

# Learn STEM

Open Universiteit  
[welten-institute.org](http://welten-institute.org)



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<https://www.youtube.com/watch?v=Vi53WzYF6hY>

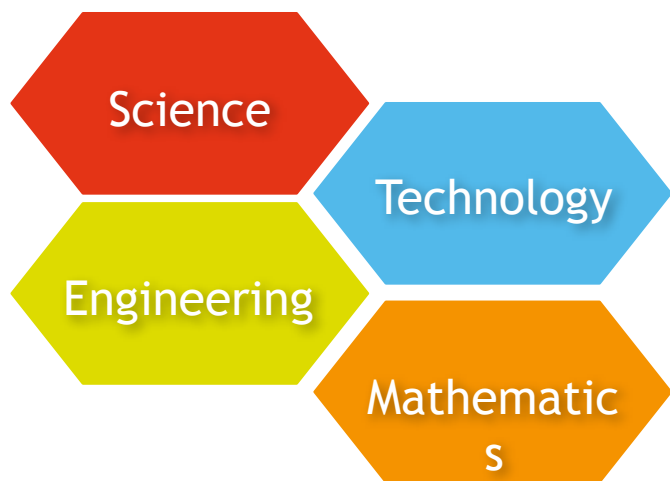
# About Me

- Guido van Dijk
- Erasmus+
  - Learn STEM projectgroep
  - CultApp
- Teacher Computer Science at SOML
- Practor Cloudengineering Techniekcollege Rotterdam
- Member of Agile in Education World Wide
- Research about Agile Learning and transitions in Education
- Co-Owner of LeX



# Introducing STEM

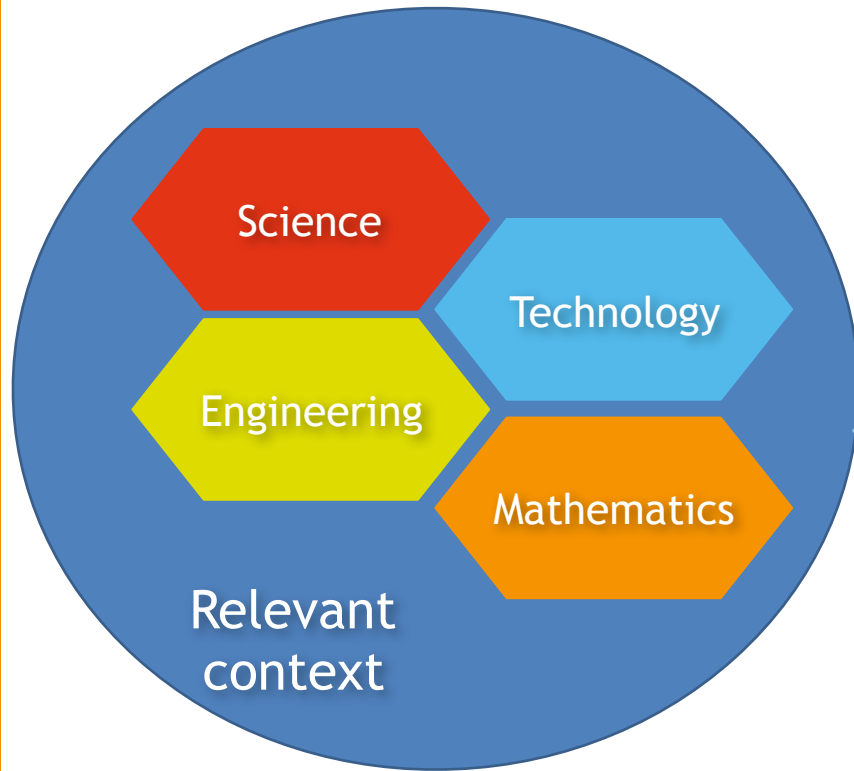
STEM is an acronym used to group four subjects:



Those subjects have many elements in common; therefore, they can follow similar pedagogical approaches and teaching methods.



# Introducing STEM



It can even occur that other subjects are also included in a STEM project, just consider arts, economics, historic perspectives...

**How can  
we improve  
STEM education?**

**We are**

*Learn*  
**STEM**






# Learn STEM network



[www.learn-STEM.org](http://www.learn-STEM.org)

Learn  
STEM



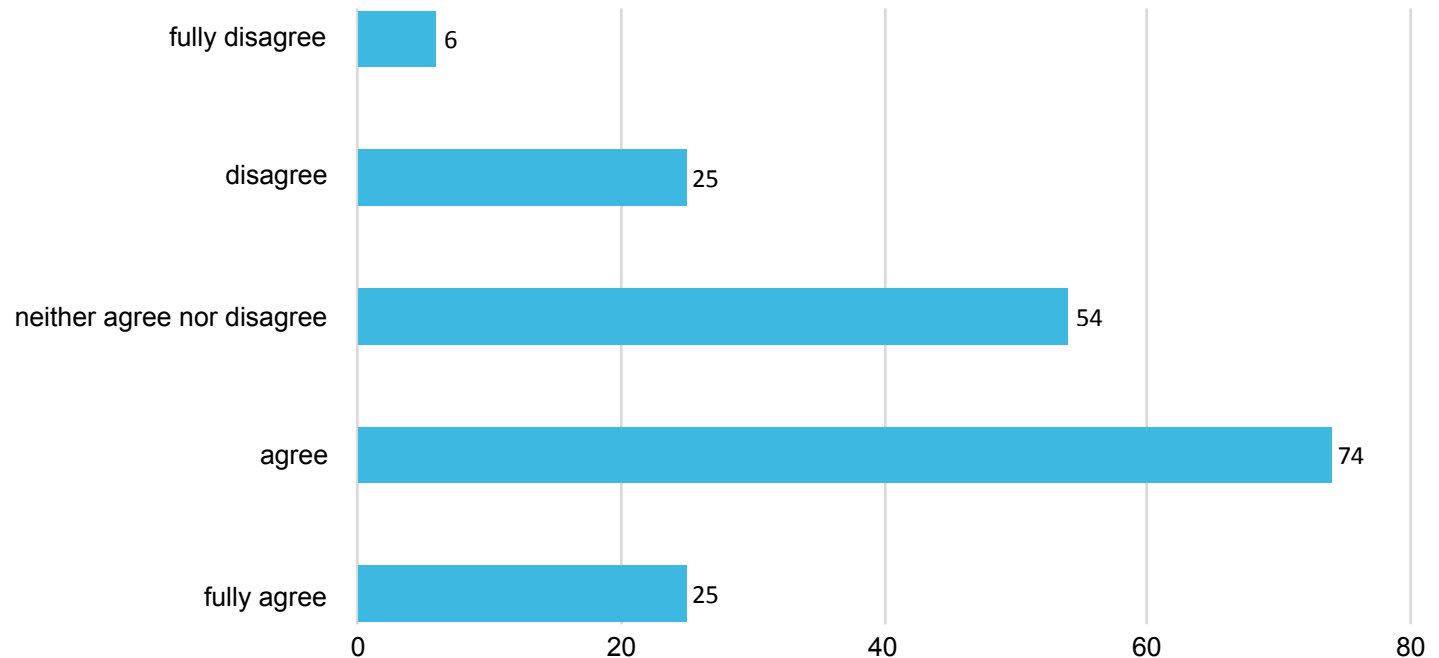
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**STEM education should be self-regulated by the learner.**

