Navigating Future Skills: The FOUNDING LAB Experience in Shaping the University of the Future

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Abstract. This paper introduces the FOUNDING LAB, an interdisciplinary, futures-oriented educational initiative designed to enhance students' skills and competencies for addressing complex global challenges through art, social sciences and technology. It brought together students from various disciplines, backgrounds, and countries to collaborate on projects that blended artistic and technical elements, fostering critical thinking, empathy, and creativity. The program offered students opportunities to engage with experts and mentors from leading institutions in media art and innovation. The design, implementation, and evaluation of the program were based on participant feedback and project analysis. The paper aims to demonstrate how the program enhanced futures literacy, a crucial 21st-century skill, along with interdisciplinary knowledge, communication, collaboration, and ethical reflection. Additionally, the challenges and limitations of the program were identified. The FOUNDING LAB set a precedent for a higher education model prioritizing questioning, experimentation, and co-creation for transformative learning.

1. Introduction

The challenges of the Anthropocene–often referred to as a “polycrisis” (Lawrence et al., 2022)–require interdisciplinary approaches based on creativity and co-creation. The fast changes in science and society require skills that prepare for the unknown future. But there is no consensus on what these “future skills” are and how to teach them in science. STS literature has long discussed that scientific and technological literacy, problem-solving, and most importantly, responsible social action is core to STS education–yet, sweeping educational reforms are to be approached with caution and care (Waks and Prakash 1985). As we discuss the creation of a novel educational program in this paper,

we attempt to remain cautious, while also responding to recent calls for future-oriented skills and their integration into curricula (Ioannidou and Erduran 2022).

This paper discusses the so-called FOUNDING LAB. This experimental program was a collaborative prototype with which the newly funded IT:U–Interdisciplinary Transformation University located in Linz, Upper Austria (also known as IDSA–Institute of Digital Sciences Austria) and Ars Electronica wanted to identify and develop new methods and formats for shaping a pioneering university. This goal was based on the aim to “equip students with the 21st century skills needed to tackle global challenges.”, as Assoc. Prof. Dr. Martin Polaschek, Federal Minister of Education, Science & Research put it (Polaschek 2024). Within the experimental program, a strong emphasis was put on interdisciplinarity within the field of technical transformation: boundaries between disciplines and between art and science were to be overcome and a multitude of dimensions of digitization to be considered. Futures literacy played a central role in the FOUNDING LAB. The project served as a platform for exploring future scenarios of higher academic learning and research settings and preparing for the future challenges coming with digital transformation, emphasizing the importance of anticipatory thinking in an ever-changing world.

Although Science and Technology Studies (STS) was not explicitly referenced in the conceptual framework of the prototype presented here, several key elements of STS were inherently integrated and were central to the project’s design. From an educational perspective, STS and its critical contributions were, for a long time, not sufficiently included in higher education curricula (Zeidler et al. 2004). With the domain of socioscientific issues (SSI), students were inspired to at least consider the relationships between science-based issues and moral principles (ibid.). These include critical reflections on the relationship between society and technology and the challenge of how artistic and design methods could be integrated to explore and reflect on science and technology.

Additionally, our role evolved into providing the structural foundation for teaching such STS principles and implicitly strengthening futures literacy as a critical skill. The primary focus was on practical implementation rather than theoretical reflection. Notably, the perspectives shared here are predominantly informed by the authors' direct involvement in the on-site realization of the project, supplemented by questionnaires filled out by the participants.

The FOUNDING LAB took place from August 2023 to January 2024 in Linz, Upper Austria, and started with a three-week-long Summer School. At the Ars Electronica Festival 2023, the students’ visions for the future university were used as the kick-off for the following semester. Previously held Festival University Summer Schools are documented on the website of Ars Electronica and in Sipos et al. (2024). For this

FOUNDING LAB Fall Term, the Ars Electronica Futurelab, together with 21 international Fellows (this term refers to lecturers in the program) from different disciplines, designed a novel approach that was then tested for feasibility and practicability. The backgrounds of these Fellows included scientists, teaching professors, leading industry heads, artists, activists, entrepreneurs, journalists, UNESCO-Fellows, feminists and government advisors. 25 students from all over the world were selected to join program and–beside taking part in the classes, workshops and lectures, and the development of their own semester projects, share their visions of the needs and wants of a new university, a "university of the futures".

2. Methods: Building on and Developing "Future Skills"

What is the goal of a "university of the future"? To train the workforce of the future? To equip students with the skills, mindset and knowledge to face upcoming challenges and grasp opportunities ahead?

