

# STEM

OUTREACH: INTERDISCIPLINARY,  
HANDS-ON AND INCLUSIVE

# EDITORIAL EN

The central aim of the project „STEM Outreach: Interdisciplinary, Hands-on, and Inclusive“ was to provide accessible science communication in the STEM field. The project demonstrated through four work packages how science communication with a focus on STEM can be successfully implemented at various levels.

Traditional science communication, such as podcasts, publications, or lectures, typically targets an already science-affine audience. In contrast, the project „STEM Outreach: Interdisciplinary, Hands-on, and Inclusive“ aims to engage so-called „hard-to-reach groups“ – such as youth in disadvantaged neighborhoods, job seekers, and migrants.

This goal was achieved through the interdisciplinary design of the subprojects, a target group-specific approach, the use of appropriate (scientific) language, and the active involvement of institutions working with non-scientific audiences. Addressing the specific needs of the target group was essential for the project’s success.

For example, the subproject „The Basics of IT“ used personas to represent different target groups. The subproject „Communicating Citizen Science“ collaborated with orga-

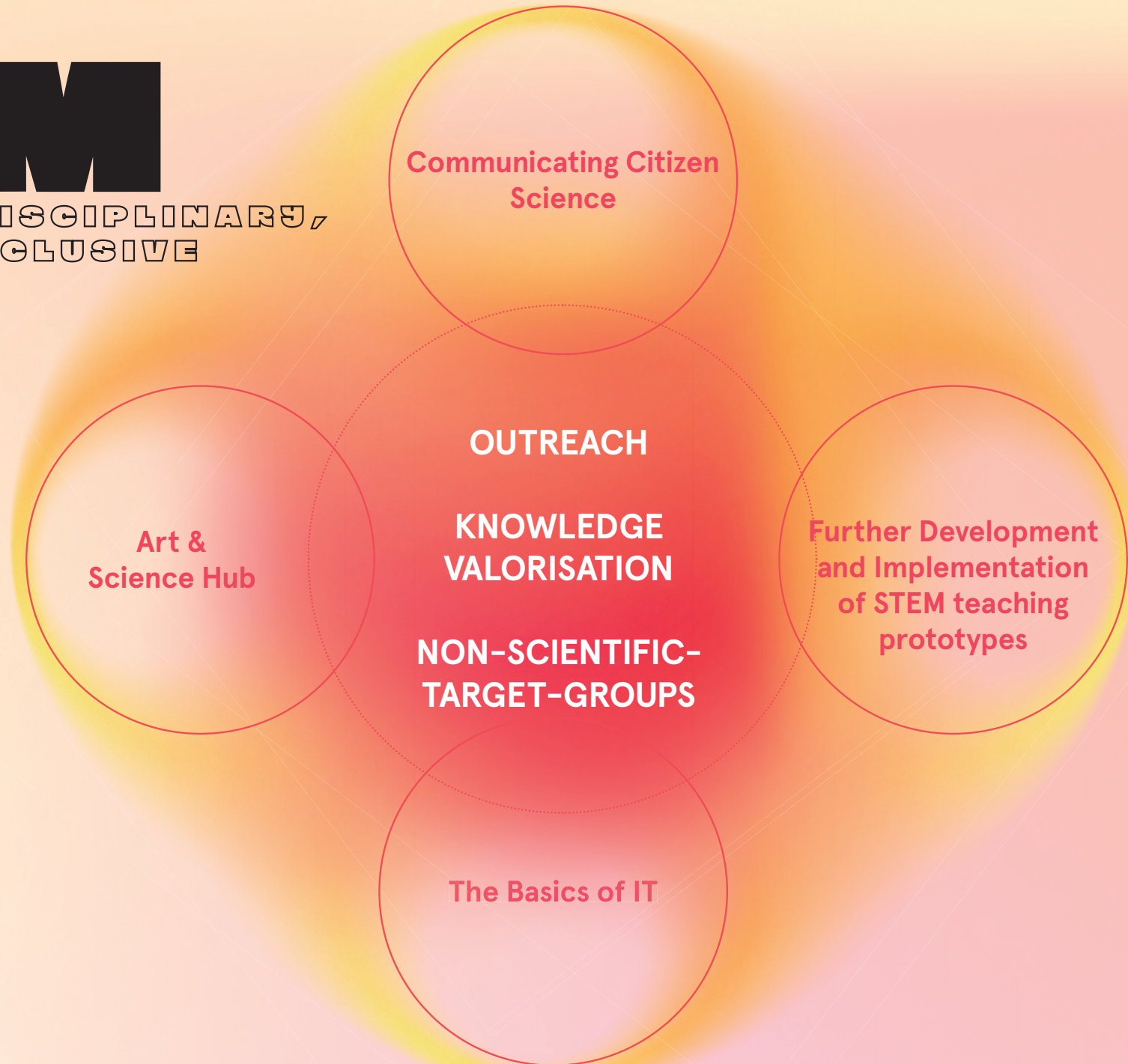
nizations that, in addition to the project leaders, have experience working with educationally disadvantaged groups. In the „Art&Science Hub,“ participating researchers and artists were prepared for working with youth through workshops. In the subproject „Further Development and Implementation of STEM Teaching Prototypes“ at the UAS Technikum Wien, female high school students took part in workshops on quantum encryption, programming and microcosm research and learned about the benefits of planting and the challenges and possibilities of generating renewable energy in urban environments.