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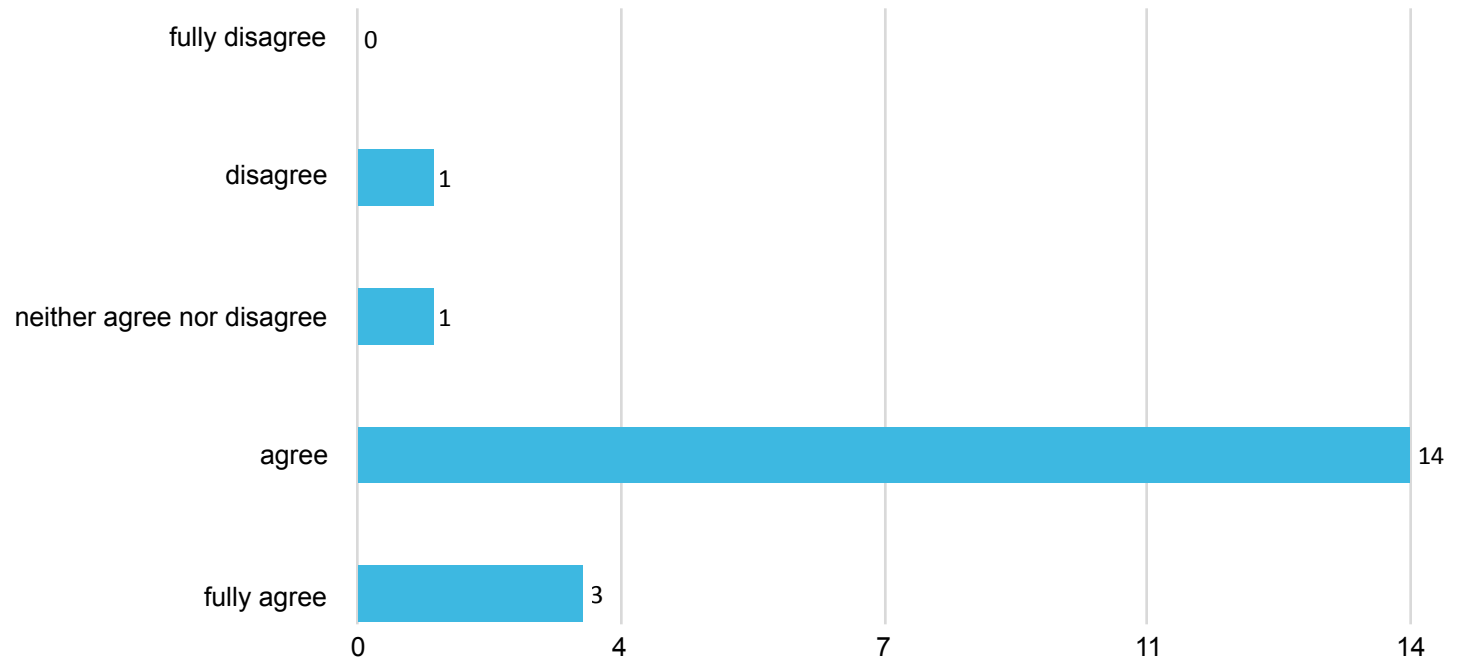
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**Point of view teacher**




Your beliefs on STEM: How much do you agree / disagree with the following statements?  
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**Point of view headmasters**



