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HOW TO ORGANISE TRANSDISCIPLINARY ACTVITIES IN HEALTHCARE EDUCATION

Handbook

TRANSDISCIPLINARY
LEARNING IN HEALTHCARE EDUCATION

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Transdisciplinary Approaches in Healthcare Education

This handbook provides a foundation for understanding and implementing transdisciplinary models in healthcare education. It aims to serve as a resource for educators, administrators, and policymakers committed to fostering innovation and improving patient outcomes through collaborative learning.

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Foreword

The healthcare sector today demands innovative approaches to education that prepare students and professionals to meet complex challenges with competence, adaptability, and creativity. This handbook provides a foundation for understanding and implementing the transdisciplinary approach in healthcare education and it aims to serve as a resource for educators in healthcare and connected fields (nurses, physicians, physiotherapists, pharmacists, psychologists and many more) and policymakers committed to fostering innovation and improving patient outcomes through collaborative learning.

Transdisciplinary education goes beyond traditional boundaries, integrating perspectives and methodologies from healthcare, pedagogy, ICT, psychology, and many other fields, to create learning experiences that are holistic and impactful. This handbook provides clear, actionable insights on how to design, implement, and evaluate transdisciplinary activities that bridge theory and practice, using a model created for this purpose, named the Arrow Model.

The handbook starts with a chapter in which the concept of transdisciplinarity is described, as well as its applicability in healthcare education, followed by one destined to presenting the learning model developed- the Arrow Model, one in which the preparations for its implementation are described, and presenting the national and transnational experiences of the partners in the "Transdisciplinary Learning in Healthcare Education" Erasmus + Project. The handbook also outlines the partners' plans for further implementation of the concept of transdisciplinarity and the Arrow Model, and it summarizes several conclusions.

The project is a pioneering two-year initiative under Erasmus+ Program of the European Union, that took place between September 2023 and August 2025 that addressed the pressing need for innovative education in the healthcare sector. The partnership included institutions from six countries, as follows: SOSU Ostjylland, from Aarhus, Denmark, FEG (Fundatia Ecologica Green) from Iasi, Romania, Instituto Politecnico de Santarem, from Portugal, CIFP Barakaldo LHII from Barakaldo, Spain, Provincial Institute of Nursing Hasselt (PIVH) from Hasselt, Belgium, and Kanuni Mesleki ve Teknik Anadolu Lisesi from İzmit, Turkey.

The project's main outcomes include a handbook on organizing transdisciplinary activities and a collection of 12 activity models, bridging theory and practice. During the project lifetime, the partnership conducted test activities with teachers and students and refined the educational model.

We hope this handbook inspires educators and institutions to adopt transdisciplinary approaches, fostering a new generation of healthcare professionals equipped to navigate the demands of the 21st century.

For further information about the project, please click on the link below. Link to project card: https://erasmus-plus.ec.europa.eu/pt-pt/projects/search/details/2023-1-DK01-KA220-VET-000152460

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Chapter I: Theoretical Framework

I.1 Where does transdisciplinarity come from?

Multidisciplinary, interdisciplinary, transdisciplinary… A concept explanation

When describing teamwork in a healthcare setting involving multiple disciplines, the terms multidisciplinary, interdisciplinary and transdisciplinary have an increased prevalence in literature. However, the terms are ambiguous and used extensively in various healthcare contexts. Below is an attempt to outline the most prevalent definitions in the literature on the differences between the three concepts.

The three terms refer to the involvement of multiple disciplines to varying degrees on a common task. Multidisciplinary approaches are emphasized in healthcare services and healthcare education. It is generally assumed that efforts to involve more than one health discipline in the solution of a patient's problem is valuable and beneficial for the patient.

Multidisciplinarity is described as an approach where professionals from different disciplines work together on a common subject within the boundaries of their own disciplines. Sticking to those boundaries, however, will ultimately mean that the team cannot progress any further. They will then have to bring themselves to the fringes of their own disciplines and create a whole new interdisciplinary field. The interdisciplinary approach thus means that professionals are crossing into another space, and there is blurring of the professional boundaries.

The prefix "trans" (Latin) means *across, beyond* or *over*, in this context in the sense that professionals go across, beyond and over disciplinary boundaries in a transdisciplinary approach to a common subject (Choi et al, 2006).

Based on literature reviews, following definitions on the three concepts are proposed:

Multidisciplinarity draws on knowledge from different disciplines but stays within the boundaries of those fields (NSERC, 2004).

Interdisciplinarity analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole (CIHR, 2005).

Transdisciplinarity integrates the natural, social and health sciences in a humanities context, and in so doing transcends each of their traditional boundaries (Soskolne, 2000).

I.2 Our understanding of transdisciplinarity

Transdisciplinary and interdisciplinary approaches to learning and teaching offer occasions to consider the same issue from different disciplinary perspectives. However, transdisciplinarity provides opportunities to transcend individual disciplines in order to collaborate to construct knowledge and create solutions to common issues. Transdisciplinary approaches, in our understanding, move beyond just learning and teaching across disciplines using common themes, topics, or issues that thread through different courses. Transdisciplinarity requires collaboration across disciplines to create a cohesive curriculum in which students/professionals collaborate to solve multifaceted problems.

It is important to note that a major purpose of transdisciplinary learning is to understand the world around us, and that learning should be contextualized in and applied to real-life, far beyond the traditional notion of "school". This learning and teaching approach includes that it has relevance across the subjects and transcends the confines of the scholastic subjects to connect to the real world. Transdisciplinarity is distinct from multidisciplinarity and interdisciplinarity, because of its goal; moving across and beyond disciplines, fostering understanding of the present world [1].

The partnership's understanding of a transdisciplinary approach is thus that transdisciplinary learning and teaching moves beyond just learning and teaching across disciplines using common themes, topics, or issues that thread through different courses. Transdisciplinarity requires collaboration between disciplines to create a cohesive curriculum in which students / professionals collaborate to solve multifaceted problems. Transdisciplinarity requires innovation, cooperation, and intentionality.

Thus, it is the view of the partnership that transdisciplinary learning in healthcare education is the exploration of a relevant concept, issue or problem that integrates the perspectives of multiple disciplines in order to connect new knowledge and deeper understanding to real life experiences.

The transdisciplinary approach transcends traditional disciplinary boundaries, promoting a unified and interconnected model of care. This approach encourages professionals to collaborate closely, sharing knowledge and skills to provide a comprehensive and holistic intervention.

[1] https://domteamscience.stanford.edu/wp-content/uploads/2023/02/Multidisciplinarity-Interdisciplinarity-and-Transdisciplinarity-in-Health-Research-Services-Education-and-Policy-1.-Definitions-Objectives-and-Evidence-of-Effectiveness.pdf 12.06.2025

I.3 Clarifying what distinguishes this approach from other approaches

As already explained, there are different definitions of the three concepts in the literature and what specifically distinguishes them from each other. Below is a brief summary of how the partnership views the approach to a given common problem differs between the three concepts.

Approaches:

Multidisciplinary approaches: where the disciplines remain intact but focus simultaneously on a common theme,

Interdisciplinary approaches: where there is conjoining of the disciplines to develop a shared understanding of a theme or solution to a problem,

Transdisciplinary approaches: where disciplinary distinctions are not evident but transcends to a collaborative solving of multifaceted problems.

https://www.inspiringinquiry.com/learningteaching/transdisciplinary

While a multidisciplinary approach maintains specialized expertise within clearly defined professional boundaries, an interdisciplinary approach unveils a blurring of professional boundaries, crossing into a new space. The transdisciplinary approach encourages a seamless blend of knowledge and skills, fostering a more interconnected model of care.

Illustratively, the distinction between the different professional approaches can look like this:

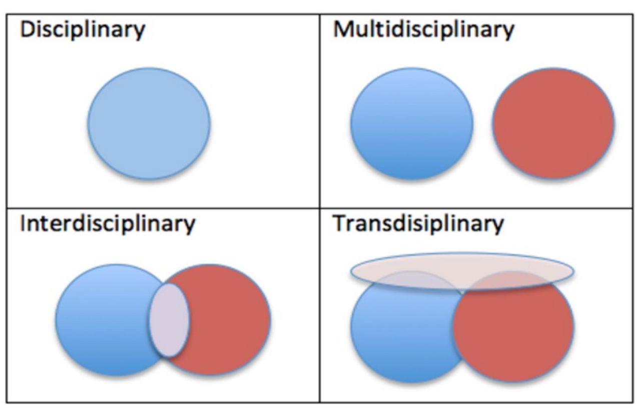

Figure 1 - The distinction between the different professional approaches

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I.4 Working with transdisciplinarity in HC Education, benefits and challenges (mindsets of the teachers, of the students, perfectionism / social Issues)

Multiple disciplinary teams, with students/professionals trained in different fields are common in complex environments such as healthcare, teaching and public health. In health care and educational settings, the methods employed by professionals play important roles in shaping the outcomes of therapeutic interventions.

Within the health and education setting, there are several approaches taken that best support those with therapy and learning needs. One such approach that is becoming increasingly used worldwide is the transdisciplinary approach to therapy. This requires several disciplines to come together to work on shared goals for the client or patient. This is achieved through a model of care where all professionals work in an integrated and connected way using a common plan, rather than that confined to their own discipline.

Each member of the team is responsible for ensuring their own area of expertise is carried out appropriately for the patient in question. In earlier models of service delivery, each professional was qualified to administer assessments and conduct therapy treatments within the remit of their profession. This means that typically, in a multidisciplinary or interdisciplinary team, a psychologist will not be doing speech therapy, and an educational therapist will not be assessing gross motor function, which is the scope of the occupational therapist.

In a transdisciplinary team, the approach is to transcend the traditional borders of each discipline in order to upskill every team member to high quality, using a holistic perspective. After all, the human body, mind, and functioning of these, work in an integrated manner.

Stahl et al. (2011) have further outlined three reasons why transdisciplinary education is important:

1. It helps students gain a better understanding of how theirs and others' perspectives, knowledge, and values contribute to solving problems

2. The provision of opportunities for altering perspectives enables a process of iterative learning to take place, which leads to appreciations of how each actor's position on an issue can change as others' positions are revealed

3. It enables students to learn that what they know can remain the same, but be viewed differently, as different people's perspectives are revealed

In *The transdisciplinary evolution of learning* Basarab Nicolescu notes that a transdisciplinary approach can make a valuable contribution to the advent of a new type of education, ensuring an integral education of the human being. Stating that "Transdisciplinarity entails both a new vision and a lived experience. It is a way of self-transformation oriented towards knowledge of the self, the unity of knowledge, and the creation of a new art of living in the society" (Nicolescu, 1997).