There has been quite some political to and fro surrounding the founding of the university project that is now named IT:U (Nimmervoll,2024, Klatzer, 2024, DerStandard, 2024). From an STS perspective, the landscape in which the new university was founded is quite an interesting one. It would be worth exploring this background in a separate paper, as a case study reflecting on the "messiness" of technoscience practices shaping and reproducing the social world (Law, 2017). Beyond the political complexities, in this paper we focus on the premise this new university was built on. Namely, one of the main goals from the beginning was "to achieve scientific excellence and to also capitalise on it with impactful contributions to society and industry, in terms of processes and start-ups that are going to change the world." (Austrian Federal Ministry of Education, Science and Research, 2022). Thus, with this paper, we aim to contribute to STS from an educational perspective, as there is an increase in policymakers urging the inclusion of so-called "future-oriented skills" to deal with pressing issues. In a similar vein, "twenty-first century skills" include foreseeing future scenarios, anticipating potential problems and critical engagement with problem-solving strategies (Ioannidou and Erduran, 2022).

In his Afterword to the Special Issue on "Politics by other means: STS and research in education", Decuypere (2018) highlights that one of the major strengths of STS in educational research is that it allows the researcher to trace how a particular practice is relationally unfolding at–and through–a particular moment in time. The paper at hand is an example of such ethnographic work, aiming to contribute to the body of knowledge rooted in "presentism". While a longitudinal follow-up study could uncover more complex insights into the stabilization and crystallization beyond what was originally intended (ibid.), this paper represents a snapshot of our times through an experiment. New

courses created by engaged lecturers are an excellent way to update the education of any discipline to address the present. One example for this is how the Technical University of Munich has been experimenting since 2023 with so-called project weeks to inspire moving away from theory and provide students with more practical skills in an interdisciplinary way, preparing them for the 21st century (TUM 2023). Such approaches to create change are widespread, as adapting whole educational systems to the rapidly changing needs of industry and businesses is a challenging task (Sipos and Kutschera, 2024). The first experimental semester of a new university however opens a unique window of opportunity to respond to those needs, experiment, and test novel formats.

The program described in this paper is situated firmly in the context painted above. The authors of this paper saw the opportunity to record their journey in re-making how we think about learning (Decuypere, 2018). In addition to recording the *how*, we also inquire about the *what* and the *who*: what competencies are necessary to face future challenges? And who identifies these demands?

2.1. Supporting Frameworks

When searching for supporting frameworks to assess our educational prototype for a selected group of international and interdisciplinary students, we turned to the Future Skills Framework, provided by an overlap of the key competencies according to UNESCO (UNESCO, 2018) and the Future of Jobs WEF reports (World Economic Forum, 2020 and World Economic Forum, 2023).

The authors of this paper selected the UNESCO and WEF frameworks for several reasons. Although–or rather because–UNESCO and the World Economic Forum (WEF) are non-scientific institutions with their own distinct cultures, values, and agendas, they wield significant influence in the non-academic world. What Ars Electronica brought to the table within the collaboration with the Founding Convent of IT:U is interdisciplinarity with the field of Art: We wanted to explore how artistic strategies, mindsets, and ways of working could enrich the interdisciplinary field of digital transformation. We also wanted to assess how our educational prototype would perform according to non-academic frameworks that influence the global economy and society. Therefore, we chose the UNESCO and WEF frameworks as references to evaluate our program's impact and relevance. We wanted to find out how a highly experimental prototype for higher education based on art science collaborations would perform against the background of these frameworks with their respective agendas outside the world of academia and art.

Also, this new higher education program was supposed to address two global trends in particular: One is that due to the climate crisis, there is an urgent need for people with the skills to sustainably transform the world. The other pertains to the changing landscape of work: as technology is rapidly adopted in the workplace, jobs are becoming obsolete,

and new jobs are being created that need new types of expertise. The FOUNDING LAB project took the chance to experiment with how higher education can concretely help address these issues.

Our decision also builds upon Kotsiou et al. (2022), who examined 99 future skills frameworks and used thematic analysis along with Social Network Analysis to create meta-categories of future skills identified by current research, observations which highlight a shift in recent times towards equipping learners for uncertainty, specifically citing UNESCO and WEF frameworks as examples (p. 182).

UNESCO, with its global mandate to promote education, science, and culture, is instrumental in shaping educational policies and fostering international collaboration. Its focus on sustainability and global citizenship aligns with the urgent need to equip individuals with the skills to address climate challenges. Some scholars argue that UNESCO's initiatives, particularly in education, can reflect a top-down, one-size-fits-all approach that may overlook local contexts and needs (McCowan, 2019). However, its emphasis on sustainability and global citizenship provides a benchmark for ensuring that our educational prototype aligns with international standards for addressing climate challenges. By integrating UNESCO's competencies, we aim to embed a global perspective on sustainability into our program.

