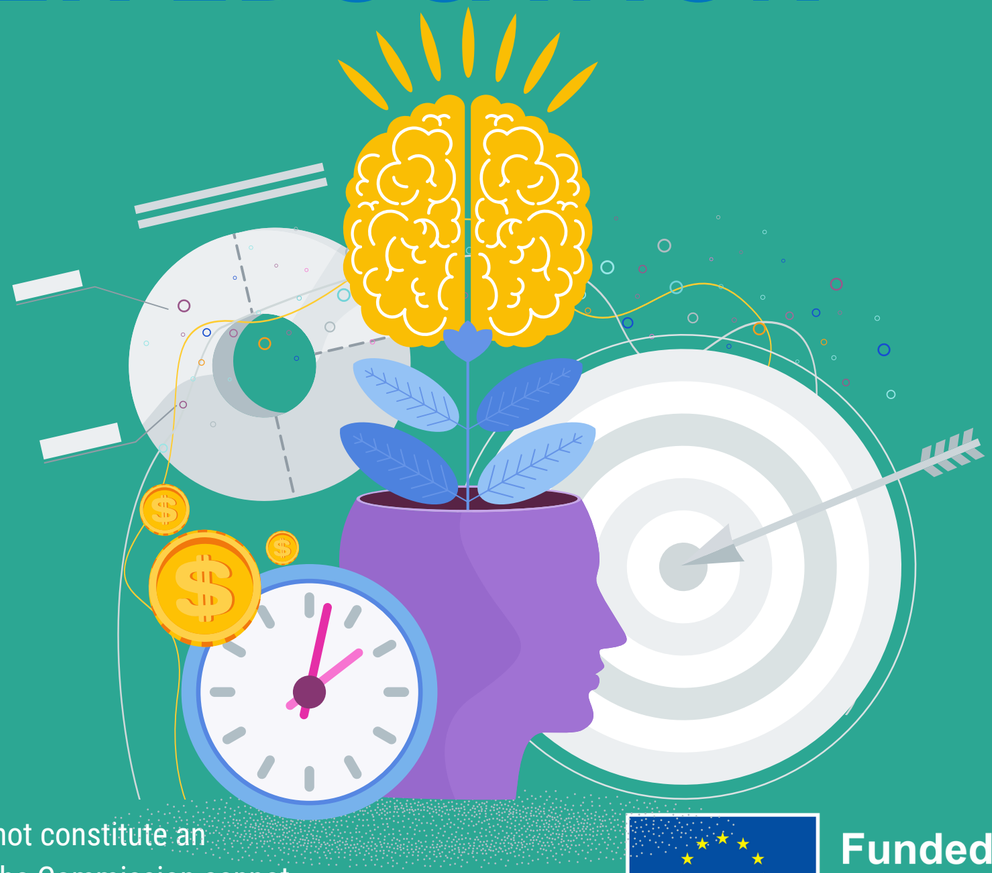
WESTEM INCLUSIVE TOOLKIT FOR FACULTY IN HIGHER EDUCATION

MATHS LEARNING RESOURCES



Funded by the European Union

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PREFACE

WESTEM, is an Erasmus+ project seeking to increase awareness and overcome the gender gap in the areas of Science, Technology, Engineering, Maths (STEM). The STEM Gap is not easy to tackle, and requires sustainable strategies for long term impact. The WESTEM project foresees to create a platform for empowering young women to confidently step into the STEM-field. The project aims to set the path in Higher Education Institutions (HEIs) for inclusive and better opportunities for girls and women to complete studies in STEM fields.

The WESTEM transnational consortium comprises 5 partner organisations from different countries across the European Union: Coordinator KC Kompetenscenter (Sweden), brainplus + Projektmanagment Schabereiter (Austria), SYNTHESIS Center for Research and Education Ltd (Cyprus), University of Thessaly (Greece) and S-NODI (Italy).

All WESTEM updates and results can be retrieved from the project website: https://www.westem.eu/

WESTEM INCLUSIVE TOOLKIT

HOW TO USE THE TOOLKIT

This toolkit provides a collection of ready to use and design-based learning activities and resources. The intention is for HEI faculty to use this toolkit to promote inclusive STEM education and support for women, especially those coming from marginalised backgrounds.

The toolkit is inspired by the HYPATIA project, which envisioned communication of science to youth in a gender inclusive way in order to realise the full potential of girls and boys around Europe to follow STEM related careers. The WESTEM toolkit is informed by the first European integrated STE(A)M framework, part of the Erasmus+ STE(A)M IT project.

The toolkit is divided into four thematic units, as many as the fields of STEM: Science, Technology, Engineering, and Maths. Each unit is independent from the others and entails five stand-alone learning resources. Each learning resource is accompanied by a set of activities and resources, proposed to be undertaken successively. All MATHS templates developed, are available on CANVA here. Internet access and a computer are a prerequisite to complete all the stages in all four thematic units.

GENDER-INCLUSIVE LEARNING ENVIRONMENT

7 GUIDING PRINCIPLES

CREATE A GENDER-NEUTRAL LEARNING ENVIRONMENT

Avoid gender stereotyping and aim to ensure that all learners are appreciated, respected, and treated equally.

PROMOTE HANDS-ON EXPERIENCES FOR ALL

Provide students, particularly girls with multiple and sustained opportunities to get hands-on, particularly with technology.

DESIGN LEARNING TO EMBRACE CONTEXT AND PROBLEM-SOLVING

Demonstrate the relevance of STEM subjects to students', especially girls' lives, and display their social value.

CONNECT LEARNING TO CAREERS AND ROLE MODELS

Introduce and/or relate with STEM careers and provide with gender balanced role models, historic and contemporary.

PRACTICE COLLABORATIVE LEARNING

Pertain to social learning and collaboration, as it has positive implications for girls' engagement with STEM subjects.

STUDENT AGENCY AND CREATIVE CHANCES TO SHOW DEEP LEARNING

Allow creative juices to flow in STEM classes. Problem-solving, creativity and design are essential to all students' STEM development.

ENCOURAGE A GROWTH MINDSET

Instil a believe in your students that success is due to effort and persistence, described as having a 'growth mindset'.

WESTEM

LEARNING RESOURCE A

MATHS

Nurturing a growth mindset

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LEARNING RESOURCE A

OVERVIEW

The proposed learning resource serves as an intervention to instil a growth mindset in students in a STEM HEI classroom. Growth Mindset is the belief that abilities and traits can be developed through strategic efforts and hard work and are not simply innate or fixed. This is particularly important for individuals belonging in social groups that experience negative stereotyping in relation to the innate intelligence or abilities needed to succeed in STEM disciplines. Through the critical reflection and discussion inspired by the video presentations in this socio-psychological intervention, students will be led to consider:

- How it is possible to rewire the brain and increase intelligence.
- How a fixed mindset can influence your success in studies and careers.

EMPATHISE | **IDENTIFY** | **DEFINE** | **CONCLUSION**

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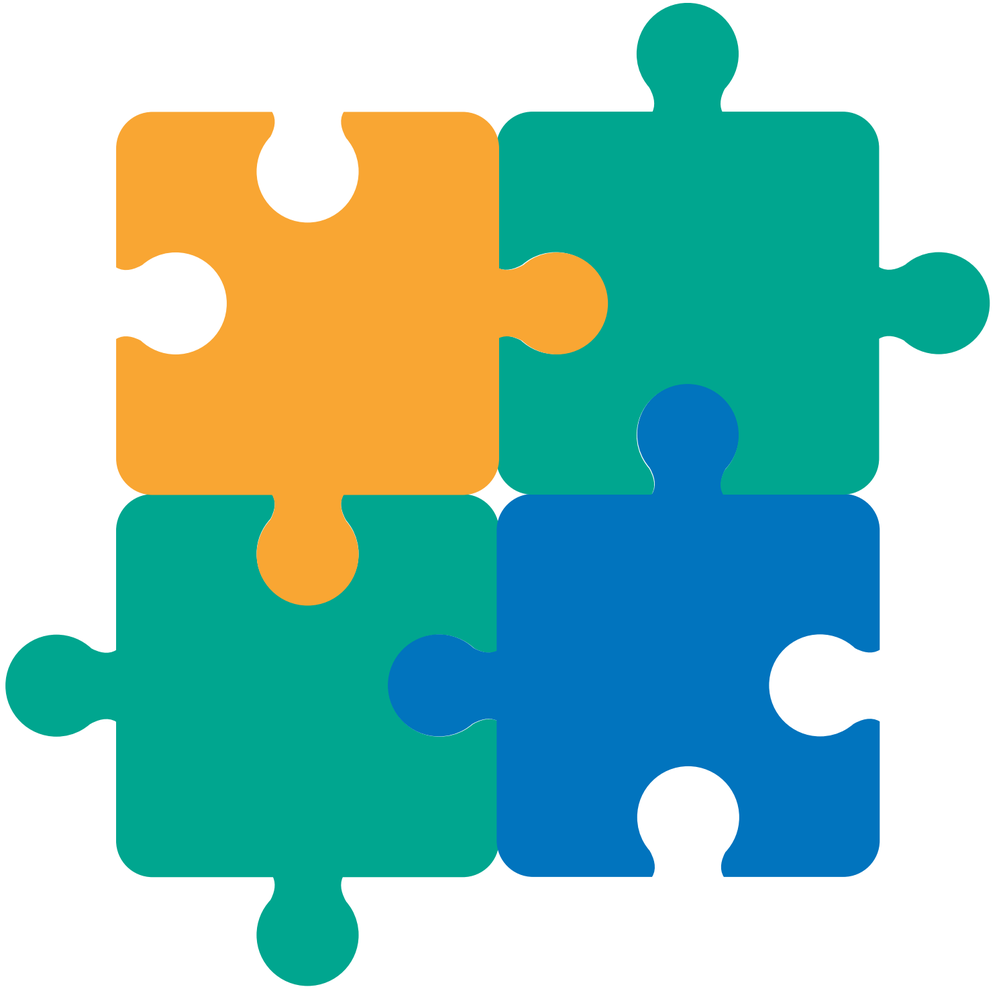
LEARNING RESOURCE A

COMPETENCES AND GOALS

This learning resource addresses the following competences and goals:

GENDER	Actively engage female learners
PERCEPTIONS	Addressing and challenging misconceptions
GROWTH MINDSET	Create a course environment that promotes growth mindset

WESTEM



LEARNING RESOURCE A

LEARNING OUTCOMES

CONSIDER AND CRITICALLY REFLECT

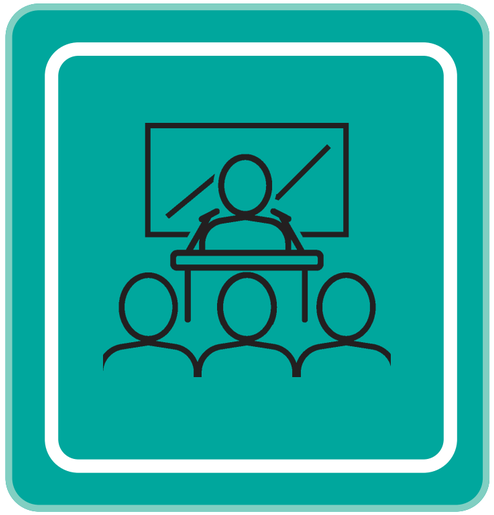
1. On completion of this task, it is expected that the student will consider and critically reflect on neuroscience aspects of intelligence and whether success is innate to skills or can derive from an individual's efforts.

REFLECT ON STUDIES & GROWTH MINDSET

2. On completion of this task, it is expected that the student will reflect on their study strategies after exposure to growth mindset materials, in order for them to be strategic in their intellectual work at developing the abilities and traits they need to succeed in the class.

LEARNING RESOURCE A

ACTIVITY - TIMELINE



INTRODUCTION: CLASS DISCUSSION

15 - 20 mins

VIDEO PRESENTATION AND DISCUSSION

10 - 15 mins

VIDEO PRESENTATION AND DISCUSSION

10-15 mins

SELF-REFLECTION

20-25 mins

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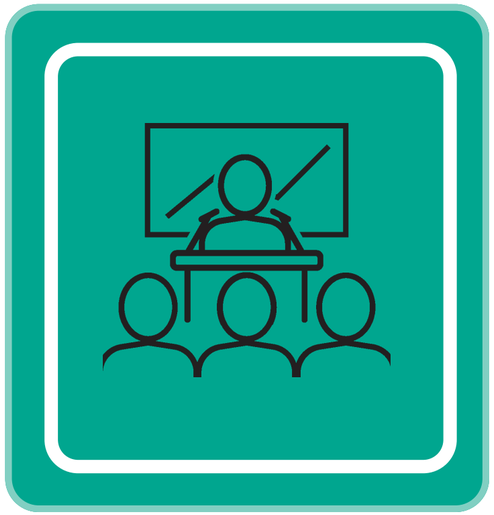
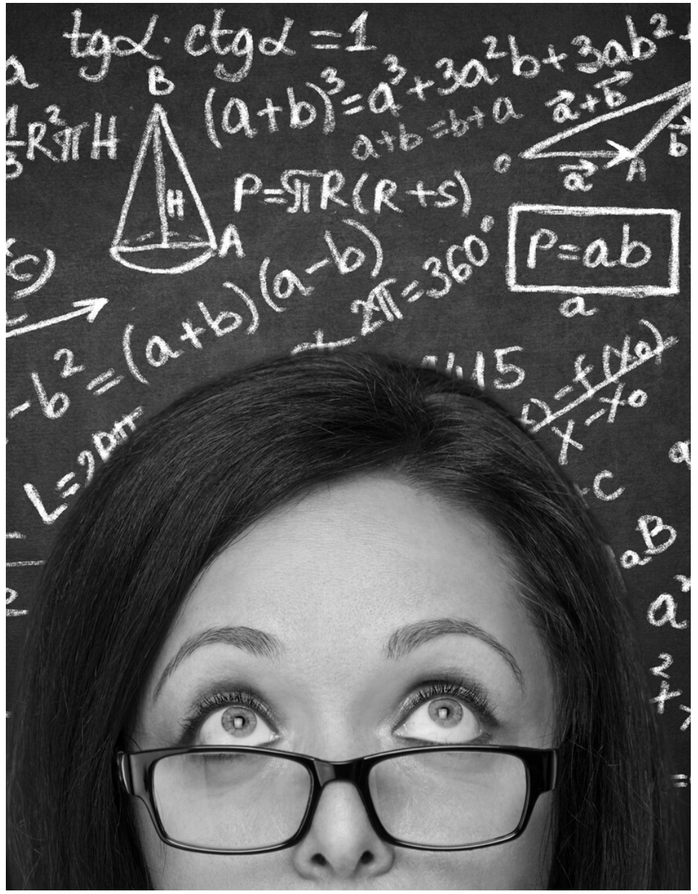
LEARNING RESOURCE A

INTRODUCTION



15 - 20 mins



We recommend to Introduce the activity as a neuroscience lesson, however without telling students explicitly that they should have a growth mindset or that they should think in any particular way. A good idea is to start with a personal short story about how you have nurtured the traits and abilities needed to master the material you teach, and how you try to maintain a similar openness to intellectual challenges.

