



# 3D PRINTS

**3D Practice to Raise INclusion  
with Technological Skills**

Erasmus+ 2023- 1-IT01-KA210-VET-000153881  
Small-scale partnerships in vocational educational and training

*Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.*



# CHAPTER 1

WHAT 3D  
PRINT IS

3D PRINT USE  
IN  
HEALTHCARE  
SECTOR

TECHNICAL  
PRINCIPLES,  
MATERIALS  
AND 3D PRINT  
PROCESS

3D PRINT  
CHALLENGES  
IN  
HEALTHCARE  
SECTOR

HOW 3D PRINT  
CAN BE USED  
IN HEALTHCARE  
SECTOR

SUCCESS  
STORIES





## CHAPTER 2

THE  
IMPORTANCE OF  
THE EMPATHIC  
SKILLS IN  
HEALTHCARE  
SECTOR

THE  
IMPORTANCE  
OF THE HARD  
SKILLS

WHAT  
INTERPERSONAL  
SKILLS ARE

THE  
IMPORTANCE  
OF THE SOFT  
SKILLS

HOW TO APPLY  
SOFT SKILLS IN  
HEALTHCARE  
SECTOR

HOW TO  
IMPROVE THE  
INVESTIGATED  
SOFT AND HARD  
SKILLS

## PROJECT DESCRIPTION

The 3D PRINTS project aims to transform the paradigm of assistance to people with disabilities by introducing 3D printing technology as a social inclusion event.

The specific objectives of 3D PRINTING include:

- Develop skills in 3D prototyping;
- Fill gaps between the social health and 3D printing sectors;
- Improve the relational and empathic skills of professionals.



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## PARTNERS PRESENTATION

- Movimento Dehoniano Europeo (EDM)
- INVIVO
- PREVIFORM
- MIRADA LOCAL

<https://www.3dpe.eu>





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# INTRODUCTION

In today's dynamic healthcare landscape, the fusion of innovative technologies and advanced medical care plays a crucial role in promoting effective and customized solutions. This project explored the depths of the revolutionary 3D printing technology and its application in the healthcare industry. Together with our valued partners, we embarked on a journey to explore the complex techniques, challenges faced and triumphs in incorporating 3D printing into various aspects of healthcare.





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# CHAPTER 1





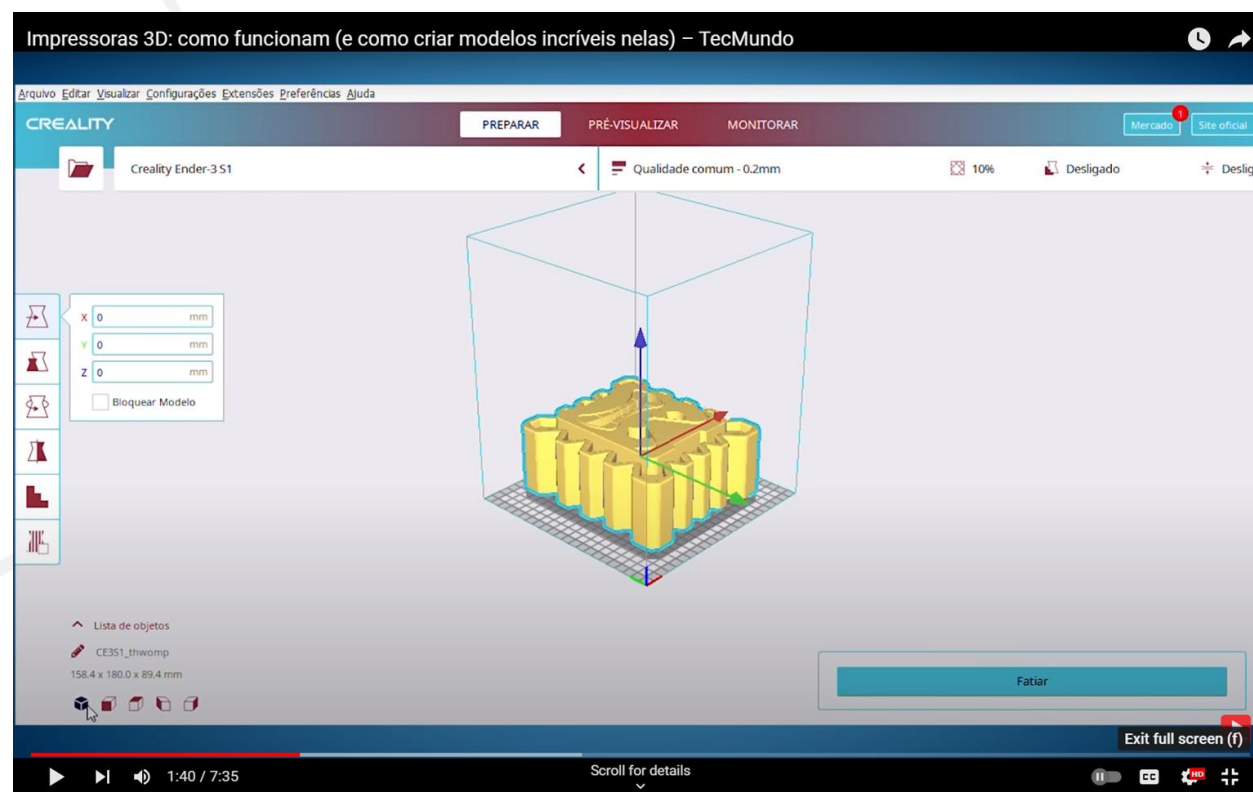
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<https://www.youtube.com/watch?v=GGkGUP9v2ZA>