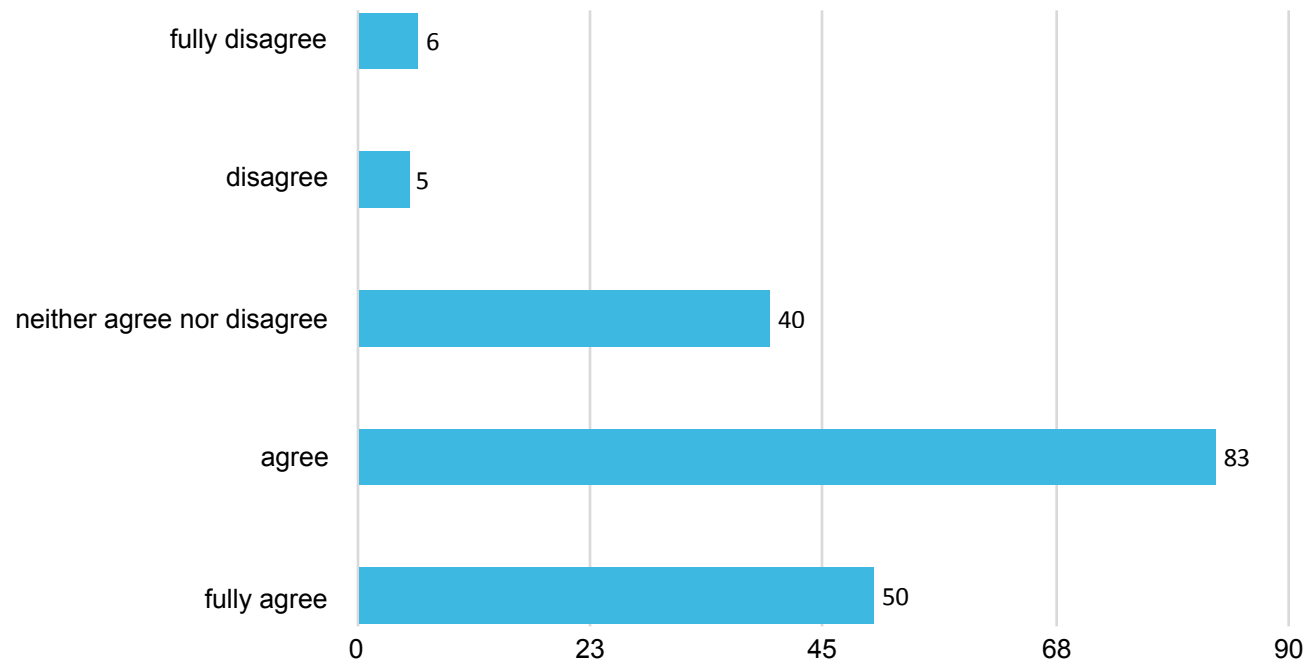




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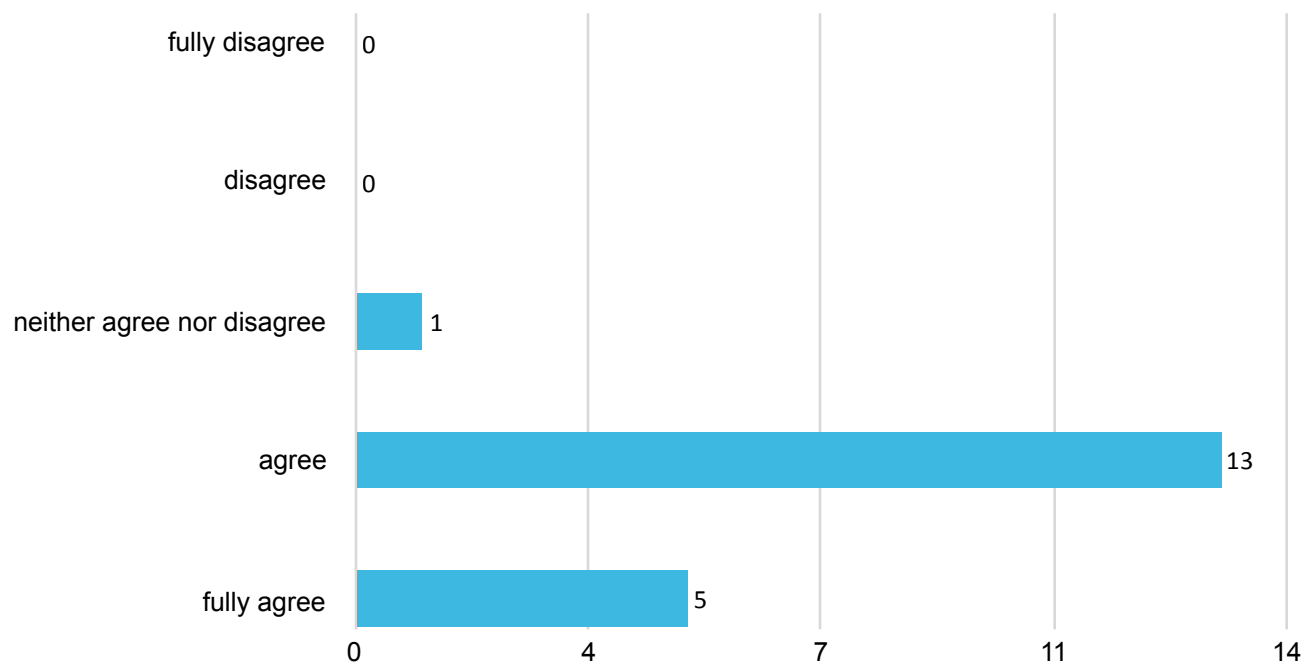
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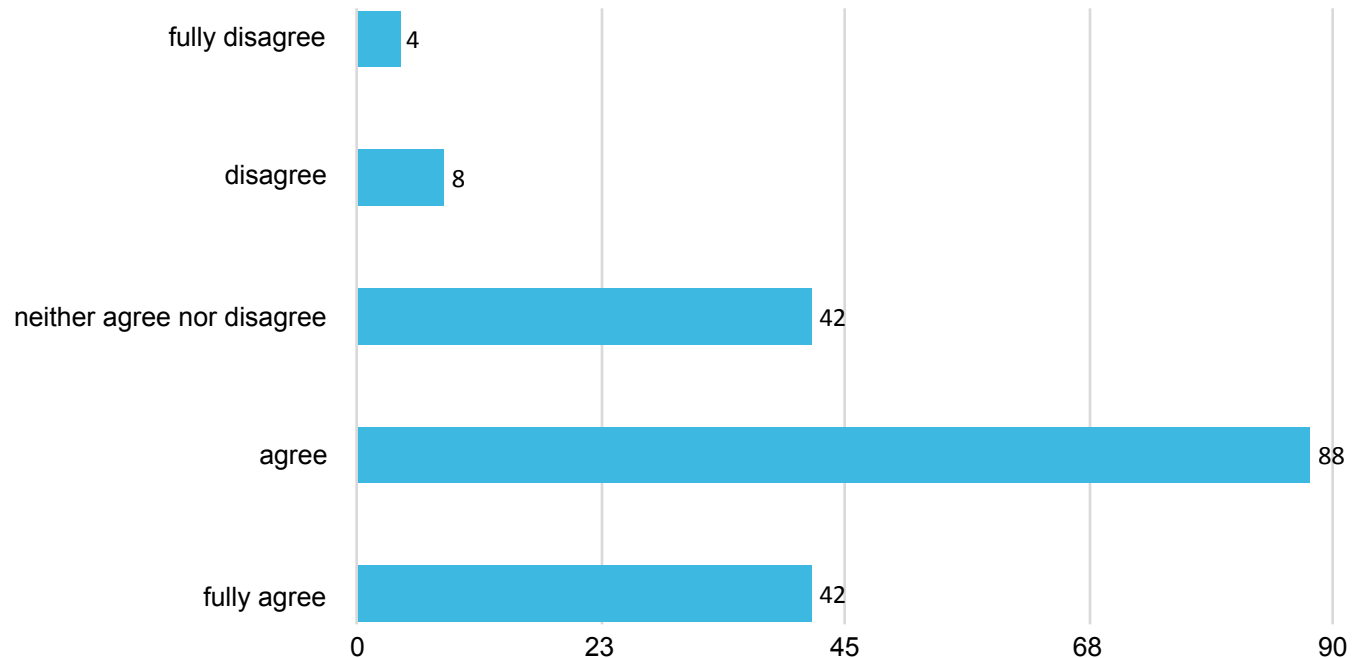
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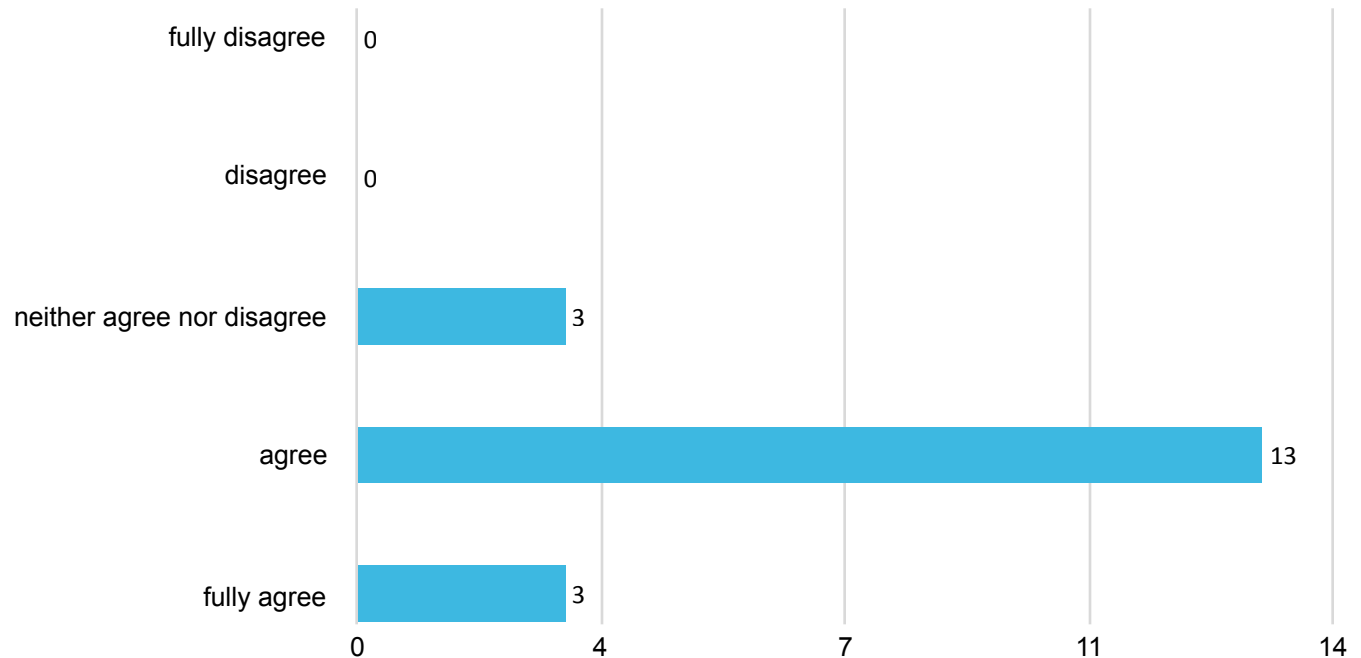
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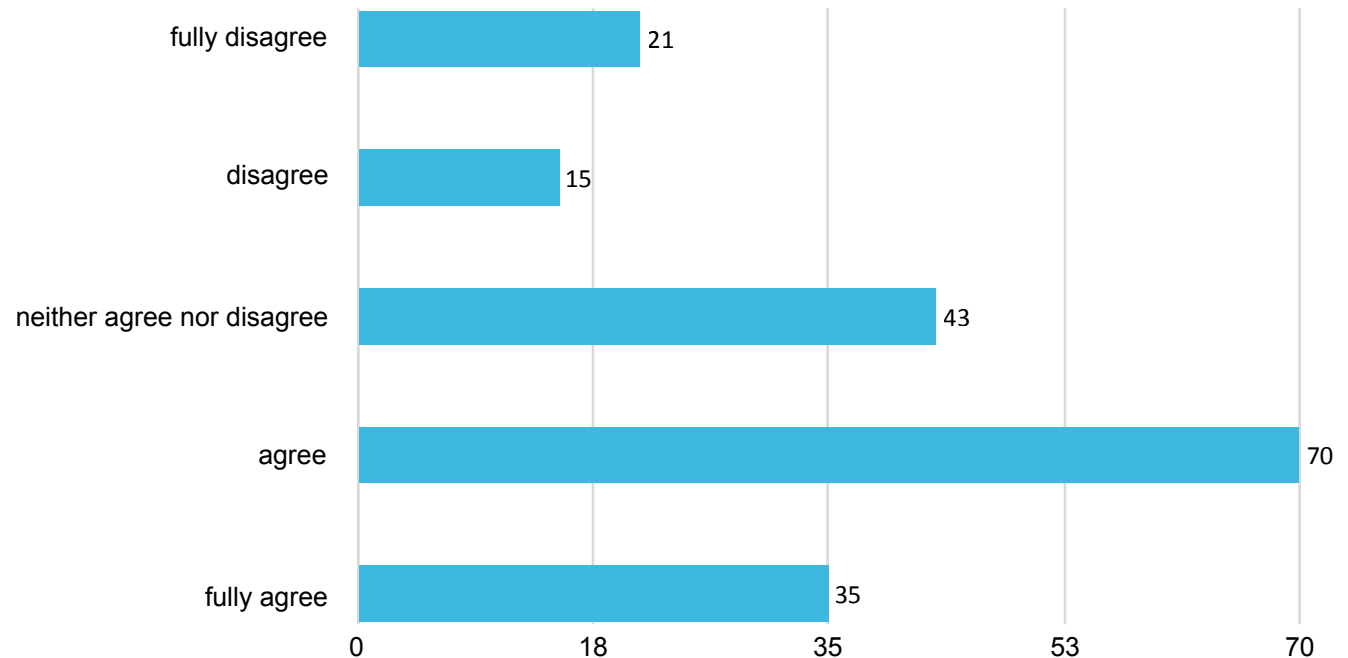