1)What determines our intelligence?

Use the Canva whiteboard in the next page to engage students interactively to answer the following:

a. Have students raise their hands if they believe it is something that is unchangeable and predetermined by nature (like genes)

b. Have students raise their hands if they believe it is something that can be grown through strategic efforts.

COLLABORATE ON A WHITEBOARD

Consider and write a short post-it and put it under the heading that best represents your opinion.

Tip: Collaboration makes teamwork easier! Click "Share" and invite your students to fill this up. Use this page for bulletins, brainstorms, and other fun team ideas.

Right-click on the **background** of the slide, or on the **thumbnail** below, for the option to **expand** this page into a **whiteboard** for more space!

Copy a note, drag to the board, and write your ideas.

Copy a note, drag to the board, and write your ideas.

Something is unchangeable, derives from our nature

Write a note here
Your name

Something can grow through strategic actions/efforts

Write a note here
Your name

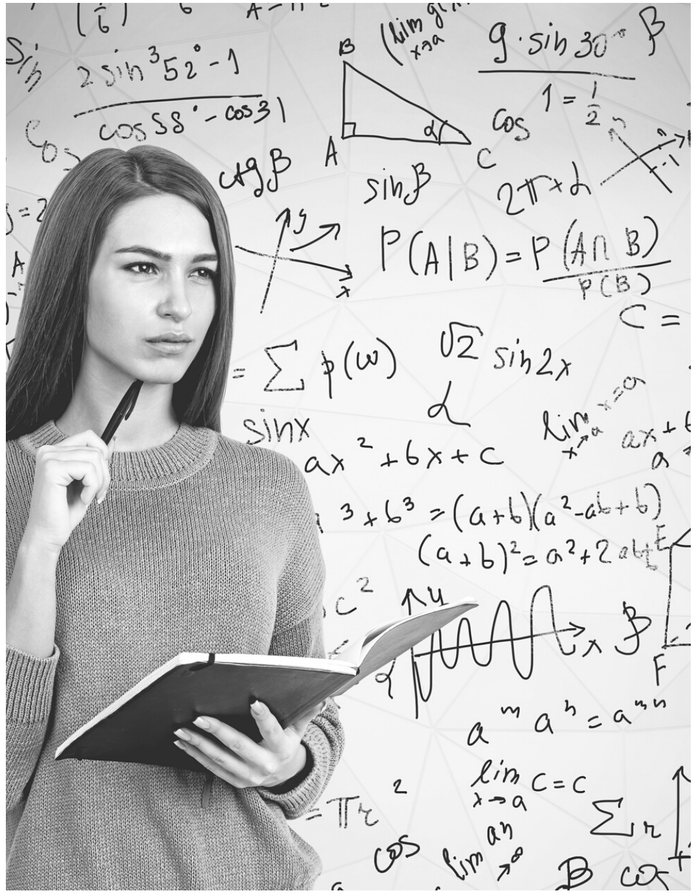
WESTEM

LEARNING RESOURCE A

VIDEO & DISCUSSION

Show class: Growing your mind video by Khan Academy (3:04)

10 - 15 mins



1)Follow with a discussion in smaller groups or breakout rooms (online) using the Canva worksheet in the next page and then report back to the whole class:

a. How will you try to learn more about [course topic]?

i. Review of materials recommended by the professor.

ii. If appropriate, practice problems that challenge you.

b. There are additional questions on pg. 3 of the Khan Academy and PERTS lesson plan for Growth Mindset activity, should you want to expand on the topic.

WORKSHEET TEMPLATE PER GROUP

One person per group:
Please make a copy of this document and share the linked digital worksheet with your group.

15min

You'll be placed in your **breakout rooms** soon to have some discussion time about the following.

a. How will you try to learn more about [course topic]?
i. Review of materials recommended by the professor.
ii. If appropriate, practice problems that challenge you.

Group Brainstorm Activity

a. How will you try to learn more about [course topic]?

Team 1

Name

Name

Name

Name

Name

Note to teacher: Publish this design as an assignment from the publish menu and students will be sent an email notifying them. Or select - Share - Share as template - copy the link and share with your students. Or simply paste the Canva link to embed the thumbnail into this document.

WESTEM

LEARNING RESOURCE A

VIDEO & DISCUSSION

10 - 15 mins

Show class: Neuroplasticity video (2:03)

1) Follow with a discussion in smaller groups or breakout rooms (online) using the Canva worksheet in the next page and then report back to the whole class:

a. What makes our brains adaptable, or change?

Use the language of the video:

1.When you think or do something you are directing your mind down a particular road or pathway in your brain.

2.Repeatedly thinking a certain way or doing something strengthens the pathway.

3.The opposite is true, too: not thinking a certain way or ceasing to do something weakens a pathway.

WORKSHEET TEMPLATE PER GROUP

One person per group:
Please make a copy of this document and share the linked digital worksheet with your group.

15min

You'll be placed in your **breakout rooms** soon to have some discussion time about the following.

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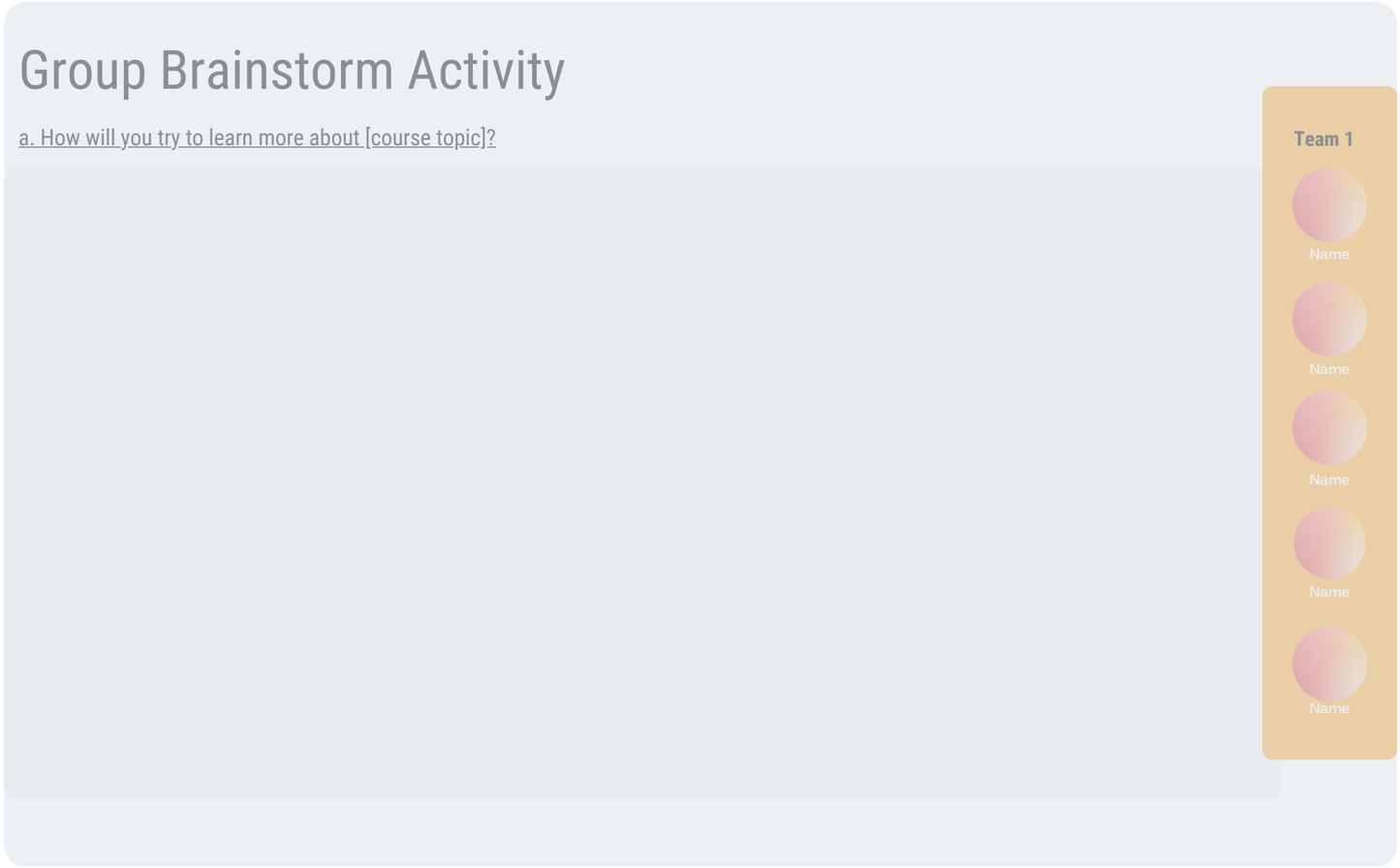

Note to teacher: Publish this design as an assignment from the publish menu and students will be sent an email notifying them. Or select - Share - Share as template - copy the link and share with your students. Or simply paste the Canva link to embed the thumbnail into this document.

WESTEM

LEARNING RESOURCE A

SELF-REFLECTION

Ask students to write a letter about a learning-related struggle.
Have them address the following questions:
How did it make you feel?
How did you overcome it, and what did it teach you?

Tell students to write a letter to a future student to tell them about their struggle, what they learned from it, and any advice they could give for the student.

You can provide the Canva template in the next page, or ask them to complete this in a print format.
Collect their letters, and save them online or in print, in order to give them back to them during difficult testing periods, such as final exams.

20-25 mins

LETTER TO A FUTURE STUDENT

- **Make** a copy of this sheet.
- Using the space, create a collage about you!
- **Task:** Take a few minutes to think of a time when you overcame a struggle to learn something.
- Reflect on the times when you failed at first but through perservering your brain created new neural connections and you eventually became better at the task at hand.
- Write a letter to a future student of your class about this struggle. In at least five sentences, tell this student your story and give them advice on what they should do next time they encounter an obstacle when learning something new.

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LEARNING RESOURCE A

RESOURCES

Growth mindset video by The University of Arizona featuring STEM faculty

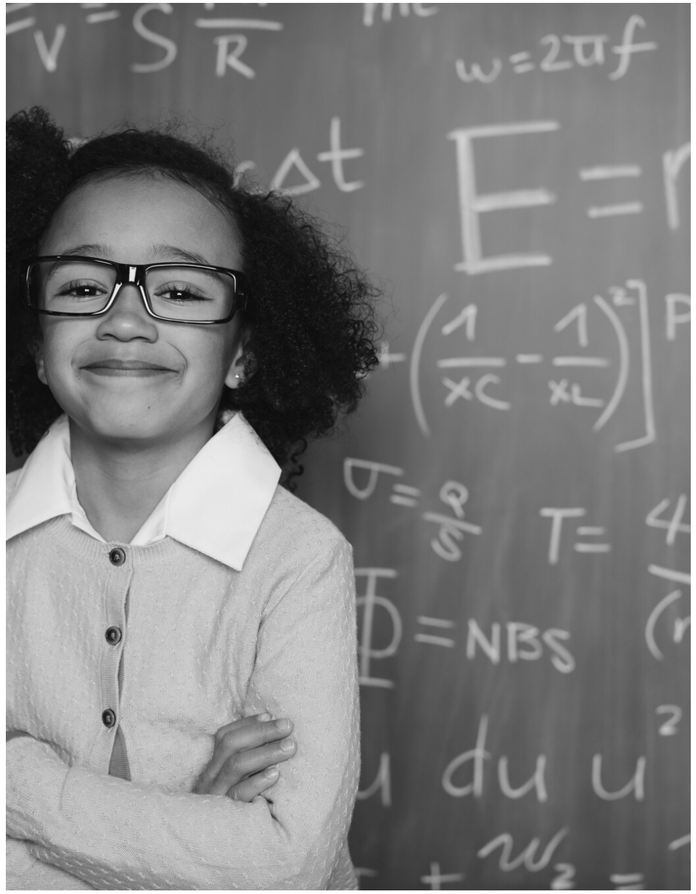
Lesson plan for Growth Mindset activity by Khan Academy and PERTS

Complete Mindset Kit by PERTS, a complete guide to the growth mindset

TED talk on growth mindset research by Dr. Carol Dweck, Professor of Psychology at Stanford University

1) Internet and computer access for online videos and Canva templates

2) Pg. 3 of Growth Mindset Lesson Plan for additional questions



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LEARNING RESOURCE B

MATHS

Gender Stereotypes in STEM Representations

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LEARNING RESOURCE B

OVERVIEW

The proposed learning resource focuses on gender-stereotyped representations of mathematics in advertisements and recruitment campaigns in studies, jobs and training, in science fields. Through the critical reflection and analysis of stereotypes in these visuals, students will be led to consider:

- How these stereotypes influence the way they view the competences associated with women and men in areas of mathematics.
- How these stereotypes influence their choice of studies and careers.