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## 3D PRINTING

- Customization
- Prototyping speed
- Geometric complexity
- Waste reduction
- Cost saving

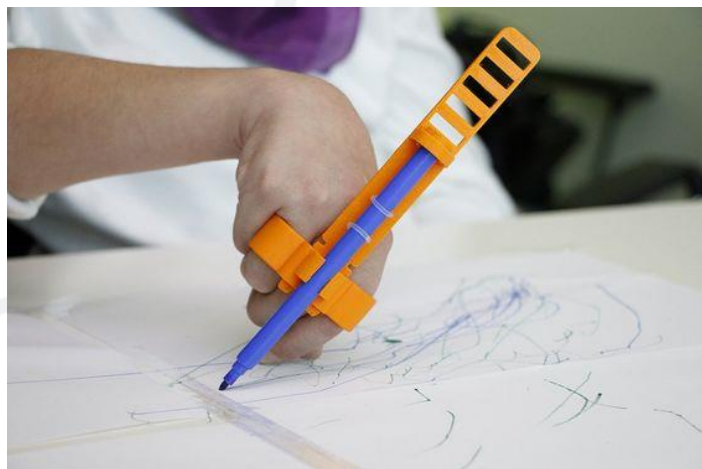




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# TECHNOLOGIES & MATERIALS



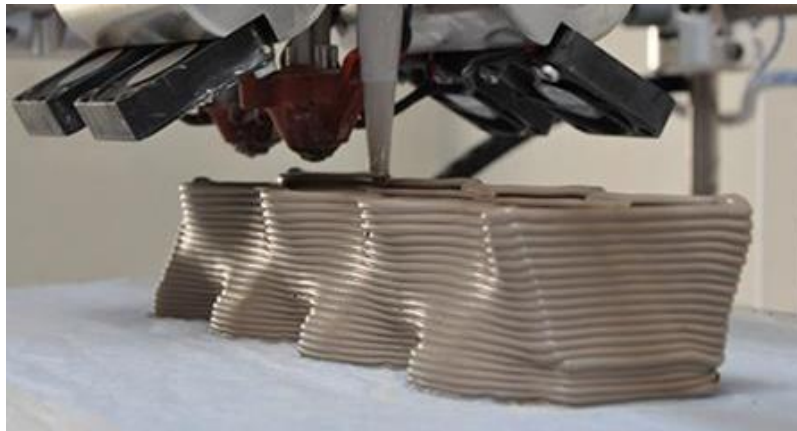
**Selective Laser Sintering (SLS)**

NYLON-METAL-COMPOSITES



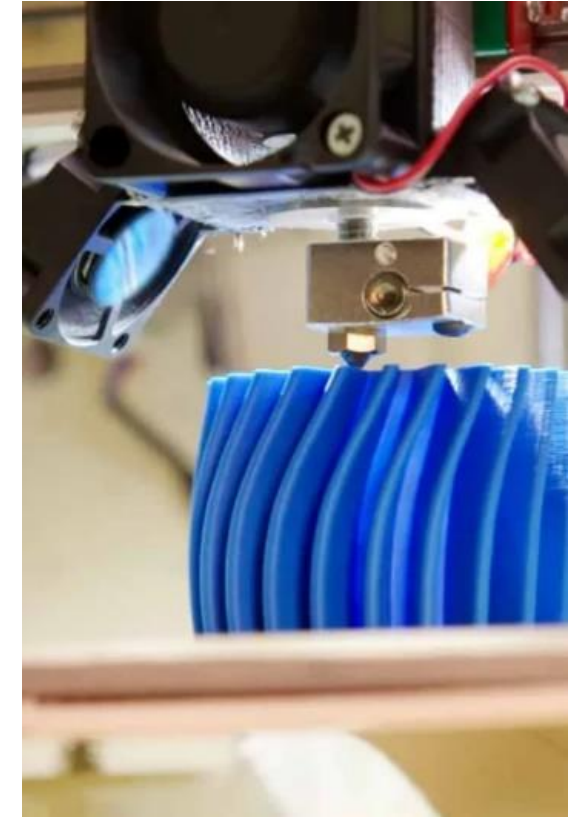
**Stereolithography (SLA)**

SOLID, FLEXIBLE OR CASTABLE METHACRYLATE  
MATERIAL, SINGLE COLOUR



**Liquid Deposition Modeling (LDM)**

CERAMICS-CLAY



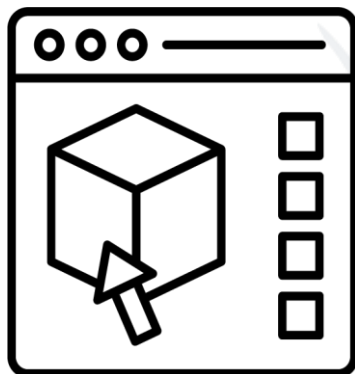
**Fused Deposition Modeling (FDM)**

PLA-ABS-NYLON-LAYWOOD-KENESIS  
SINGLE-COLOUR EXTRUDER



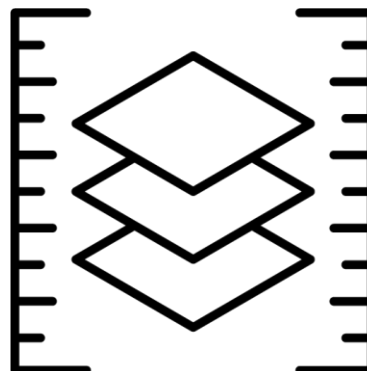


## PROCESS



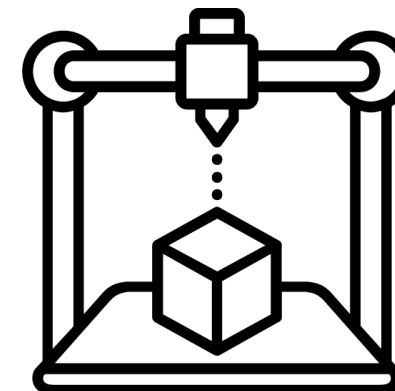
3D file

- Modeling
- Scanning
- Download



Slicing

Use a slicer software  
to get the G-Code file



3D printing

Start your 3d print!



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File Edit View Settings Extensions Preferences Help

Ultimaker Cura

PREPARE PREVIEW MONITOR

Marketplace Sign in

Draft - 0.15mm 15% On Off

Print settings

Profile: Draft - 0.2mm

Search settings

**Quality**

Layer Height: 0.15 mm

**Walls**

Wall Thickness: 0.8 mm

Wall Line Count: 2

Horizontal Expansion: 0.0 mm

**Top/Bottom**

Top/Bottom Thickness: 0.8 mm

Top Thickness: 0.8 mm

Top Layers: 6

Bottom Thickness: 0.8 mm

Bottom Layers: 6

**Infill**

Infill Density: 15.0 %

Infill Pattern: Triangles

**Material**

Printing Temperature: 220.0 °C

Build Plate Temperature: 80.0 °C

**Speed**

Print Speed: 40.0 mm/s

Infill Speed: 40.0 mm/s

Wall Speed: 20.0 mm/s

**Travel**

Enable Retraction:

Z Hop When Retracted:

**Cooling**

**Support**

Generate Support:

Support Placement: Everywhere

Support Overhang Angle: 60.0 °

**Build Plate Adhesion**

Build Plate Adhesion Type: None

Color scheme Line Type

0.15 mm

0.8 mm

2

0.0 mm

0.8 mm

0.8 mm

6

0.8 mm

6

15.0 %

Triangles

220.0 °C

80.0 °C

40.0 mm/s

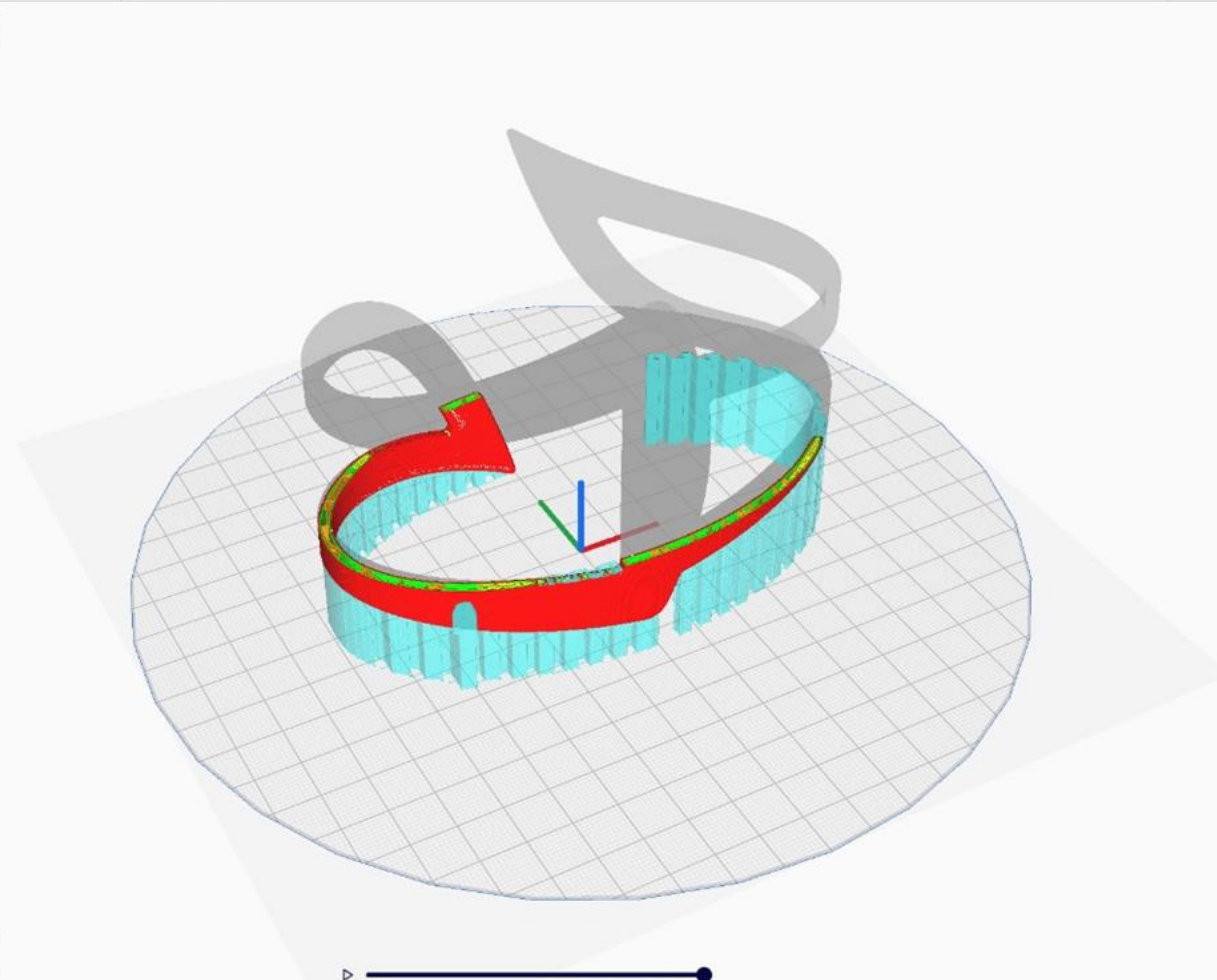
40.0 mm/s

20.0 mm/s

Everywhere

60.0 °

None



4 hours 31 minutes

