

13 febbraio 2026 sala conference CNI via XX settembre, 5 Roma



# Engineering the Future: STEMinsieme

Come far appassionare gli studenti alla cultura tecnica

**Carmen Panepinto Zayati**

PhD Biorobotics - LM Bionics Engineering - LT Ingegneria Elettronica





# insieme  
STEM

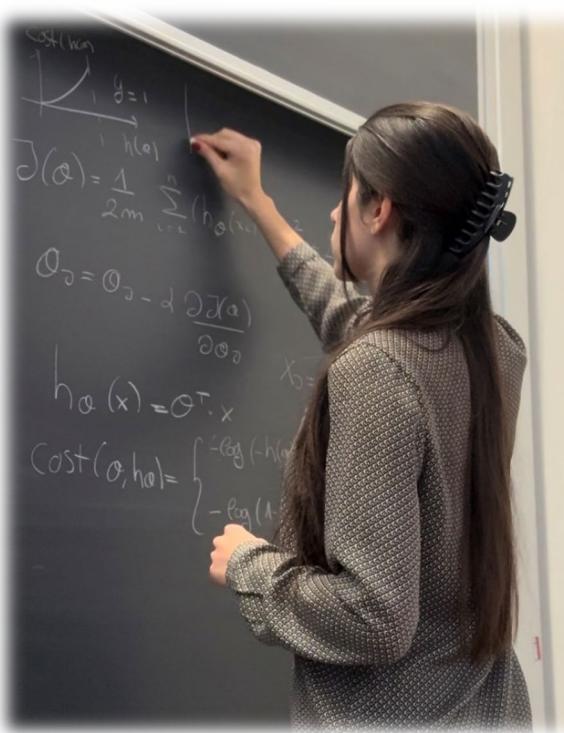
CONSIGLIO NAZIONALE  
DEGLI INGEGNERI

# Breve Biografia

- Dottoranda in Biorobotica alla Scuola Superiore Sant'Anna
- LT Ing. Elettronica, LM Bionics Engineering



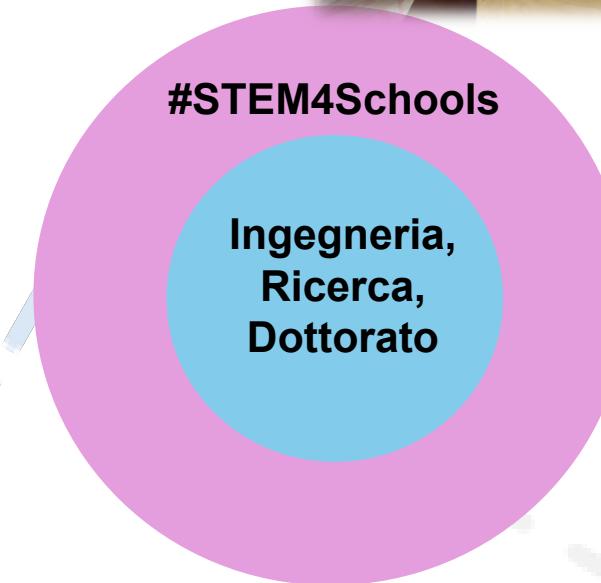
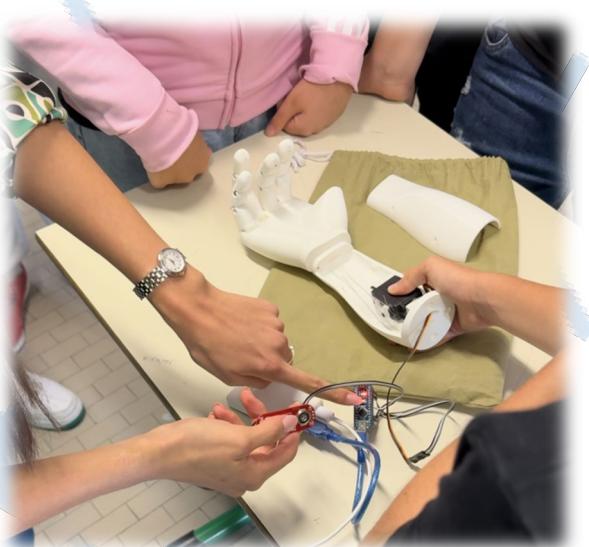
Ingegneria,  
Ricerca,  
Dottorato



Engineering the Future:  
STEMinsieme

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- **Formatrice e fondatrice del progetto #STEM4Schools di orientamento scientifico**

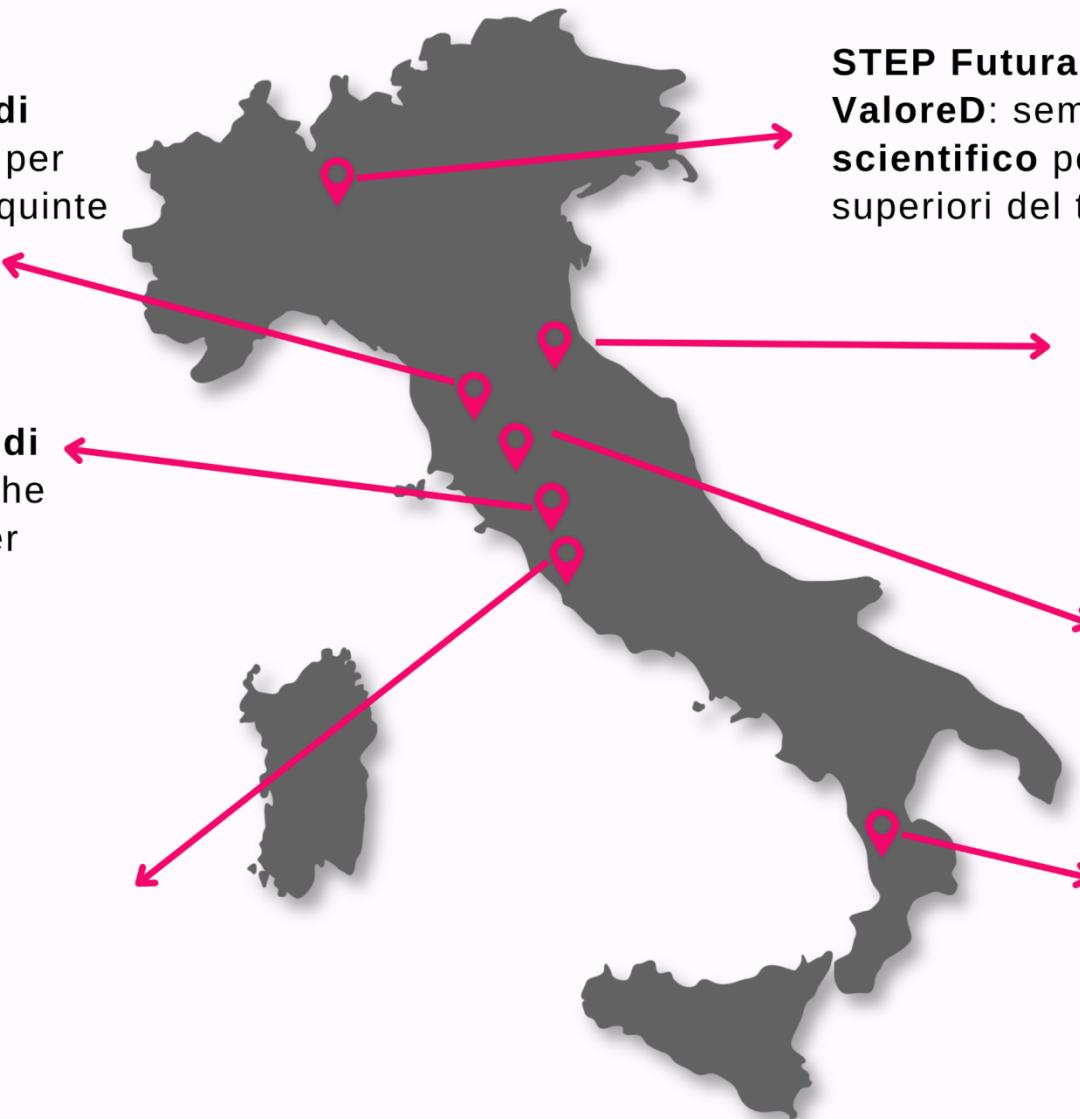


ES



# ALCUNE TAPPE DEL PROGETTO #STEM4SCHOOLS

Licei Lunigianesi: **seminario di orientamento all'ingegneria** per studenti delle classi quarte e quinte



**STEP Futurability District, Fastweb & ValoreD:** seminari di **orientamento scientifico** per studenti delle scuole superiori del territorio

**Meeting di Rimini&ValoreD:** workshop pratici per bambini di introduzione alla scienza che ci circonda

Istituto "IC Massa 3": due edizioni di un corso intensivo di 14 ore di **introduzione alla biorobotica** per scuole medie