On the other hand, the WEF, a forum where business, political, and societal leaders meet, is a critical player in forecasting the future of work. The WEF's Future of Jobs reports highlight the evolving skill sets required in an increasingly automated and digitized world. It has been criticized for its elitist nature and potential to prioritize corporate interests over broader societal needs (Fuchs, 2020). The WEF's Future of Jobs reports, while influential, have also been questioned for further blind spots, for example focusing exclusively on technological change and missing major shifts throughout entire private and public organizations (Ehlers 2020). Despite these critiques, the WEF's insights into emerging labor market trends are an interesting perspective on our program and can support the exploration of how well it would equip students with the skills demanded by an increasingly automated and digitized economy–as the WEF sees it.

While UNESCO tends to prioritize long-term societal well-being and global equity, the WEF is more concerned with immediate economic outcomes and the needs of the global market. Despite these differences, there is overlap in their focus on skills for the future—both institutions recognize the need for education and training to address emerging global challenges, such as technological disruption and sustainability. However, UNESCO approaches this from a humanistic perspective, advocating for education that supports inclusive and sustainable development, while the WEF's approach is more closely aligned with preparing the workforce for the demands of the global economy. In essence, UNESCO and WEF can be seen as complementary yet distinct forces:

UNESCO advocating for educational and cultural policies that promote equity and sustainability, and WEF driving economic and technological policies that prioritize efficiency and innovation. Juxtaposing the two reports, we attempt to balance those economic imperatives and the broader social goals necessary for sustainable global development. Their perspectives are particularly relevant when considering the program's potential impact from the vantage point of industry, entrepreneurship, and human resources, rather than purely through an academic lens.

By choosing these two frameworks, we not only examine perspectives that challenge academic conventions but also aim to evaluate our program's effectiveness in a broader, real-world context. This approach helps us bridge the gap between academia and the reported needs of the global economy, fostering a new generation of professionals capable of driving sustainable transformation.

This does not mean however, that academia has not considered similar skillsets valuable. In STS literature, specifically in the discourse on SSI, the need to achieve a practical degree of scientific literacy is highlighted. For example, a combination of practical and theoretical skills, such as scepticism, open-mindedness, critical thinking, an acceptance of ambiguity, multiple forms of inquiry, as well as a search for data-driven knowledge are considered (Zeidler et al. 2004). Similarly, but more recently, Hodson outlined the need for more radical change by building a curriculum for sociopolitical activism (Hodson 2020). Each element of this combined list of skills has a strong presence in the list of future skills we address below.

The 2023 WEF's Future of Jobs report highlights cognitive skills, particularly complex problem-solving, which are anticipated to experience the fastest growth in evolving significance of skills for their workforce for the upcoming five years. Creative thinking is projected to rise slightly more swiftly than analytical thinking, while technology literacy ranks as the third-fastest growing core skill. Notably, self-efficacy skills are reported to increase in importance at a higher rate than working with others. Businesses identify socio-emotional attitudes such as curiosity, lifelong learning, resilience, flexibility, agility, motivation, and self-awareness as rapidly growing in importance. This underscores the emphasis on cultivating resilient and reflective workers who embrace lifelong learning in an environment where skill lifecycles are diminishing. The top 10 also include systems thinking, AI and big data (World Economic Forum, 2023, p. 38).

The UNESCO's report "Issues and trends in education for sustainable development" (UNESCO, 2018) emphasizes crucial competencies essential for sustainability. These competencies include systems thinking, anticipatory, normative, strategic, collaboration, critical thinking, self-awareness, and integrated problem-solving. Each competency addresses specific aspects related to understanding relationships, anticipating multiple futures, negotiating values, collaborating effectively, and critically examining norms. The

integrated problem-solving competency is highlighted as particularly important, emphasizing the interconnectedness of these skills. With this strategy as base, the FOUNDING LAB program employed learner-centred, action-oriented, and transformative learning approaches. The program also prioritized interdisciplinary and transcultural collaboration, incorporating project-based and research-based learning. To be able to gauge the impact of the approach, the Fall Term program employed a feedback and evaluation process, enabling students to self-assess their development regarding future skills. For the student feedback and evaluation of this project, we subsumed anticipatory, and systems thinking under the term futures literacy and understood it as a crucial skill to face future challenges and lead transformation and innovation processes:

Interdisciplinarity: Highlighted by UNESCO and the WEF as one of the major future skills, interdisciplinarity involves the ability to integrate knowledge and perspectives from various fields, fostering a holistic understanding of complex issues. This skill is particularly crucial in research and education, where it plays a vital role in breaking down silos, promoting collaboration, and encouraging innovative solutions by working with people from diverse backgrounds. Effective communication is key in conveying complex ideas and encouraging the development of innovative solutions.