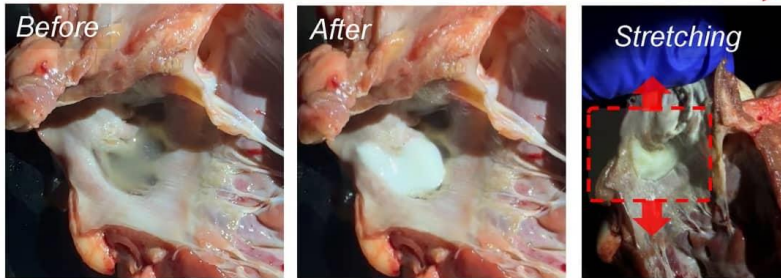
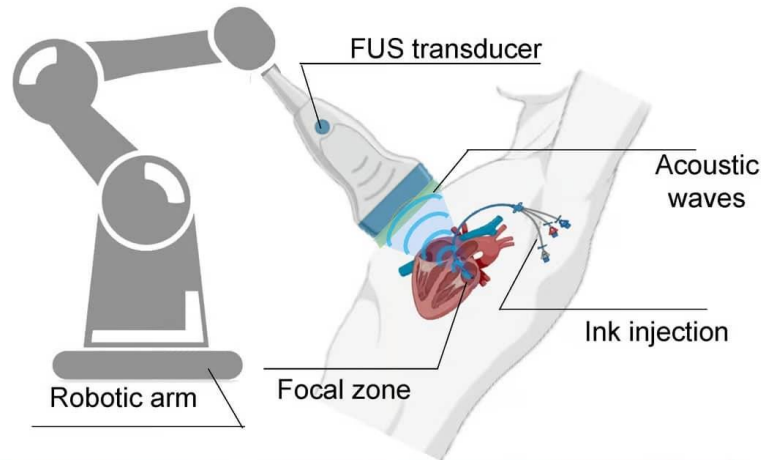
29g - 0.56m

Save to Disk

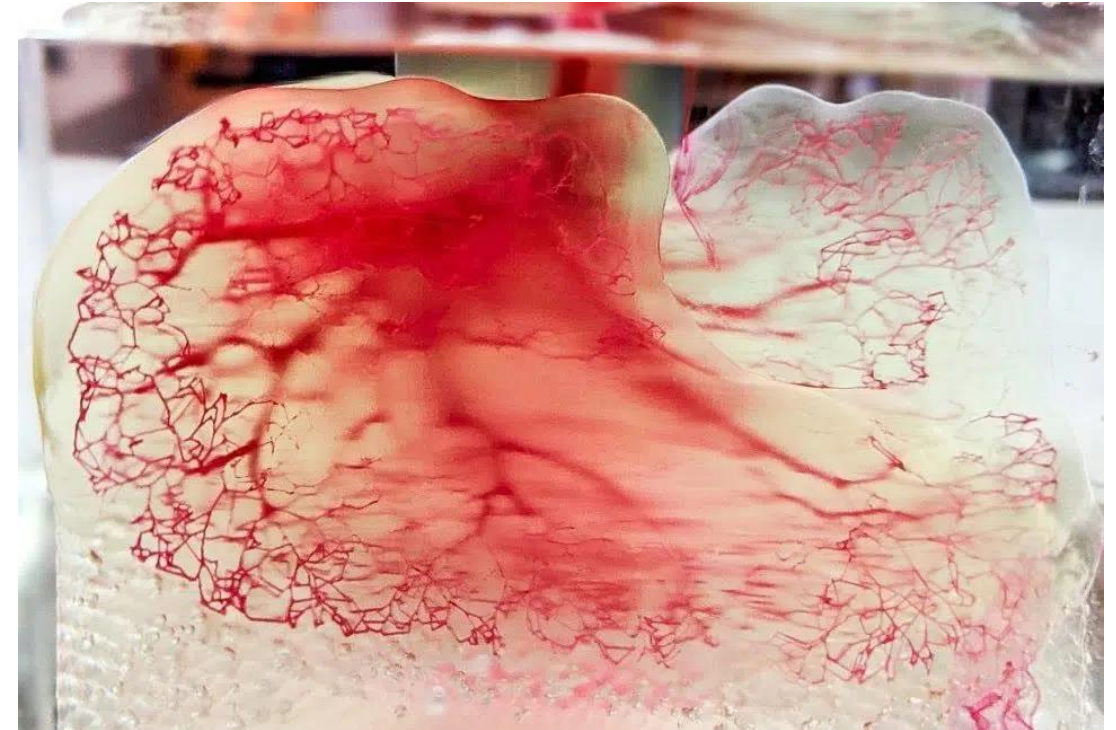




# CHALLENGES OF 3D PRINTING FOR THE HEALTHCARE SECTOR



**Duke University, Harvard Medical School,**  
Implants printed directly inside the human body.  
3D printing based on ultrasound  
Biocompatible sonic "ink" (sono-ink)