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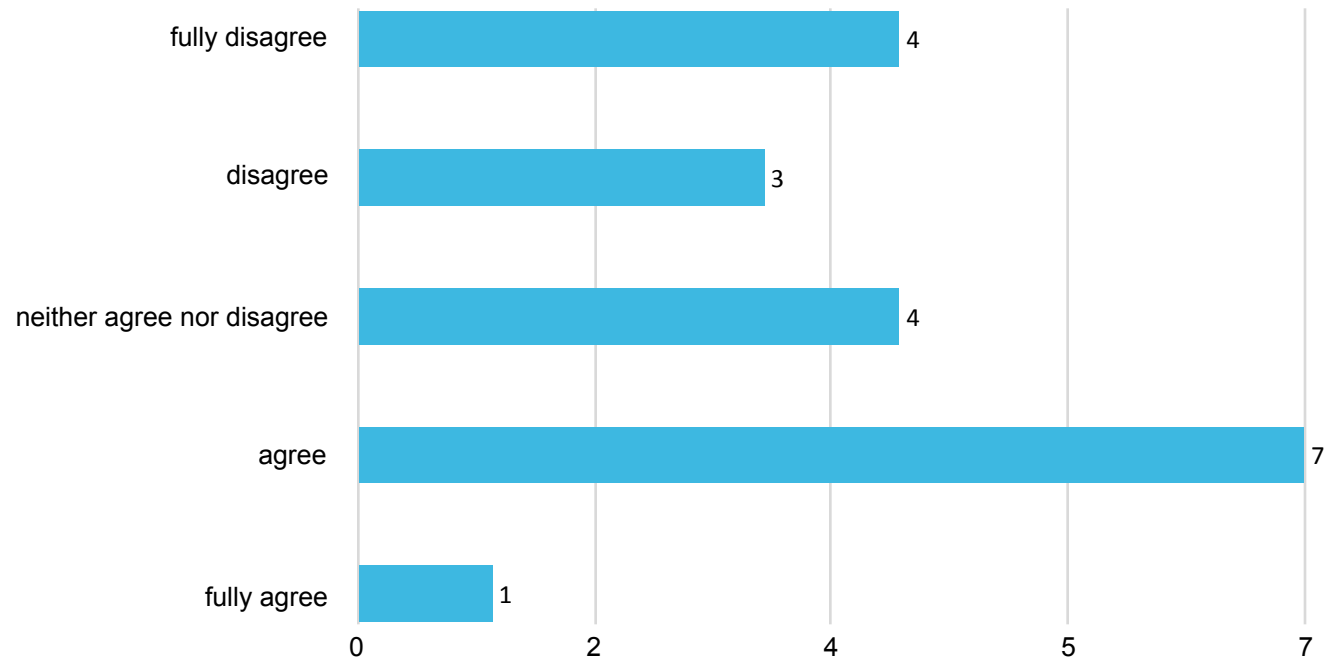
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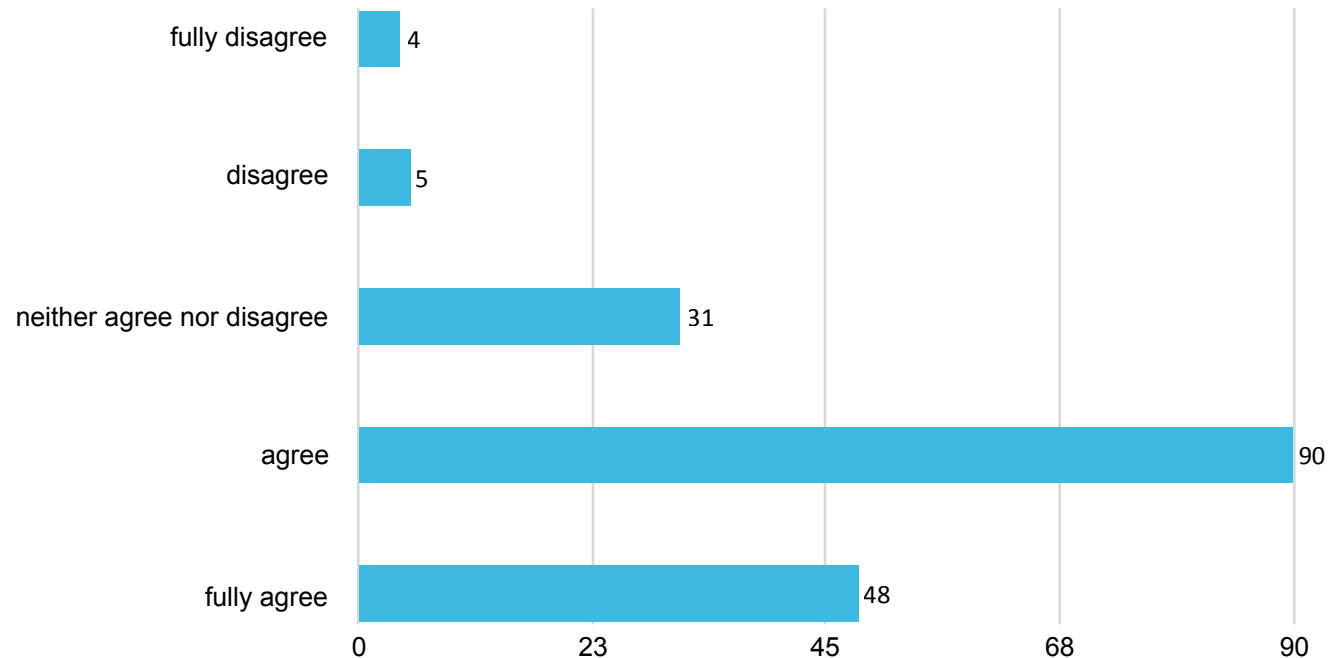