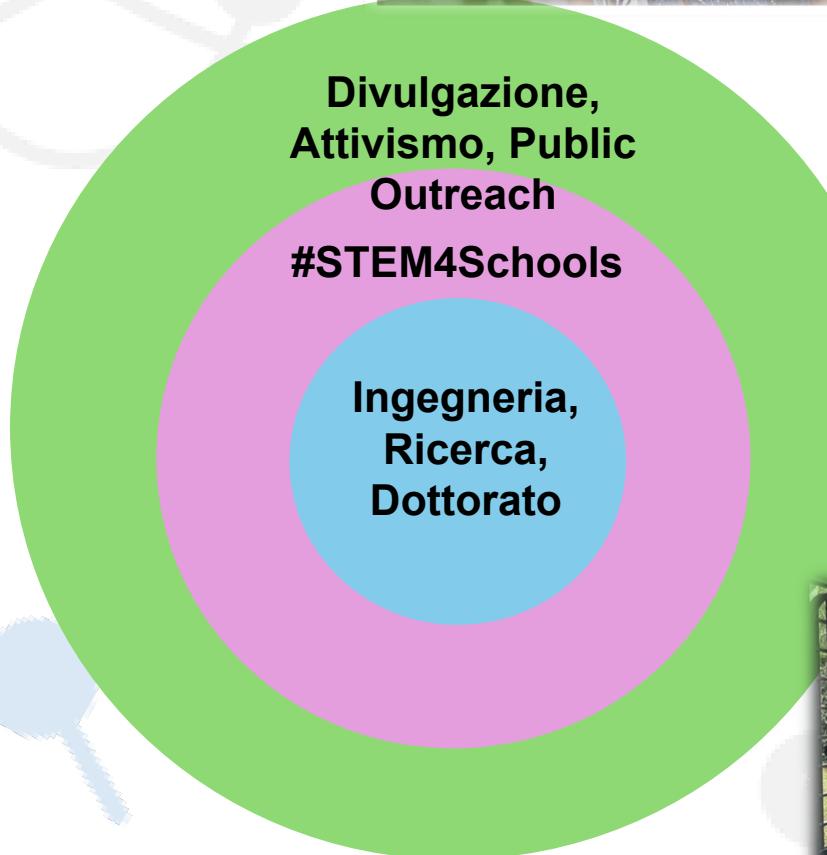
Istituto "De Andrè": **open day di biorobotica** con attività pratiche introduttive alla biorobotica per studenti delle medie

Scuola Superiore Sant'Anna: Seminari di orientamento nel progetto "**STEM le ragazze si mettono in gioco**" e "**MEMO: Merito e Mobilità Sociale**"

Istituto "Mazzone": Seminari di **orientamento all'ingegneria bionica** per licei ed istituti tecnici

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- **Role Model Settimana STEM (legge n.187/2023)**
- **Ambasciatrice STEM di Samsung Italia**
- **Attivista STEM, divulgatrice, speaker**



# Come far appassionare i giovani alle materie scientifiche?

1

**INQUADRAMENTO DEL PROBLEMA E SCOMPOSIZIONE IN COMPONENTI**

2

**FORMULAZIONE DI IPOTESI E SEMPLIFICAZIONI OPERATIVE**

3

**PROPOSTA DI SOLUZIONI, ITERAZIONE E OTTIMIZZAZIONE**



# **STEP 1: INQUADRAMENTO DEL PROBLEMA E SCOMPOSIZIONE IN COMPONENTI**

# Il paradosso delle STEM...

**Le discipline STEM sono tra le più richieste dalle aziende  
ma le meno scelte dagli studenti**

Nel 2024 il 22.3% dei laureati italiani ha conseguito una laurea STEM (di questi il 25% in ingegneria)

Il 50% dei profili professionali che le aziende italiane cercano sono STEM

1 in 4 aziende non trova profili STEM quando ne ha bisogno

# Perchè pochi giovani scelgono le STEM?

(e soprattutto poche ragazze)

Esperienze  
precoci

Narrazioni  
sociali

Stereotipi di  
genere

$$\left\{ \begin{array}{l} \det \nabla^2 u = \lambda_{\Omega} \quad u \text{ st. convexe} \\ u|_{\partial\Omega} = 0 \quad \Omega \subset \mathbb{R}^n \end{array} \right.$$

Vol  $\Omega$

## Eccellenza

### accademica

$$\text{Donc } (\cdot)^n =$$

$$(\text{Vol}_{\Omega})^n \leq \left( \frac{\sup_{\Omega} |u|}{D(\Omega)} \right) \left( \frac{A(\partial\Omega)}{n} \right)^n = \left( - \frac{A(\partial\Omega)}{n} \right)^n$$

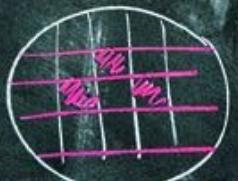
$$\text{So } n^n w_n \leq \frac{A(\partial\Omega)^n}{\text{Vol}(\Omega)^{n-1}}$$

Alexandrov

$$\text{On peut montrer que } B\left(x_{\min}, \frac{\sup_{\Omega} |u|}{D(\Omega)}\right) \subset \nabla u(\Omega)$$

Faits: Tout minimum est atteint sur  $\Omega$ .

Unicité car .



$$u(z_{\min}) \geq u(z') + \langle \nabla u(z), z_{\min} - z' \rangle \Rightarrow$$

$$z \rightarrow \partial\Omega : + \sup_{\Omega} |u| \leq - |\nabla u(z)| D(\Omega)$$

$$\leq \sup_{\Omega} |\nabla u| \frac{A(\partial\Omega)}{D(\Omega)} \leq \frac{\sup_{\Omega} |u|}{D(\Omega)}$$