Collaboration: According to UNESCO, in education, this refers to the ability to learn from others; empathy: understanding and respecting the needs, perspectives and actions of others; to exercise empathetic leadership, meaning understand, relate to and be sensitive to others, and deal with conflicts in a group; and facilitate collaborative and participatory problem-solving. According to WEF, in the workforce this includes emotional intelligence, or the concern for others (being sensitive to others' needs and feelings and being understanding and helpful on the job); cooperation, or being pleasant with others and displaying a good-natured, cooperative attitude; social orientation, meaning that the job requires preferring to work with others rather than alone and being personally connected with others on the job; as well as social perceptiveness, or being aware of others' reactions and understanding why they react as they do.

Futures Literacy: UNESCO coined the term Futures Literacy to describe the skill of cultivating optimism and motivation for change amid global challenges. While literacy traditionally refers to basic reading and writing skills, in the context of the future, it involves training imagination to construct narratives that address and overcome challenges. This also encompasses anticipatory competency, involving the understanding and evaluation of multiple futures—possible, probable, and desirable. It includes creating personal visions, applying the precautionary principle, assessing consequences, and navigating risks and changes. Additionally, strategic competency plays a crucial role, emphasizing the collective development and implementation of innovative actions to promote sustainability locally and globally.

Critical Thinking: In UNESCO's summary, this means the ability to question norms, practices and opinions; reflect on one's values, perceptions and actions; and take a position in the sustainability discourse. According to WEF, this means critical thinking and analytical skills, e.g. using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems. It also includes monitoring and assessing the performance of yourself, other individuals, or organizations to make improvements or take corrective action.

Problem Solving: In education, UNESCO highlights the overarching ability to apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive and equitable solutions that promote sustainable development. In the WEF Report, competencies include reasoning, problem-solving and ideation, which are abilities that influence the application and manipulation of information in problem- solving. It also includes quantitative abilities, in the case of problems involving mathematical relationships.

Anticipatory and Systems Thinking: According to UNESCO, this is summarized by the ability to recognize and understand relationships, to analyse complex systems, to perceive the ways in which systems are embedded within different domains and different scales, and to deal with uncertainty. In WEF's understanding, analytical thinking and innovation will be relevant in jobs that require analysing information and using logic to address work-related issues and problems. Furthermore, creativity and alternative thinking skills will be necessary to develop new ideas for and answers to work-related problems.

Self-Management: For UNESCO, self-management is the self-awareness competency: the ability to reflect on one's own role in the local community and (global) society, continually evaluate and further motivate one's actions, and deal with one's feelings and desires. In the Future of Jobs, this translates to resilience, stress tolerance and flexibility, as jobs require being open to change (positive or negative) and to considerable variety in the workplace. Jobs will also require maintaining composure, keeping emotions in check, controlling anger and avoiding aggressive behaviour, even in very difficult situations. Finally, self-management includes accepting criticism and dealing calmly and effectively with high stress situations.

Technology Use: In education Technology Use plays a role that becomes more and more important – from media competency to actual skills of using technology to learn, research and create results. Using technology with a critical awareness and basic understanding of the underlying rules and technical properties. For WEF, this means technology use, monitoring and control, being able to determine the kind of tools and equipment needed to do a job, including controlling operations of equipment or systems,

but also technology design and writing computer programs for various purposes, as well as generating or adapting equipment and technology to serve user needs.

2.2. Futures Literacy

The term futures literacy has been used and interpreted in different ways and is nowadays often seen more as a concept of UNESCO that is yet to be translated and applied in the educational field. We move away from this concept towards the understanding of the UNESCO Chair on Futures Literacy at Hanze University of Applied Sciences, who define futures literacy on their website as „*the capability of imagining diverse and multiple futures, and using futures as lenses through which we look at the present a new*“, also referring to Riel Miller (see https://futuresliteracy.net/). It is an ability that can be enhanced through practice, training, and experience, entailing ”*the capacity to decipher and categorize as well as produce (design, conduct and interpret) explicit (volitional and intentional) processes of anticipatory knowledge creation, as a necessary and ordinary skill. (...) Futures Literacy is the knowledge and skill of how to ‘use-the-future’, it is a familiarity with anticipatory systems and processes.”* (Miller, 2018, p. 58)

Moreover, it also involves the competence to critically examine existing and emerging narratives of futures and their implications for society. The analysis of such future narratives and their link to certain technologies enables to draw insights about society, its desires, its fears and its potential to transform. In the FOUNDING LAB program, we also followed the structured action learning process of the Futures Literacy Laboratories which Miller (2018) describes how participants develop their skills step by step, from an initial recognition of how their notions of the future influence their perceptions of the present, all the way to collaborative knowledge creation and capacity to design processes of collective intelligence. (Miller, 2018, pp 16-17).