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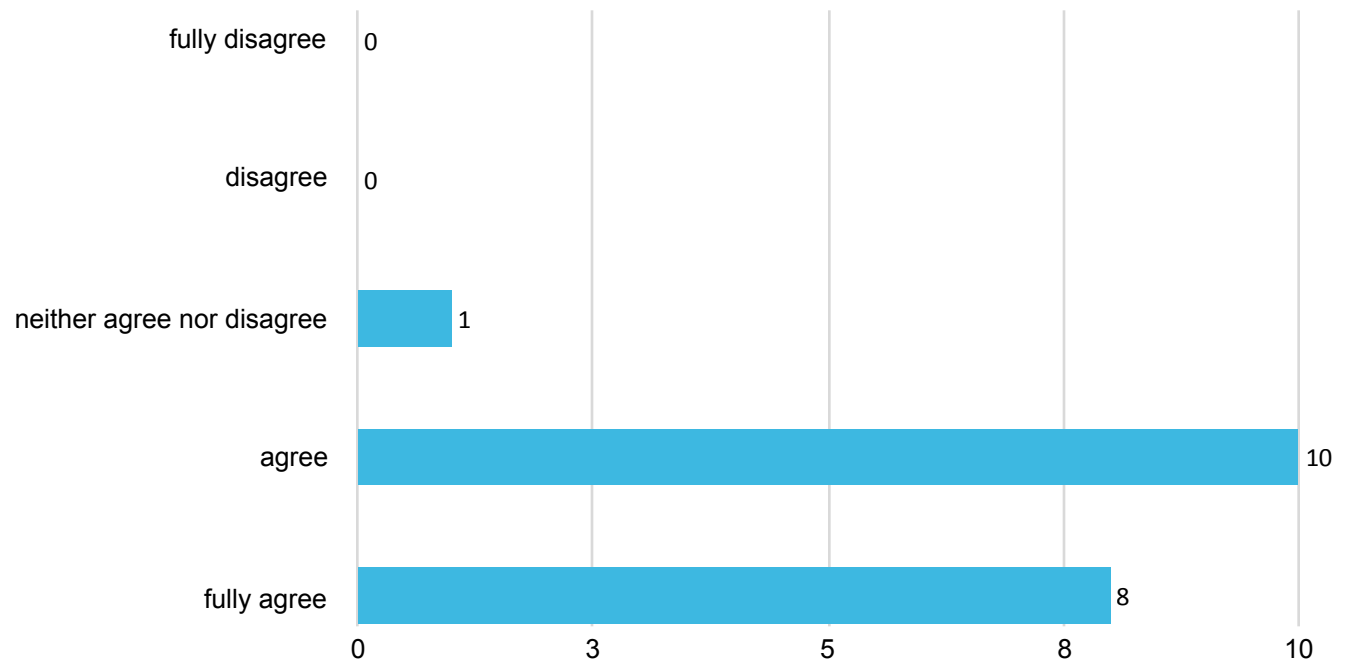
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# Topics requested