$$u(p_1) + \beta(\frac{p_1}{r}) \leq u(z) \leq u(p_1) - \beta(\frac{p_1}{r})$$

$$m(z) - m(p_1) \geq \beta(r)$$

$$|\nabla u(z)| \geq \beta r$$

$$|\nabla u(z)| \leq \beta r$$



$$H_n(\mathbb{R} \# N) \xrightarrow{\cong} \mathbb{M} \vee N$$

$$H_n(\mathbb{R} * \mathbb{R}, N, \mathbb{R}) = \mathbb{R}$$

$$\xi = \frac{d}{dz} \left( z, w + s \nabla u(z)(X) \right) \rightarrow e(X)$$

## Talento 'naturale' per la

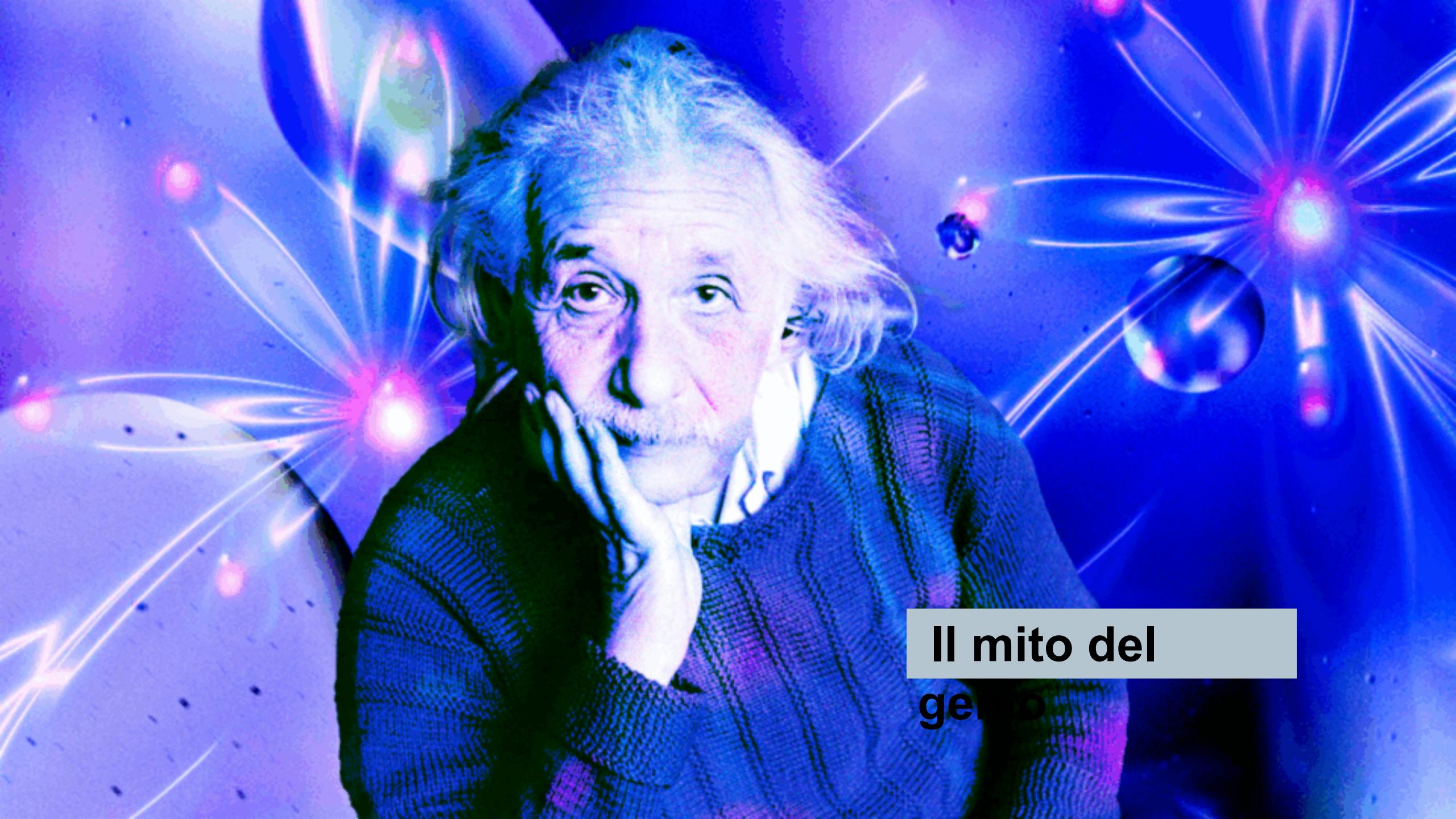
### matematica

$$\xi = \xi^+ + \xi^-$$

$$K_V(\xi) = \nabla u(\alpha)(X)$$

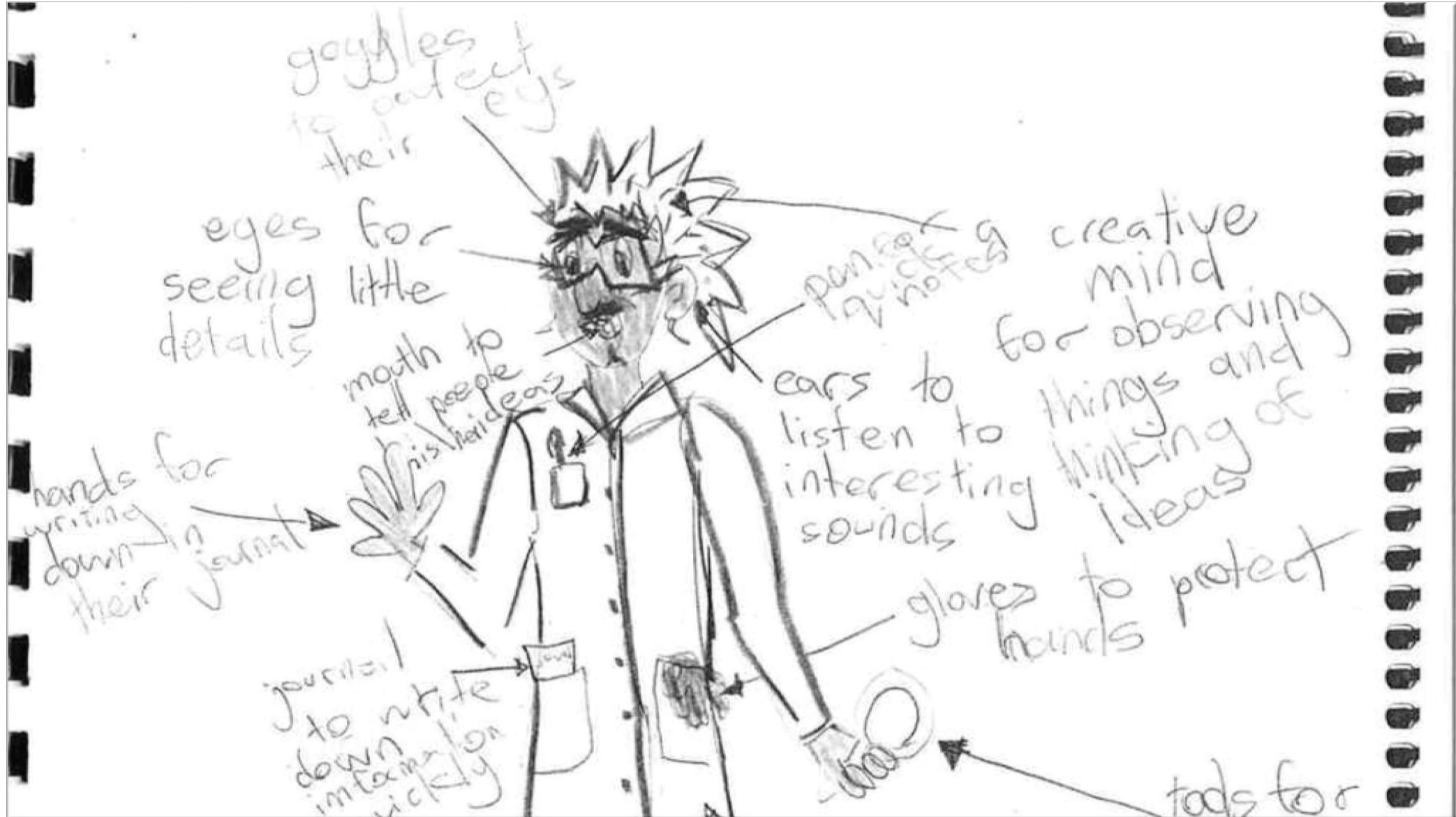
$$dP_{2|V}(\xi) = 0 - \frac{d}{ds} P_2 \circ \alpha_1(s) \Big|_{s=0} = \frac{d}{ds} \alpha_1'(0)$$

$$\nabla u(z)(X)$$

A composite image featuring a portrait of Albert Einstein in the center. He is shown from the chest up, wearing a dark green ribbed sweater over a white collared shirt. His right hand is resting against his chin, and he has a thoughtful expression. Behind him is a vibrant, abstract background of glowing blue and purple energy spheres and light rays, suggesting a scientific or metaphysical theme.

**Il mito del  
genio**

# Draw-a-Scientist Test (DAST), 1983



## **Lo stereotipo del “genio” incide sulle scelte, soprattutto delle ragazze**

Voti alti in matematica e scienze aumentano la probabilità di iscrizione STEM

GPA elevato è correlato a scelte STEM

Le ragazze hanno performance scientifiche spesso uguali o superiori

(Fonti: NSF, ResearchGate, AXIOS – 2023,2024)



engineer



F Forbes  
Why Engineers Are The Makers Of...



I The Engineering Leadership Project  
Successful Engineer ...



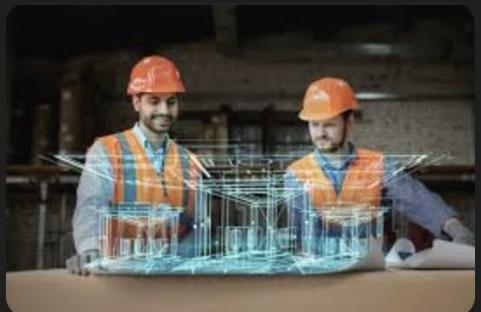
S Sustainable jobs at Nobian  
Process Engineer at Nobian



AI-Powered Career Aptitude Test  
What Does an Engineer Do? A ...



A Austin Nichols Technical Search  
an Engineer ...



BML Munjal University (BMU)  
Top 12 Types of Engineering - Scope ...



KU KU Edwards Campus - The University of Ka...  
How to become a better civil engineer ...



TMC  
Process engineer jobs | TMC



Atwell  
Black engineers share their experien...