EMPATHISE | **IDENTIFY** | **DEFINE** | **CONCLUSION**

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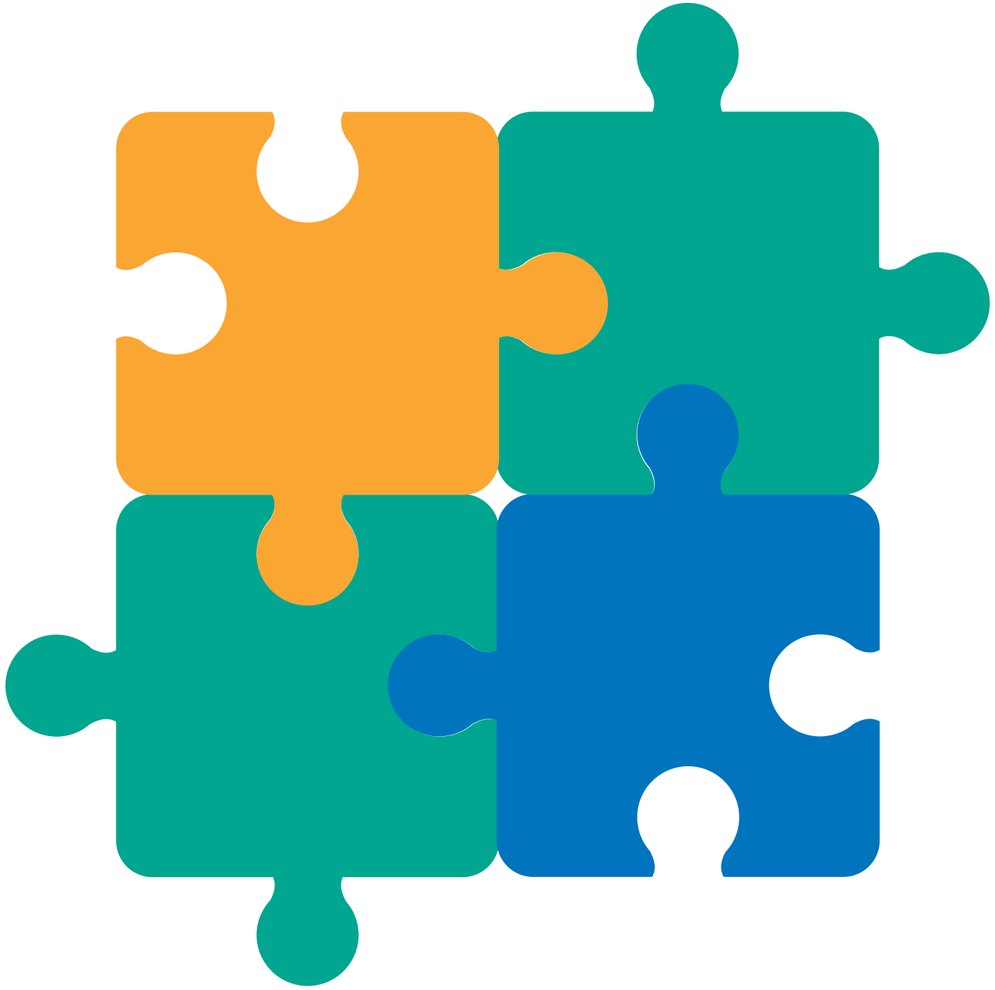
LEARNING RESOURCE B

COMPETENCES AND GOALS

This learning resource addresses the following competences and goals:

GENDER	Actively engage female learners
PERCEPTIONS	Addressing and challenging misconceptions
GROWTH MINDSET	Create a course environment that promotes growth mindset



LEARNING RESOURCE B

LEARNING OUTCOMES

IDENTIFY AND DEFINE

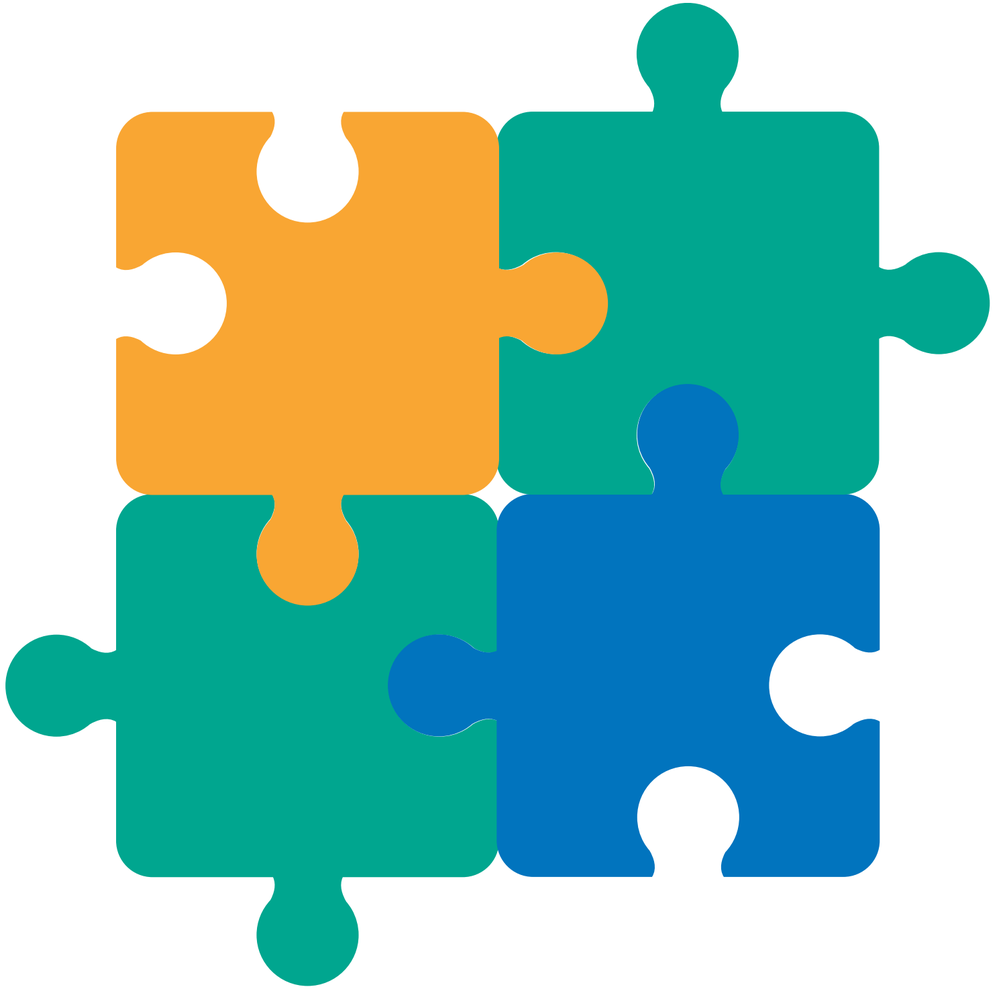
1. On completion of this task, it is expected that the student will identify and define sex and gender stereotypes in the field of Science in a European context.

EMPATHISE AND BECOME AWARE

2. On completion of this task, it is expected that the student will use empathy to challenge themselves to grow and become aware of stereotypes in their daily lives.

RECOGNISE

3. On completion of this task, it is expected that the student will recognize the negative impact they can have on their own representations of maths and the world of mathematics, and their study/career path.



LEARNING RESOURCE B

LEARNING OUTCOMES

CONSIDER AND CRITICALLY REFLECT

4. On completion of this task, it is expected that the student will consider and critically reflect on careers in Science and be empowered in continuing their studies and pursuing these careers, regardless of their sex.

REFLECT ON STUDIES & GROWTH MINDSET

5. On completion of this task, it is expected that the student will reflect on their study strategies after exposure to growth mindset materials, in order for them to be strategic in their intellectual work at developing the abilities and traits they need to succeed in the class.

LEARNING RESOURCE B

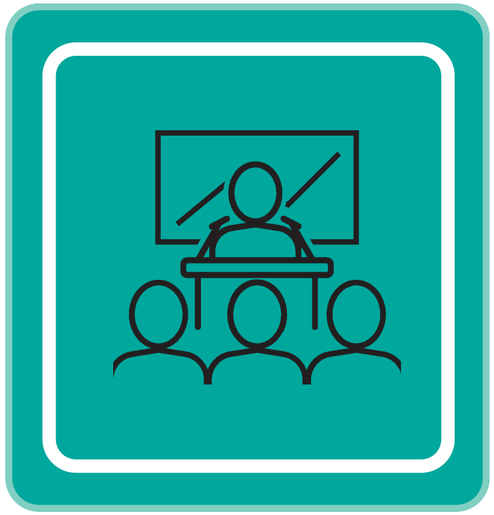
ACTIVITY - TIMELINE

INTRODUCTION: VIDEO AND DISCUSSION

15 - 20 mins

ASSIGNMENT

1-2 days



GROUP ACTIVITY & DISCUSSION

20-25 mins

SELF-REFLECTION

20-25 mins

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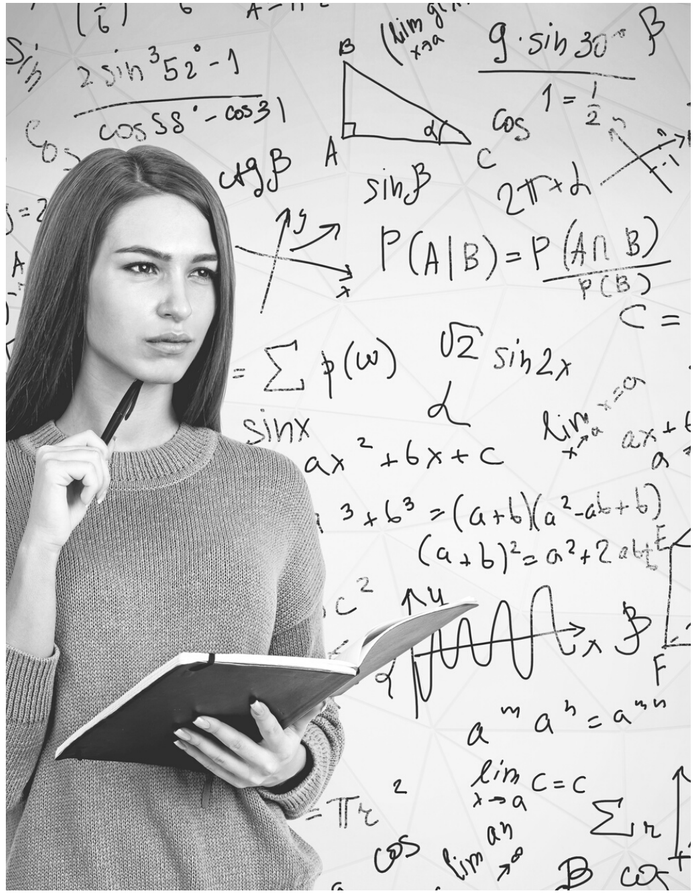
LEARNING RESOURCE B

VIDEO & DISCUSSION

Introduce the activity with a short video:
OLAY #STEMTheGap - It's Time to Change the Equation
(2:29)

15 - 20 mins



Use the Canva whiteboard in the next page to engage students interactively to answer the following:
1)What are the skills, ideas, adjectives, qualifiers that you spontaneously associate with men, boys, girls and women?

Assign 2 post-its to each student: they will write what they associate with women/girls on one and what they associate with men/boys on the other. Note: post-its are anonymous, a very short period of time is given to write down the associations. A discussion follows on stereotypes, clichés, preconceived ideas.

COLLABORATE ON A WHITEBOARD

What are the skills, ideas, adjectives, qualifiers that you spontaneously associate with men, boys, girls and women?

Tip: Collaboration makes teamwork easier! Click "Share" and invite your students to fill this up. Use this page for bulletins, brainstorms, and other fun team ideas.

Right-click on the **background** of the slide, or on the **thumbnail** below, for the option to **expand** this page into a **whiteboard** for more space!

Copy a note, drag to the board, and write your ideas.

Copy a note, drag to the board, and write your ideas.

Associations with women

Write a note here

Associations with men

Write a note here

WESTEM

LEARNING RESOURCE B

ASSIGNMENT

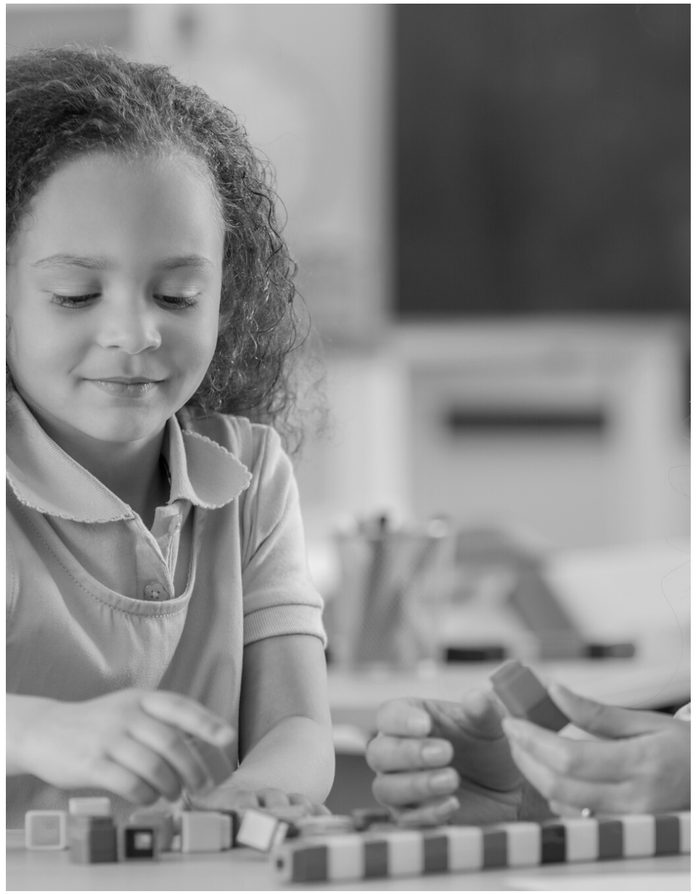
1. Identify and record in writing 4–6 advertisements (online and/or print) in relation to maths (200–300 words in total). Try to find advertisements that correspond to the following categories:

- a very stereotyped visual
- a less stereotyped visual to foster debate
- a more neutral visual in terms of sex and gender

representation and, if possible, diversity, one that can be used as an example of respecting gender equality and diversity.

2. Briefly summarise the characteristics and qualities that make each advertisement distinct in terms of gender representations. Explain each of your 4–6 choices, summarising in 50–100 words. Include a brief elaboration on the ethical and sustainability aspects of your choices.

Estimated completion time for this activity: 1-2 days



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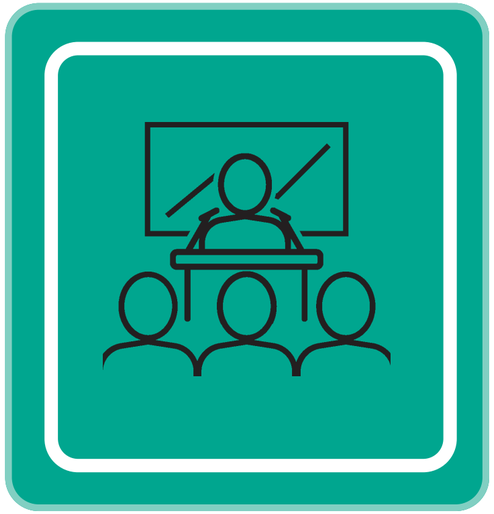
LEARNING RESOURCE B

GROUP ACTIVITY & DISCUSSION



20 - 25 mins

Show to the classroom

- a very stereotyped visual
- a less stereotyped visual to foster debate
- a more neutral visual in terms of sex and gender

Follow with a discussion in smaller groups, that then report back to the whole class: Note the people represented and the field or place where they are represented. The distinction between interior/exterior, infinitely small/infinitely large, is produced in recurring stereotypes.
Ask from students to identify and discuss the sex and gender stereotypes in the visuals, to fill in the analysis grid, and discuss their observations.

GROUP DISCUSSION

Team 1
Marie Curie


Carla


Anna


Danny


Josh


Ina

Instructions

Preparation:

- As a group, choose one of the categories available about ads and choose one advertisement to discuss.

Activity:

- In the first box, paste your chosen advertisement.
- Look at the advertisement, then answer the following questions as a group.

1 min:

- Write your names on the sticky notes.
- Use them to answer the questions.