The top 7 of the content that needs to be included in the Teacher Training Programme presented by the **teachers** is:

1. Development of interdisciplinary modules (90)
2. Soft skill enhancement (87)
3. Open content material (75)
4. Learner-centred pedagogics (74)
5. Self-regulated competence building (73)
6. Curriculum design (68)
7. Holistic view on STEM (65)

[www.learn-STEM.org](http://www.learn-STEM.org)



# Teachers concerns

## INTEGRATION

Integration of different topics into STEM versus separate topics: requirements of curriculum, national exams, expectations of higher education...

## ORGANISATION

Curriculum, schedules and education systems: existing law, regulations and tradition isn't (always) favourable for the implementation of STEM education;

School organisation: sometime too rigid, STEM education needs a flexible organisational approach;

Infrastructure and resources: introduction of STEM needs supplementary investment.

# Teachers concerns

## TEACHERS

Teacher: not well enough prepared for STEM teaching;

Pedagogics and didactics: a huge need for pedagogical and didactical support

Assessment: how to assess a STEM-project (larger groups, interdisciplinary, process versus product, team work...);

Teacher initial training: better preparation of starting teachers;

Support: better support for the mind shift towards STEM teaching of experienced teachers.

## LEARNERS

Learners: improve the motivation of (STEM) learners;

# Headmaster concerns

## INTEGRATION

Integration of different topics into STEM versus separate topics.

## ORGANISATION

Curriculum, schedules and education systems;

School organisation: sometime too rigid;

Infrastructure and resources.

## TEACHERS

Teacher: not well enough prepared for STEM teaching;

Pedagogics and didactics.



# Learners requested

Learners find that their teachers could make STEM subjects more interesting for them by:

## INTEGRATION

Integration of different topics into a STEM-project, include real life problems

## ORGANISATION

Curriculum, schedules and education systems: non-formal learning, multi-media, more practical work, more experiments,

School organisation: students ask a more flexible approach, outside activities, study visits

# Learners requested

## TEACHERS

Teacher: include real life and practical exercises, now not the case, find better prepared teachers for STEM teaching;

Pedagogics and didactics: use of activating and motivating teaching methods, less frontal teaching, develop the 'investigation skills', step away from lecture-style teaching and move towards more practical exercises

Assessment: correct and transparent ways of assessing

## LEARNERS

Learners: STEM improves the motivation (but not only STEM), STEM education is important for my future employability and career opportunities

# Explorative Pedagogies

## The four phases of Oh, DEAR!

Teacher cycle



Learner cycle



# Open STEM Learning

**Learn STEM for school innovations:**

- **Pedagogical Model for Open STEM**
- **Innovative open tools and resources**
- **Teacher training and OER materials**

# Pedagogical Model

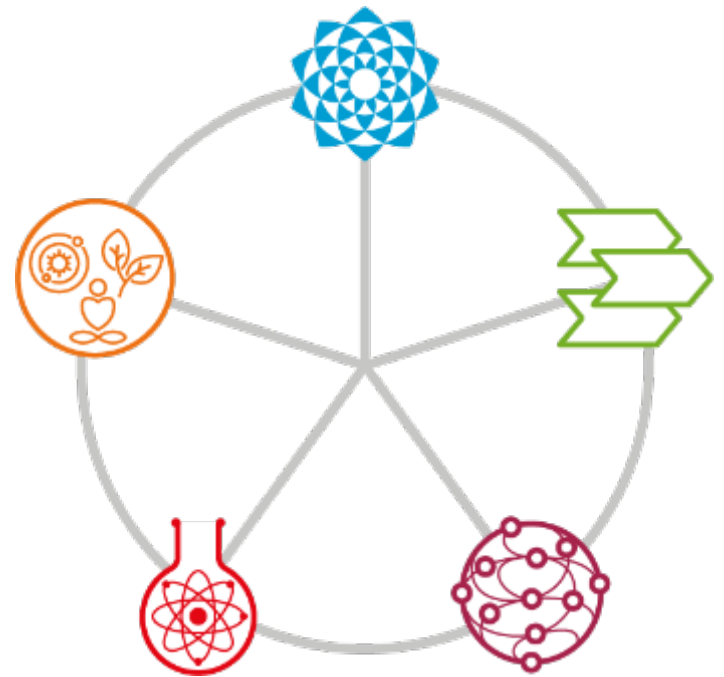
COMPLEX

PROCESS-ORIENTED

HOLISTIC

PRACTICAL

SOCIAL



# Learn STEM is COMPLEX

- Is interdisciplinary and connects numerous subjects
- Underlines common principles and approaches
- Represents the complex relations between Science, Technology, Engineering and Mathematics
- Supports a complex growth of the learner: intellectual, emotional, and social development



# Learn STEM is PROCESS-ORIENTED

- Learners can explore STEM in a self-regulated and creative way
- Processes are iterative, focusing on:
  - *the learners' development*
  - *training basic skills*
  - *building profound knowledge*
- Practicing, repeated training and applying knowledge reinforce abilities, skills and competences



# Learn STEM is HOLISTIC

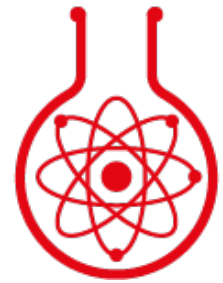
- Focuses on understanding STEM general idea in STEM rather than accumulating specialized knowledge
- Emphasizes the ethical component of STEM
- Contributes to the learners' personal development
- Explains and explores the environment on different levels using different models and even 'languages'
- Is not simply the sum of many components, but holistic for its various interrelations





# Learn STEM is PRACTICAL

- Supports learners in acquiring knowledge, skills and competences through real-world experiences and observations
- Practical experiments are essential for the learning process and for the development of practical skills
- Practical lab work develops creativity and follows the iterative learning cycle
- Practical exercises stimulates learners' interest and engagement