I.5 Advantages of the Transdisciplinary Approach

A transdisciplinary approach boasts advantages such as:

- Holistic patient-centric care,
- Seamless collaboration, and
- The ability to overcome disciplinary silos.
- Recognizes the interconnected nature of various facets of the human's development and encourages professionals to collaborate closely, sharing insights and strategies for more effective outcomes.
- It allows for better outcomes in the holistic treatment of patients and means if one specific professional is unavailable the client does not go without treatment in any given area.

I.6 Challenges in Implementation

Since the basis of the transdisciplinary approach is teamwork, one may encounter resistance and scepticism when trying to implement it, as it requires professionals to upskill beyond their traditional boundaries, demanding a high level of trust from the team members.

Evidently the transdisciplinary approach blurs the lines of professional boundaries and allows overlap of professionals working outside of their traditional remit.It is also costly for the institutions as intensive, high-quality training takes time and expense which many settings are simply not in a position to access.

Time constraints should also be considered. Gaining a thorough understanding of transdisciplinarity and effectively organizing transdisciplinary activities demand both time and consistent practice. Shifting the mindsets of teachers and students toward this approach is a gradual, long-term process that requires careful planning and sustained effort.

https://www.totalcommunication.com.sg/post/multidisciplinary-vs-transdisciplinary-approach-in-healthcare

I.7 The need for a conceptual model

Within a healthcare curriculum, educators should identify ways to help students develop a deep understanding of different perspectives and explore the challenge through different lenses. The curriculum should provide regular opportunities for students to tackle questions from multiple disciplinary perspectives and connect those efforts.

The above section clearly illustrates that the transdisciplinary approach is a complex entity, both in its conceptual framework and, not least, in its execution in an educational and healthcare practice.

To make the concept less abstract and more tangible to work with in a healthcare educational context, the partnership identified the need to create a model that concretizes the different steps that enable students to work with a transdisciplinary approach in healthcare education. The model had to accommodate the complexity of the transdisciplinary approach but make it more operational for students to work with in an educational context. The model, developed by the partnership, which we have named "The Arrow Model" is inspired by the ETHAZI learning model. The central element on which this learning model is articulated; is *collaborative learning based on challenges*.

https://tknika.eus/en/cont/proyectos/ethazi-3/

This approach was appealing to the partnership as it contains a strong transdisciplinary element in its essence. In short, the model is applied as a learning methodology as follows: challenges*, in all cases, are raised to a class configured in teams, where the work process has to enable the students to feel the challenge and, from there, has to have the opportunity to generate the necessary knowledge that Allow you to provide the best solutions.*

In the original ETHAZI model, there are 11 steps. The partnership set out to simplify the model a bit and has now ended up with a learning model containing 8 steps. In the next chapter, the different steps of the model are explained in more detail.

Chapter II: Model for Transdisciplinary Activities in Healthcare Education

II.1 The Arrow Model and its objectives

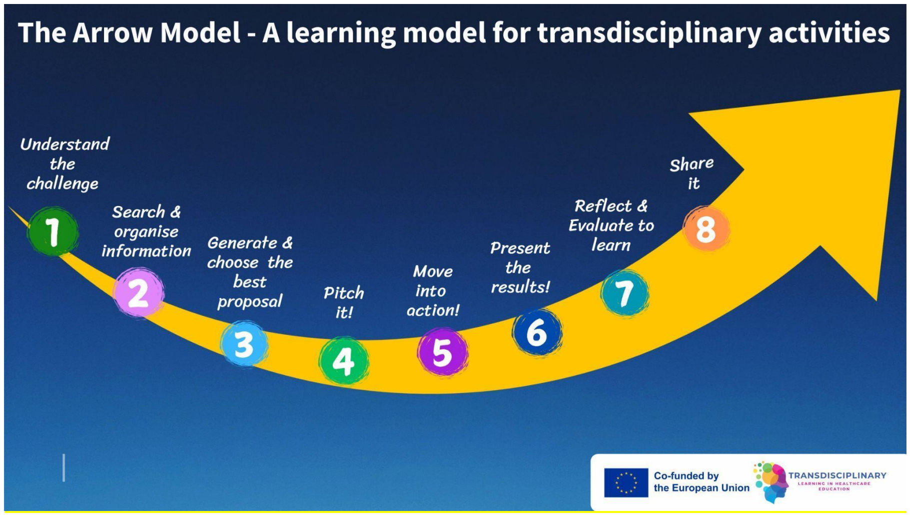

Figure 2 - The Arrow Model

The Arrow Model, developed within the Erasmus K220 project **Transdisciplinarity Learning in Healthcare Education (TDL)**, is a new learning model, designed to be adaptable to various contexts, and it emphasizes collaboration, problem-solving, and the integration of knowledge from diverse disciplines. This model is inspired by the ETHAZI model developed by Tknika in the Basque Country. Below these lines, you will find a detailed overview of the Arrow Model, including its steps, objectives and benefits.

General Objective

The general objective of the Arrow Model is to foster learning in a collaborative way and enhance problem-solving skills in healthcare education by implementing a structured, flexible, and integrative framework that encourages students to address complex challenges through teamwork, creativity, and critical thinking.

Specific Objectives

- To promote transdisciplinary collaboration
- It facilitates the creation of diverse teams that combine knowledge from various disciplines, ensuring roles and responsibilities are well-distributed for effective teamwork.
- To develop problem-solving skills
- It equips students with strategies to deconstruct complex challenges, identify key issues, and propose viable, innovative solutions.
- To enhance research and information management

- It guides students in identifying knowledge gaps, conducting research, organizing information, and critically analyzing data to support their decision-making process.
- To encourage creativity and innovation
- It fosters an environment where students can generate original ideas and explore unconventional solutions while respecting diverse perspectives.
- To strengthen communication skills
- It trains students to present their findings and proposals effectively, both within their teams and to external audiences, through well-structured pitches and presentations.
- To instill reflective practices
- It encourages continuous reflection and evaluation to consolidate learning, identify areas for improvement, and make informed commitments for future challenges.
- To promote knowledge dissemination
- It advocates for the sharing of processes, experiences, and outcomes to a broader audience, enhancing the visibility of the students' work and fostering a culture of open learning.

II.2 Steps of the Arrow Model

Before starting to use the model in the classroom, it is advisable to make the corresponding teams among students a few days in advance (please see chapter III).

Create diverse teams: Ensure that each team includes students from different profiles. Assign clear roles and responsibilities: define the roles of team leaders, researchers, communicators, etc. Sometimes it could be useful to elaborate and sign a team contract.

STEP 1: UNDERSTAND THE CHALLENGE

The objective of this phase is to present and expose to students the problematic situation that they will have to solve. The teaching team will present the situation in an attractive way that activates surprise and curiosity.

In this step students must identify what the challenge is about and all the aspects of the problematic situation. Teachers must ensure that all student teams have the same understanding of the situation at hand.

This could be an appropriate moment to offer the students the document in which they will find all the necessary information to carry out the challenge: timing, resources, work methodology, evaluation criteria and tools, delivery of evidence, feedback moments, etc. Students must read the document and be aware of the learning objectives of the challenge and the tools and resources they have to solve it.

STEP 2: SEARCH & ORGANISE INFORMATION

What do you know and what do you need to know to meet this challenge?

The aim of this phase is to provoke questions to guide students towards the investigation of the different areas of knowledge into which the challenge is subdivided. The purpose is to make students aware of what they know, aware of what they don't know and have them move forward to search for information that will complete their lack of knowledge.

This should happen in 3 steps:

Identify knowledge gaps: Determine what additional information is needed to address the problem.

Knowledge Acquisition: Conduct a thorough literature review to explore existing research, ask the teacher for further information on a topic, find out information from professional experts, etc.

Encourage critical thinking and questioning: Promote the exchange of ideas between student teams to develop new insights.

STEP 3: GENERATE & CHOOSE THE BEST PROPOSAL

In what different ways could we solve the challenge?

Based on the knowledge built up in the previous phases, now is the time to come up with different options to solve the challenge.

There are 3 moments to be respected :

Individually, each student thinks of the best way to solve the challenge. We are all creative. Give yourself a chance. Get the typical solutions out of the way as soon as possible and try to imagine some original or unconventional solution.

Each student shares their idea with the members of their team. Sell your idea to others with conviction. Listen carefully to the ideas of others without judging. Listen and take on board the different proposals put forward by the members of your team.

After listening to all the team members, discuss the different proposals and decide how to solve the challenge. One of the ideas can be selected as the best solution or it could also be a nice combination/integration of different proposals.

STEP 4: PITCH IT

Each team will share their approach to the challenge with the rest of the class and they will listen to the other teams with a critical view. This should not take more than 5 minutes per team.

This allows all the class to be on the same page and even get inspiration from other teams.

STEP 5: MOVE INTO ACTION!

The team agrees on the set of actions to be developed as well as the associated resources and organises them detailing: the sequencing, timing, allocation of tasks within the team, monitoring procedure and risk analysis.

The teaching team will adapt the planning tool to the capacity of the students. It is recommended to use simple, collaborative and visual planning tools, especially with younger learners. Some of these tools classify for example all the actions to be carried out in three levels: TO DO, DOING and DONE, and this makes them much easier to manage. Some useful tools are: Trello, Miro or Site.

Some things students should bear in mind:

The set planning can be wrong, but no planning leads to disorder and anarchy.

The planning tool should be considered as a means and not as an end in itself.

The team is constantly monitoring the fulfillment of the plan, controlling and correcting any deviations that may occur.

This phase promotes the development of specific skills and abilities through practice and experimentation. It is advisable to check whether the actions that are being carried out are providing the expected learning.

All team members should obtain all the competences of the curriculum, therefore it should be avoided to specialise too much in specific tasks.

At this stage, the teaching team should observe whether the teams have identified what they have to do, as well as their level of compliance in terms of deadlines, responsibilities, etc., Additionally, students should have a plan to know how to face problems and unforeseen events.

This is a good time for the teaching team to take evidence for the evaluation process, especially by means of a check-list.

At the end of this phase, the teaching team should expect results in the form of a product or a service, although they should not forget that the process itself is equally or even more important.

STEP 6: PRESENT THE RESULTS!

Each student team presents the results of their work, in other words, they show the rest of the class the solution they have come up with for the challenge.

It is important to present not only the results or conclusions reached, but also to show the development process the team has gone through including personal discoveries, difficulties, etc.

