Building a Career-Connected Learning Program in Data Analytics Courses – Concept, Methodology, and Outcomes

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Abstract

In the era of digital transformation, data analytics has become a critical skill across industries, creating a growing demand for education that prepares students for the complexities of the modern job market. This paper explores the ConnecTM (*Connect Me*) program at West University of Timisoara, as a model for career-connected learning, blending academic rigor with practical, hands-on experience. Over three editions, ConnecTM has integrated real-world projects, industry partnerships, and cutting-edge technologies to develop students' technical and soft skills, making them highly competitive in the workforce. This paper details the program's structure, teaching methods, and outcomes, while highlighting the scalability potential of ConnecTM across institutions and countries. Additionally, the paper discusses the broader implications of career-connected learning, addressing the need for continuous learning, interdisciplinary collaboration, and partnerships to meet the evolving demands of a data-driven economy. Recommendations for universities, employers, and policymakers are presented to foster the development of sustainable learning ecosystems that bridge the gap between education and industry, and that make graduates better equipped to navigate a very dynamic job market, for jobs of the future that have not yet been invented.

Keywords: *career-connected learning, data analytics education, social impact, collaborative learning ecosystems, emerging technologies in education*

Introduction

In today's job market, data analytics skills have become indispensable across nearly every industry. According to the World Economic Forum's (WEF) *Future of Jobs Report 2023*, data analysts and scientists are among the top emerging job roles expected to see high demand across industries by 2025. The report also highlights that 50% of all employees will need reskilling by 2025 as the adoption of technology increases, with skills like data analysis, artificial intelligence (AI), and critical thinking taking center stage (2023). Furthermore, the demand for these roles is constantly growing, as the digital transformation of organizations and institutions is rapidly increasing (Sundaram et al. 2020; Pittaway

and Montazemi 2020). This growing need underscores how essential data-related skills have become, as data-driven decision-making is more and more needed to stay competitive (for businesses), accountable (for public institutions) and sustainable (for all organizations across sectors) (Alibasic et al. 2022).

However, traditional educational programs, especially in social sciences, often prioritize theoretical instruction over practical, empirical, data-driven applications. But the role of social scientists has never been more important than it is today (Lazer et al. 2009). Research shows that many social science graduates possess solid foundational knowledge about the mechanisms of social impact, the dynamics of markets, or the underpinnings of decision making, but lack hands-on experience in applying these concepts to real-world data, in interdisciplinary teams or in later leadership positions in organizations, to drive better decision-making (Kwiek 2012; Proteasa and Fierascu 2018). This disconnect between academic training and industry demands limits the immediate employability of graduates and hinders their ability to make meaningful contributions to the workforce upon entering it (Béduwé and Giret 2011; Kittelsen Røberg and Helland 2017; Nilsson 2017).

To address this skills gap, education must evolve to better integrate academic learning with real-world experience, particularly in the field of computational social science (Lazer et al. 2020). Career-connected learning programs offer a powerful solution by combining rigorous academic instruction with hands-on project work and exposure to industry-relevant tools, practices, and professional networks. Studies emphasize that experiential learning - through internships and project-based learning - not only enhances student engagement, but also better prepares them for job market requirements (Darling-Hammond et al. 2020). Additionally, *The Future of Jobs* report identifies skills like problem-solving, self-management, and working with people, as increasingly important in the modern workforce (World Economic Forum 2023), all of which can be cultivated through experiential learning models.

This paper introduces ConnecTM (*Connect Me[1]*), a career-connected learning program designed to bridge the gap between academic education and industry expectations, specifically for computational social scientists. By combining academic rigor with experiential learning, ConnecTM prepares students for the complexities of the modern job market. The program allows students to collaborate with relevant partners from all sectors, work on meaningful data projects, and develop professional portfolios that showcase their skills. In an era where data analytics expertise is increasingly vital, I argue that programs like ConnecTM offer a scalable and effective model for equipping students to thrive in this evolving landscape.

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[1] ConnecTM, read *Connect Me*, is a play of words and acronyms to match similar location-based community initiatives in the city of Timisoara, Romania. An example of a similar naming convention is SmarTM – Timisoara's community of volunteers working on co-designing and implementing the Smart City and Digital Transformation Strategy for the city.

The importance of data analytics in the workforce

The data-driven economy

As digital transformation accelerates, businesses and public institutions are increasingly relying on data to drive decision-making, optimize operations, and gain competitive advantages. For social scientists, the ability to analyze vast datasets, interpret social dynamics, and communicate findings effectively is increasingly critical as the world becomes more interconnected and dependent on data-driven insights grounded in social, organizational and political theory. Whether it is through analyzing voting patterns, mapping social networks, or studying public health trends, data-driven insights enable organizations to tackle complex societal problems more effectively, from micro-scales to the level of policy.