10 mins:

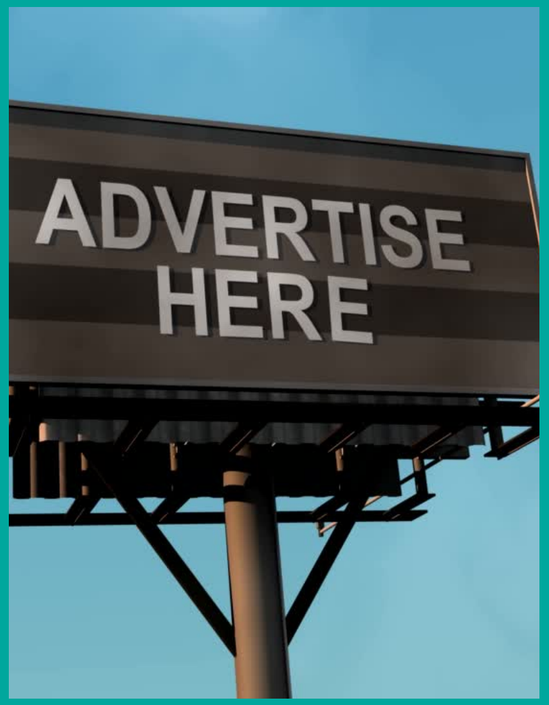
- Write down your answers to the questions in the boxes.
- These can just be phrases or bullet points.

5 mins:

- As a group, discuss the answers.
- Decide which answers you will present to the class.

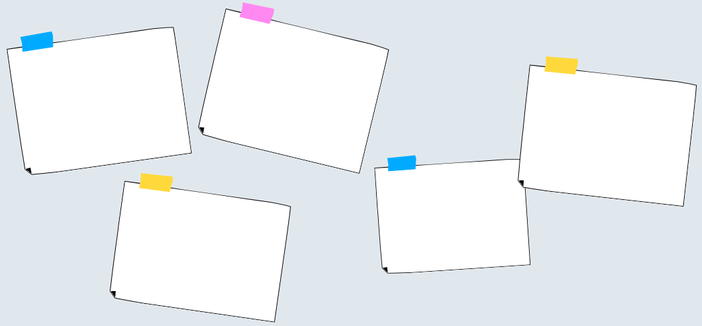
5 mins:
During the plenary session, each presenter explains the group's findings to the rest of the students.
A class discussion can follow to give everyone an opportunity to share his or her opinion.

Our Chosen Advertisement

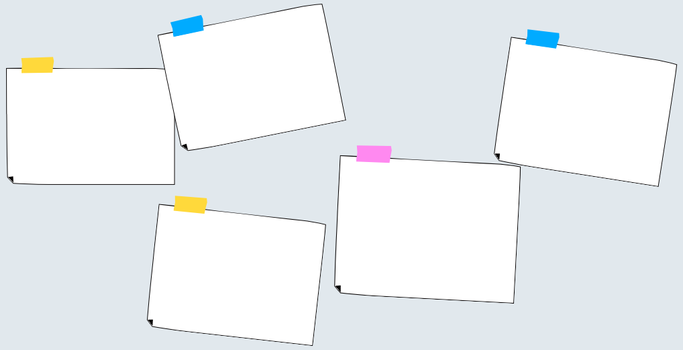


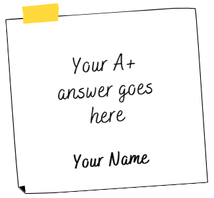
Title of advertisement
Link to the resource

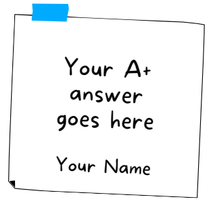
How does the advertisement make you feel?

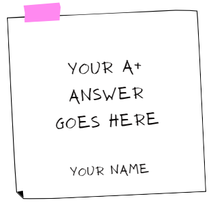


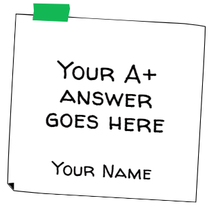
What is the advertisement's message for you? Does it differ for each gender?











WESTEM

LEARNING RESOURCE B

SELF-REFLECTION

This step will conclude with a look back at the post-its. Students will compare what was written on the post-its, i.e. women/girl and men/boy word associations:

- with the stereotypes identified in the ads for mathematics
- with the stereotypes tied to careers in mathematics

In most cases, there will be many similarities.

You should encourage a group discussion on the impact stereotypes have on study/career choices and the representation of careers in STEM.

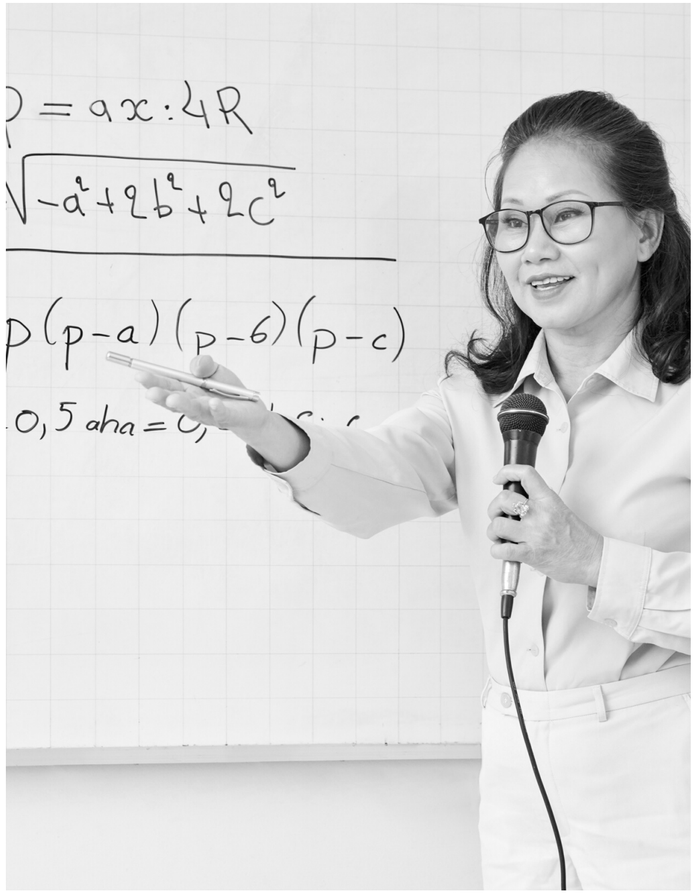
Instil a mindset that jobs should be mixed gender, the need to choose one's studies and career based on skills and likes/dislikes without the influence of preconceived ideas. End the session with a renowned video about stereotyping and putting people in boxes.

TV 2 | All That We Share (3:00)

20-25 mins

LEARNING RESOURCE B

RESOURCES



1) HYPATIA Toolkit

2) Internet and computer access for online videos and Canva templates

3) The STEM Gap: Women and Girls in Science, Technology, Engineering and Mathematics
https://www.aauw.org/resources/research/the-stem-gap/

4) YOU TUBE
video What it takes to be a Woman in STEM | Fatima AlKaabi
https://youtu.be/waD95VUbWC0

5) YOU TUBE
video Female Engineers Share Experiences In A Male-Dominated Field
https://youtu.be/WBdNfOJ5vMY

6) WHY SO FEW Women in Science, Technology, Engineering, and Mathematics
https://drive.google.com/file/d/1-DngrhBF1bVU_EIsDIFzQ92FQeURxq8O/view?usp=sharing

WESTEM

LEARNING RESOURCE C

MATHS

Maths Ambassadors and Ambassadresses

WESTEM

LEARNING RESOURCE C

OVERVIEW

The proposed learning resource seeks to bridge the gap between the industry and studies. Some preparation is required beforehand, to invite one or two speakers, including at least a woman, to meet a class. The activity can be followed by a visit to a company or research institute, where the speakers work. Several research findings shine a light on the importance of role models in driving girls interest in STEM subjects. Through the critical reflection and discussion in this learning resource, students will:

- Meet professionals they can relate to.
- Demystify the image of male dominance in STEM professions
- See the workplace and people in their work environment
- Reflect on their course of study, background and prospect for life: obstacles (economics, gender, etc.), doubts.

EMPATHISE | **IDENTIFY** | **DEFINE** | **CONCLUSION**

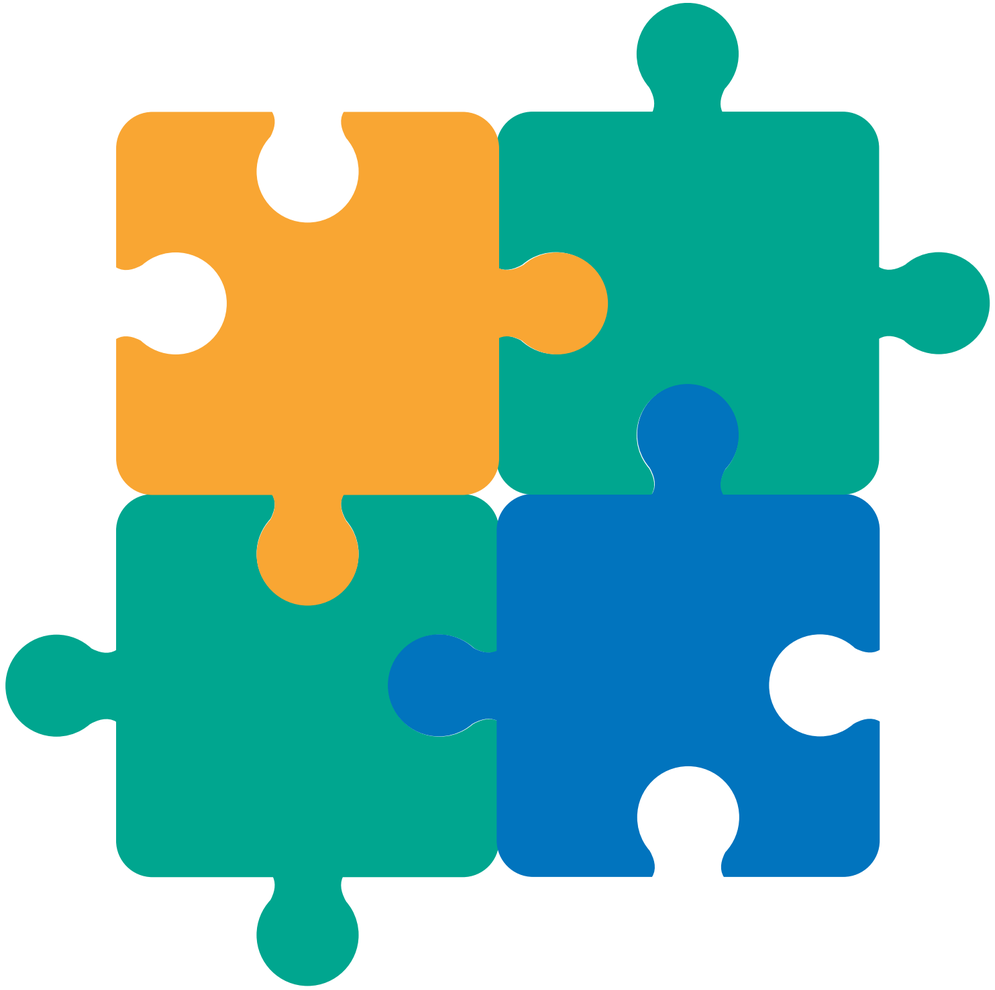
WESTEM

LEARNING RESOURCE C

COMPETENCES AND GOALS

This learning resource addresses the following competences and goals:

GENDER INCLUSION	Actively engage female learners with relatable role models and career-life prospects
PERCEPTIONS	Showcase that women can succeed in STEM careers and how representations can influence their career choices.
GROWTH MINDSET	Create a course environment that promotes growth mindset



LEARNING RESOURCE C

LEARNING OUTCOMES

CONSIDER AND CRITICALLY REFLECT

1. On completion of this task, it is expected that the student will consider and critically reflect on the work path they want to follow, after exposure to positive and relatable role models in STEM careers.

REFLECT ON STUDIES & GROWTH MINDSET

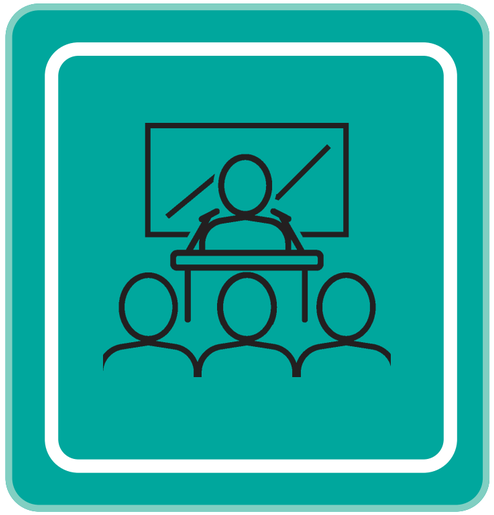
2. On completion of this task, it is expected that the student will reflect on their perceived notions of who can be a successful STEM professional, in order for them to be confident in their intellectual work at developing the abilities and traits they need to succeed in their studies and future career paths.

RECOGNISE

3. On completion of this task, it is expected that the student will recognise the negative impact they can have on their own representations of mathematics and the world of mathematics, and their study/career path.

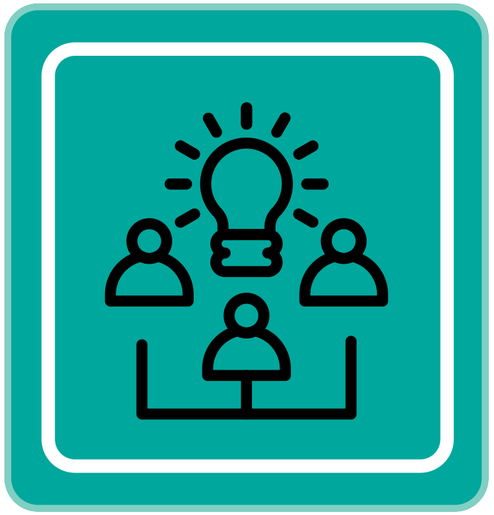
LEARNING RESOURCE C

ACTIVITY - TIMELINE



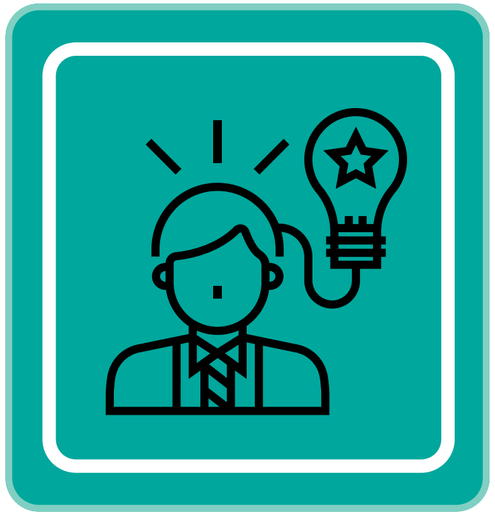
SPEAKER & CLASS DISCUSSION

5-minute presentation, 10 minutes questions



SPEAKER & CLASS ACTIVITY

10-minute presentation, 15 minutes questions from students



STEM CAREERS AMBASSADORS SCHEME

Estimated completion time for this activity: 1-2 weeks

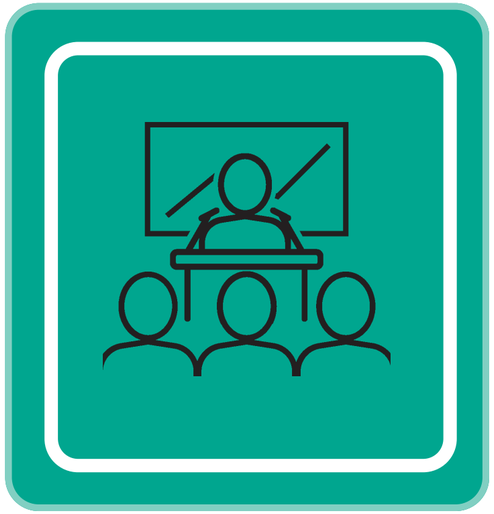
SELF-REFLECTION

10-15 mins

WESTEM

LEARNING RESOURCE C

SPEAKER & CLASS DISCUSSION



5-minute presentation, 10 minutes questions

Preparatory work: brief the speakers beforehand and ask them to provide with figures on the gender representation among their staff and the profile of jobs they do; also whether a man or woman, is the head of the unit/department/company. It is an easy way to show horizontal and vertical gender segregation.
Speakers should bring pictures of their work environment to provide a view of the workplace: lab, office, team, key locations in the institute/center/company, etc. Provide with some frequently asked questions, like the ones in the next page.