The team should experience this phase as a great opportunity to improve, especially, their communication skills in oral presentations.

STEP 7: REFLECT & EVALUATE TO LEARN

Although this is a process that must be carried out throughout the challenge, this is a key moment to complete the learning process. Teachers and students gather together to get and receive feedback. The teaching team helps students to reflect on what they have learnt and what went well, but also on the areas for improvement identified during the development of the challenge, which will be recorded in the form of future commitments for next challenges.

The teaching team and the students carry out the evaluation from a 360 degree perspective (self-evaluation, co-evaluation of peers and teacher evaluation), taking into account the evidence of the results of the challenge, actions and attitudes. The results of this evaluation are used as elements of reflection for students so that they can make commitments to improve and evolve for future challenges.

Through feedback, students, both individually and in teams, will be able to identify their areas for improvement and define their own learning commitments. The aim is to make them aware of how far they want to go, where they have really got to, the reasons for it, and what commitments they have made for the future. It is also important that they reflect on their own functioning as a team.

It can be very helpful for the teaching team to design digital tools and/or paper formats to support the feedback, allowing students to see in a clear and simple way the current state of their skill acquisition and their evolution over time.

The teaching team should plan this feedback process well before giving feedback, to decide the appropriate time, place and the information they want to share with each student.

Please note that the feedback sessions can be done in teams or individually with each student. Our recommendation is to have 2-3 teachers giving feedback in the first moment to the team of students that have worked together throughout the challenge and later on have a short time to speak with each student individually.

STEP 8: SHARE IT

The process, the challenge results, and experiences during the development of the challenge are shared with the school community and on students' or institution's social networks, depending on the magnitude of the work.

II.3 Possible topics to develop challenges

This are some examples of topics / areas to develop interesting challenges for our students:

Healthcare education: Address complex healthcare challenges by integrating medical, ethical, technological, and managerial knowledge.

Social and community development: Explore solutions for social issues such as health equity, community health education, and access to care through collaborative approaches.

Sustainability in healthcare: Develop strategies to address environmental and resource management challenges in healthcare settings.

Technological innovation in healthcare: Investigate and propose the use of emerging technologies like AI, robotics, and telemedicine to improve healthcare delivery.

Global health challenges: Work on transdisciplinary solutions for global health crises, pandemics, and international public health issues.

Mental health advocacy: Integrate psychological, social, and educational perspectives to address mental health challenges in diverse populations.

II.4 Benefits of the Arrow Model

The following benefits reflect the Arrow model's ability to prepare future healthcare professionals in a holistic manner, equipping them with the competencies needed to meet the challenges of the evolving healthcare sector.

These are some of the most important benefits of working with the Arrow Learning Model:

- Fosters transdisciplinary learning: The learning model allows to integrate knowledge from various healthcare disciplines, promoting a holistic approach to education
- Enhances real-world problem-solving skills: By presenting students with authentic healthcare challenges, the model prepares them for complex scenarios they may encounter in their future careers.
- Develops critical thinking and communication skills: The model encourages questioning throughout the learning process and improves presentation abilities, particularly through pitching ideas.
- Provides a flexible and adaptable framework: The Arrow Model can be tailored to various educational contexts, making it versatile for different healthcare education settings.
- Promotes self-reflection and continuous improvement: Through its evaluation phase, the model enhances self-assessment skills and encourages ongoing personal and professional development.

II. 5 Additional Guidance to the Arrow Model

Timing: Challenges can be designed to be as long or as short as needed. It can be possible to design a 8 hour-long challenge or a 4 week-long challenge (120 hours), it all depends on the time allocated to students to develop each step. For instance, if we need to create a 8 hour-long challenges, we must establish the objectives and allocate time accordingly.

Time allocation for an **8 hour-long challenge**:

STEP 1 - UNDERSTAND THE CHALLENGE: 15 minutes.

STEP 2 - SEARCH & ORGANISE INFORMATION: 1 hour.

STEP 3 - GENERATE & CHOOSE THE BEST PROPOSAL: 30 minutes.

STEP 4 - PITCH IT: 15 minutes.

STEP 5 - MOVE INTO ACTION!: 3 hours.

STEP 6 - PRESENT THE RESULTS!: 1 hour.

STEP 7 - REFLECT & EVALUATE TO LEARN: 1 hour.

STEP 8 - SHARE IT: 1 hour.

Time allocation for **4 week-long challenge (120 hours)**:

STEP 1 - UNDERSTAND THE CHALLENGE: 2 hours.

STEP 2 - SEARCH & ORGANISE INFORMATION: 50 hours.

STEP 3 - GENERATE & CHOOSE THE BEST PROPOSAL: 2 hours.

STEP 4 - PITCH IT: 2 hours.

STEP 5 - MOVE INTO ACTION!: 53 hours.

STEP 6 - PRESENT THE RESULTS!: 5 hours.

STEP 7 - REFLECT & EVALUATE TO LEARN: 3 hours.

STEP 8 - SHARE IT: 3 hours.

The Arrow Model can be applied to challenges that are monodisciplinary, multidisciplinary or transdisciplinary. It all depends on the knowledge that students need to solve the challenge and how many disciplines are involved in the problem.

Chapter III. Preparations before applying the Arrow Model as a learning method

III.1 Preparing the transdisciplinary activities

Creating the teachers' team

When working with transdisciplinary learning, it will be a great advantage to work together as a team of teachers, both in terms of preparing the material, i.e. describing the challenge itself, and implementing the transdisciplinary way of working in the classroom. When the team has to develop a new challenge, the task is as follows:

- Teachers set the challenge together
- An accompanying case study is developed
- All necessary information is described in the teacher and student template (see chapter III), which is the common reference tool for teachers and students in the transdisciplinary learning programme. The 8 steps of the template are a specification of the 8 steps of the Arrow Model.

Depending on how your school/institution and programmes are structured, you can put together teams of teachers in different ways. These can be teams of teachers from the same discipline, e.g. nursing, or teams of teachers from across different disciplines. The point of creating a team of teachers is that transdisciplinary learning, especially for new or inexperienced teachers, can be a demanding task. As an educator, it is important to rest in your own professionalism and be able to take on classroom management before engaging in a new learning discipline like transdisciplinary learning. It is therefore also the partnership's recommendation that the teaching team is composed as a combination of a few new and more experienced teachers, to support the less experienced teachers.

If your school or programme is organised so that teachers have multidisciplinary teaching roles, there is also the possibility that a single experienced teacher can initiate and manage a transdisciplinary learning programme alone. However, we would recommend that, as a starting point, you put together a team of several educators who together can take responsibility for both the development and implementation of transdisciplinary learning programmes. The reason for this is that the task is demanding, especially in the beginning, and it is vulnerable if the responsibility rests with a single teacher if they fall ill, for example.

It is also in the interest of the school/organisation that transdisciplinary learning is further applied in the programme as an approach to complex healthcare issues. This requires that more teachers feel competent and confident in using the transdisciplinary learning approach.

Setting the challenge

Once the team of teachers has been created, it's time to design the challenges. Throughout the course, challenges of different characteristics and levels of difficulty are designed. When creating a challenge, the input of all the teachers in the group is essential to reflect all the technical (theoretical and practical) and soft skills that will be addressed.

In the initial stages of the course, it's important to propose challenges that help students develop values such as group cohesion, the ability to listen, respect, and learn from the opinions of others, and the ability to organize information—in other words, skills that will be essential when working transdisciplinarity on the challenges that will arise throughout the course and in real life.

An initial challenge can be a seemingly simple project unrelated to health sciences learning, such as building a structure with limited materials. The objective of the activity is to introduce students to the dynamics of teamwork and the aforementioned work model (Arrow Model) within the framework of an action that does not require extensive technical knowledge related to their studies, but rather soft skills.

Once the students have worked with the model to solve the first challenge, it is time to apply the same model and work system to solve other challenges that will be presented to them. These challenges will typically be case studies, that is, patients whom our students will treat using a transdisciplinary approach.

The case study design will be carried out by the teaching team. In this process, the different team members will consider the knowledge the students have acquired in the different disciplines when solving the case and the possibilities of obtaining more information and interrelating it, in order to achieve the transdisciplinary perspective that is the objective of this method.

Case studies can be very diverse: an Erasmus student who suffers a bone fracture and wants to continue studying at the university, despite all the difficulties this may entail; an elderly person with an ostomy and other health complications who suffers from the loneliness of the disease and the difficulty in managing daily activities, but who does not want to lose their independence… In other words, cases that present people with problems that cannot be adequately resolved by isolated workers, but rather by professionals who truly place the patient at the center of all of them and who collaborate in a transdisciplinary manner to provide the best possible care.

Working with the templates

To work transdisciplinary, one can use different models. After studying the Ethazi model, we developed the Arrow Model within our project. We designed a structured template based on the Arrow model (see chapter arrow model). The template is also linked to the case study developed by the teachers and presented to the students, forming the context of the challenge they will work with.

It is essential to elaborate each step of the template carefully to achieve sufficient depth in the challenge. It is important not to want to rush to solutions, as this gives to narrow an approach to the needs of the client. Each discipline should be heard within each step to ensure a transdisciplinary approach. It is necessary to always start from the client's needs and inquire concretely about their needs and questions.

The team of teachers working out the template should carefully consider in advance the content of each step and the questions that may come from the students, so that they can arrive at a coherent approach in a concrete and focused way. Guiding students through each step of the template ensures that students start thinking in a transdisciplinary way.

When working out the template, consideration should be given to describing the learning outcomes (technical skills and soft skills). Depending on the size of the challenge and the curriculum of the programme, it should be determined before how much time students can spend on each step of the template.