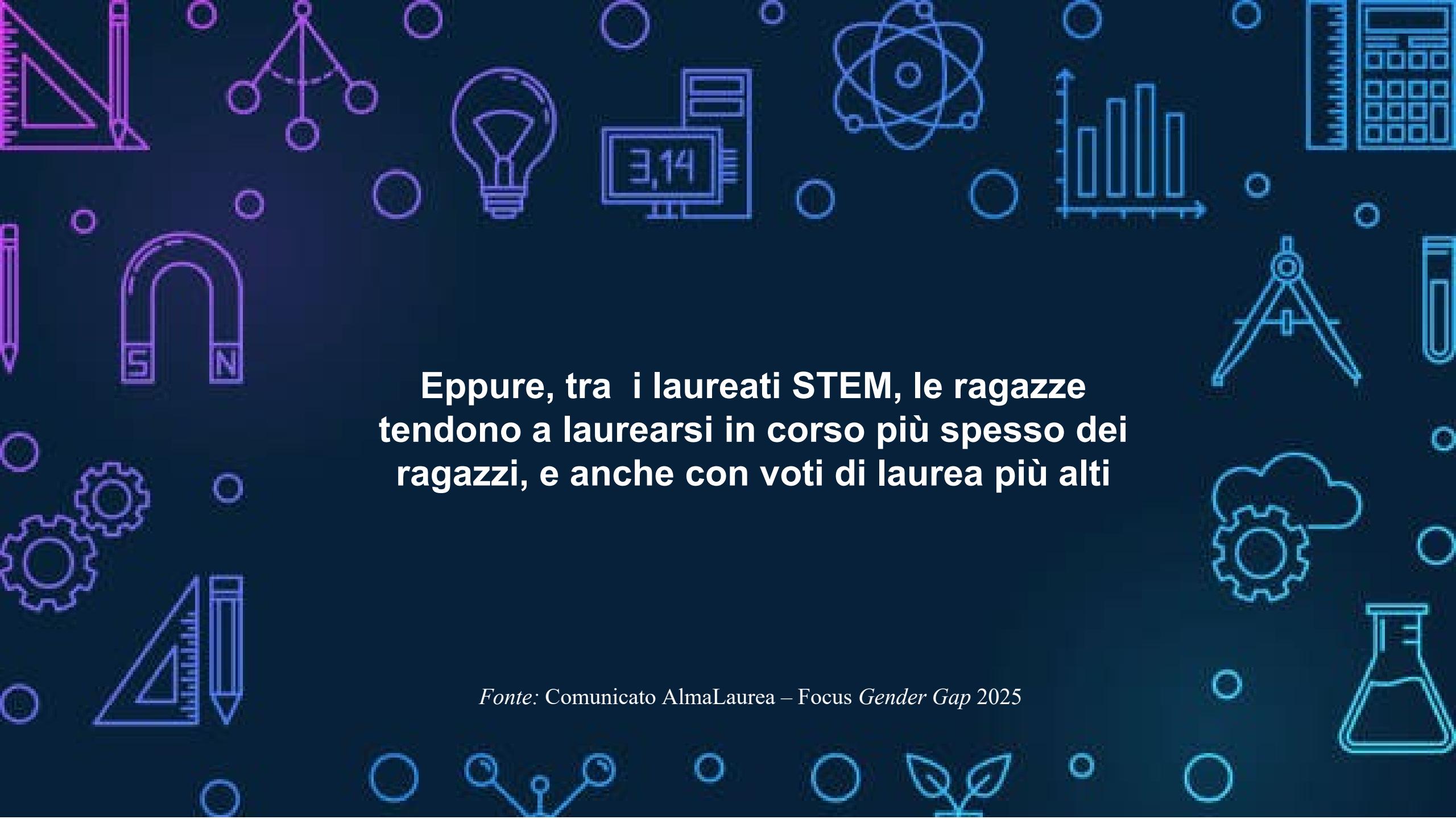
Go Construct  
Civil Engineers Do? (Job Descrip...



*Le ragazze  
italiane laureate  
in STEM sono il  
16.8%*

*In Italia solo il 5%  
delle quindicenni  
sogna una carriera  
STEM*

*Il 31.7% di donne  
occupa posizioni  
lavorative tecno-  
scientifiche*



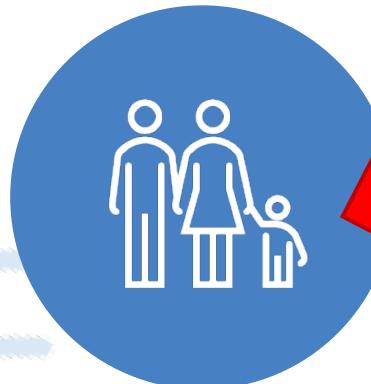
**Eppure, tra i laureati STEM, le ragazze  
tendono a laurearsi in corso più spesso dei  
ragazzi, e anche con voti di laurea più alti**

*Fonte: Comunicato AlmaLaurea – Focus *Gender Gap* 2025*

## **STEP 2: FORMULAZIONE DI IPOTESI E SEMPLIFICAZIONI OPERATIVE**

# Come avviene tipicamente la scelta della carriera?

Formuliamo un'ipotesi



Se fosse sempre così,  
non ci sarebbe  
innovazione!



## Incremental innovation

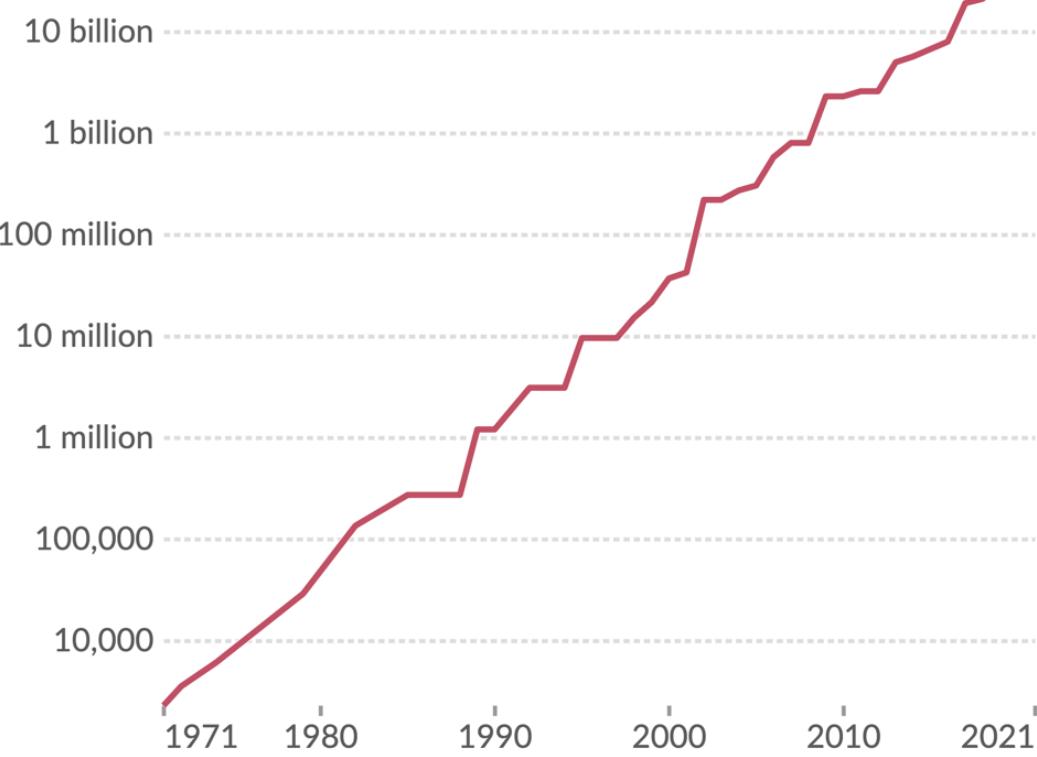




# Un esempio di innovazione incrementale

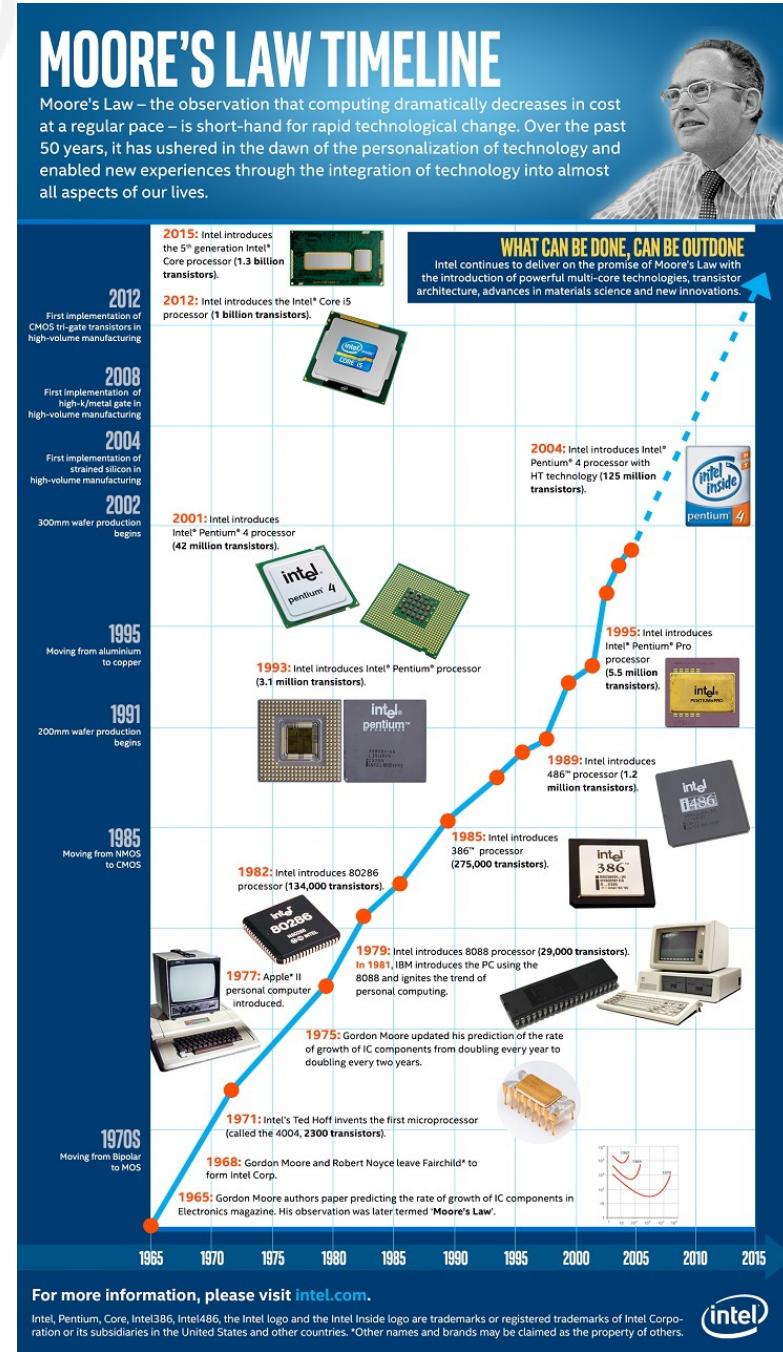
Moore's law: The number of transistors per microprocessor