During the class: Warm welcome to the speaker and the class. Introduce the speaker(s), who will preferably begin with a focus on their personal experience.
Note: It is important to select profiles that everyone can relate to so as to avoid feelings of exclusion.

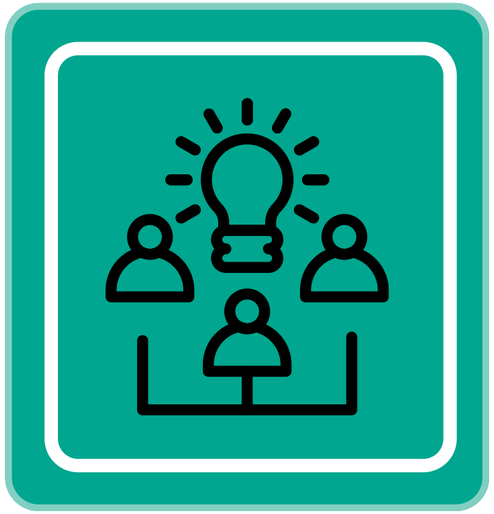
FAQ for speakers

1. What qualifications do I need to apply to your company?
2. How many graduates does the company hire per year (What levels of qualification, kinds of degrees, for which departments?)
3. Is this the first job you landed post-studies?
4. How do beginners get their start in the company or research institute? (internships, volunteering for International Experience programs, etc.)
5. Could you name some of the biggest challenges related to your profession? How did you deal with them?

WESTEM

LEARNING RESOURCE C

SPEAKER & CLASS ACTIVITY



10-minute presentation, 15 minutes questions from students

The speaker gives an outline of a day in the workplace and can show material on their real and concrete life (or videos, little experiments, pictures of working tools) to accompany their talk.

It is also interesting to evoke, if that is the case for one of the speakers, some more “chaotic” path or any doubts they may have had to reach their current professional situation. It is important to show that challenges do occur in anyone's professional path, but how we deal with these affects us in the long run.

Ask the students to use the Canva whiteboard in the next page to ask questions for the speaker, related to their work and challenges faced.

Alternatively, split students up into small groups (2-3) to prepare their questions for the speaker(s), give them a few minutes to come up with questions.

Whiteboard Page

Copy a note, drag to the board, and write your ideas.

Copy a note, drag to the board, and write your ideas.

Write a note here

Write a note here

Tip: Collaboration makes teamwork easier! Click "Share" and invite your students to fill this up. Use this page for bulletins, brainstorms, and other fun team ideas.
Right-click on the **background** of the slide, or on the **thumbnail** below, for the option to **expand** this page into a **whiteboard** for more space!

LEARNING RESOURCE C

STEM CAREERS AMBASSADORS SCHEME

Estimated completion time for this activity: 1-2 weeks

This step involves setting the ground for a STEM Careers Ambassadors programme at your department or HEI. You could consult relevant existing training packs, and also encourage your colleagues to enroll in the WESTEM platform and the mentoring programme to be launched.

You should encourage your students to enroll also in mentoring programmes focussing on women in STEM studies and careers, like the one to be launched by the WESTEM team.
Discuss the benefits of mentoring for pursuing studies and careers.

LEARNING RESOURCE C

SELF-REFLECTION

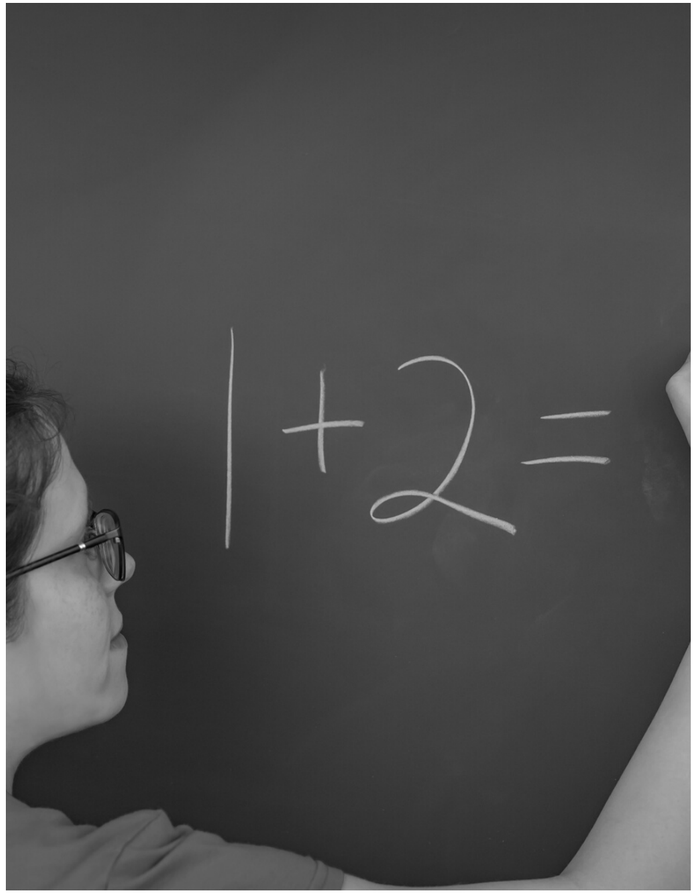
This step will conclude with a self reflection activity. Students will use the Canva whiteboard in the next page to answer the following :

- What do you think about your studies and career prospects? Does gender matter? What are your chances to succeed?
- How do you view the stereotypes tied to careers in science and technology?

You should encourage a group discussion on the impact stereotypes have on study/career choices and the representation of careers in STEM.

Instil a mindset that jobs should be mixed gender, the need to choose one's studies and career based on skills and likes/dislikes without the influence of preconceived ideas. Also showcase the importance of positive and diverse role models to pursue studies and careers in STEM.

15-20 mins



COLLABORATE ON A WHITEBOARD

Now that the session is complete, and you have listened and engage with our speakers, what do you think about your studies and career prospects? Does gender matter? What are your chances to succeed?

Tip: Collaboration makes teamwork easier! Click "Share" and invite your students to fill this up. Use this page for bulletins, brainstorms, and other fun team ideas.

Right-click on the **background** of the slide, or on the **thumbnail** below, for the option to **expand** this page into a **whiteboard** for more space!

Copy a note, drag to the board, and write your ideas.

Copy a note, drag to the board, and write your ideas.

What I thought of my career prospects are before this session

Write a note here

What I think of my career prospects following this session

Write a note here

LEARNING RESOURCE C

RESOURCES

Briefing Pack for STEM Careers Ambassadors

Guidance Notes for Organisations Delivering STEM Ambassador Training

Boosting the effectiveness of STEM role models

Be a role model - DiscoverE

STEM Women Global

3 things to know about women in STEM fields, according to UN | World Economic Forum (weforum.org)

Internet and computer access for online videos and Canva templates

WESTEM

LEARNING RESOURCE D

MATHS

STEM ROLE PLAY GAME

WESTEM

LEARNING RESOURCE D

OVERVIEW

The proposed learning resource serves as an intervention using gamified approaches, to provide insights into the competences required for being a STEM professional, while students will discover the role of women in STEM knowledge and inventions throughout history up until today.

Through a cooperative card game, students will be introduced to women in STEM throughout history, history of sciences and technologies, and equality.

EMPATHISE

IDENTIFY

DEFINE

CONCLUSION

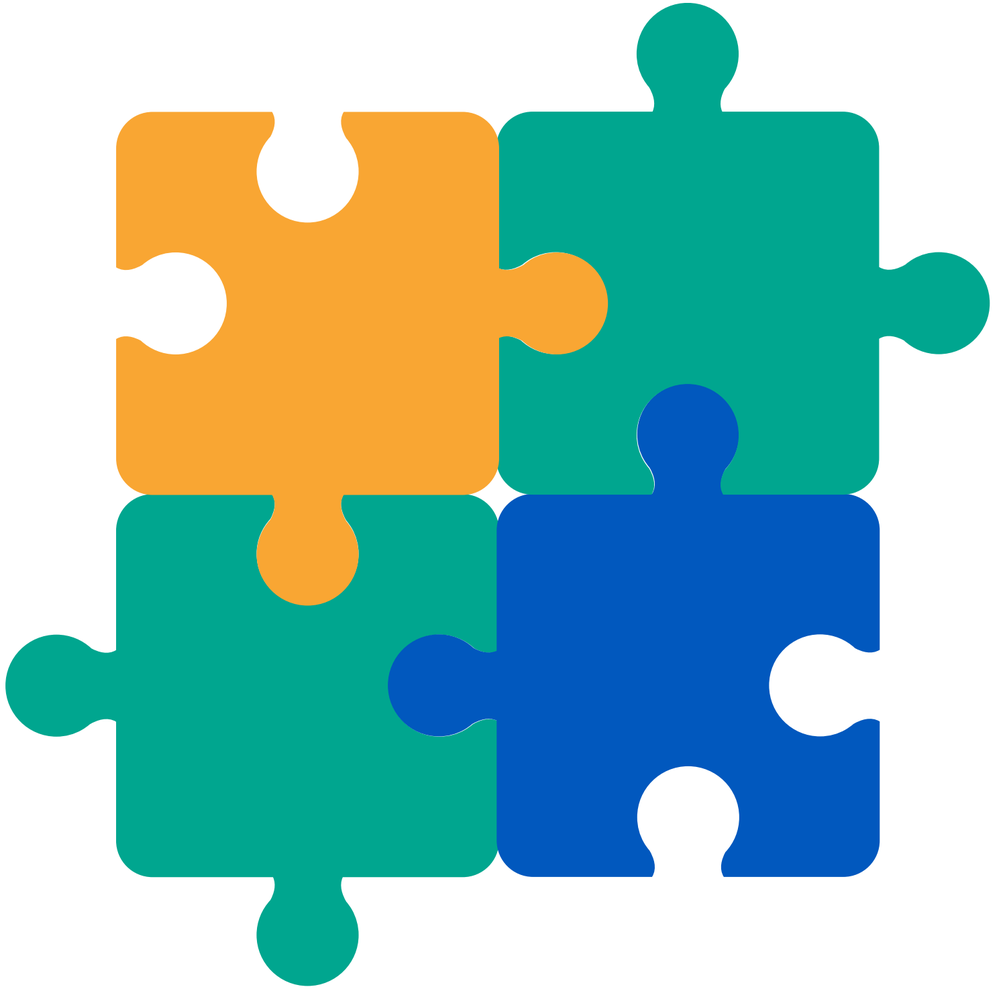
WESTEM

LEARNING RESOURCE D

COMPETENCES AND GOALS

This learning resource addresses the following competences and goals:

GENDER	Offer new/relatable role models to female students.
PERCEPTIONS	Promote a better representation of women in STEM innovation.
GROWTH MINDSET	Show women's contribution to scientific knowledge and encourage a growth mindset.



LEARNING RESOURCE D

LEARNING OUTCOMES

IDENTIFY AND DEFINE

1. On completion of this task, it is expected that the learner will identify and define historical key figures in STEM and reasons for underrepresentation of women in STEM throughout history.

EMPATHISE AND DISTINGUISH

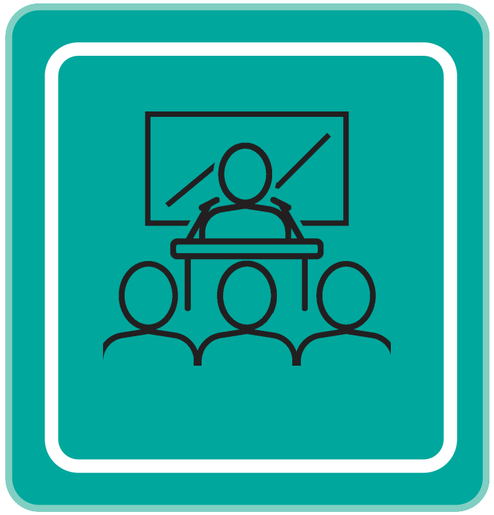
2. On completion of this task, it is expected that the student will use empathy and role play to break down ways in which influential female STEM figures deal with challenges related to their gender, background, and other differences.

RECOGNISE AND CRITICALLY REFLECT

3. On completion of this task, it is expected that the student will recognise and critically reflect on the negative impact not having female representation in STEM can have on their own representations of science and the world of science, and their study/career path.

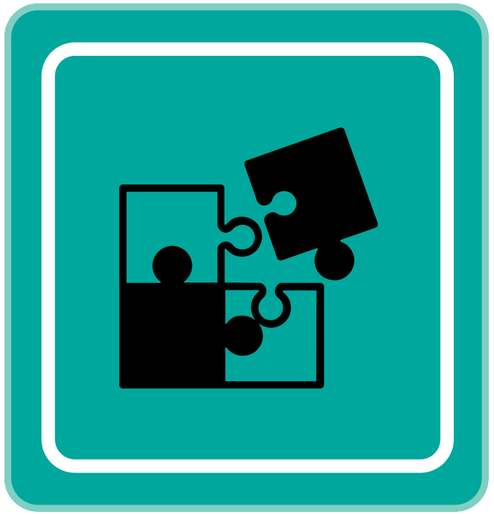
LEARNING RESOURCE D

ACTIVITY - TIMELINE



INTRODUCTION TO STEM GAME

5 - 10 mins



PLAY THE GAME: ROUND 1

25 - 30 mins

ASSIGNMENT & ROUND 2

Estimated completion time for this activity: 1-2 days

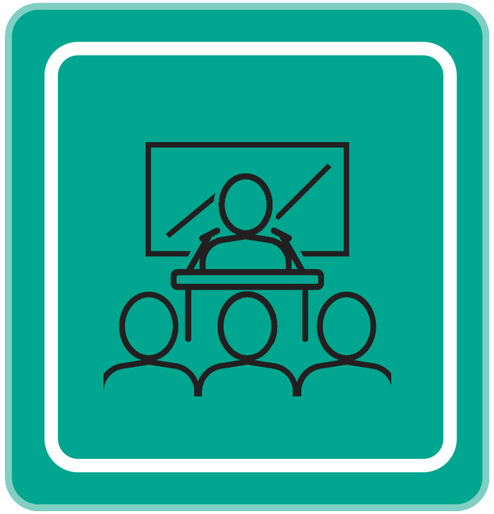
GROUP DISCUSSION AND SELF-REFLECTION

20-25 mins

WESTEM

LEARNING RESOURCE D

INTRODUCTION



5 - 10 mins

For a large group, dedicate 5 min to explain the game. Show a portrait card from the ones you created (see the next pages for examples - use the templates here to change your persona) and mention that this game is like time travel, to meet women scientists and learn about their discoveries. It is also a role play in round 2, since students can choose a persona to pretend to be and imagine the skills and competences, also the challenges involved in their era to pursue their STEM fields.