III.2 Preparing the students for the transdisciplinary activities

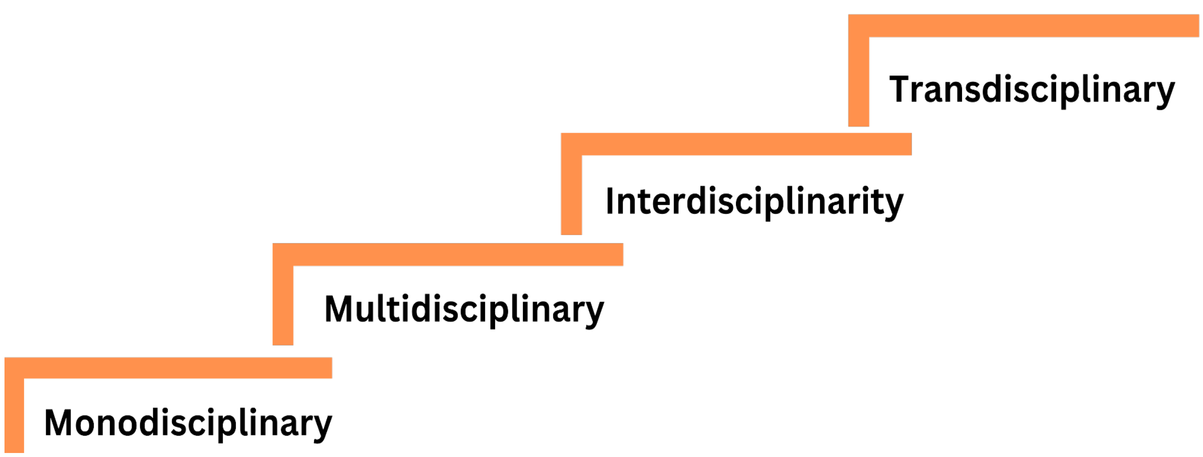

Figure 3 - Mono, Multi, Inter and Transdisciplinary

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When working in healthcare, there will be collaboration at different levels.

From a stakeholder's point of view, for example, it might look like this: Patient A has fallen, fractured his femur and subsequently needs a hip alloplastic:

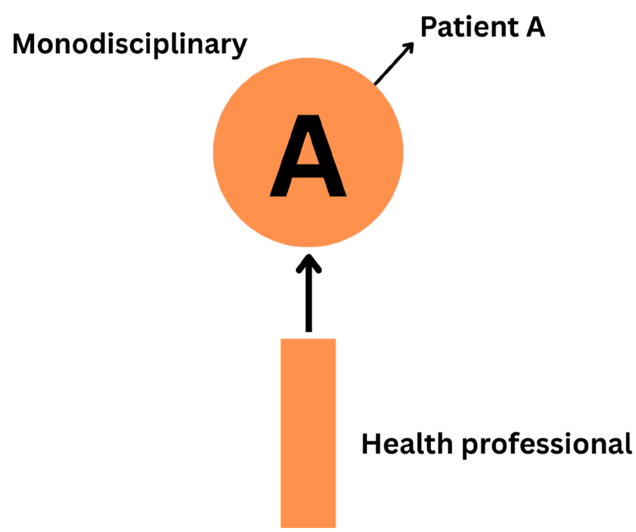

Figure 4 - Monodisciplinary

Monodisciplinary is the action of a single healthcare profession. In this case, it would be Patient A's meeting with his GP. This will be an action by a single healthcare professional. Most likely, the GP will meet Patient A, assess the situation, and then send him to the hospital for further treatment. The mono-disciplinary action is then completed from the GP's side.

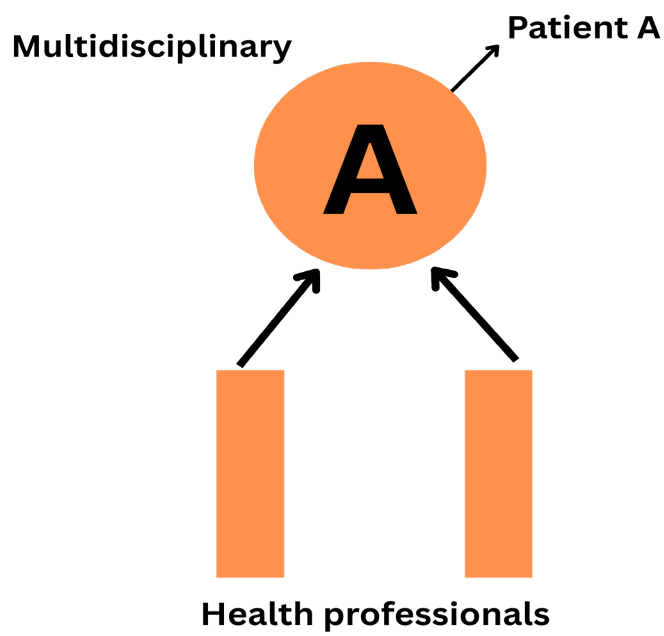

Figure 5 - Multidisciplinary

Multidisciplinary collaboration is defined by 2 or more healthcare disciplines working in parallel on a common challenge but working separately at all levels. In this case, Patient A will experience it when he is hospitalised.

He will be seen by a surgeon for the fracture, a nurse to get him admitted to the right ward, a lab technician to take blood samples, an anaesthesiologist to know his weight to calculate how much anaesthesia he needs, etc.

All of these healthcare disciplines are working towards a common goal: that the surgery is as smooth as possible, that patient A is taken care of and that all preparations for the surgery are in order. However, all the healthcare interventions are done in parallel to get an overview of the different disciplines' needs to fulfil the common goal.

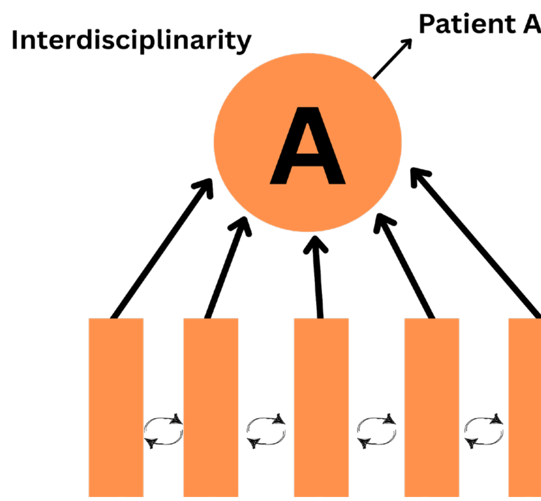

Figure 6 - Interdisciplinarity

Interdisciplinary collaboration is defined by healthcare professionals exchanging ideas, knowledge and decisions across healthcare disciplines in collaboration towards a common goal.

However, there is no overlap of professional boundaries. In this case, Patient A will experience it after the surgery: Patient A will meet many different professionals who will all try to make a plan, taking into account Patient A's needs and future goals.

There will be a complex collaboration between the different healthcare professionals together with Patient A. For example, the daily morning hygiene will need to be planned in order to comply with all restrictions after the surgery and to start the rehabilitation of Patient A.

Here, it might be necessary to hold an interdisciplinary conference to ensure a safe and well-thought-out plan, which could look like this: Patient A needs help from the physiotherapist to get out of bed, then the nurse will bring the breakfast planned by a dietician, to ensure that all nutritional needs after surgery are met.

Furthermore, simultaneously the doctor is present to collaborate with the nurse to ensure that Patient A gets the right pain medication, both in terms of pain relief but also to ensure that the intake of the medicine should be with a meal. In this discussion, both the physiotherapist and occupational therapist have also been involved to ensure good pain coverage for all steps of the morning hygiene.

After breakfast, the occupational therapist will come and help Patient A to the bathroom and complete the morning hygiene. The physiotherapist will be on hand afterwards to help Patient A back to bed so he can get a morning rest etc.

Transdisciplinary

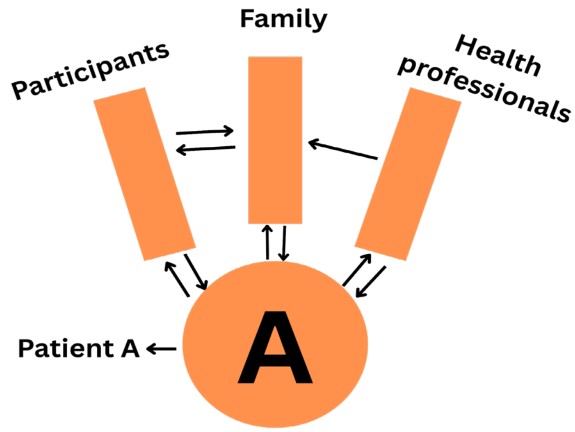

Figure - Transdisciplinary

Transdisciplinary collaboration is defined as a collaboration that transcends individual professional understanding, and disciplines working together with a common goal regardless of professional boundaries and professional understanding. Here, other non-healthcare professionals can also be involved, such as family, friends, the local grocery store, etc.

When working transdisciplinary, the patient, their needs, values and goals are always at the centre, and the patient is seen as an active partner in the collaboration. In this case patient A will experience it when the rehabilitation phase starts. Patient A's goal will be to be ready for discharge and eventually live as independently as possible in their own home.

Often a transdisciplinary conference will be organised where all relevant healthcare professionals are invited, but of course also the patient, his family or friends or whoever he considers relevant.

The goal will be to create a forward plan that addresses all the patient's needs and goals for the future. For example, it could look like this: At the conference, Patient A is asked what he would like to be able to do after discharge? For him, it is important to be able to go for a walk with the dog, as he previously appreciated the fresh air, the structure it gave to his everyday life and the relationships it provides to always go for the same walk and meet the same people. Furthermore, he would like as few visits from healthcare professionals during the day as possible. To achieve this goal, transdisciplinary collaboration is needed. To make the day work according to Patient A's needs, a plan is made; the physiotherapist offers to come in the morning and walk A with the dog. This means that the occupational therapist volunteers to help A out of bed in the morning (although this would normally be the physiotherapist's job) and then help A to the bathroom.

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The dietician has made a diet plan that meets A's nutritional needs, and the occupational therapist offers to make breakfast according to the written instructions together with A after morning hygiene routine. The nurse offers to visit A in the morning an hour before the physiotherapist arrives to administer painkillers and take A to bed for a rest so he is rested. It is also agreed that the physiotherapist will help A out of bed after the rest, do gait training and help A prepare lunch (although this would normally be the dietician's job). A's neighbour offers to take the dog for an extra-long walk at the start of the course in the afternoon, so A doesn't have to worry about getting enough exercise. The doctor wants to do daily follow-ups, so it is agreed that he stops by A in the late afternoon and at the same time makes sure to let the dog out in the garden for 15 minutes. The dietitian offers to do the same in the evening, so she can also help make dinner and follow up on whether A is in pain at the end of the day. A's family offers to do the shopping and other small practical chores during the week. Thus, the conversation and planning will continue to evolve and all participants in the conference, regardless of profession or affiliation, will offer what they can do to make the day work as well as possible for Patient A having his goals and dreams for the future as the priority for all, without being fixated on professional boundaries. The conference will be the start of the transdisciplinary work that will continue in A's home until he has an independent lifestyle.