## 3D Systems e United Therapeutics Print to Perfusion

High resolution scaffolds that can be perfused with living cells to create tissues.





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### **Terasaki Institute for Biomedical Innovation di Los Angeles**

Innovative bioink that uses a prolonged release hormone to promote the growth and regeneration of 3D printed muscle tissues





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- Customization and adaptability
- Reduction of production times
- Easy access to dentures and custom devices
- Innovations in surgery and pre-operative planning







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# CHAPTER 2





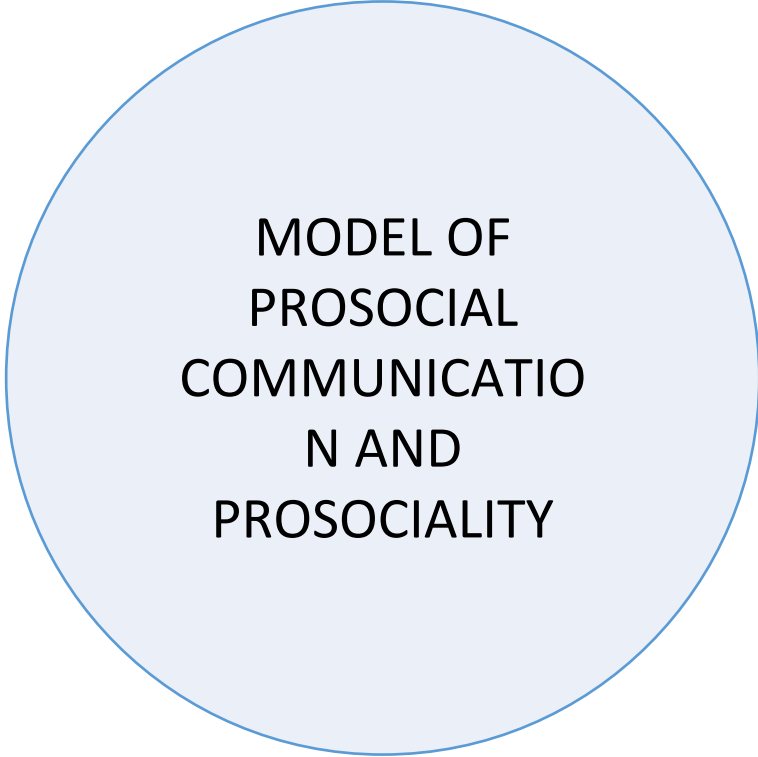
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# THE IMPORTANCE OF THE EMPATHIC SKILLS IN HEALTHCARE SECTOR



MODEL OF  
PROSOCIAL  
COMMUNICATIO  
N AND  
PROSOCIALITY





## WHAT HARD SKILLS ARE

Hard skills can also be defined as "technical skills". These are skills that can be learned, demonstrated and evaluated and that are fundamental to a given job. In short, these are all the teachings that we have learned during our studies and that we perfect with experience when we start working. These include language skills, the use of graphics programs, programming skills, knowledge of software and programming languages and graphic skills (a set of technical skills aimed at the efficient use of digital tools).





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<https://www.youtube.com/watch?v=0FFLFcB9xfQ>





# PROSOCIAL PARTICIPATORY VISUALIZATION

The PPV works on the basis of open questions that serve to guide and empower a group to discover ways to plan, analyze and diagnose, as well as solve problems, etc. with the help of a facilitator who is responsible for the method and the steps taken, without interfering in the content.





## THE IMPORTANCE OF THE HARD SKILLS

Their importance varies depending on the nature of the work, but they typically include elements such as knowledge of technical software, mathematical skills, programming skills, knowledge of languages, among others. While hard skills are important, it is crucial to recognize that soft skills, such as communication skills, teamwork and conflict resolution, also play a crucial role in professional success.