Within the field of futures studies the concept of futures literacy has been critiqued for the framing of it as an individual competency that can be trained or "leveled up." This approach, so the argument, risks placing the responsibility for global change on personal skills, potentially overshadowing the need for deeper structural and systemic transformations (Slaughter, 2004; Inayatullah, 2007). Slaughter, for instance, has warned that focusing too heavily on individual foresight may oversimplify the complex and collective nature of global challenges, while Inayatullah has highlighted the importance of addressing broader societal and institutional dynamics in futures work. Despite these critiques, futures literacy remains a useful tool for empowering individuals to navigate within the systems they are a part of, influence their environments, and establish the individual mindset that can be shared with allies and is necessary for systemic change.

2.2.1. The Ars Electronica Futurelab Angle on Futures Literacy

One of the main research areas of Ars Electronica Futurelab's Art Science Research strategy is Futures Fluency. This terminology was introduced to express a capacity beyond the basic skill of futures literacy in its original meaning. According to this definition, a future-literate person could deconstruct existing future narratives, and a future-fluent one could create new, meaningful stories that convey a shared vision, which can express and reinforce collective values, emotions and norms. This research focuses on developing and applying future thinking processes such as Art Thinking (Ogawa, 2020) and Future Narratives (Pfeifer, 2021), which help to create and evaluate philosophical value systems and collaborative future prototypes in various domains, such as business, culture, and education. Narratives play a significant role in initiating and guiding change processes in the present. Here we take the notion of the individual skill of futures literacy to a shared vision that can be the driver for systemic changes, from individuals as "agents of change" to a collective "agency of change", also defined as "sociopolitical change" by Hodson (2020).

Art is one means to fabricate and reflect such narratives, as it is both a reflection and a projection of society. It depicts reality as it is and as it could be. Employing artistic strategies to materialize ideas can be a form of knowledge production that transcends the intellectual level and appeals to the emotional and sensory dimensions of human experience, as it provides an immediate emotional and sensual reaction. Recent studies in science and technology studies (STS) are increasingly focusing on art and design as key areas of inquiry and how "STS scholars can benefit from the ways artists and designers bring about new futures and work in speculative modes of inquiry that are not necessarily beholden to established epistemological frames, methods, conventions, and practice ", with an emphasis on the entanglement of bodily senses and knowledge (Salter et al. 2017).

The projects and research at the FOUNDING LAB involved cultivating such an artistic mindset introduced by the Ars Electronica Futurelab, and applying different artistic methods, such as prototype experimentation, artistic journalism, Art Thinking (Ogawa, 2020), and an overall creative and critical attitude towards future technologies with the aim to produce immersive and engaging experiences that encouraged dialogue and collective intelligence. For easier referencing, in the following, the term futures literacy is used, subsuming all previously described skills according to Miller (2018).

3. Training Futures Literacy at the FOUNDING LAB

The future skills framework was a key starting point. In addition to the skills presented in the previous section, we need to keep in mind that the group of diverse students who took part in the program, already had many of the key competencies, which we were able to build upon. Thus, Futures Literacy was applied in the FOUNDING LAB Fall Term using implicit as well as explicit methods.

Explicitly, we designed sessions on the university of the futures and workshops on future thinking methods. We also built anticipatory competency and the skill to comprehend and assess different futures through exercises, workshops and lectures. To give some concrete examples, the FOUNDING LAB Fall Term concept foresaw one online meeting before every program block in Austria. These so-called Zoom-in calls introduced the new chapter topics and set a common ground for the work on-site. During the Zoom-in calls, following the methodology of Art Thinking (Ogawa, 2020), the students were asked to concentrate the content input into creative questions that reach beyond the presented content. The curated art works inspired to see beyond their final form, to ask reflective, daring, visionary questions that open up new thinking possibilities for future scenarios. Also, they were asked to come up with imaginary future tasks and conceptualize a machine that responds to that urge. The students were challenged to render a proof-of-concept draft plus create an AI generated promo video for their current semester projects projected to our world in 2050. During the so-called Zoom-out calls after each program block on-site, the learning experiences were collectively contextualized within the bigger frame of the university of the future. These included, amongst others, workshops and discussions on possible future university concepts, as well as crucial skills to be taught in next generations.

Even more dominantly used were implicit methods for training futures literacy. The overall endeavour was conducted under the flag of envisioning and practicing a university course for future students. The FOUNDING LAB program served as experimental testbed for future university concept ideas. Digital transformation served as a recurring theme throughout the project. The Fellows and the Ars Electronica Futurelab team created interdisciplinary learning opportunities like the Dancing Drone Challenge. By forming interdisciplinary teams and given different learning context including a preselected technology like drones, the students built meaningful, tangible scenarios that opened up profound questions for future developments. Also, one of the major contexts for personal and professional growth were the students' semester projects. They provided hands-on experience in tackling future challenges.