# Learn STEM is SOCIAL

- Is a Social activity with human interaction and emotional involvement
- Is learner-centered (*aiming to impact individuals and the society*)
- Is inclusive, gender balanced and values diversity
- It creates a trusted environment for the learning process, where human diversity and self-directed learning are core elements



# Learn STEM for you

**Results from Mixed Methods research:**

- **Pedagogical Model**
- **Teacher Training Programme**
- **Open Online Course (March 2020)**

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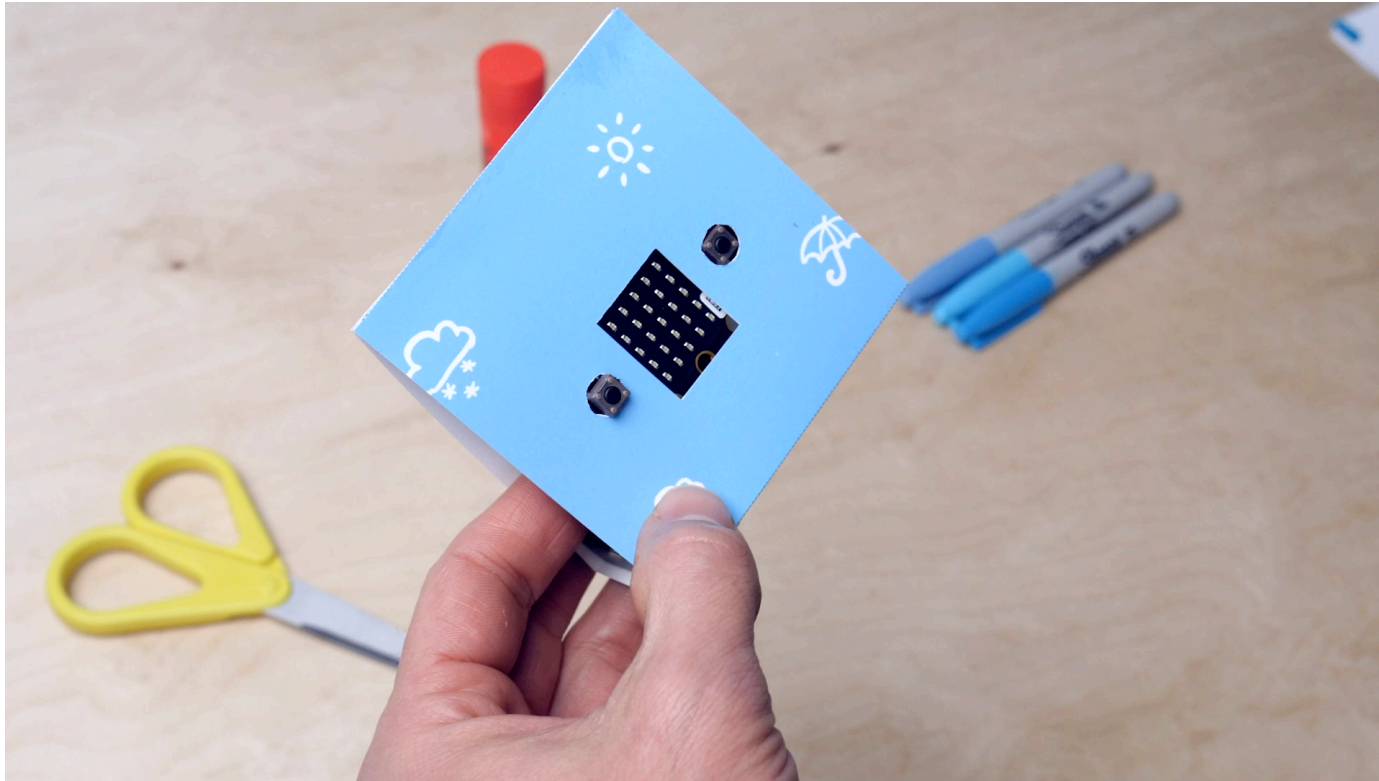
**Free to use & to adapt!**