## Some features that, in parallel with Soft Skills, become crucial

- Technical knowledge of the operation of 3D printers
- Understand the printed materials
- Ability to solve problems
- Management of 3D Printers
- Use of the software
- Printing parameters
- Trouble shooting



## WHAT INTERPERSONAL SKILLS ARE

While hard skills are "technical" knowledge and skills, soft skills are about a person's social and relational skills. They are also called "interpersonal skills" and are personal. Soft skills are personal and are not always easy to demonstrate. Some examples of soft skills are analytical thinking, active learning, autonomy in performing the required tasks, problem solving, analytical skills, creativity, originality and initiative, leadership, programming skills, flexibility, stress tolerance and the creation of innovative solutions.







# PROSOCIALITY

## THE PROSOCIAL QUESTION AND THEORETICAL APPROACHES

Pro-social behavior means "behaviors that, without expecting extrinsic or material rewards, favor other people or groups according to their criteria or objectively positive social goals, increasing the likelihood of generating good quality and positive reciprocal articulation in interpersonal or social relations, safeguarding the identity, creativity and autonomous initiative of the individuals or groups involved" (Roche, 1995, p. 16).





## WHEN CAN AN ACTION BE DEFINED AS PROSOCIAL?

One element to underline in this definition is that even pro-social actions carried out with the consent of the recipient must respect certain quality standards in order to safeguard identity, the autonomy, creativity and initiative of the individuals or groups involved. These conditions or requirements pose a critical question, for example, about an action desired by a recipient and perceived by them as beneficial.



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# THE IMPORTANCE OF SOFT SKILLS

## IMPORTANCE AND BENEFITS OF PROSOCIALITY

Pro-social action is a clear and incisive preceptive stimulus, effectively directed at the target and the recipient towards which it conveys attention and consideration.





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## EMPATHY AND PROSOCIAL COMMUNICATION

What are the skills that healthcare professionals should possess to achieve good results, strengthen their career and develop over time? Empathy skills, the ability to establish credibility, gain confidence, and be positively judged by patients, are considered crucial.





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# HOW TO APPLY SOFT SKILLS IN HEALTHCARE SECTOR

To find out how to apply soft skills in the healthcare sector, we present the pro-social communication model, which consists of a practical self-assessment test. For a better understanding of the test, we will explain the 17 factors of the communication model.





# HOW TO IMPROVE THE INVESTIGATED SOFT AND HARD SKILLS

To increase the hard and soft skills in using the 3D printer, you can adopt different methodologies:

- Technical training
- Practical experimentation
- Collaboration and knowledge sharing
- Personal projects
- Self-learning





# HOW TO MAKE A PRO-SOCIAL VISUALIZATION

- What is pro-social participatory visualization (or: "Inclusion is participation")?



- The VPP as a tool to identify training needs:

The VPP is ideal for detecting the needs and expectations of a group in relation to a given situation, objective or task, as a series of rules are applied: First, each member of the group has the same opportunity to express themselves by writing their own idea, need or expectation on a board, which will be displayed on the dashboard. The process is therefore anonymous and inclusive, as you cannot remove or delete tabs, etc. The facilitator supervises this process and makes sure there are no boards with judgmental or offensive content. To identify the needs of a group of training participants, several questions can be asked



- Steps to follow in pro-social participatory visualization

Tempo	Conteúdo	Material
	<p><b>Preparação:</b></p> <p>Que perguntas quero fazer? O grupo está em posição/tem conhecimento para respondê-la?</p> <p>Quantos participantes somos (ou: eu convido)? Quem são eles?</p> <p>Quanto tempo quero gastar nesse processo? Estilo de facilitação mais diretivo ou mais permissivo?</p> <p>Quantas ideias (cartões) posso visualizar neste intervalo de tempo?</p> <p>Qual é o meu papel como facilitador?</p>	<p>Painel, papel para cobertura de painel, pontos de cola, cartões, canetas</p>



5-10min	<p><b>Introdução do facilitador sobre os seguintes aspectos:</b></p> <p>O que vamos fazer e porquê? Como vamos proceder? Qual é o objetivo da sessão e a duração?</p> <p><b>O facilitador:</b></p> <p>Explique a pergunta e certifique-se: os participantes compreenderam a pergunta? Explique o seu papel como facilitador. É responsável pelo processo, não intervirá nos conteúdos, ideias, respostas escritas nos cartões Explique como funciona o anonimato (escreva em letras maiúsculas, por exemplo. Além disso: não identifique o autor de um cartão, mas interprete-o como um grupo)</p>
5-10min	<p><b>"Debate":</b></p> <p>Distribuir um cartão por participante (exemplo)</p>
	<p>Cada participante escreve num cartão uma resposta à questão colocada (uma ideia), aquela que lhe parece mais importante. Importante: use letras que sejam legíveis à distância.</p>



mais 15  
minutos

O facilitador recolhe os cartões dos participantes

Lê um cartão em voz alta e o coloca no painel.