Our World in Data



Data source: Karl Rupp, Microprocessor Trend Data (2022)

CC BY

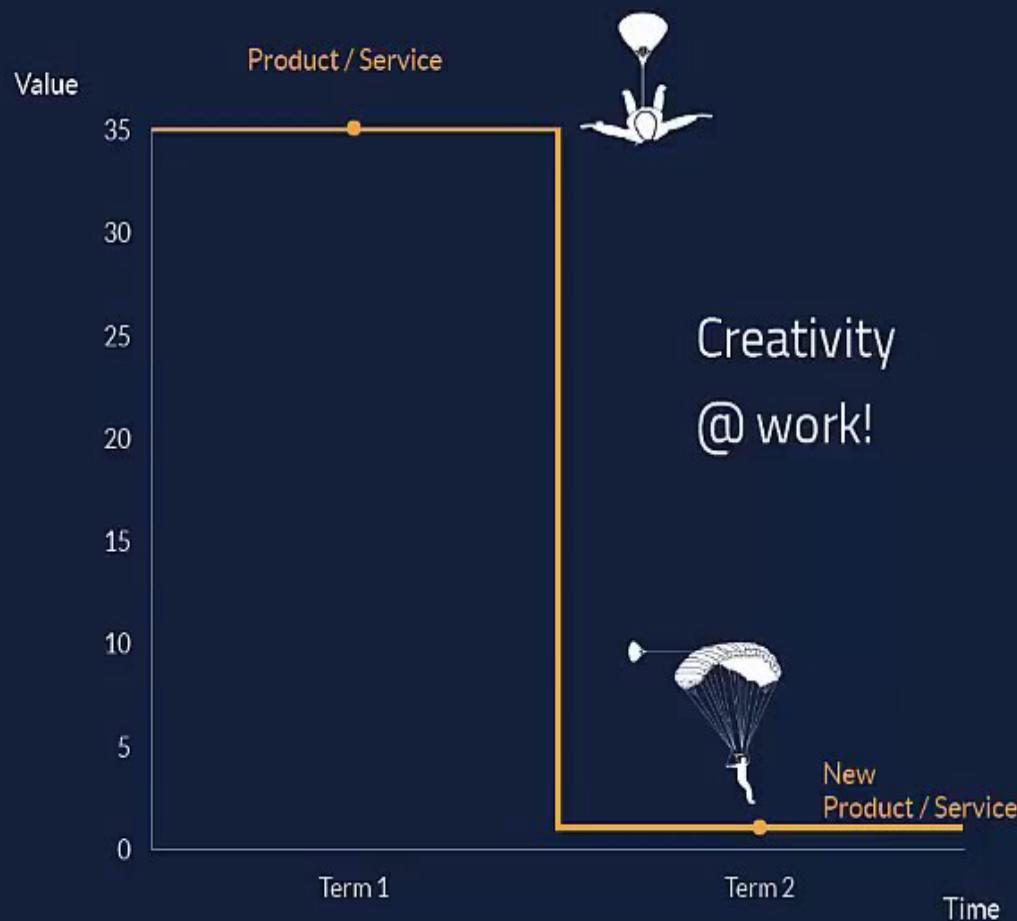


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## Incremental innovation



## Disruptive innovation

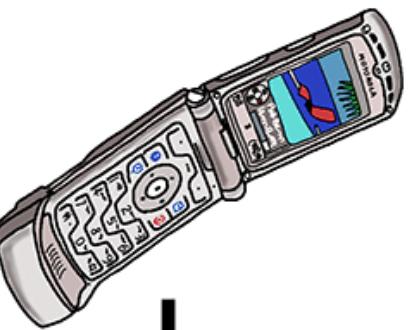


## Incremental innovation





TODAY



2006



2000



1989



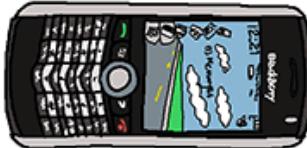
1983



2007



2004



1990



1986





# Ingegneria Bionica



Nasce da un punto di  
discontinuità nel  
rapporto tra uomo e  
macchina

Natura = 3.8 miliardi di anni di R&D + un'infinità di  
fallimenti

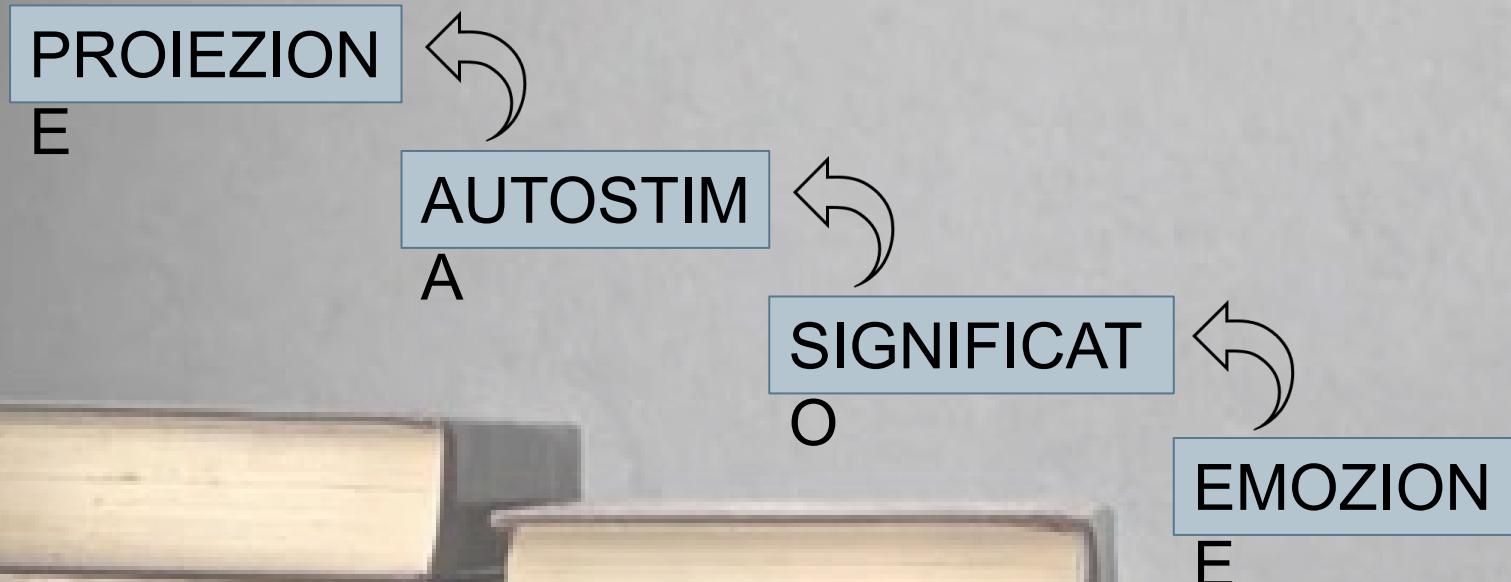
## **STEP 3: PROPOSTA DI SOLUZIONI, ITERAZIONE E OTTIMIZZAZIONE**

# Ci stiamo già muovendo verso una soluzione...

*We are already moving towards a solution as a society:*

- **Politics:** new laws are being implemented, such as the STEM week law, instituting a national yearly week dedicated to STEM fields;
- **Companies:** as today, increasing efforts are being dedicated to raising STEM and gender gap awareness;
- **Education:** schools are investing more in STEM education and universities are creating interdisciplinary degrees that relate science to arts, literature and all the other fields.