# Learn STEM example



<https://youtu.be/gJNOKjP7sYM>

# Learn STEM example



<https://youtu.be/Qx2Ol1ixVN0>

<https://kidzcourse.com/make-microbit/>





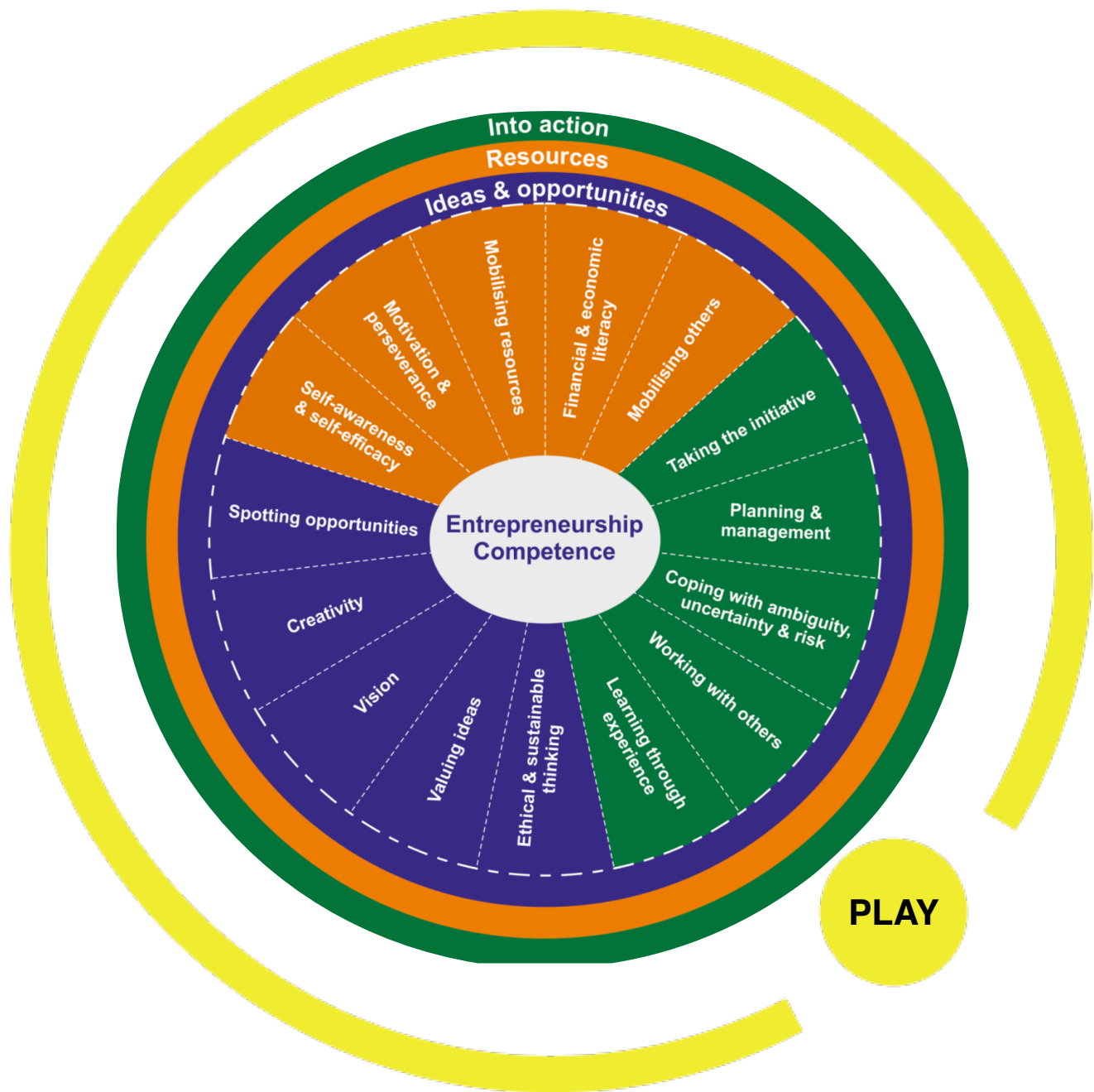


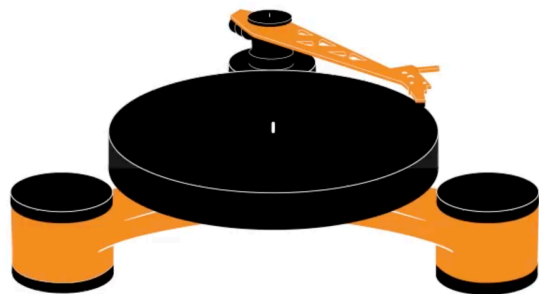


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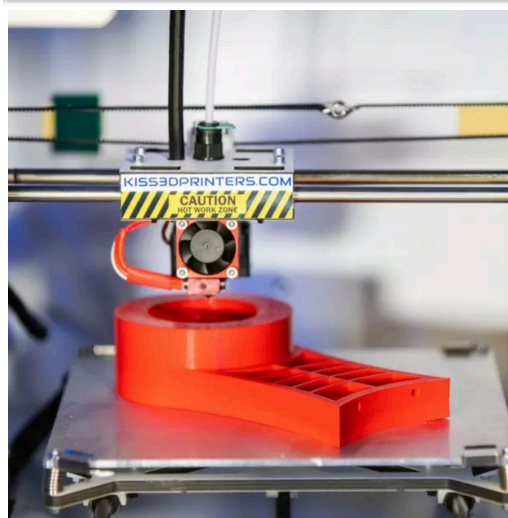
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STEM







# Lenco-MD<sup>®</sup>



## MODULARITY

The Lenco-MD consists of multiple modular units. These modular units can be interchanged allowing you to adapt the turntable to suit your particular situation. On a sunny day, plug in the 'Lenco-MD Solar Module', combine it with the 'Lenco-MD Speaker Module' and you are set up to enjoy your favourite LP's right in your backyard. More into headphones and streaming? Plug in the 'Lenco-MD Bluetooth Module' and you are ready to go wireless.

But there is more. The modularity also enables you to upgrade your Lenco-MD player to a High End version, step by step, over time. Start with a 3D printed version and slowly upgrade parts to high quality metal / acrylic parts. More on this to come.



**GAIAZOO EN DE OPEN UNIVERSITEIT  
SAMEN TEGEN PLASTIC**

**Plasticvervuiling van de oceanen wordt door het Milieuprogramma van de Verenigde Naties gezien als een van de meest urgente milieuproblemen. Ook in rivieren en beken in onze eigen omgeving ligt veel plastic afval. Daarom slaan GaiaZOO en de Open Universiteit de handen ineen om de strijd tegen plastic aan te gaan.**

**Plastic Speurtocht**  
 Wat weet jij al over plastic vervuiling en weet jij wat je er zelf tegen kan doen?

**Plasticvervuiling**  
 Plastic is een van de meest duurzame materialen die we kennen, en tegelijk een van de grootste vervuilers van onze aarde want plastics blijven heel lang aanwezig in het milieu.

**Plastic in het milieu**  
 Er komt jaarlijks 8 miljoen ton plastic afval (3% van de jaarlijkse productie) in onze zeilen terecht. Dit komt voor 90% van slecht gemiddelde afvalstortenplaatsen of toerisme; maar ook van bronnen op zee, zoals netten van de visserij (20%). Plastic ligt inmiddels zelfs in de diepevelen, en in het ij van Antarctica (en op afgelegen plekken zoals Henderson Island).

**GEBRUIK VAN PLASTIC WERELDWIJD**

- Per minuut worden ongeveer 1 miljoen plastic flessen geproduceerd.
- Per jaar worden er ongeveer 1 biljoen tassen gebruikt. Deze worden gemiddeld maar voor 15 minuten gebruikt.
- In duizenden verzorgingsproducten wereldwijd zitten minuscule microplastics.
- Versleten autobanden komen in het milieu terecht (0,8 kg pp/per jaar).

**Microplastics en microplastics**  
 Microplastics zijn grote stukken plastic. Onder invloed van de zon, golfslag en wind worden ze steeds kleiner. Als ze kleiner dan 5 millimeter zijn noemen we ze microplastics. Voor bepaalde doeleinden zoals scrub, worden ook microplastics gemaakt.

**Plasticvervuiling & dieren**  
 In een groot onderzoek bleken 683 mariene soorten op de een of andere manier in aanraking te zijn gekomen met zeefval. 17% van deze soorten hebben volgens de Internationale IUCN Rode Lijst van bedreigde soorten de status 'ernstig bedreigd'.

- Vogels leven vaak op afvalbergen. Er is voor hen veel voedsel te vinden. Helaas eten ze daardoor ook veel plastic; of ze raken erin verstrikt.

Microplastics: iets groter dan een zandkorrel...

Learn  
**STEM**



STUDENT

TITLE

TEACHER

Learn  
STEM

Idea

COMPLEX

PROCESS-ORIENTED

HOLISTIC

PRACTICAL

SOCIAL

CREATOR(S)



Learn  
STEM

# Your STEM idea



# Learn STEM

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