Depois ele ou ela lê o próximo cartão em voz alta e pergunta ao grupo:

“Este cartão está relacionado com o anterior ou acham que é uma ideia nova?”

- Se a ideia do cartão representa o mesmo contexto da primeira, coloque-a ao lado dela, ou seja, alinhada com a primeira.
- Caso a carta não represente o mesmo contexto da primeira, coloque-a sob a primeira carta abrindo assim uma nova linha

Então, da mesma forma continue com os demais cartões:

- 1) leia em voz alta
  - 2) pergunte se pertence a uma das linhas que já existem no painel, ou se é uma ideia nova, então uma nova linha se abre.
- Proceda assim até que todas as cartas sejam colocadas no painel.
  - Se o grupo não chegar a acordo sobre onde colocar um cartão, o cartão pode ser escrito uma segunda vez e colocado em duas filas diferentes.



5 minutos	<p>Terminada a visualização, o facilitador pede aos participantes que proponham um título para cada linha. O facilitador (ou participante) escreve este título num cartão e coloca-o no início da respetiva fila.</p> <p>No final, o facilitador alcançou os seguintes objetivos:</p> <ul style="list-style-type: none"><li>-promover a participação de todos, sejam eles tímidos ou extrovertidos</li><li>- permitir a criatividade (sem censura, exceto insultos, ataques pessoais, etc.)</li><li>-uma estrutura visual organizada para as ideias/cartões</li><li>-os participantes resumiram longas explicações em uma única frase curta (uma ideia em um cartão)</li><li>-o facilitador ajudou a resumir linhas de diversas ideias em um único título, o que dá uma melhor visão geral</li></ul>
-----------	--



5 minutos	<p><b>Voto:</b></p> <p>O facilitador distribui um ponto de cola (adesivo autoadesivo) para cada participante do grupo, se houver menos de 7 linhas no painel, e dois gomets se houver mais de 7 linhas.</p> <p>-em seguida, uma nova pergunta é escrita e exibida: “Qual linha de ideias/temas que acha mais relevante/...quer trabalhar?”</p> <p>Os participantes votam.</p>
	<p><b>Os resultados da votação permitem:</b></p> <ul style="list-style-type: none"><li>- priorizar certos tópicos em detrimento de outros</li><li>-dividir o grupo em pequenos grupos. Cada pequeno grupo pode trabalhar num tema/resultado.</li></ul>
30-45min	<p>-após 30-45 minutos os pequenos grupos apresentam os seus resultados a todo o grupo (plenário)</p>
	<p>Fim da sessão</p>

# EVALUATION EXERCISES

## 1. THE PROSOCIAL BEHAVIORS

- A. Are linked to empathy
- B. Depend exclusively on the behavior of others
- C. Are a political statement
- D. Are a completely new invention



## 2. THE DEFINITION OF PROSOCIAL BEHAVIOR SHALL BE BASED ON:

- A. The corresponding national legislation
- B. The cognitive capacity of the aid recipient
- C. The benefit of the other person according to their needs
- D. The emotional state of the recipient

### 3. WHAT ARE THE IMPORTANT CRITERIA FOR EFFECTIVE PROSOCIAL ACTIONS?

- A. Trust and the likelihood of reciprocity increase and the recipient gains autonomy
- B. Make the recipient more dependent on the author
- C. Increase mutual sympathy
- D. Cause inferiority emotions in the recipient





#### 4. When I actively listen to the other person

- A. From time to time I ask if I understand what you are trying to say
- B. I already think of what I want to answer
- C. I deal simultaneously with other thoughts
- D. I interrupt when the interlocutor speaks too long



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# ASSESSMENT FORMS TO EVALUATE

<https://forms.gle/GRevrr35T7Y1nk3c8>