Working transdisciplinary is a dynamic way of working that is constantly changing and requires continuous adaptation by the different parties involved. As A becomes more independent, his needs and therefore the tasks will also change. In order to work transdisciplinary, healthcare professionals need to be confident in their core tasks, and thus not feel a loss of professional identity when they bid for tasks that are not traditionally within their professional scope, but instead see the value in making a transdisciplinary process work optimally in favour of the patient, their own competence development and the quality of their joint efforts.

Presenting the Arrow Model to the students

Contact with the Arrow Model should be made after having integrated the concept of transdisciplinarity, since this concept is one of the pillars that support the operationalisation of the Model.

For students to be able to work with the Arrow Model by using the template in solving the challenge presented as a clinical case, it is essential that they understand it as a whole, as well as the specifics of each step.

Explaining the Model to students is an important stage in the teaching/learning process in health training, for them to take ownership of the method of approaching the challenge proposed in this Model and to feel motivated to use it.

It's important to share with the students that they will develop soft, technical, and relational skills throughout the process, well as the learning objectives, since the aim is not only to encourage students to think critically in a transdisciplinary way, but also to develop them personally and professionally.

After that, the teacher must clearly and objectively explain the eight steps of the Arrow Model and the sequence in which they are integrated in order to respond to the challenge and find a transdisciplinary and creative best solution, centred on the person's needs, to provide the best care they can. It is very important to make the students aware of the importance of completing each step and not going beyond any of them, with the intention of quickly resolving the challenge presented in the clinical case .

Students should realise that focus is the process of finding a transdisciplinary, innovative and creative solution, not the speed with which the challenge is solved. The success of each step depends on how well the previous one is developed and completed.

This can be one of the biggest challenges for the teacher during the process, helping students progress step by step, making sure they are ready to move on to the next one. That's why it's so important to explain the different steps in detail and with rigour, clearly explaining what students are expected to do in each one.

The teacher is a facilitator of the process, monitoring its development and being attentive to the students' needs, encouraging them to think critically and innovatively in order to collaborate in the construction of a transdisciplinary solution and be proactive elements in the healthcare teams.

Chapter IV: National and Transnational Experiences in the Transdisciplinary Learning in Healthcare Education Project

In this chapter, we compile and analyze various national experiences from healthcare institutions that have implemented transdisciplinary education models. Case studies from different countries will highlight the successes, challenges, and lessons learned from their initiatives.

IV.1 Belgium

Who are we? How experienced are we in Transdisciplinary Learning Activities?

As team Belgium, we are part of one of the 20 HBO5 Nursing schools located in Flanders and the Brussels Capital Region. The Provincial Institute of Nursing Hasselt is the only provincial school within this and is a partner in the Transdisciplinary Learning in Healthcare Education project. The teachers participating in this project are nurses who both teach and supervise internships in the field. The other Belgian participants are teachers who are part of the coordination team at the school, also with a nursing background.

We belong to the secondary education program whose curriculum is composed of five modules with related internships. Each year is composed of different course units (OLODs). After the first year, the student can register as a healthcare professional. The entirety of the 3 years leads to the graduate degree in Basic Nursing. This can go to work in various sectors within the healthcare industry (law of May 1, 2015 on the practice of healthcare).

What experiences we have with transdisciplinary activities

On some specific internships, i.e. in the field, the student already comes into contact with transdisciplinary work. Transdisciplinary consultation occurs in Belgium mainly in home care and mental health care, involving a limited number of but highly relevant disciplines. We also sometimes see these consultations in elderly care and on palliative wards. In most internships, however, multi- or interdisciplinary consultation is used more often, where different disciplines work together, but not always integrated to the same extent as in transdisciplinary consultation and not always explicitly based on the specific needs of the patient. The field often lacks cooperation with external actors, resulting in care planning that is not always optimally tailored to the care recipient. In addition, the participation of the care recipient himself and his family often falls short during consultations. In particular, the involvement of disciplines outside the healthcare system is a major omission, which reduces the ability to provide an integrated approach to care.

In terms of teaching, the current curriculum does not yet include transdisciplinary learning in healthcare. However, as part of the project, we are addressing its integration into our education. As a start, we brought together a group of teachers and students to whom we explained the concept of transdisciplinarity with a video, which used role-playing to clarify the concept. This was followed by a group discussion afterwards. In our curriculum, several topics come into consideration to work around transdisciplinarity. It helps students gain insight into cooperation between different disciplines based on a concrete case. This is not yet a concrete transdisciplinary elaboration of a problem of a person, but gives an idea of what transdisciplinary work entails and where to go with transdisciplinary consultation.

We use the Arrow model as a tool for practical elaboration. This can be started in training in the first year. The application and evaluation of this model in working out a challenge happened during the blended mobility week. The Arrow Model and the template of the challenge proved to be very workable and were therefore considered as a basis for working out other cases.

So we created a second challenge around a case related to stress and coping in the theme of psychology. Its elaboration can be seen as the next step in transdisciplinary learning in healthcare. Students from the first year of training took up this challenge. They found transdisciplinary work on a challenge interesting and meaningful. The elaboration of the challenge, together with the information provided, was felt to be sufficient to get started. The students generally found the Arrow Model to be very workable. Involving transdisciplinarity in the programme in this way was felt by the students to be enriching, both in terms of broad problem-solving thinking across disciplines and in terms of working together. The time they were given to work on the challenge was challenging, though, because it was limited.

Further on in the course, more complex challenges related to healthcare can be worked on. Solving such challenges will also require knowledge from other current, previous and possibly future classes. The content of these lessons is provided to students using a variety of work formats and can be accessed digitally at all times.

Finally, in the final year of the program, a workshop day or two-day event around “transdisciplinary working” can be organized, where external experts from different disciplines can be invited to share their expertise. This creates a rich learning environment in which students can experience, elaborate and discuss the interaction between disciplines in practice. It makes sense to begin a workshop in this way with a clear theoretical explanation, after which extensive time can be spent dealing with a challenge in small groups. Here it is important to paint a realistic picture that matches the practice in the field. Inviting external experts adds extra value. The elaboration of the challenge can be concluded with a presentation by all those involved, in order to eventually, through cooperation and mutual communication, arrive at one concrete feasible elaboration of the care question. Finally, the various participants who participated in the elaboration of the challenge will evaluate the whole by asking themselves questions such as: 'What did we learn?', 'What went well? ', 'What could be better?', ... This way of working, can be considered as a 'final piece' of the training where theoretical and practical knowledge align.

We recognize transdisciplinarity in healthcare as a challenge in training and strive to prepare our students for a work environment in which transdisciplinary work is increasingly becoming the norm.

Lessons learned /preliminary reflections

While working on the challenge, we gained the following positive experiences:

students at the beginning of the programme are already able to work out a simple challenge using the Arrow model;

working in a team and thinking beyond your own professional framework

holistic approach based on the specific needs of the client;

We also noted the following points of interest:

provide sufficient time for working out the challenge;

students should gather sufficient information in step 1 before taking the next steps to avoid working too quickly in a solution-oriented way.

As a school we also see it as one of our tasks to disseminate the knowledge and education experience regarding transdisciplinarity in health care education to partners in the field. We have already made this concrete by giving training to a department where patients with psychotic disorders work on their resocialization in a psychiatric hospital. The target group consisted of nurses, living group supervisors, students on internship, experts by experience, a psychologist and internship mentors. They were already somewhat familiar with transdisciplinarity and saw it as an added value to have a tool (the arrow model) to implement it. In the near future, we will also start collaborating with some VTO partners in order to inform the field, as well as external partners, both inside and outside the health care system, about transdisciplinarity.

IV.2 Denmark

Who are we and what experience do we have with transdisciplinary learning activities?

SOSU Ostjylland is a healthcare vocational school with approximately 1200 students. The school's management and teachers are generally very committed to pedagogical development, which includes the implementation of new learning methods. A key focus area is the use of simulation-based learning and Virtual Reality to supplement traditional teaching methods. Our main programmes include Nursing Assistant (EQF 4) and Healthcare Assistant (EQF 3). The school follows a government-mandated curriculum, but we have some flexibility in how we implement the curriculum through local curricula.

The Danish healthcare system has a long tradition of interdisciplinary collaboration, and the programme typically takes a holistic approach to health, both theoretically and in practice. This approach is particularly evident in the interdisciplinary collaboration between students who work together to solve healthcare problems. However, until the start of the Transdisciplinary Learning in Healthcare Education (TDL) project, we did not have dedicated transdisciplinary learning activities to develop a transdisciplinary mindset in students. Fostering a transdisciplinary mindset and approach to learning is therefore something completely new in our educational context.

How did we start working with TDL?

The initial testing of the Arrow model at SOSU quickly revealed that we needed a different approach to lesson planning and teaching when working with the Arrow model and transdisciplinary learning activities. Initially, there was a lack of a didactic framework for both the planning of the teaching and the teaching itself when students were working with a transdisciplinary learning activity in the form of a challenge.

By developing a common template that covers all eight points of the Arrow model, we established the didactic framework we lacked in the first trial. This framework became crucial for the subsequent application of the Arrow model. We chose two specific areas in the teaching of 'Anatomy, Physiology, Nursing and Pathology', where the students work with the Arrow Model and thus also in a transdisciplinary way.

The first pilot lacked a clear structure, which made it difficult for the students to understand and follow the Arrow Model. We also found that they had difficulties distinguishing between the different forms of professional cooperation. These experiences led us to start the second trial by clarifying the different forms of cooperation. This time the challenge had a clear structure and the developed template was used, which meant that the students could easily follow the structure of the Arrow Model and work in a highly transdisciplinary way.

In the Arrow model and template, in point 7 - 'Reflect and evaluate' - an evaluation form has been developed, however we do not use it, as it does not apply to the Danish pedagogical approach. Instead, the reflection and evaluation takes place orally in 'The Circle of Trust', where the students give and receive feedback based on three criteria: the feedback must be concrete, constructive and loving.

Is it realistic to use the model and what are the benefits?

So far, we have only applied the Arrow Model and method in the final part of the students' education, where they already have a solid theoretical foundation to work from. However, the model is undoubtedly a didactic method that we plan to implement in several parts of the education, as it strengthens students' reflective skills, self-reflection and self-efficacy, and supports a holistic mindset, creating a better understanding of what it means for patients when healthcare professionals work transdisciplinarily.

As mentioned earlier, our experience has shown that the use of transdisciplinary learning as a teaching method both makes sense and increases learning outcomes. In a survey, 66.7% of students responded that they believe the transdisciplinary approach has helped them more in their education as healthcare professionals than traditional teaching has.