Through this comprehensive and targeted approach, the project „STEM Outreach: Interdisciplinary, Hands-on, and Inclusive“ makes a significant contribution to inclusive science communication and demonstrates how barriers can be broken down and diverse target groups can be successfully engaged in STEM topics.



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CHAPTER 1

# ART & SCIENCE HUB

## Art&Science Hub 2023

### University of Applied Arts Vienna & University of Music and Performing Arts Vienna

Science communication for and with children and youth is a central concern of the STEM outreach project, from which the Art&Science Hub emerged. The aim was to evoke curiosity for science and create awareness of what research and art could be as well as what questions they deal with. Children and young people were introduced to science and art at an eye level in order to perceive themselves as active participants in art and science. This early education not only lays the foundation for later career paths, but above all also reduces skepticism about science.

The Art&Science Hub was coordinated by the University of Music and Performing Arts Vienna (mdw) and the University of Applied Arts Vienna (Angewandte) and carried out together with the Josef-Enslin-Platz secondary school. During the three-day workshop, students conducted research based on suggested topics, discussed questions and presented their findings. The workshop was held at the end of June 2023 in a class with a STEM focus, involving a total of 25 pupils aged 10 to 14, four researchers with a STEM background and five artists from the fields of music, performing arts and visual arts, with a particular focus on interdisciplinarity and diversity.

Teams consisting of one researcher with a STEM background, one artist and around five pupils worked on one of the following questions:

- Ø How can we help and protect the smallest creatures in our environment?
- Ø What is the state of nature around our school and how can we figure it out?
- Ø What does water sound like?
- Ø What can you fill a space with?

The format was successfully evaluated: All participants (teaching staff, researchers, artists, pupils) would like to see it continued and found the workshop very enriching.

#### Concept and realization:

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**Anna Wukovits-Zethner**  
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#### Artistic direction:

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CHAPTER 2

# COMMUNICATING CITIZEN SCIENCE

## Communicating Citizen Science

**BOKU University & University of Vienna**

Citizen science, the participation of the public in research projects, has not only established itself as an important scientific method, but also contributed to a broader understanding of what science is and towards a social acceptance of scientific methods and findings. Austria plays a pioneering role internationally in this area with the Citizen Science Network Austria coordinated by BOKU University.

Deriving from this, the workpackage „Communicating Citizen Science“ dedicates itself to a specific challenge found in participatory research projects: reaching and including target groups that are far removed from science. In two pilot initiatives, work was conducted together with civil society actors.

In the first initiative, the two citizen science projects *wettermelden.at* and *Biodiversity at the Cemetery* were integrated into German courses at different levels at Viennese adult education centers in order to create a space for people with migration backgrounds to be involved in citizen science. The project content was prepared and communicated to the course participants in an accessible way and excursions were offered to the project leaders. This created an occasion for the participants to engage with the German language through a concrete project as well as an opportunity to participate in research activities.