4. Measuring Future Skills in the FOUNDING LAB Fall Term Program

To record the impact of our approaches, the Fall Term program employed a feedback and evaluation process, enabling students to self-assess their development regarding future skills. Due to the small number of 25 students participating, the assessment focused on collecting qualitative impressions to measure whether the program lived up to its promises regarding the development of future skills. One of the challenges we faced in the evaluation process was the small and heterogeneous sample size of 25 participants, who were involved in a one-time prototype program. We wanted to measure the development of future skills, which are not easy to quantify or standardize. Therefore, we used a mixed-methods approach that combined numerical ratings with open-ended questions and group interviews. We asked the students to self-assess their growth in each of the five skills, as well as to share their more general feedback and reflections on the program. We acknowledge that this method has some limitations, such as potential bias, subjectivity, and inconsistency in the responses. However, we also believe that it still provides valuable insights into the students' individual and collective learning experiences and outcomes. We also aimed to use the evaluation results as a formative tool for improving the program design and content delivery throughout the semester, rather than as a summative assessment of academic performance at the end. Therefore, we shared the feedback with the fellows who led the program, with the opportunity to discuss the strengths and areas for improvement. In this paper, we present some of the findings and implications of the evaluation process, while recognizing its exploratory nature and scope.

4.1. Rating Futures Literacy as a skill? An Exploration towards Quantitative Analysis

We evaluated the program with online surveys where the participants rated the contents and conducted self-assessments. For a streamlined approach, we concentrated on five key skills for the anonymous feedback process. In the online questionnaire, the students rated how the content chapters supported them in developing:

- critical thinking, including problem-solving, questioning norms, and creativity,
- technology use, including the use, design, and development of technology,
- self-management & self-awareness, including active learning, curiosity, and the ability to reflect on one's own development,
- interdisciplinarity, including collaboration and communication across disciplines,
- futures literacy, including anticipatory competency and the ability to understand and evaluate multiple futures.

The following graph (Figure 1) shows the students' rating on how well they felt, the six different program sections (1 Infrastructure, 2 Data & Code, 3 Machines & Robots, 4 Interfaces & Visualizations, 5 Media, 6 Digital Society & Policy.) supported their skill development of Futures Literacy. The survey used a six-point scale, with six being the highest. The definition of Futures Literacy was not explicitly discussed before the survey, but well understood in the line of 21st century skills within the group. The feedback was given directly at the end of each program section.

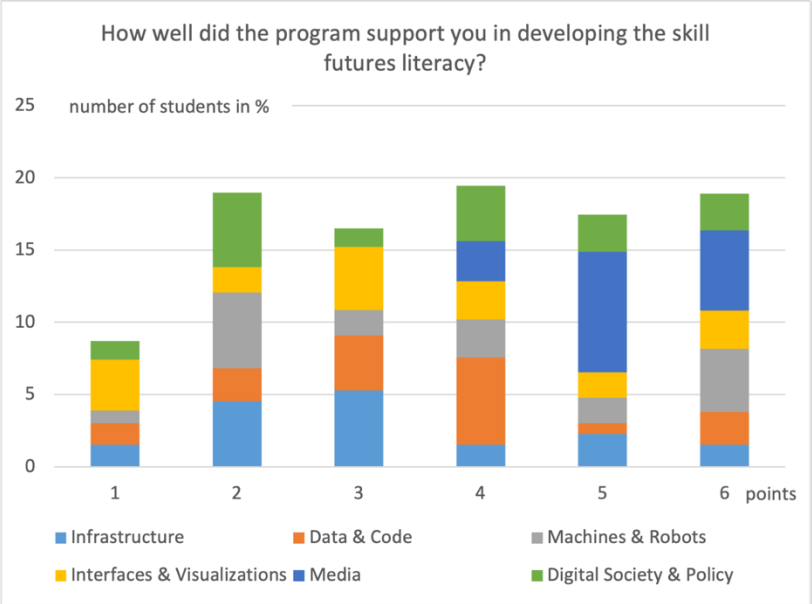

Figure 1. Quantitative evaluation of the explicit and implicit training methods of futures literacy in the six content blocks during the FOUNDING LAB Fall Term

The average scores for futures literacy skill development during each content block ranged from 3.18 to 5.6.