Our observations, along with the students' statements and responses in the questionnaire, show a clear picture of students having a high learning outcome that goes beyond their own professionalism. It also gives them a deeper understanding that transdisciplinary collaboration supports a holistic mindset, which both increases the quality of care and ensures that the patient's needs and wishes are in focus for all professions involved.

Cultural and social challenges

As mentioned earlier, we have not had dedicated transdisciplinary learning activities at the school to develop a transdisciplinary mindset in the students. Developing a transdisciplinary mindset and a transdisciplinary learning approach is therefore new in our educational context. However, the implementation of this learning mindset is facilitated by the fact that the Danish healthcare system has a long tradition of interdisciplinary collaboration. The healthcare system is built with a flat structure, and some parts of the healthcare system already work in a transdisciplinary way - for example, terminal teams in hospice, certain areas of psychiatry and neurorehabilitation. This means that students will experience the transdisciplinary approach both in class and in practice, supporting the development of an interdisciplinary mindset.

Testimony from the students

What did you like most about the transdisciplinary activity?

“ What I liked most about the transdisciplinary activity was the collaboration with the other students and the clear focus on putting the patient at the centre. It was motivating to see how we could create a holistic plan together through shared knowledge and ideas.”

“Unfolding the areas of other professions.”

What do you think was the biggest challenge in understanding the activity?

“The biggest challenge was to understand how the different disciplines should work together as a unified team, rather than each student only focusing on their own role. It took time to figure out how to share knowledge and perspectives to create a common plan with the patient at the centre.”

In your opinion, what is the most important thing you learnt during the transdisciplinary activity?

“The most important thing I learned is the importance of putting the patient at the centre and ensuring that all decisions are based on the patient's needs and goals. I have also learnt how crucial it is to collaborate, listen to other perspectives and find common solutions across different professional approaches.”

“Gaining insight into the competences of other professional groups and learning what they can contribute.”

“Taking other professions into account and using their competences.”

“The good tone and playing well together with the citizens at the centre.”

IV.3 Portugal

Who are we? How experienced are we in Transdisciplinary Learning Activities?

The Polytechnic of Santarém is a Portuguese public polytechnic higher education institution located in Santarém, with approximately 5000 students. It is made up of five organizational units and operates in two centers (one in the city of Santarém and the other in the city of Rio Maior). Santarém is home to the School of Health, the School of Agriculture, the School of Education and the School of Management and Technology. The Rio Maior School of Sport is located in the city of Rio Maior.

It is an institution committed to high-level training and qualification of its students, promoting lifelong learning, with a training offer covering various levels of qualification, Professional Higher Technical courses (Qualification 5 of the National Qualifications Framework), Undergraduate, Postgraduate, Master's and PhD programmes. It also offers micro-credentials and short-term training in different areas.

It promotes institutional co-operation and the effective mobility of all its agents, both nationally and internationally.

How have we implemented the Transdisciplinary Learning Activities in our teaching?

Solving challenges using the 'Arrow Model' was developed with the students of the Specialised Higher Technical Course (TeSP) in "Home Support" at the Escola Superior de Saúde de Santarém. Most of the students on this course come from secondary school and their main aim is to go on to study for a degree (mostly in the health field, such as nursing or physiotherapy, and also in the field of education, primary school teacher or social education). The TeSP course in "Home Support" has 120 ECTS (European Credit Transfer and Accumulation System) and is made up of theoretical, theoretical-practical, laboratory practice and internship components. These students know the concept and the differences between monodisciplinary, interdisciplinarity and transdisciplinarity from the first year of the course, but they have no experience of working with transdisciplinary models.

About our experience:

The teachers created a clinical case for the students to solve. Their criteria were that the situation should be similar to those the students experience in their clinical practice during their internship, as close to reality as possible, that it integrated the theoretical content they have covered, and that it should be multidimensional. We started for a review the concept of transdisciplinarity in health and its structuring axes, and after we explained the steps of the Arrow Model proved important for operationalising the use of transdisciplinarity in the search for solutions to the challenge. It was clear to the students that they were using knowledge from other disciplinary areas, and the Arrow Model's proposal for operationalising this was innovative. At the same time, presenting the steps in a structured way makes it easier to mobilise them to solve challenges, leading students to develop their critical thinking and creativity. After each step, the teachers gave the students feedback.

By involving students in the discussion process with their peers, it forces them to become aware of the importance of appropriating theoretical knowledge and mobilising it in an integrated way to find solutions.

Solving challenges using this model increased critical thinking and promoted a transdisciplinary approach to the problem and the solutions being considered, making students look at the person and their context in a holistic way. By carrying out this activity in a more controlled environment such as a classroom, it gave them more confidence to mobilise it in a real care context and at the same time enabled them to be more proactive members of the healthcare team.

By following the steps proposed by the Arrow Model and working through each one consistently, they also became more aware of the importance of each phase in achieving the final result. Each phase proved to be important to the whole. This was not always an easy exercise, since the different phases are interconnected and sometimes there is a temptation to move on without having completed the previous one. However, it was very important for them to realise the importance of analysing the problem and planning the solution in an integrated and consistent way.

The current course curriculum does not specifically include problem-solving through transdisciplinarity, although its mobilisation in the approach to the person is implicit.

Teachers & Professionals - How we created the team

The two groups were created in the Higher Technical Professional Home Support course, One of the students group has participated in the blended mobility and had already worked with the arrow model, the other group came into contact with the model for the first time. After getting to know the Arrow Model, they were presented with the challenge. After identifying the areas in which they were going to intervene, they looked for the professionals who could be part of the team. As they have teachers in these areas, the discussion was held with them.In the way they operationalised each of the phases, although supervised by the teachers, they were given the freedom to use their creativity.

What experiences we have with transdisciplinary activities

Our experience has allowed us to recognise the importance of transdisciplinarity in approaching people with problems and finding solutions, that teamwork is fundamental to finding more integrated solutions and, at the same time, promoting personal and professional development, that appropriation of scientific evidence is fundamental to being a proactive element in healthcare teams and presenting credible solutions, and that creativity and discussion shared in a transdisciplinary logic make it possible to find innovative and effective solutions. Transdisciplinarity only makes sense if care is centred on the person, their needs and their potential. Using this model to solve challenges is a concrete way of giving visibility to the use of transdisciplinarity.

Lessons learned /preliminary reflections

The use of this methodology proved to be an asset to the students' teaching/learning process, enabling them to develop soft and technical skills.

The preparation of the clinical case is fundamental to the success of the activity, as is the preparation of the students and teachers.

Appropriation of the concept of transdisciplinarity and the different steps of the Model by all those involved are fundamental pillars for achieving the learning objectives and developing competences.

Obtaining results requires time and resources to develop all the steps correctly, which is why we consider the preparation of the activity (developing the clinical case, space for students to work, providing the necessary materials, time to work, etc.) as fundamental to its success.

Developing this activity allowed students to develop common and specific transversal skills (communication skills, argumentation skills, teamwork, development of critical thinking and creativity) that enable them to intervene more effectively and holistically in real situations. It also contributed to the development of teachers' skills and strengthened the pedagogical relationship.

Students' testimonials

"At first it seemed confusing, but then it was very interesting"

"It led me to think differently, to think for the whole"

"It was very interesting to look for solutions outside my area to work together"

"I had to analyse what I know and I felt I needed to have more secure knowledge"

'It forced me to use critical thinking together with others"

“I looked at the person in a different, more complete and more complex way”

“It was important to think of solutions as a team for a clinical case, that could be a real case”

It's helped me learn, it's a more motivating way of learning”

Teachers’ testimonials

"It was challenging, the process is regulated by the students and they are very creative"

“We've talked about the importance of transdisciplinarity and now we're giving it visibility”

“It's important to keep the students focused on the strategy and objectives, but the decisions are theirs, and that's very stimulating”

“I would like to be able to study the Arrow Model in greater depth, so that I feel better able to guide students through this challenge.”

IV. 4 Romania

Who are we? How experienced are we in Transdisciplinary Learning Activities?

FEG Post Secondary School is a private educational institution, operating in Romania, at national level, set up in 1997, in Iasi. It offers training in various fields, at EQF 5, providing qualifications as: nurse for general care, pharmacy assistant, physiotherapy assistant, aesthetician, stylist, computer analyst, accountant, bank clerk and interior designer.

How have we implemented the Transdisciplinary Learning Activities in our teaching?

The curriculum our teaching is based on is a complex one, combining separate subjects (e.g. Anatomy, Biochemistry, Hygiene) with modules (e.g. Internal Medicine and specific nursing - consisting of several diseases and the nursing process for these diseases- e.g. Diseases of the respiratory system and the specific nursing, Diseases of the cardiovascular system and the specific nursing).

However, the approach is monodisciplinary, combined, in some cases with a multidisciplinary one. Transdisciplinarity is not part of our culture, so the experiences we had in time on this subject were coincidental or determined by the work in different EU cooperation activities.

We started working with transdisciplinarity because we felt the need for a different approach and a better education, more rooted in the reality of today's rapidly changing society and labor market.

How we created the activities

We organized two transdisciplinary activities during the project lifetime, as extracurricular activities.

The first one was designed and run before having created the Arrow Model and the second one was designed and run following the model.

For the first one, when the team gathered, some proposals for activities were launched, cases based on: colostomy, diabetes, obesity, heart failure and others.

Two teams decided to start working with Colostomy and Obesity, created the case studies and started working on the materials.

At the beginning, our understanding (rooted in our culture) was that the teachers should deliver the content to the students and should prepare all the materials, not allowing the students to take full responsibility for the results.

So, we decided to start with the Colostomy activity and made a plan for activities, following a red thread and then created a set of resources – videos, audio files, presentations, interviews, guest speakers interventions, list of available services, legal provisions etc. The teachers met 3 times before starting working with the students.

Then we invited a group of 9 students, to whom we explained the concept of transdisciplinary. Then, the students divided themselves into two groups and we organized a series of 5 meetings with them, each lasting for 2- 2.5 hours, including one for the presentation of results and evaluation. The teachers presented the materials created, asked for feedback and then handed in one case study to be solved.

Besides the five meetings with the teachers, the students worked collaboratively in the groups and had one week to make their project and presentation of the case study solving.

The second activity had the topic of COPD.

It was organized differently, the teachers facilitating the understanding of the concept of transdisciplinarity and of the Arrow Model by the students.

So, after explaining the steps of the model, a challenge was presented to the students and access to the materials was provided. Again, two groups were formed at the initiative of the 12 students who expressed their interest in working with the topic.