In the second initiative, a course concept was developed with the Association for the Promotion of Work and Employment (FAB) in which citizen science was brought to long-term unemployed people. The aim was to help people affected by unemployment restructure their everyday lives and show them that their contribution is important for research. This experience was intended to facilitate their re-entry into the workforce.

### Concept and realization:

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CHAPTER 3

**FURTHER DEVELOPMENT  
AND IMPLEMENTATION  
OF STEM TEACHING  
PROTOTYPES**

## Further Development and Implementation of STEM Teaching Prototypes

### UAS Technikum Wien

Austria is below the EU average for tertiary degrees in scientific and technical subjects. Stakeholders from industry, research and education see reasons such as insufficient information about study programs, school lessons and too few innovative science communication formats.

The UAS Technikum Wien addressed this with the FIT Info Days 2023 through workshops specifically for schoolgirls. In the „Quantum Encryption“ workshop, participants experimented with laser light and learned the basics of quantum physics. The LEGO robot workshop offered insights into programming, while the „Research in the Microcosm“ workshop covered cell culture and ecotoxicology.

Another project, the Living Wall Sensor Network, is a vertically green wall with sensors for environmental measurement data that are used in class and further processed by students. Island solar systems and small wind turbines were investigated for sustainable energy supply. The social science team of the R&D focus on Renewable Energy Systems actively integrated students into the supervision and perception of the project, which promoted methodical knowledge transfer and citizen science.

Thanks to feedback from teachers, the UAS Technikum Wien was able to further improve its hands-on teaching formats. These workshops are now an integral part of science communication and promote interest in STEM subjects through practical implementation and peer-to-peer activities. The workshops are designed to be inclusive and offer a variety of role models to counteract gender stereotypes in career choices.

Targeted science communication and practice-oriented formats can inspire young people to study STEM and thus increase the number of graduates in these fields in the long term. This is an important step towards reaching the EU average and strengthening Austria's innovative strength.



CHAPTER 4

# THE BASICS OF IT



## The Basics of IT

### The Distance-Learning University of Applied Sciences

As part of the STEM outreach project, the prototype „The Basics of IT“ for adults was developed and successfully implemented. Following a target group survey, personas were identified. They formed the foundation for the customized development of the prototype, ranging from graphic designers, teachers, homemakers, interns and more.

The resulting prototype was presented as a “self-paced online course” with the title “The 1x1 of IT”. This innovative teaching and outreach format was created to appeal to beginners who want to acquire basic knowledge of information technology (IT) in order to act safely and competently in the digital age.

The course guides participants through a beginner-friendly and practice-oriented program, covering basic questions in an accessible way such as “How does a computer work?”, “How does the Internet work?”, “How does a search engine work?” and “How does artificial intelligence work?”.

The teaching format was specially designed to provide an accessible introduction for people with little prior knowledge, with a particular focus on making the learning content practical and application-oriented in order to not only impart knowledge to participants, but also to strengthen their ability

to act and participate in the digital world. The overarching goal of the course is to support participants on their path to digital sovereignty and to impart the skills necessary for successful participation in the digital world. Thanks to the practical and everyday teaching, participants are subsequently optimally supported on their path to digital sovereignty.

### Concept and realization:

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# IMPRINT

## STEM Outreach:

### Interdisciplinary, Hands-on, and Inclusive

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## Project management:

UAS Technikum Wien &

University of Applied Arts Vienna

## Project partners:

BOKU University, University of Vienna, The Distance-Learning University of Applied Sciences,

University of Music and Performing Arts Vienna

## External project partners:

Hertha Firnberg Schools for Business and Tourism,

MS Josef-Enslein-Platz, Schrack Technik GmbH,

FAB - Association for Work and Education,

Vienna Adult Education Centers

GeoSphere Austria

## Knowledge Transfer Center East

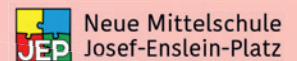
Cooperation project: STEM Outreach: Interdisciplinary, Hands-on, and Inclusive

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## Cooperation partners



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