For a small group, you can print the rules and have them available beforehand on the tables with a set of cards. Invite students to discuss as a group to find the correct place for each discovery in the timeline. The activity can be conducted in class or online, and features also an assignment for home. It can take place within a broader event or as a standalone activity.

Note: It is important that women portrayed are representing diverse profiles in terms of scientific field, education, age, nationality, sexual orientation (where stated by the historic figure).

ROUND 1: TIMELINE

Begin the game by showing the class a STEM card which has the date on.

Each subgroup will have their chance to pick 2 cards to reveal which historic figure they got.

Once the random choice is made, players have 2-3 minutes to review the fact card about their historic figure and consider where it fits in the timeline on Canva.

A representative then presents their card in the class for discussion, addressing the background, life and achievements.

Another group chooses one card randomly and the same procedure follows.

When the game is completed, or time is up, facilitators invite participants to have a look over the entire timeline: “In a short time, we have seen a lot of discoveries by women throughout history.

WESTEM

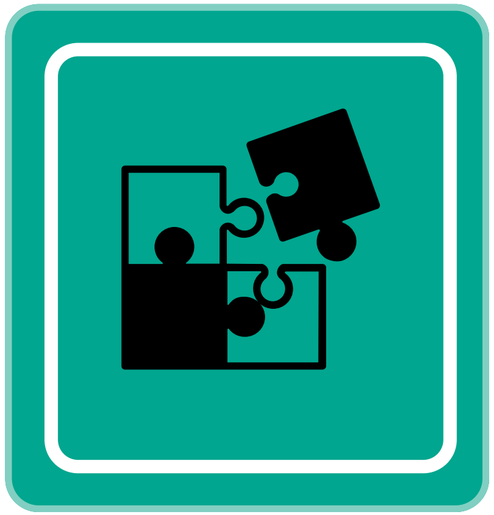
LEARNING RESOURCE D

PLAY THE GAME

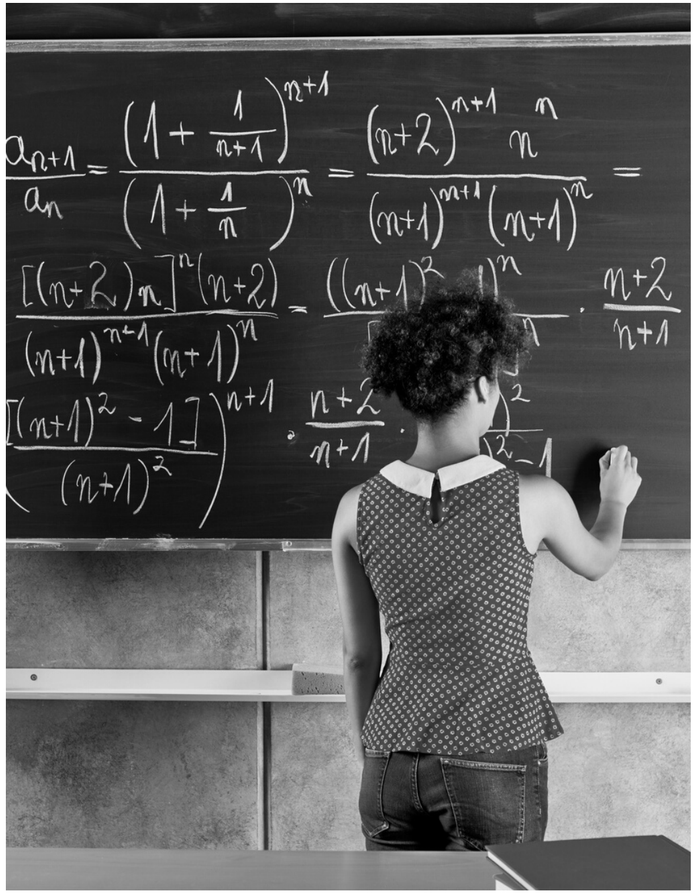
For a large group: Have students (mixed gender) separated in smaller groups (breakout rooms if online).

With the whole class:
You first hang a first card with the date showing or display it on the Canva timeline of historic female STEM figures (See the next page).

- Have one student from each group pick 2 cards (randomly). In their breakout rooms, students consult with each-other for 2-3 minutes on where the cards should go in the timeline - before or after the first one.
- The card is hung where the group says it should be or it is placed on the timeline.
- The answer is revealed and the card repositioned if needed.
- You pick a new card (or ask one of the players to take their role) and follow the same procedure.



25 - 30 mins



HISTORIC
WOMEN IN STEM

Choose one card to flip and reveal the historic STEM female figure.

TIMELINE OF HISTORIC STEM FIGURES

DATE
STEM card

DATE
STEM card

DATE
STEM card

DATE
STEM card

DATE
STEM card

DATE
STEM card

Tip: Collaboration makes teamwork easier! Click "Share" and invite your students to fill this up. Use this page for playing the STEM ROLE PLAY GAME. Have your students place the STEM card where they see fitting.
Right-click on the **background** of the slide, or on the **thumbnail** below, for the option to **expand** this page into a **whiteboard** for more space!

AINA WIFALK

A Swedish social scientist and inventor of the modern walker.

Life

Suffered from polio when she was 21 years old. The disease affected her badly, but eventually it led to one of the most important innovations for people whose bodies need support in their daily lives – the rollator.

Purpose

Aina Wifalk was a driving force in welfare issues and established a number of patients' associations, including groups for people with multiple sclerosis and victims of traffic accidents.

Best achievement

When she had formulated her idea – a walking frame on wheels – she submitted a proposal to a government innovation fund, which gave her a small grant and put her in contact with a fabricator. Production began three years later.

WESTEM

LEARNING RESOURCE D

ASSIGNMENT & ROUND 2

Estimated completion time for this activity: 1-2 days

Assign students with the following task:

1. Identify and record in writing 2–3 contemporary influential women in STEM (200–300 words in total).
2. Briefly summarise their background, achievements and challenges. Explain your 2-3 choices, summarising each one in 50–100 words. Briefly elaborate on the characteristics and qualities that made these women succeed.
3. Imagine you are the STEM figure you researched about and discuss in the whole class how you deal with challenges related to your gender or other characteristic that is different than the dominant culture.

ROUND 2: ROLE PLAY

Identify and record in writing 2–3 contemporary influential women in STEM (200–300 words in total).

A representative then presents their card in the class for discussion, addressing the background, life and achievements.

They then have to imagine the challenges faced in the era the persona lived and dedicate 1-2 days to research about this and return to present in the whole class.

The class decides the teams and individuals who best represented their historic figure.

WESTEM

LEARNING RESOURCE D

SELF-REFLECTION

Follow with a discussion in smaller groups or breakout rooms to consider the entire timeline: “In a short time, we have seen a lot of discoveries by women throughout history.“

Pose the question for debate in class or through a dedicated online brainstorming session in groups (use the Whiteboard template in the next page):

- Why are women are under-represented: prohibited from teaching, publishing, studying, etc.

A general discussion can then be engaged, if there is time and demand on how to ensure better representation of women in STEM and why it is important.

15-20 mins

What's your brainstorming topic?

Brainstorm Area

Our Favorite Ideas

01 Copy a sticky note, and then we'll write our thoughts, ideas, and inspiration.

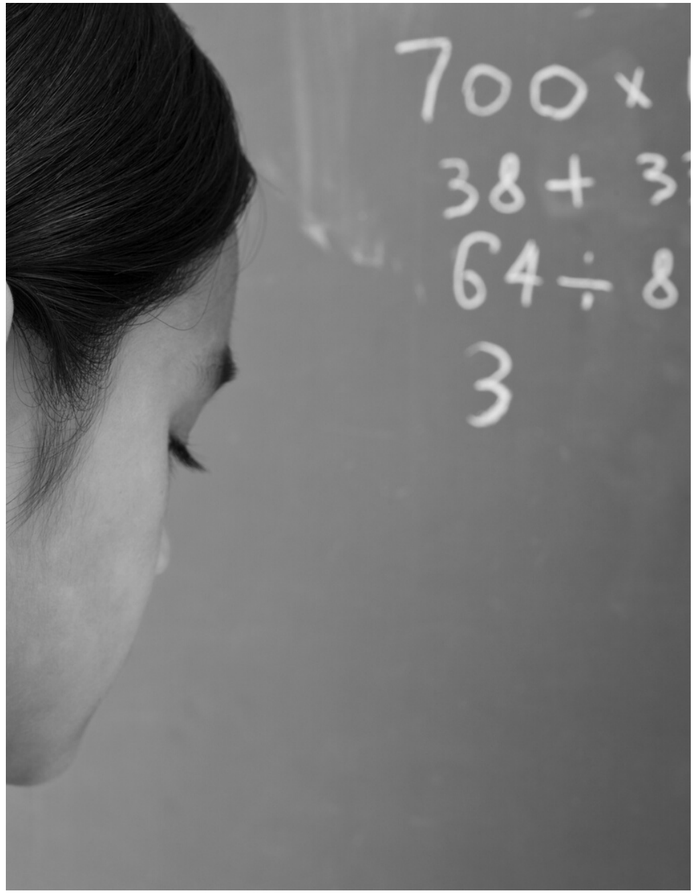
02 Use the stars to vote which ones we like to pursue.

02 Circle or comment on any promising ideas.

WESTEM

LEARNING RESOURCE D

RESOURCES



Internet and computer access for online videos and Canva templates

Printed Historic Women STEM cards

https://www.sciencebuddies.org/blog/women-in-science-history

https://www.lcmcmd.org/lcmc-news/2021/2/28/womens-history-month-notable-women-of-color-in-stem

https://humantechnopole.it/en/outreach/remember-my-name/

https://www.css.edu/about/blog/12-historical-women-in-stem-youve-probably-never-heard-of/

https://diversityinsteam.com/2020/04/history-women-science-technology/

https://www.stemwomen.com/inspiring-women-in-stem-posters

https://thebestschools.org/magazine/women-in-stem/

WESTEM

LEARNING RESOURCE E

MATHS

VISUAL ROADMAP

WESTEM

LEARNING RESOURCE E

OVERVIEW

The proposed learning resource can be introduced at the beginning of a course or programme of studies, to instil a growth mindset in students in a STEM HEI classroom and encourage a mindset that everything can be achieved with effort. This is particularly important for individuals belonging in social groups that experience negative stereotyping in relation to the innate intelligence or abilities needed to succeed in STEM disciplines. Through the critical reflection using the visual roadmap in this socio-psychological intervention, students will be led to consider:

- How it is possible to rewire the brain and achieve your goals by setting milestones to achieve.
- How a growth mindset can enable you to succeed in your studies and career path with effort.

EMPATHISE | **IDENTIFY** | **DEFINE** | **CONCLUSION**

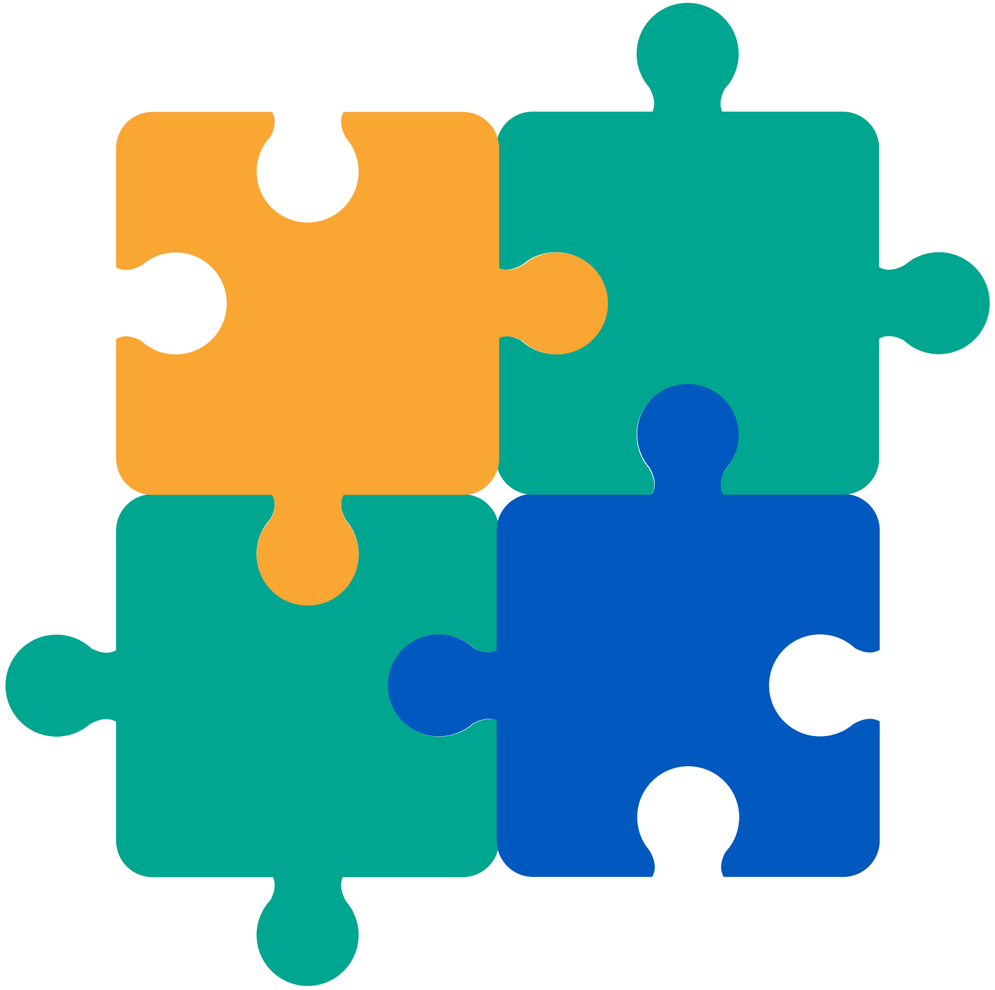
WESTEM

LEARNING RESOURCE E

COMPETENCES AND GOALS

This learning resource addresses the following competences and goals:

GENDER	Actively engage female learners with relatable experiences and aspirations
DIFFERENTATION / PERSONALISATION	Allow for personalised learning paths for your students.
GROWTH MINDSET	Create a course environment that promotes growth mindset



LEARNING RESOURCE E

LEARNING OUTCOMES

CONSIDER AND CRITICALLY REFLECT

1. On completion of this task, it is expected that the student will consider and critically reflect on visual mapping strategies to facilitate success through individual efforts and setting milestones to reach.