This time, the teachers did not teach the contents, nor have they organized further activities, until the meeting during which the students had to present their proposals. After clearing all the aspects and answering the questions of the students, the teachers remained at the disposal of the students, but were not actively involved in the students' projects.

Then the presentation of the two projects took place and the students used a variety of tools and materials: short videos, audio files, posters, flyers,a website, practical exercises and Canva presentations.

The activity was followed by an evaluation session and then, the students could disseminate the activities.

Cultural and social challenges

During the activities, we realized that we do not have the exercise of working together as a team of several professionals to work on a case/challenge, but the energy and the enthusiasm of both teachers and students were very high.

It proved difficult for the teachers to work as a team, at the very beginning, but afterwards it turned out to be not only challenging but also very instructive and interesting. Many of the teachers stated that they needed extra time for preparation, but also that they learnt a lot during the process of preparing the activity.

About our experience: Teachers & Professionals - How we created the team

We invited the colleagues in the Health Department to join a meeting during which the concept was explained and we asked the teachers to form teams interested in working on various topics.

We started from the idea that the more professionals involved in one activity, the better, in order to ensure a multi angle perspective.

The participating teachers assumed roles and shared tasks and started preparing different kinds of resources. Teachers' meetings are essential for a common understanding of the challenge and to be able to answer the students' questions.

Lessons learned

Preparing the activities is essential, like in any other learning activity.

Both teachers and students should have a deep understanding of the transdisciplinary concept before starting working with the Arrow Model.

The students should be supported all the way in the phase of finding and organizing information, making sure that they "see" all perspectives. If they don't, the teachers should direct them into the process.

The quality of the resources made available to the students is very important. The most effective ones, in our case, were the filmed interviews with the real patients who counted their experiences.

There should be made a list of basic principles to be respected by the students and be presented to them before the activity, but also in the end, when the evaluation is done.

Some of them should include:

Centering the person/patient in case solutions. The person/patient and his/her needs are in the centre and a part of the solution of the case.

Considering diverse perspectives from different fields. In order that the activity could be considered transdisciplinary, many perspectives should be taken into consideration, from different fields.

Following all steps methodically for a comprehensive outcome. Don't "burn" any step, follow each one at its time, since they have their own importance.

As a conclusion, the use of a transdisciplinary model in learning was a real success and it aroused the interest of both teachers and students.

The students were empowered to take learning in their own hands and the teachers learnt not to rely only on the knowledge delivered, but also on the students' capacity to learn and to solve problems in creative ways.

Students' testimonials

"This approach helped me understand better the disease and they way I can contribute to help the patient"

"The most important thing I've learnt was that we are always learning new things and that it is often important to seek out as much information as possible."

"I think we can become better versions of us if we see the problems from more perspectives and try to find solutions in teams".

Teachers' testimonials

"Collaboration between specialists who could improve the condition of patients is very important, right from the training stage."

"To understand other points of view and integrate them into your vision and that overcoming obstacles is part of the learning process"

"Starting from the daily reality, a holistic approach to a patient is the solution to improve the quality of the patient's life. The patient's medical context implicitly generates social, psycho-emotional, financial, behavioral, etc. problems and for a favorable evolution all these aspects must be taken into account. The holistic approach of the patient in practice requires a transdisciplinary approach in teaching / learning."

IV. 5 Spain

Who are we? How experienced are we in Transdisciplinary Learning Activities?

CIFP BARAKALDO LHII is a public VET and Higher VET school, located in one of the most populated municipalities of Biscay, Barakaldo. This school has been in operation for more than 75 years, which has allowed it to consolidate its position as a benchmark in vocational training. Due to this trajectory, the students it welcomes come from Barakaldo as well as from other towns in the territory.

Vocational Training is offered, with 16 Higher VET courses and 9 VET courses in language models A and D, corresponding to the two existing official languages - Spanish and Basque- and students can study in the morning or in the afternoons. These courses belong to different professional families: industry, services, health and community services.

How have we implemented the Transdisciplinary Learning Activities in our teaching?

The Arrow Model was implemented in the Auxiliary Nursing Care course, corresponding to EQF level 4 (European Qualifications Framework for Lifelong Learning). Our students come mainly from compulsory secondary education. The age of the students is around 17 years old, although there are also some older people who come from other studies or from the world of work, attracted by the high employability that this qualification provides.

Transdisciplinarity had not been worked on at the school (although inter-modularity had been worked on), so the concept of transdisciplinarity was new.

The transition to The Arrow Model was facilitated by the school's previous experience with the ETHAZI model, with similar characteristics. Therefore, the adaptation to the new model, both for students and teaching staff, has been natural. The results obtained during the implementation have been considered highly satisfactory. The challenges were carried out in both the Basque and Spanish groups and no particular difficulties were observed in understanding and applying the new model.

About our experience:

It was observed that solving challenges using The Arrow Model promoted transdisciplinary learning, allowing students to integrate knowledge from different areas of health and thus obtaining a more holistic view of nursing. Problem solving in real-life situations was significantly improved through the use of challenges based on authentic clinical cases.

We consider both the design of the challenges and the first steps of the model (understanding the challenge, searching for information) to be fundamental in order to work on the students' cognitive and reflective skills. This model helped the students, despite their youth, to apply theoretical knowledge to practical contexts in an orderly and conscious way.

Step 3 of The Arrow Model (‘Generate and choose the best proposal’) seems to us to be essential when working on soft skills such as the ability to listen, respect and accept the opinions of group mates and the willingness to engage in honest self-criticism.

The development of critical thinking and communication skills was also highlighted, particularly during the phases of presenting ideas and results. Students showed progress in their argumentation and oral expression skills as the process progressed.

The assessment step is a perfect opportunity for reflection and constructive feedback among all participants in the process, both students and teachers. The existence of a self- and co-assessment rubric, in addition to the traditional assessment by teachers, facilitates the process considerably, and carrying it out digitally (in our case, using the SET - Skills Evolution Tool - programme, developed at TKNIKA - a centre promoted by the Vice-Ministry of Vocational Training of the Basque Government's Department of Education), is useful for working on the digital skills established by the European DIGCOMP Framework.

The flexibility of The Arrow Model was considered one of its main advantages, allowing it to be easily adapted to the specific context of CIFP Barakaldo LHII and to the needs of the nursing course. The results obtained have been highly satisfactory, even exceeding the initial expectations of the teaching staff.

In conclusion, the experience with The Arrow Model was perceived as enriching and aligned with the Challenge-Based teaching Methodology included in the strategic lines of our school.

IV. 6 Türkiye

Who are we? How experienced are we in Transdisciplinary Learning Activities?

Our school is a high school health education school in İzmit district of Kocaeli province. Our school has been producing graduates in many sub-fields, primarily nursing, for quite a long time. In our country, in Anatolian health vocational high schools; programs are implemented that are based on the general purposes and basic principles of Turkish National Education, are suitable for the special purposes of health education, provide general information at secondary education level, common professional information about health, and special professional information and skills in each field, prepare students for life, the field of health and higher education, and aim to teach English as a foreign language. The education period in our school is 4 years and graduates of the Health Services Department can work in private and public, inpatient/outpatient health institutions and organizations affiliated to the Ministry of Health with the title of "Nurse Assistant", "Midwife Assistant" and "Health Care Technician". In addition, another field of activity in our school is Patient and Elderly Care Services and graduates of this field can work in private and public health institutions and organizations affiliated to the Ministry of Health and in elderly care centers.

As an educational institution that trains auxiliary health personnel, we aim to give our students the awareness that each individual has different needs and that an approach should be taken in this direction.

With the awareness that “There is no disease, there is only the patient” and the approach that every individual with the same disease has different lives and different needs, we try to benefit from Transdisciplinary learning activities.

How have we implemented the Transdisciplinary Learning Activities in our teaching?

Before moving on to the transdisciplinary learning activity, students were given general information about this method. 15 volunteer students were determined for the study we were going to conduct and care was taken to ensure that these students had different characteristics. 3 groups of 5 students were formed. First, a case presentation was made to the groups and they were asked to help with this case within the framework of their previous professional training. The students were asked guiding questions by the teacher in order to focus on the problems of the case. Students developed their own questions under the guidance of these questions. The aim was to reach the problems and from the problems to reach the solutions by asking questions. Students who worked to achieve this goal prepared presentations containing their own problems and solution suggestions and shared them with the groups.

With this project, we aim to create a new teaching model in the field of transdisciplinary education. It is aimed that this model will make our previous studies more organized. In our course presentations before starting the TDL application, we were focusing on the needs of the patients, but working with TDL in a more systematic and organized manner has revealed a holistic approach to the patient/case, and this has provided a better understanding of the subjects.

How we created the activities

When starting the TDL application, priority was given to case writing. When determining the case, care was taken to create many problems and to create a connection with real life. It was thought that the complexity of the case would help students working in groups to gain/develop different perspectives.

In this context, students were asked to focus on the case first and to determine the problems they considered important in order. Within the framework of the determined problems, the priority ones were selected and they were asked to present solution suggestions to the priority problem. The presentations prepared by the groups were shared and evaluated and feedback was provided by the other groups.

Cultural and social difficulties

One of the difficulties experienced in the TDL study was that the students had different cultures, which made it difficult for them to reach a common conclusion about the problems of the case and the solution suggestions. However, this difficulty turned into an opportunity as a result of the teacher's leadership role and guidance. Different cultures and different social experiences broadened our perspective and allowed us to see more problems with common sense. Since the first stage of problem solving is to accept the existence of the problem and see it, it contributes to finding the right solutions to the right problems.

About our experience:

Our previous knowledge about transdisciplinary activities was a bit scattered and incomplete, and with this study, a more systematic gain was created. We experienced students using their knowledge systematically. We had the opportunity to experience that not only professional knowledge is sufficient to solve problems, but also personality traits, environmental factors, and life skills contribute to problem solving.

Teachers and Professionals:

In this study, the teacher uses his leadership and guiding role to motivate groups to work together. This situation not only contributed to the teacher's own professional development but also contributed to the students' implementation of the instructions.

How we formed the team:

While creating the study team, we tried to determine volunteer students, but students with different characteristics were motivated and guided to volunteer. After selecting 15 students, the teacher first assigned a student who he saw as the leader to each group to make 3 groups of 5 people, and distributed the other students according to their characteristics. Care was taken to have one leader, one slightly passive, one excited and active, one sensible and one friendly in each group.