# La strategia



# La strategia

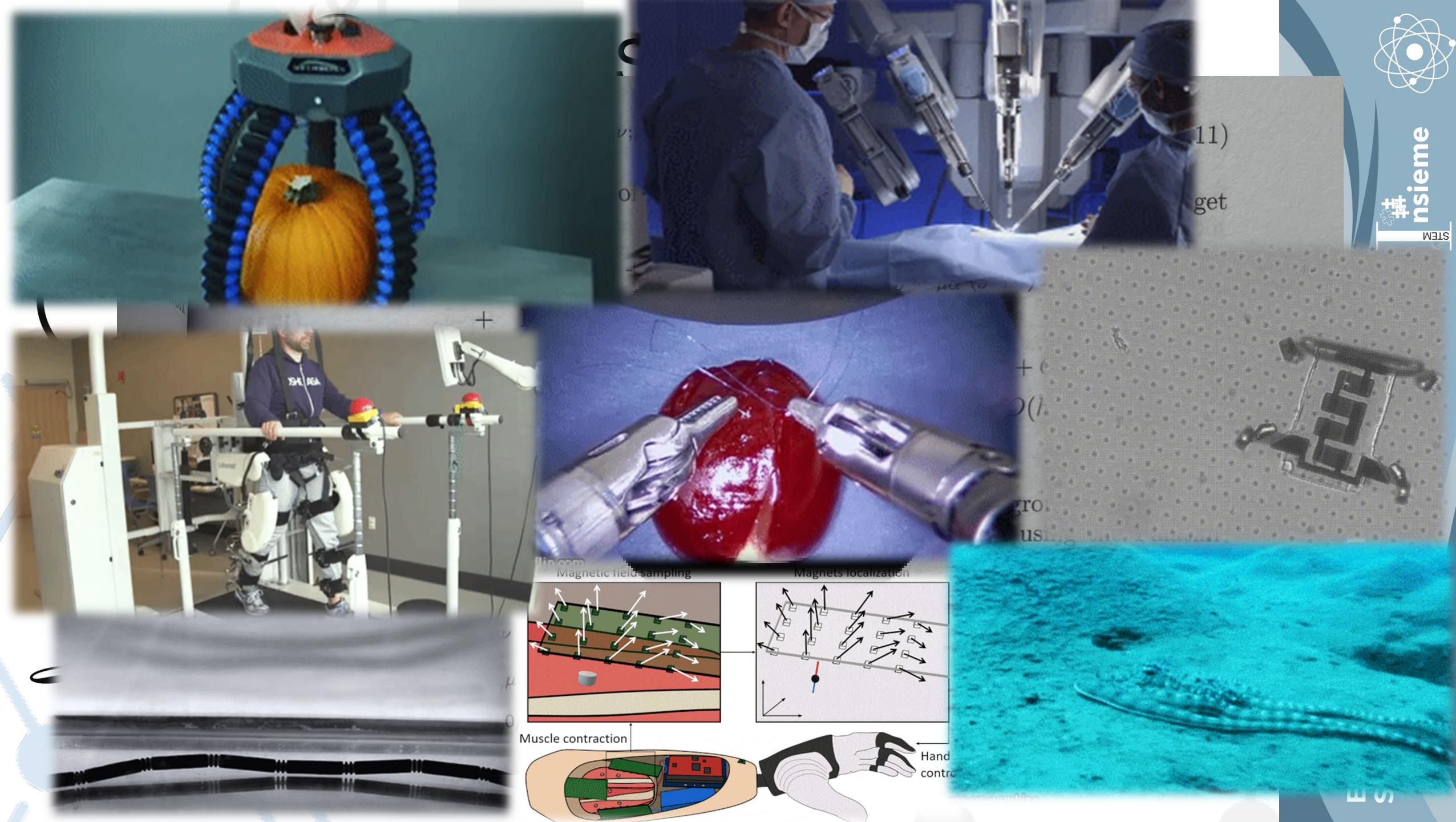
EMOZION  
E



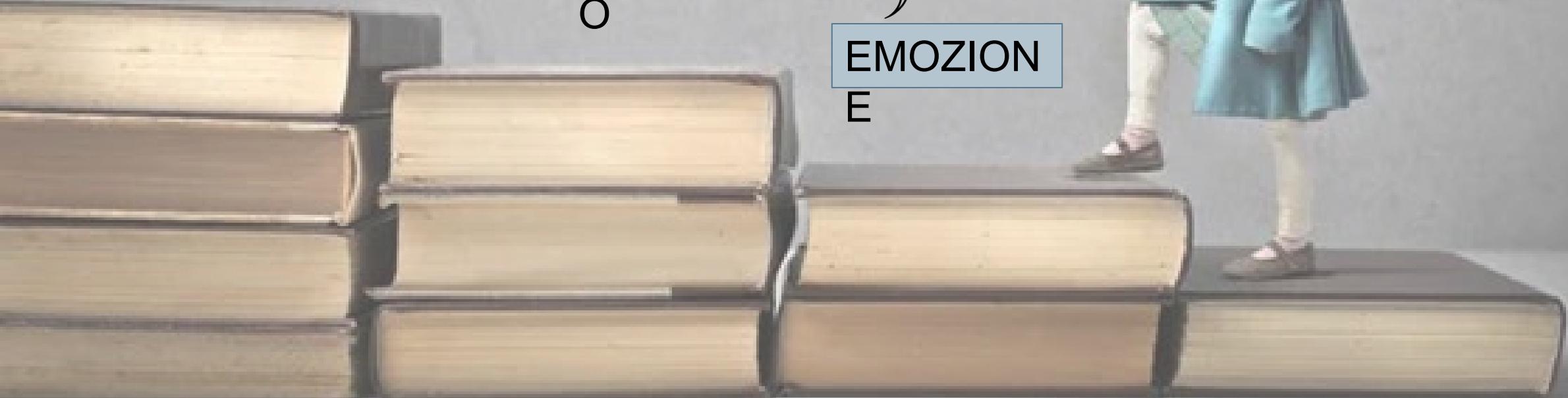


#nsieme

STEM



# La strategia



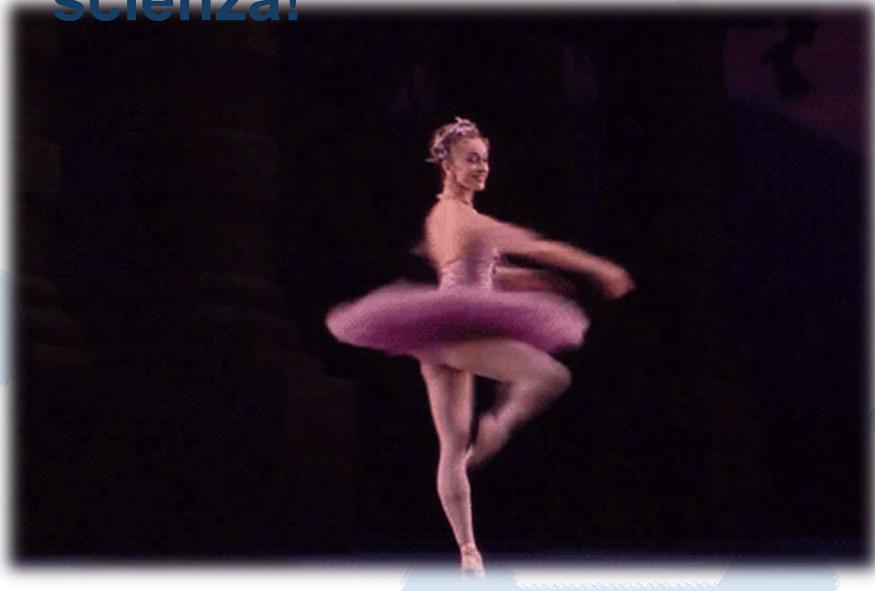
SIGNIFICAT  
O



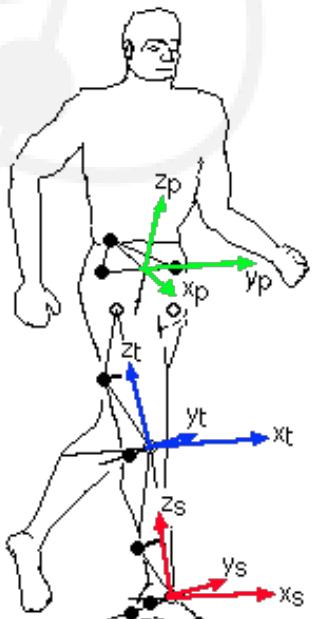
EMOZION  
E

# STEP 2: SIGNIFICATO

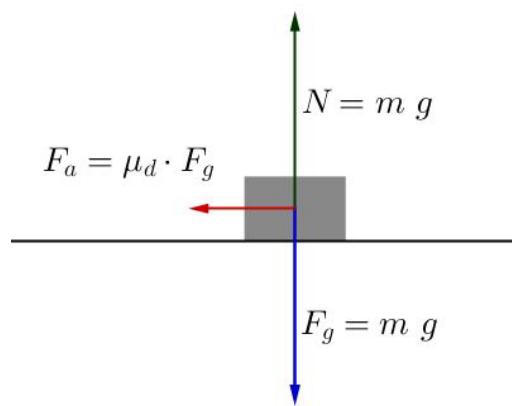
**Gioco: Trova la  
scienza!**



$$\left\{ \begin{array}{l} x_{CM} = \frac{m_1x_1 + m_2x_2 + \dots + m_nx_n}{m_1 + m_2 + \dots + m_n} \\ y_{CM} = \frac{m_1y_1 + m_2y_2 + \dots + m_ny_n}{m_1 + m_2 + \dots + m_n} \end{array} \right.$$