REFLECT ON STUDIES & GROWTH MINDSET

2. On completion of this task, it is expected that the student will reflect on their study strategies after exposure to growth mindset materials, in order for them to be strategic in their intellectual work at developing the abilities and traits they need to succeed in the class.

LEARNING RESOURCE E

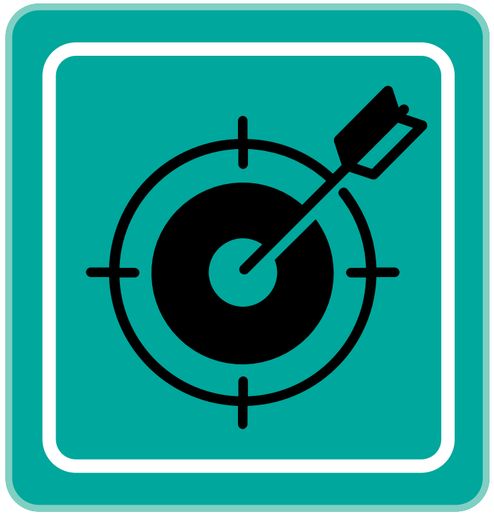
ACTIVITY - TIMELINE

INTRODUCTION: VIDEO AND DISCUSSION

5 - 10 mins

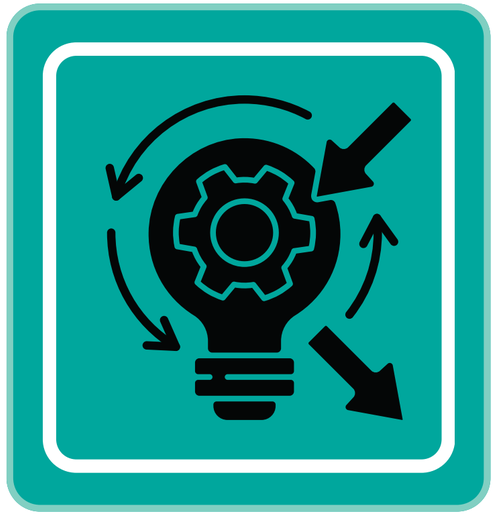
ASSIGNMENT AND GROUP DISCUSSION

25 - 30 mins



SELF-REFLECTION AND ROADMAP

25-30 mins - expand until 45 minutes



ACTION

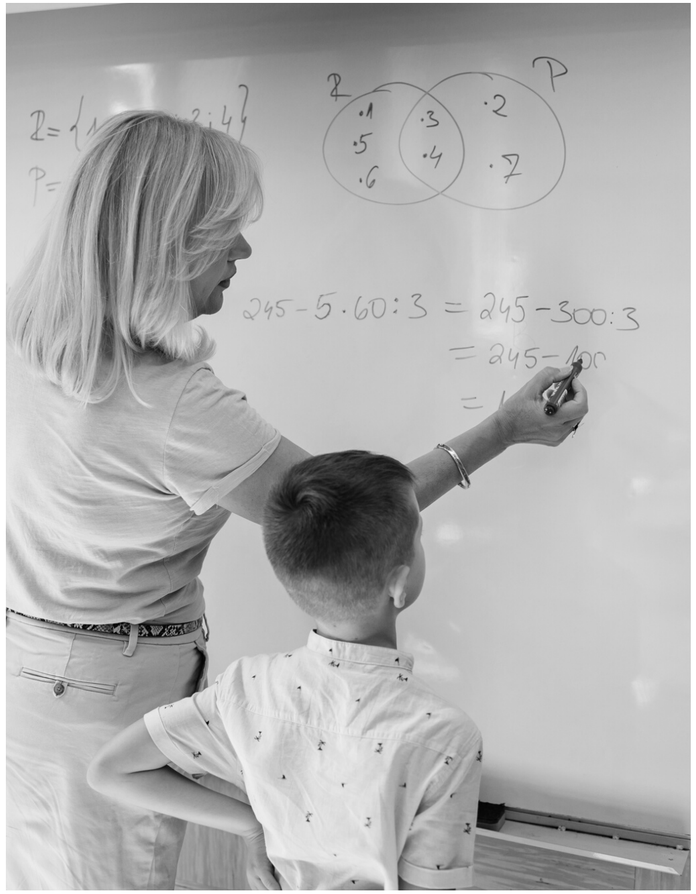
25-30 mins - expand until 45 minutes

WESTEM

LEARNING RESOURCE E

VIDEO & DISCUSSION

5 - 10 mins



Introduce the activity with 2 short videos:

- John Legend - "Success Through Effort" (2:01)
- Khan Academy - "You Can Learn Anything" (1:30)

Follow with a discussion in smaller groups or breakout rooms (online) to consider the questions:

1) Is success innate or does it require effort?
2) How can you create the path for success mentally and practically?

Explain what is a visual roadmap and why it is meaningful to use it to pursue studies or careers. Introduce the activity with the next slide and ask students to fill in each of the milestones they want to reach on the way to their ultimate goal.

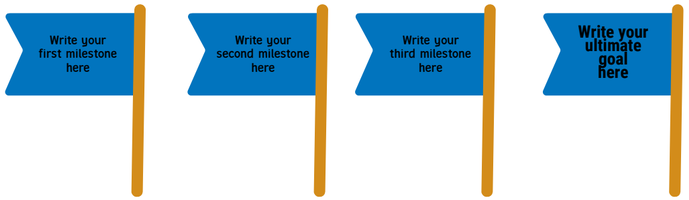
Tip: Collaboration makes teamwork easier! Click "Share" and invite your students to fill this up. Ask them to copy and paste the slides for the activity and complete it individually.

STEM Studies Visual Roadmap

Achieving our ultimate goal does not happen overnight.
It's the totality of small, individual milestones added up together. This project future roadmap will help us visualize the small milestones we need to complete to achieve our ultimate goal.

We will also identify blockers that could prevent us from moving forward and come up with practical solutions to address those blockers.

1. Fill in each of the milestones we want to reach on the way to our ultimate goal.



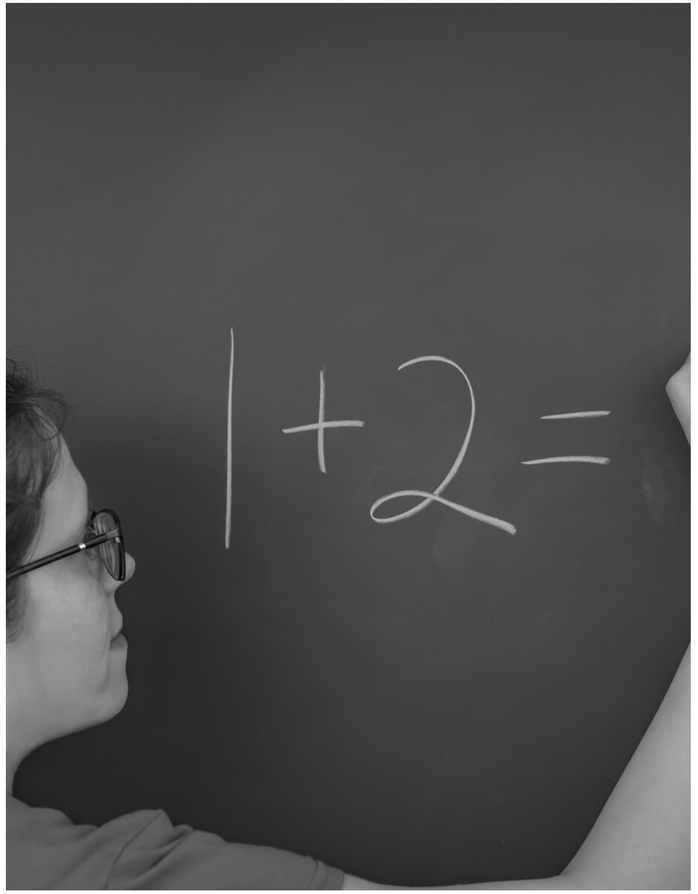
2. What are blockers that might stop us from reaching these milestones?

3. How can we solve or address these blockers?

LEARNING RESOURCE E

ASSIGNMENT & GROUP DISCUSSION

25-30 mins - expand until 45 minutes



Show class the video: How to Set Goals, Tasks and Milestones When Making a Plan (4:39)

This video gives an introduction into how you can do exactly that, to break your overall aim into an actionable plan. Remind students that hierarchy is key; they have to be able to prioritize appropriately and distinguish milestones from tasks.
Ask students to fill in each of the milestones they want to reach on the way to their ultimate goal (using the slides provided). You can opt to complete the activity in class or have it as an assignment to return.

Ultimate Goal

This is the bigger goal we want to achieve, which we will break down into smaller, achievable milestones below.

Things to do

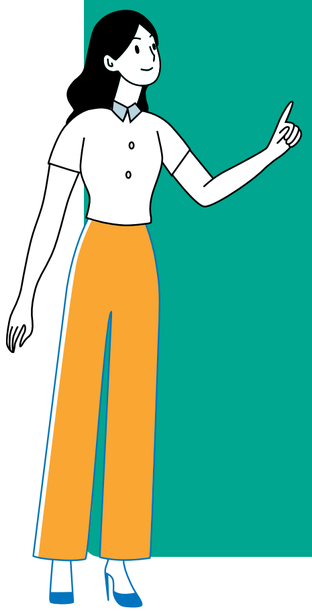
Things to do

Things to do

Things to do

Things to do

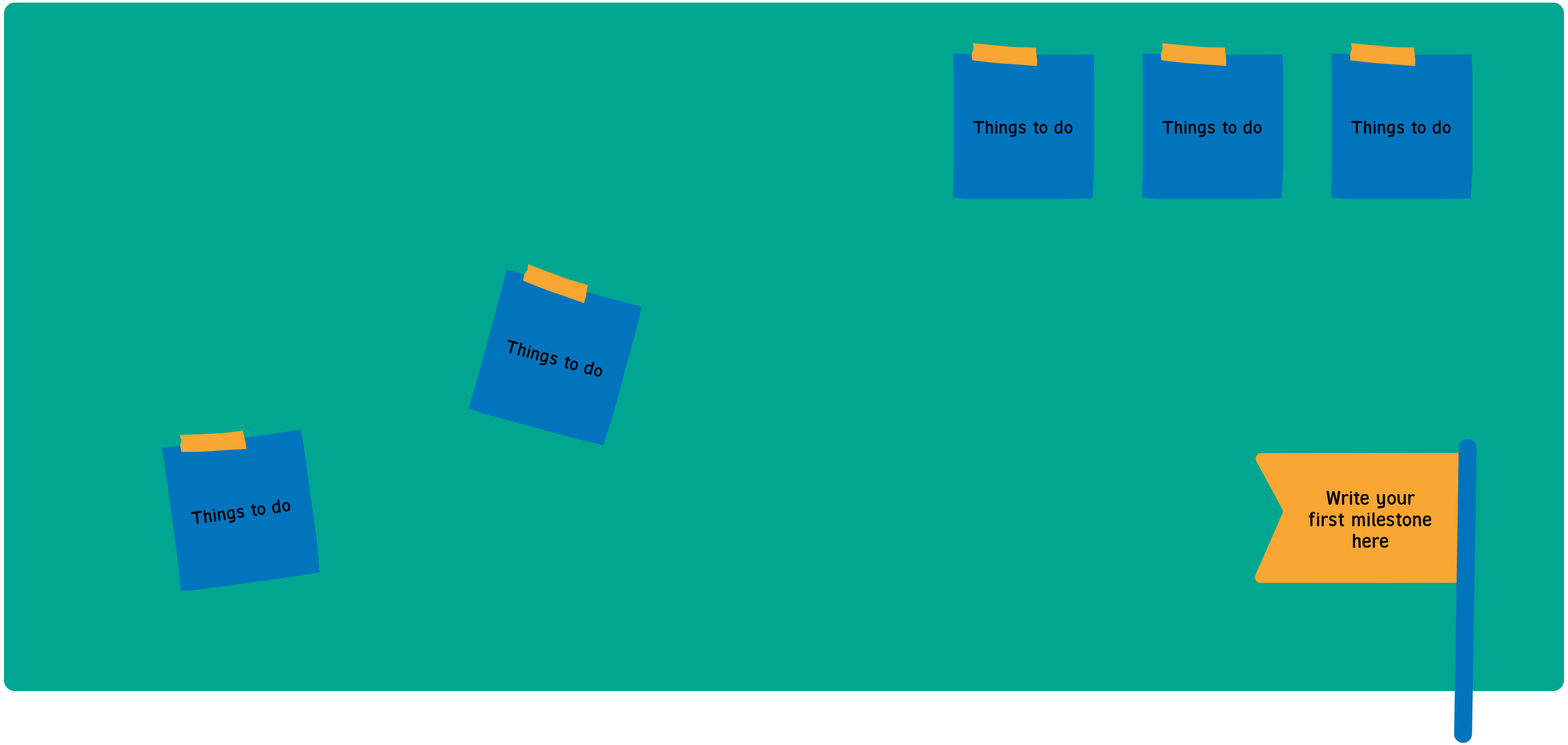
Write your ultimate goal here



Milestone 1

This is our first milestone we need to reach to inch closer to our ultimate goal.

Tip: Collaboration makes teamwork easier! Click "Share" and invite your students to fill this up. Ask them to copy and paste the slides for the milestones and complete it individually, one for each milestone.

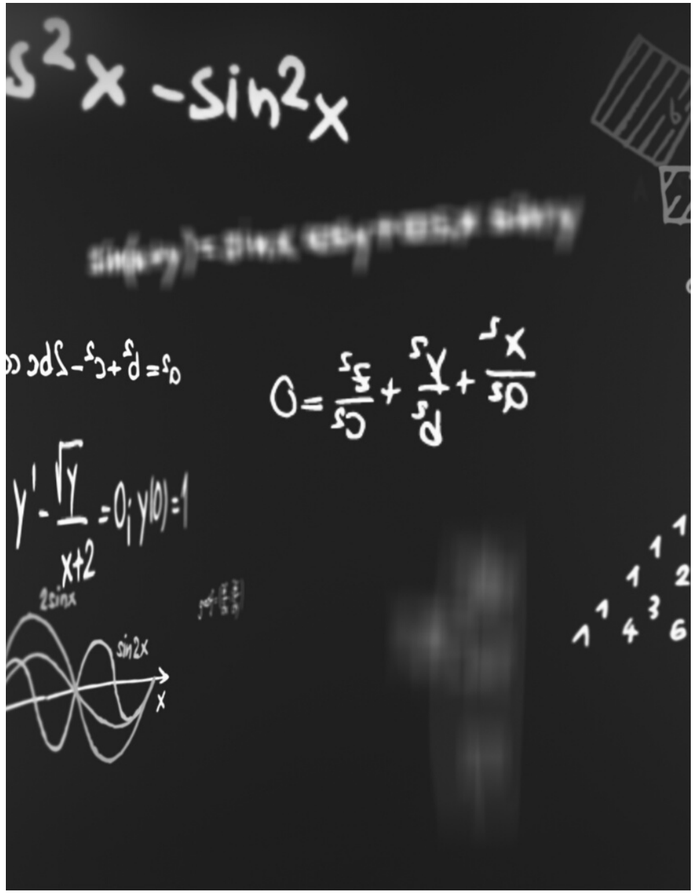


WESTEM

LEARNING RESOURCE E

SELF-REFLECTION

25-30 mins - expand until 45 minutes



Ask students to self-reflect on their perceived understanding of challenges/barriers to successfully completing their studies by completing the two worksheets: barriers and solution and the visual roadmap.