Lessons learned

- In our TDL studies, we have taken care to keep communication with the patient at the forefront.
- We have developed skills in patient psychology and correct communication with the patient by using the gains of the psychology and communication courses that the students have taken before.
- Students were enabled to help the patient using their knowledge of anatomy and physiology.
- Using their first aid knowledge, we helped them develop skills on how to position themselves and how to help in emergency situations.
- The gains from the Professional Practices course were used to develop their skills in disease detection and patient care.
- Pharmacology course and Disease Information course outcomes were used for the development of post-hospital care and medication use skills.

Lessons learned/preliminary thoughts

Teaching the lessons theoretically at school does not turn into a skill, it only provides the learning of knowledge. In order to teach how a drug will benefit in which disease or situation, it is not enough to just give information, and to turn this situation into a skill, the implementation of activities related to real life increases learning. In this context, the TDL studies we have conducted aim to reach the achievements of Anatomy-Physiology, Communication in Health Services, Health Psychology, Pharmacology, Disease Information, and First Aid courses.

Student/Teacher Testimonials

While working with students, I had the opportunity to observe each student in a group, which contributed to my knowledge about the students. In our studies, the missing gains were determined and learning activities were planned for these gains. It made me realize that some students needed to be encouraged to express their thoughts by putting themselves forward in group studies and taking the floor. Students were encouraged in this regard and were made to participate in the study. It was a study that helped our students gain new perspectives on the fact that the patient does not have a single need and that a holistic approach should be taken to the patient.

Opinions from students and teachers

In this study, the teacher determined that each student has different characteristics and this provided the opportunity to develop his attitudes towards the students. It contributed to the determination of the students' missing professional skills and the elimination of missing gains. The fact that the course gains could be achieved increased the teacher's professional satisfaction. The interactive nature of the lessons positively affected learning.

The feedback we received from students after the TDL studies we conducted indicated that they enjoyed being part of a group, had the opportunity to share their ideas on the subject, and their communication with their friends improved. In addition to these gains, they stated that they had the opportunity to develop their professional knowledge, learned new and different information from their friends, and that it was an enjoyable activity.

How can we adapt this project topic to our school curriculum?

The use of TDL studies in our school courses can only be realized starting from the 11th grade (3'rd year) . When students take a clinical science course in the 11th grade on top of the basic sciences they have taken in the 9th and 10th grades, their professional knowledge will become sufficient to enable them to apply TDL. In order to apply TDL, a TDL study that includes approximately 6-8 hours of activities on the subject should be determined after the completion of theoretical education, the activities should be related to the subject and should be applied by more than one teacher.

For example; After the respiratory system diseases are explained in the System Diseases course and the respiratory system drugs are explained in the Pharmacology course, two teachers should prepare a challenge case study that includes the use of diseases and drugs and apply it with the students, the studies should be presented jointly and evaluation/feedback should be provided by the students.

Chapter V: Future implementation of transdisciplinary learning (The Arrow Model) in curriculum

The goal for the future is to integrate transdisciplinarity into the curriculum of healthcare courses. Of course, this varies from country to country. This chapter suggests possible implementation in the curriculum for each school.

PIVH, Hasselt, Belgium

In the first year, students are introduced to the TDL concept and the Arrow model. They start working with these concepts by taking on a challenge, with the goal of applying their newly acquired knowledge. The first year culminates in a presentation where students showcase their work and receive an evaluation.

In the second year, students continue to work on the same challenge, which has now increased in complexity. This means dealing with more intricate pathologies and involving more partners in finding a solution. The second year also concludes with a presentation and evaluation of the students' progress.

In the third and final year, a two-day workshop is organized, where external partners may be involved. During this workshop, students are required to apply and demonstrate all the theoretical and practical knowledge they have acquired in a comprehensive challenge. The final year ends with another presentation and evaluation.

Kanuni Mesleki ve Teknik Anadolu Lisesi, Izmit, Turkiye

The use of Transdisciplinary activities in our school courses can only be realized starting from the 11th grade (3’rd year) . When students take a clinical science course in the 11th grade on top of the basic sciences they have taken in the 9th and 10th grades, their professional knowledge will become sufficient to enable them to apply TDL. In order to apply TDL, a TDL study that includes approximately 6-8 hours of activities on the subject should be determined after the completion of theoretical education, the activities should be related to the subject and should be applied by more than one teacher.

For example; After the respiratory system diseases are explained in the System Diseases course and the respiratory system drugs are explained in the Pharmacology course, two teachers should prepare a challenge case study that includes the use of diseases and drugs and apply it with the students, the studies should be presented jointly and evaluation/feedback should be provided by the students.

FEG- Scoala Postliceala FEG Iasi, Romania

At FEG Post-Secondary School, we plan to introduce transdisciplinarity and the Arrow Model to create a fresh and collaborative way of learning. This approach helps teachers and students address complex challenges by combining knowledge from different fields and working as a team.

The process begins with Step 1: Train the Trainers. Our teachers take part in training sessions to understand the principles of transdisciplinarity and how to apply the Arrow Model. This ensures they are well-prepared to guide students through this new way of learning.

Next, in Step 2: Presenting the Concept to Students, we explain to students what transdisciplinarity means, why it matters, and how it can help them tackle real-world problems. This introduction sets the stage for their active participation.

In Step 3: Presenting the Arrow Model, we walk students through the steps of this framework, which provides a clear and structured way to approach challenges. The model helps them focus and work systematically.

We then move to Step 4: Testing Challenge 0 in the Classroom. This first challenge is a trial run, where students get hands-on experience with transdisciplinary work. Teachers play an active role, providing guidance and ensuring that students understand the process.

To further inspire students, Step 5: Presenting an Example Challenge showcases a previously completed challenge. This example helps students see the practical results of transdisciplinary work and gives them a roadmap for their own projects.

As transdisciplinarity becomes part of the curriculum, Step 6: Semester Challenges ensures that every class takes on two challenges each semester. Students are divided into groups, and each group works on one of the challenges. This approach fosters teamwork, critical thinking, and creativity.

In Step 7: Including Challenges in Practice Evaluations, we integrate transdisciplinary activities into the evaluation process. By linking challenges to practical assessments, we make this approach a key part of how students demonstrate their skills.

Finally, in Step 8: Sharing the Idea, we aim to spread this approach to a wider audience. By sharing our experiences and results with other FEG schools, educational authorities, and specialists, we hope to inspire the adoption of transdisciplinary learning on a larger scale.

SOSU Østjylland, Aarhus, Denmark

To implement the transdisciplinary approach and methodology, we have gathered teachers teaching the subject in which the trial actions were carried out. The students are in their last term of school and thus have the theoretical foundation that we believe is necessary to develop their competences in relation to transdisciplinary learning. Three of the teachers will be testing the model and the two transdisciplinary activities that have been developed during the project.

Once the teachers have tested the transdisciplinary activities, follow-up meetings are planned. We will then work to implement the model as a permanent part of our curricula, both in the individual subjects and in the interdisciplinary programmes developed in the different school periods.

We also plan to involve the training counselors from practice to disseminate the method and to support the students in the transdisciplinary mindset.

Santarém Polytechnic University, Santarém, Portugal

The TeSP Home Support course at the School of Health of Santarém is structured in two academic years. In the first semester of the 2nd year, there is the curricular unit "Satisfaction of human needs throughout life" with 165 hours, corresponding to 11 ECTS. The evaluation of the students is done through two written group assignments on the intervention of the home support technician with the person with changes in the satisfaction of one of the physiological needs studied.

Our proposal is to use the methodology proposed by the Arrow Model, integrating transdisciplinarity in the realization of these works, solving a challenge (created by the teachers) through the mobilization of the Arrow Model.

We propose the following phases to implement this new form of evaluation in the curriculum:

Submit the proposal for amendment to the holder of the Curricular Unit and to the Pedagogical Council of the School of Health;

Operationalization in the class:

- Integrate teachers into the Arrow Model methodology
- Create the challenge by presenting it according to the templates

- Consolidate the concept of transdisciplinarity (addressed transversally from the 1st year onwards)
- Solve the challenge according to the steps recommended by the Arrow Template
- Dissemination of the results in a Seminar to the school community.

CIFP Barakaldo LHII from Barakaldo, Spain

The legislation that regulates our studies indicates certain objectives that students must achieve. By adapting these objectives, we have defined the skills (technical and soft skills) that students must achieve when they finish their studies. The soft skills are defined by the school, while the technical ones are based on the different study objectives established by the legislation.

Based on that legislation, we prepare a course programme every year. Previously, each subject had its own programme, but for the past two years, in order to encourage collaboration and teamwork, we have compiled a single programme for all the subjects that make up our studies. This programme shows the technical and soft skills that our students must achieve at the end of the course.

At the beginning of the course, the teacher team will decide which challenges will be proposed, taking into account the students' evolution and after reflecting on the previous year's experience. This year, in addition to the initial challenge, a total of six challenges consisting of case studies will be proposed. These challenges will be linked to the different skills, and it will be ensured that all skills are achieved by the end of the course.

This year we have introduced a transdisciplinary perspective to some of our challenges, through the "Arrow Model" proposed in Barakaldo in September.

Chapter VI: Conclusions

Transdisciplinary approaches represent the future of healthcare education and practice. As the complexity of healthcare challenges grows, it is essential for professionals to work beyond the confines of their respective disciplines. This handbook highlights the critical role that education plays in fostering collaboration, creativity, and comprehensive care.

To fully realize the potential of transdisciplinary models, institutions must commit to:

- Building robust curricula that integrate diverse fields.
- Fostering collaboration among faculty and students.
- Supporting research and innovation across disciplines.

The journey to a transdisciplinary healthcare system will require sustained effort, but the rewards—better patient outcomes, more holistic care, and greater professional satisfaction—are well worth the investment.

As the challenges in care are increasing and we face more complex care needs more often, a 'better', 'new' approach to care needs is necessary. A transdisciplinary approach can be of great help here. This requires the necessary effort in terms of time management and organisational framework for collaboration between different disciplines, but will lead to a well-considered and most appropriate response to the client's care needs.

A transdisciplinary approach to complex healthcare issues has not yet been integrated throughout the healthcare system. This handbook, however, can be a great support for the implementation of transdisciplinary thinking and working, both in healthcare education and in the field. It makes students, teachers and healthcare providers aware of the needs and benefits of a transdisciplinary approach.

A practical, applicable learning model, The Arrow Model, is provided in the handbook that has already been tested and found to be applicable by several of the partnership's healthcare educators in different countries.

The transition to a more transdisciplinary healthcare system will require sustained effort, but the rewards in terms of better patient outcomes, more holistic care, and greater professional satisfaction-are well worth the investment.

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