*"Le STEM mi  
riguardano"*



# STEP 2: SIGNIFICATO

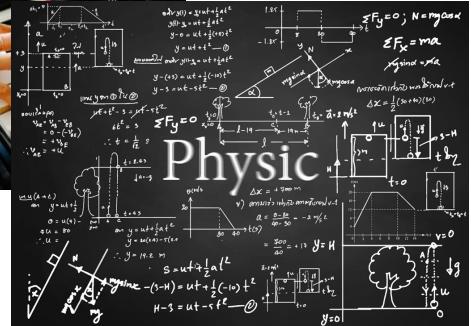
**We have to look at science from a different perspective, not as a goal, but as a means to achieve our goals in a more efficient way.**



**Baking skills + chemistry skills**

=

*to optimize the chemical reactions behind perfect baking such as gelatinization and browning*



**Music skills + Physics skills**

=

*optimal understanding of acoustics of instruments and of sound propagation in concert rooms*

**"Le STEM mi riguardano"**



# La strategia

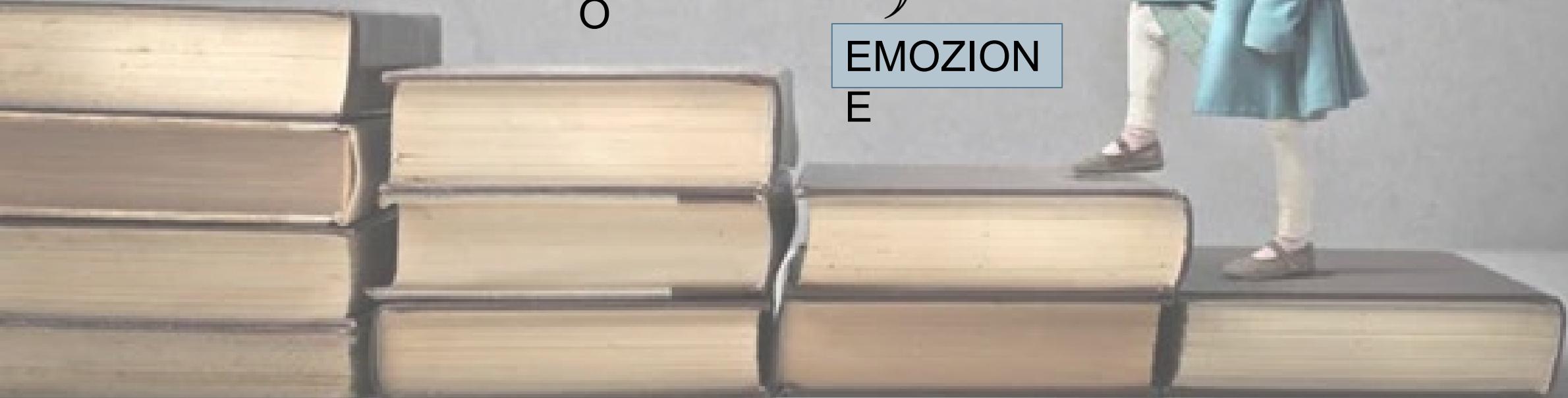
AUTOSTIM  
A



SIGNIFICAT  
O



EMOZION  
E



*"Posso farcela"*



# STEP 3: AUTOSTIMA

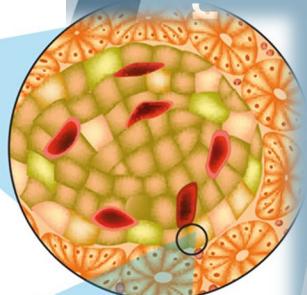
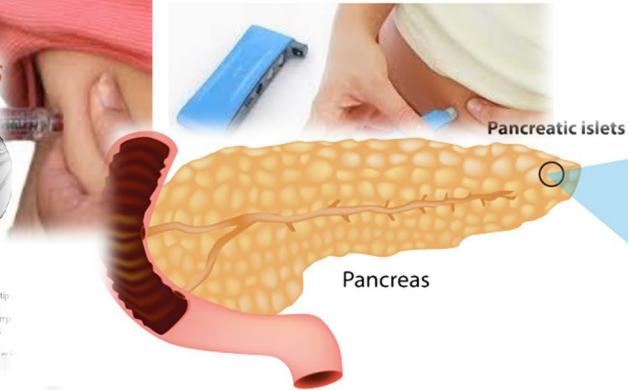
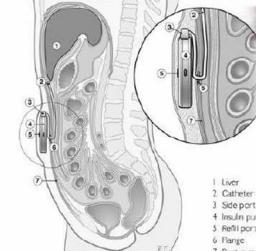
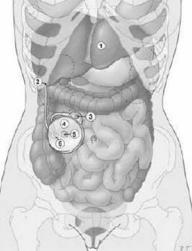
*Insulin syringes*



*Insulin jet injectors*



Intraperitoneal insulin release – OPTIMAL ABSORPTION – NO DELAYS



Beta cell  
(secretes insulin)

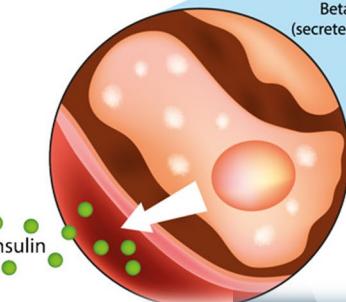
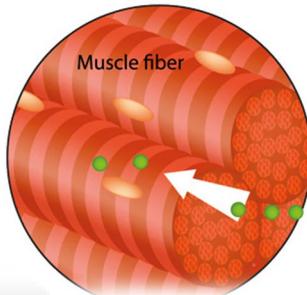
Implanted artificial pancreas would represent the optimal solution, due to:

- NO DELAYS
- FULLY DISAPPEARING TECHNOLOGY

However:

**X** they need periodical refilling procedures (frequent surgical operations needed)

**X** Insulin clotting blocks tubes and pumps, thus requiring periodical maintenance



I CONSIGLIO NAZIONALE DEGLI INGEGNERI

re:

#insieme STEM





STEM  
insieme



CONSIGLIO NAZIONALE  
DEGLI INGEGNERI

STEMinsieme

# STEP 3: AUTOSTIMA



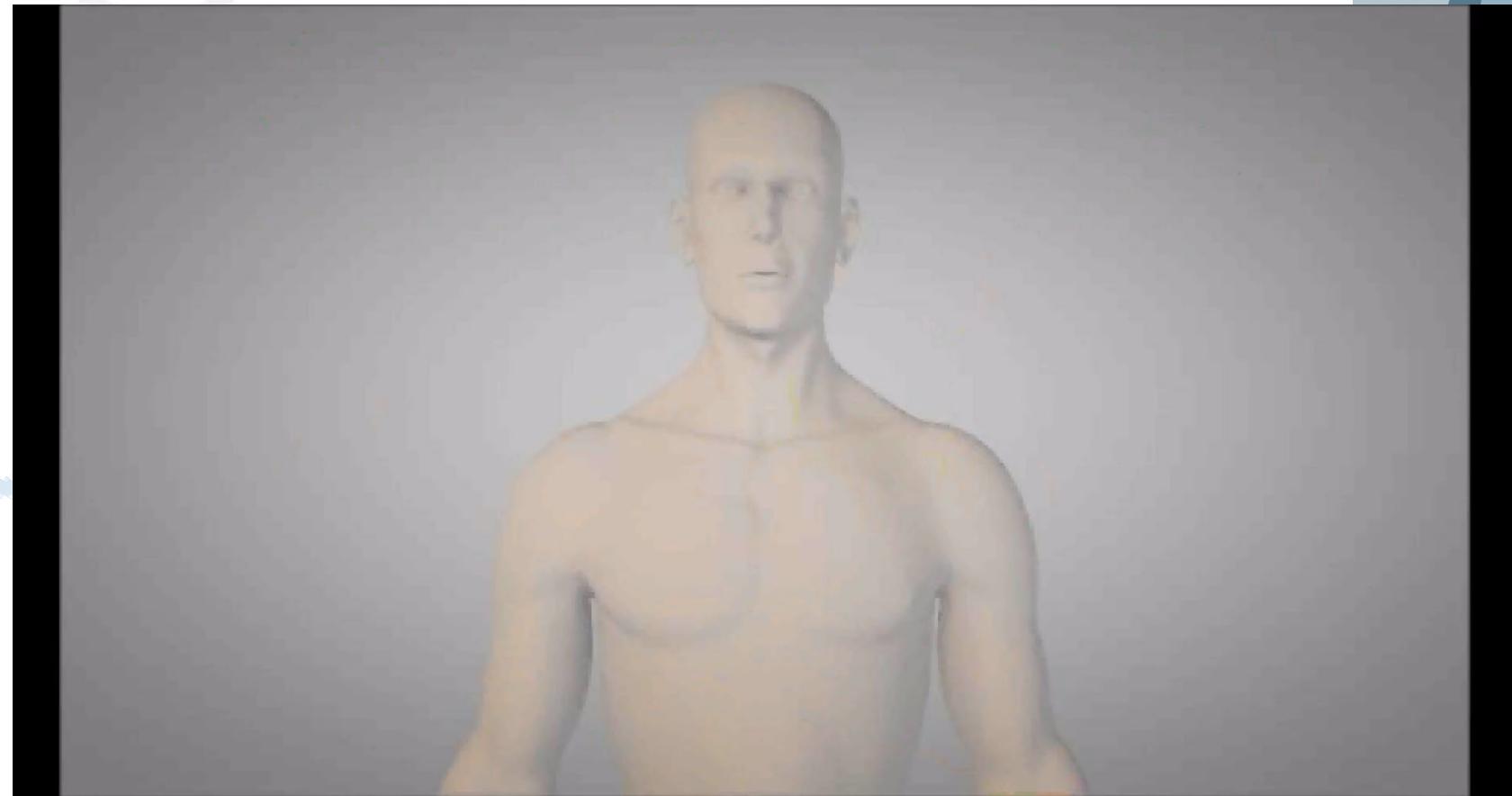
Regenerative  
Technologies  
Lab



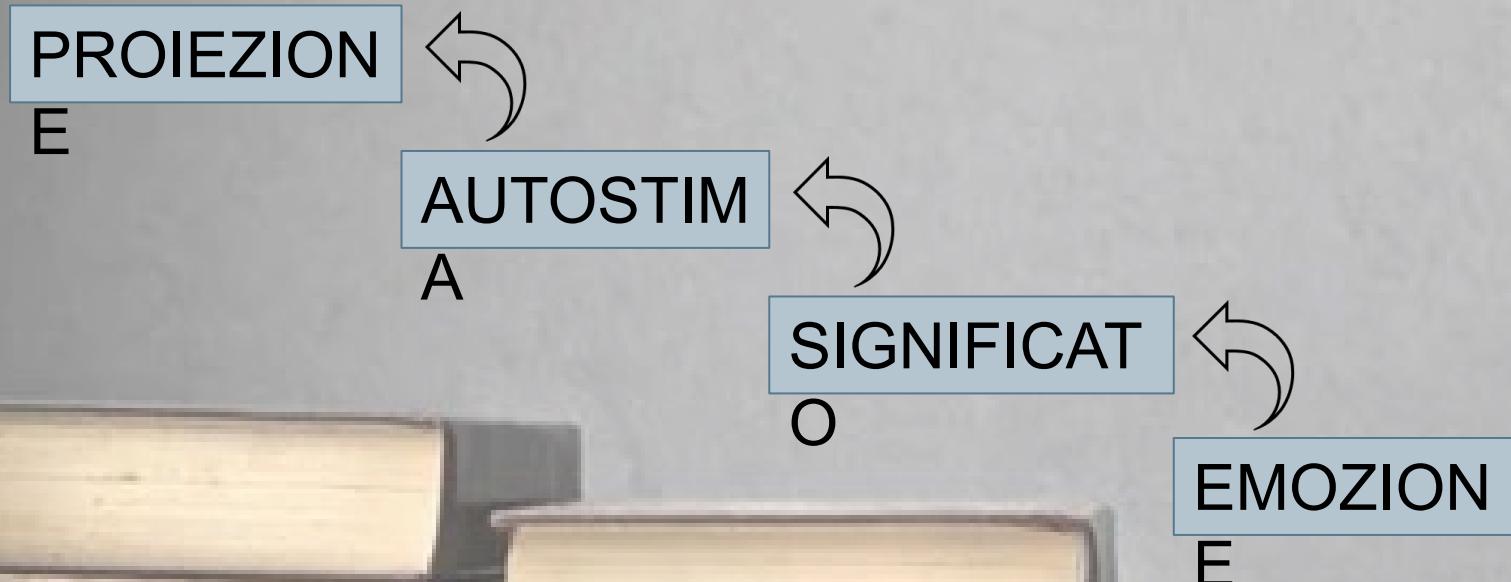
ISTITUTO  
DI BIOROBOTICA



Scuola Superiore  
Sant'Anna



# La strategia





# STEP 4: PROIEZIONE

**Perchè i role models sono fondamentali per trasmettere messaggi impliciti di empowerment?**

Iniziano da un background simile alla target audience

Il loro successo appare raggiungibile

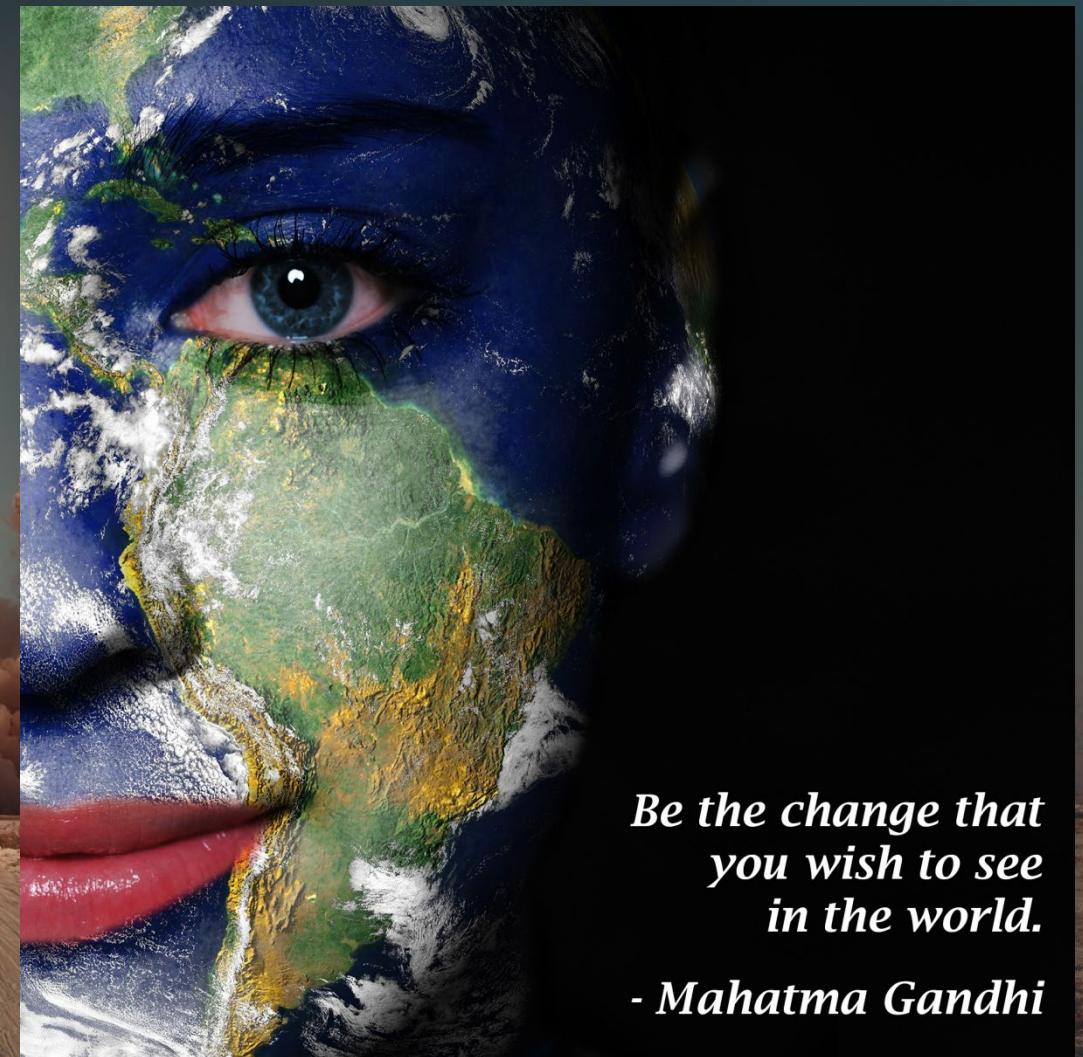
I loro risultati sono evidenti ed ispirazionali

*"Potrei diventarlo anche io"*





**It's up to us to become role  
models for future  
generations, so that they  
don't grow up believing they  
are not enough and can  
envision themselves in our  
shoes**



*Be the change that  
you wish to see  
in the world.*

*- Mahatma Gandhi*

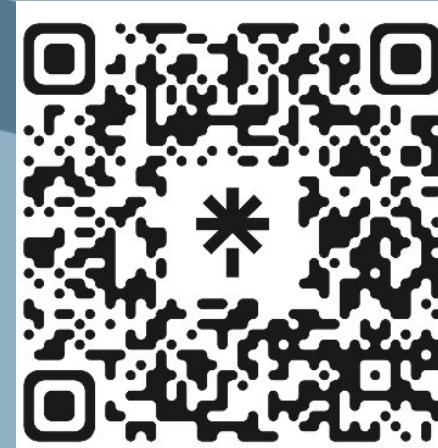


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# Engineering the Future: STEMinsieme



## Grazie per l'attenzione!



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