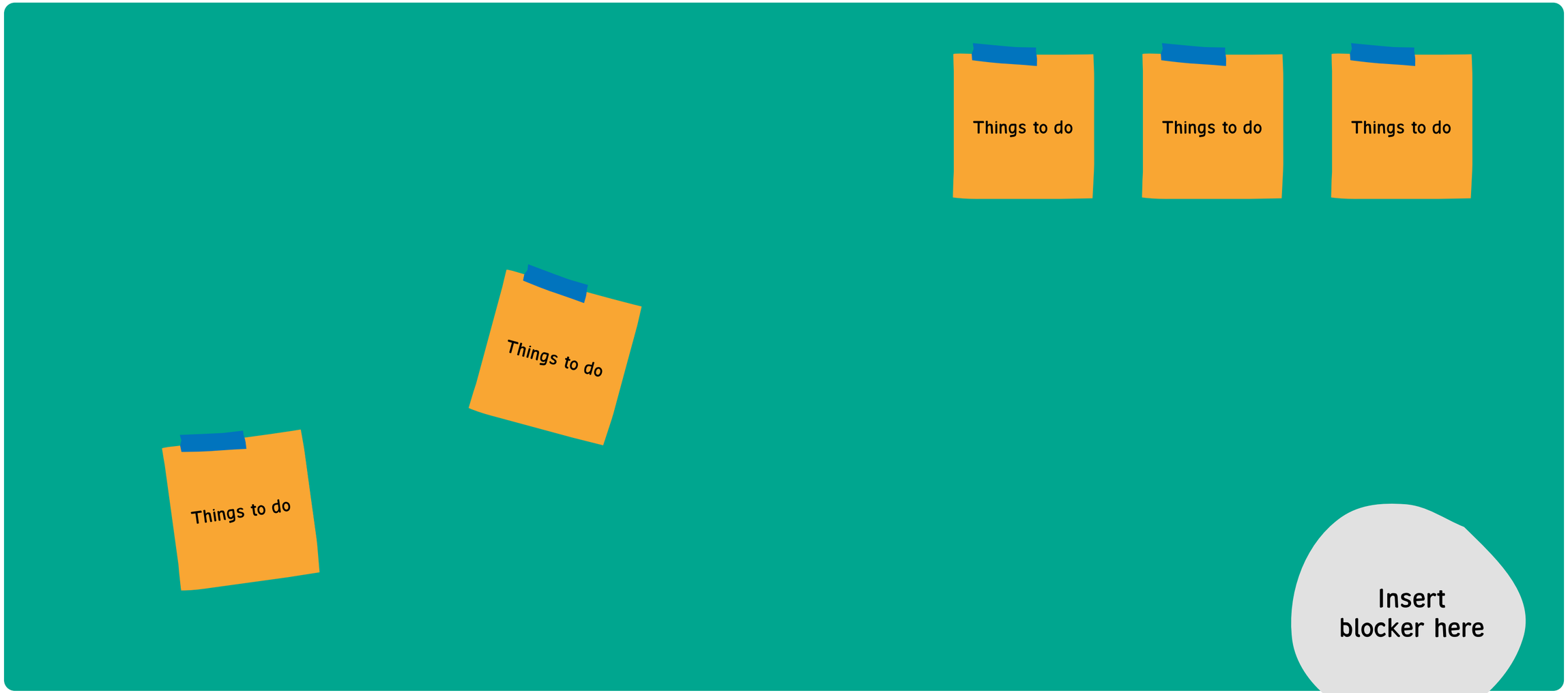
Clarify that they can complete these parts anonymously if they feel uncomfortable. Display the slides with some of the completed sheets from the students.

Follow up with a discussion in the whole class to consider:

- How does gender affect success in STEM studies?
- Do they feel supported in their studies, especially considering their gender and background?
- What are some ways to address barriers they face? Does having a fixed mindset help?

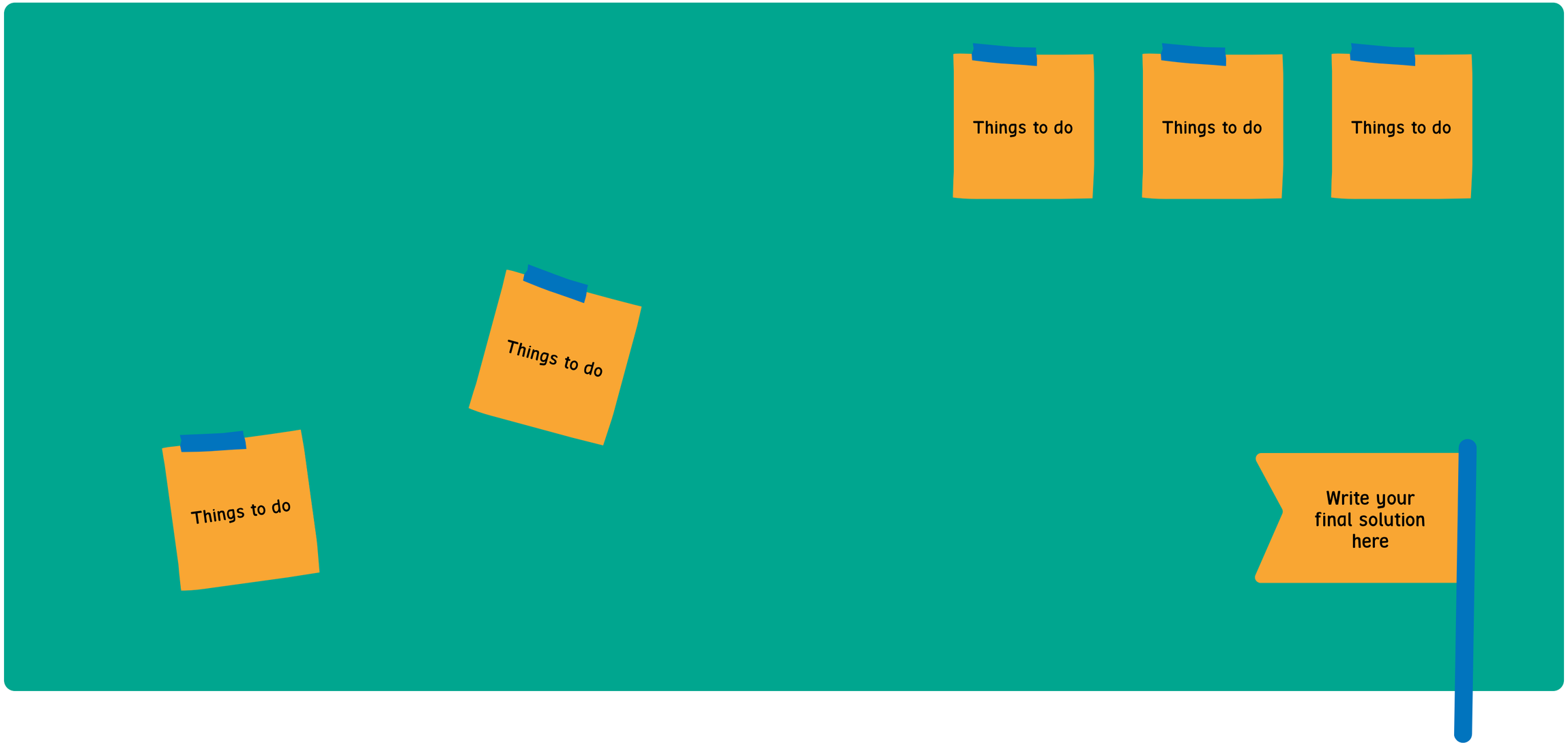
Blockers

What are factors that might stop us from reaching our milestones and ultimate goal? How do these relate to your gender, or other characteristics of diversity, if at all?



Solution

How can we solve or address these blockers to reach the ultimate goal?



STEM Studies

Visual Roadmap

Ultimate Goal

Write your ultimate goal here

Milestone #3

Write your third milestone here

Milestone #2

Write your second milestone here

Milestone #1

Write your first milestone here

1

Fill in the flags with milestones showing major progress of the team's journey towards the goal.

2

Write down in the notes any tasks you need to do to reach the milestone and place it on the mountain.

3

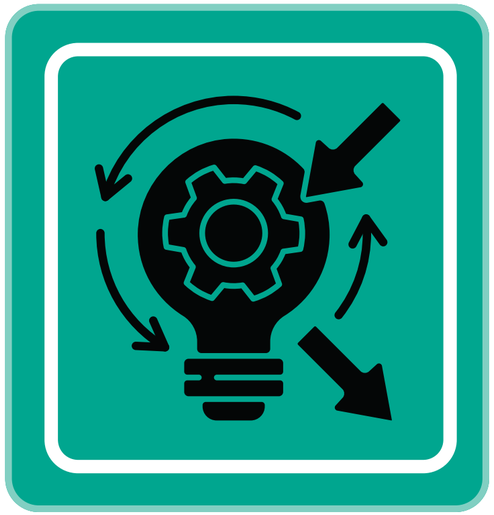
List down any blockers related to gender or other diversity characteristics that may be stopping you from reaching these milestones and place it on the mountain.

Insert blocker here

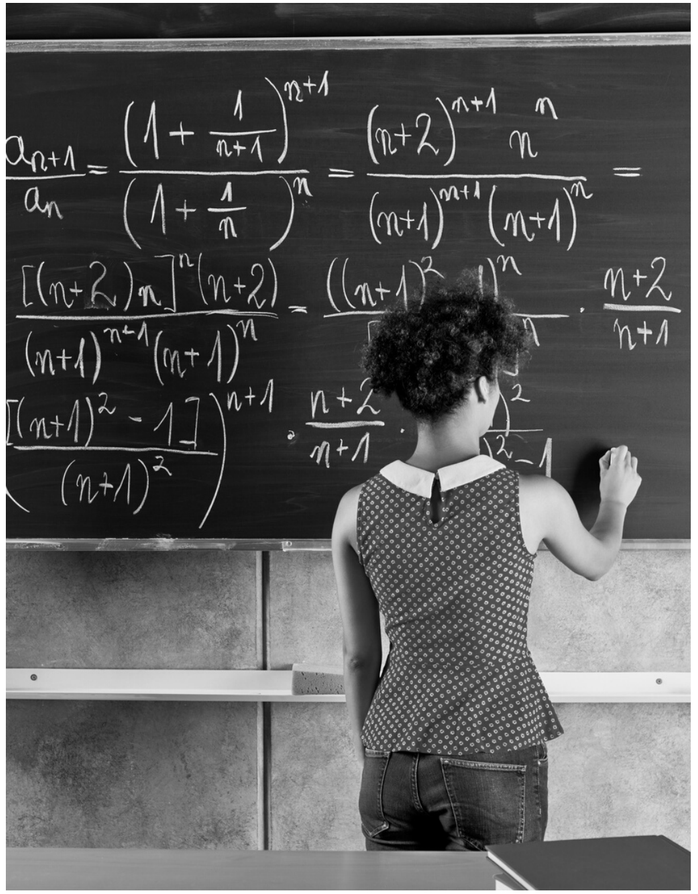
WESTEM

LEARNING RESOURCE E

ACTION



25-30 mins - expand until 45 minutes



Show this TED Talk: Derek Sivers - “Why You Need to Fail to Succeed” (5:24)

Conclude the activity with a group activity and discussion for action to take towards addressing challenges/barriers to successfully completing studies.

Ask students to consider the work on previous worksheets and synthesize what next actions are appropriate to move forward as a group and individually in this course.

Use the templates in the next two slides and have students express their opinions collaboratively.

Action Items

Let's go back to the previous worksheets and synthesize what next actions are appropriate for us to move forward as a group and individually.

1. Write action items in the boxes.

2. Drag your photo under the action item you want to own.

Action Items

1. Write action items in the boxes.
2. Drag your photo under the action item you want to own.

Action 1

Action 2

Action 3

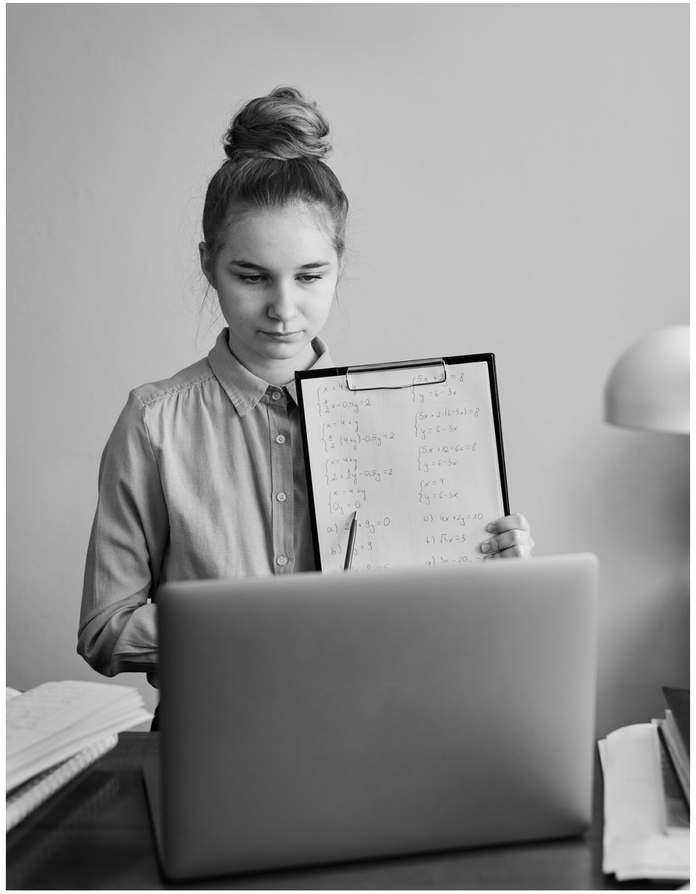
Action 4

The mind is just like a muscle — the more you exercise it, the stronger it gets and the more it can expand.

Idowu Koyenikan

LEARNING RESOURCE E

RESOURCES



Internet and computer access for online videos and Canva templates

3 Truths About “Overnight Success” No One Tells You (marieforleo.com)

Why Overnight Success Is a Myth Holding You Back

The Myth of the 'Overnight Success' and How Brilliant Ideas Actually Emerge

WESTEM

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