The survey results showed that the program section on media literacy had the highest rating for futures literacy skill development, while the one on infrastructure had the lowest. This could be due to the different approaches and tools used in each block, as well as the students' expectations and criteria for this skill. It is important to highlight that self-assessment is only one potential tool and might not completely accurately reflect the actual competence level. At the same time, other methods of assessment such as practical tests (improvement in the ability to complete a given task) or written tests might provide a more comprehensive picture. However, such examination tools were not foreseen for this program. The students were asked to write a reflexive summary of their semester projects for our archives and show their newfound knowledge and skills by exhibiting the outcomes of their semester projects. While speaking with the visitors of the exhibition, we could hypothesize that they improved e.g. science communication skills. In future programs, more accurate tools of skills development might be deployed. The fact that students had diverse backgrounds and expertise would also have complicated centralized skills measurement. The complexity arising from their diversity also becomes

visible in how their backgrounds influenced the personal ratings of different sessions. The degree of education varied from Bachelor's to PhD and students came from different universities and disciplines.

The key finding from these ratings is that the overall feedback on the program in total was positive. 80% of the students rating 5 or 6 out of 6, estimating how well the program prepared them for future challenges (see fig. 2).

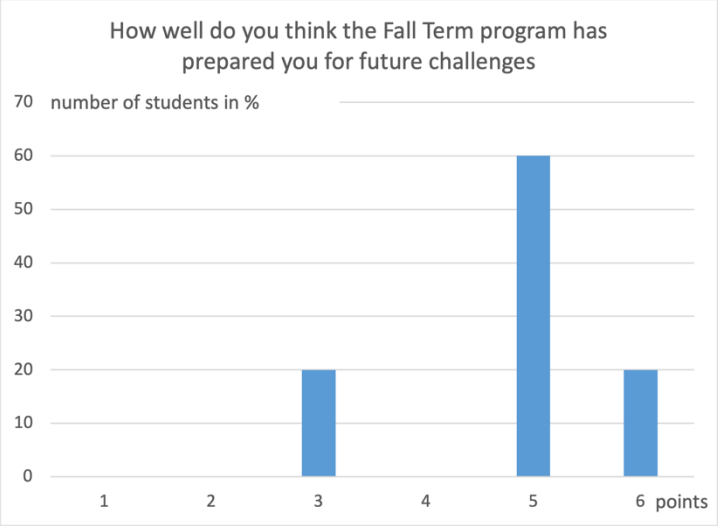

Figure 2. Quantitative student self-assessment of how well the FOUNDING LAB Fall Term prepared them for future challenges

4.2. Tackling Future Challenges? A Qualitative Assessment

We also collected qualitative data on the students' experiences, challenges, and outcomes of the project. We had regular check-in sessions after each program block for collecting verbal assessments in addition to the constant exchange between students and faculty. Continuous communication based on mutual trust between students and faculty allowed for constant feedback flow.

In anonymous, written feedback, participants shared in which aspects the Fall Term program prepared them for future challenges:

- Exposure to Game Changers: Participants felt that the program introduced them to individuals who are catalysts for change, expanding their perspectives significantly.
- Expanded Network and Career Insights: Many participants noted the value of expanding their network and gaining insights from the lived experiences of fellow participants, shaping their views on future career trajectories.
- Skills for Transdisciplinary Work and Collaboration: Participants highlighted the acquisition of skills and knowledge valuable for working in transdisciplinary groups and emphasized the significant improvement in collaboration and interdisciplinary skills because of the program.

- Equipped for Global Discussions and Increased Confidence in Addressing Societal Issues: The program enabled participants to engage in dialogues with global implications and to feel more confident in tackling societal challenges related to digital transformation, AI, and decolonization.
- Overcoming Personal Barriers: Some participants mentioned overcoming personal fears and gaining confidence to engage with the world outside of virtual environments, which was a significant personal takeaway.
- Strengthened Thinking: While acknowledging the program's positive impact on their thinking, participants recognized the need for personal effort to translate their learning into practical skills.

Overall, the responses reflect a diverse range of experiences and insights gained from the Fall Term program, highlighting its effectiveness in preparing participants for future challenges across various domains, including interdisciplinary collaboration, global discussions, and personal growth.

4.3. Comparison of the FOUNDING LAB and Home University Experiences

In this section, we report on the participants' perceptions of how the FOUNDING LAB program differed from their previous university courses. We asked them to compare the two types of learning environments in terms of various aspects, such as the teaching methods, the assessment criteria, the feedback mechanisms, the level of challenge, and the impact on their thinking and skills. The following themes emerged from the analysis of their responses:

- Participants mentioned several major differences between the FOUNDING LAB program and their home university courses, such as a highly personal learning environment, better communication with teachers and Fellows, and more flexible and intense activities. Participants appreciated the increased time spent with one another and the depth and length of conversations during the program. While courses at their home universities were similar in format, the intensity and range of disciplines available in the FOUNDING LAB program were noted as key differences, with unrestricted study being enjoyed.
- Participants stated that the FOUNDING LAB program helped them grow interdisciplinary skills and critical thinking more than their home university courses. Moreover, participants rated the time and effort spent on interacting and communicating with students much higher in the FOUNDING LAB program, and pointed out the advantages of wider networks, more knowledge, and a supportive team.

Given that such a survey reflects very individual experiences, this still reveals a noteworthy picture. The survey results reflect the diverse and heterogeneous nature of

the program, both in terms of its curriculum and its participants. The program, co-designed by a multidisciplinary team of fellows, offered educational methods and thematic inputs catering to different interests and needs. The participants also brought their own backgrounds and skills to the program, which resulted in a wide range of subjective responses and experiences.

5. Reflection and Conclusions

In conclusion we observed a reflection of the program's inherent heterogeneity. The curriculum, a result of interdisciplinary collaboration among a diverse cohort of Fellows, consisted of varied educational methods and individual thematic approaches. The students brought diverse backgrounds and skill levels too, so their individual responses exhibited a substantial range. While the average ratings were clearly favourable, there were always some students who could not relate to or gain competences during the various inputs.

According to the questionnaires, the FOUNDING LAB program has had a significant impact on participants' research and artistic practices, providing opportunities for collaboration, experimentation with new technologies, and a supportive environment to try without fear of failure. Key takeaways include the realization of the potential for art to catalyze change in thinking and to connect individuals with diverse lived experiences, the value of interdisciplinary collaboration in both artistic and technical projects, and the importance of mental health and balance in one's approach to work. Participants also highlighted the fruitful debates with peers and Fellows, expressing a desire for more dedicated time for such discussions. The program has led to the development of interdisciplinary projects, expanded networks for learning and collaboration, and newfound confidence in taking on complex projects that involve diverse skills and people. Overall, participants have gained new perspectives, critical thinking skills, and confidence, while also forming meaningful connections and friendships. The decision on and application of the quantitative feedback and the rating of skills on a scale was a deliberate choice to provide a simple and accessible tool for students and Fellows to evaluate their learning outcomes and competencies. However, we are aware of the limitations and criticisms of such a method, which can be seen as reductive, subjective, and biased. Therefore, we do not claim that the results are definitive or representative of the entire program or its participants. Rather, we see them as a quick check-in and an invitation for further dialogue and reflection on the complex and multifaceted nature of the program and its impact. The feedback we received suggest that the program is effectively enhancing students' skills to meet the challenges of the future. In the overall feedback we can also see a strong tendency in the development of one of the skills the World Economic Forum named as one of the “core skills top 10“ in their Future of Jobs

report 2023: “*empathy and active listening*” (World Economic Forum, 2023, p. 38) and, similarly to Hodson (2020), propose that it should also be added to the education of interdisciplinarity.

Also, this notion of “care” was extremely well received in the supporting programs, not provided by the different Fellows, that dropped in and out of classes. The team consisting of Ars Electronica Futurelab members and facilitators was able to connect with the students on a substantial level, due to the more long-term interaction and by giving support not only on intellectual challenges but by helping to overcome obstacles–from visa issues to accommodation and intercultural conflicts–so that the students were able to realize their envisioned projects at the end of a Fall Term. Here the students could develop the skill of futures literacy, by feeling empowered, by realizing their visions and creating tangible outcomes. Skills associated with futures literacy, including imagination and creativity, adaptability and resilience, interdisciplinary knowledge, communication and collaboration, ethical reflection, and learning agility were strengthened. Linked to the future-oriented topics at hand the whole program was very much about developing futures literacy – even though only some inputs were explicitly “futuring” or scenario-building exercises.

In the FOUNDING LAB program, we combined the idea of saying goodbye to one’s individual ideas and embracing change and collaboration for novel outcomes with UNESCO’s action-oriented learning for a transformative learning experience. All of this was only made possible by bringing together a diverse group of students: diverse in terms of age, gender, cultural background and nationality, and discipline. In a forthcoming book (Liebl et al. 2024), we present the project descriptions. These show that interdisciplinarity was not the result of different disciplines working alongside each other but by allowing different ideas to merge and emerge through collaboration. The FOUNDING LAB experience, marked by its diverse and collaborative nature, provides a valuable case study for designing futures-oriented, futures-literate and futures-fluent university curricula. By balancing the potentials and limitations of collective action and creating learning environments that prioritize questioning over knowledge transfer, the program aimed to inform precedents for the university of the future. By recording the findings in this paper, the authors hope to contribute to the recent re-uptake of STS’s interest in SSI by providing a practice-based, experimental perspective.

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