In the context of social sciences, emerging roles include data analysts, computational social scientists, social network analysts, data journalists, public policy data specialists, and social researchers. These professionals are tasked with interpreting complex datasets to uncover patterns in human behavior, social interactions, and societal trends. For instance, a network scientist might map communication patterns within a community to understand how information spreads, while a data journalist could use public data to investigate social inequalities or policy impacts.

These roles are important in business, governance, public policy, and civil society, where data analytics helps inform decisions that directly impact individuals, organizations and communities. As the integration of technology and society deepens, data professionals working on social science problems will become even more essential in shaping solutions to pressing societal issues (Lazer et al. 2020).

Current gaps in education and employment

Despite the increasing demand for data analytics and technology-driven skills, there remains a significant gap between university education and employability. Many academic programs still emphasize theoretical knowledge over practical, hands-on experience, leaving students underprepared for the realities of the modern workforce (Proteasa, Bleotu and Fierăscu 2018). This disconnect leads to several challenges for both students and employers.

From the students' perspective, while they may graduate with strong substantive knowledge, they often lack the practical skills needed to navigate complex, real-world environments (Kittelsen Røberg and Helland 2017). Without exposure to the tools, technologies, and collaborative processes commonly used in industry, graduates face a steep learning curve when transitioning to the workforce. This contributes to difficulties in securing employment, as many employers expect new hires to be job-ready.

For employers, the challenges are even more pronounced. Hiring new talent is often expensive and time-consuming, with many organizations struggling to find candidates whose educational background matches the specific skills required for the job. The mismatch between academic training and job descriptions means that companies often have to invest heavily in onboarding and additional training to bring new hires up to speed. This can be particularly costly for businesses in fast-paced industries where up-to-date technical skills are critical for maintaining competitive advantage. Moreover, the investment is not always paying off on the long run, especially for companies in dynamic, competitive markets, where the turnover rates among young hires is already large and still growing (International Labour Organization 2024).

What is more, performance and engagement can suffer when employees lack the proper grounding in practical applications of their academic knowledge. New hires who are not fully prepared for the demands of their roles may struggle to meet performance expectations, leading to decreased job satisfaction, low engagement, and ultimately, higher turnover rates. The retention of talent becomes a significant issue, as employees may leave if they feel they are not being sufficiently challenged or if they lack the skills to succeed in their positions.

In addition, many employers are increasingly prioritizing soft skills, such as communication, collaboration, and problem-solving, alongside technical expertise (Succi and Canovi 2020). However, these skills are often underdeveloped in traditional academic programs, further contributing to the challenges of integrating new graduates into the workforce. As a result, employers are left grappling with a workforce that may be technically qualified, but lacks the ability to adapt to the complex, collaborative, and dynamic nature of modern work environments.

To bridge this gap, I developed the career-connected learning program at West University of Timisoara, ConnecTM, which focuses on integrating academic learning with real-world experience. By collaborating closely with organizational partners from across sectors and offering students hands-on projects and mentorship, the program helps students better align with the skills employers need. This, in turn, improves the employability of graduates, reduce the burden on employers, and fostering stronger connections between education and the workforce (Ito et al. 2013; Wardle and Geronikos 2024).

The following section defines my teaching philosophy and practice in ConnecTM, for students in the Department of Communications Sciences and for students across the university who enter my classes.

Essential Elements of a Career-Connected Learning Program

There are a few elements that career-connected learning programs integrate to provide learning and development: (1) core learning experiences that build a foundation, (2) continuous assessment on skills and abilities useful on the job market, (3) honing in the process of support that help students scale their projects and improve their skills beyond the classroom, and (4) offering students positive exposure of their work, recognizing their efforts that add to their professional profiles.

Core learning experiences

Real-world passion projects – in teams

Real-world passion projects offer a powerful way to connect academic learning with personal interests, fostering deeper engagement and skill development. These projects allow students to apply their academic knowledge to real-world challenges that align with their interest, whether in areas like public policy, social justice, sustainability, or digital media. By working on issues that resonate with them, students are more motivated to take ownership of their work, leading to increased creativity, critical thinking, and dedication (Kotsopoulos 2014; Gelman and Nolan 2017).

Passion projects also provide a platform for students to make a tangible impact on their communities or industries. These projects often involve collaboration with local organizations, nonprofits, or businesses,

allowing students to see firsthand how their skills can address real-world problems. The practical nature of the projects gives students the opportunity to apply theoretical knowledge to meaningful tasks, such as analyzing data on issues they care about and are curious to understand more about, designing solutions, or creating communication strategies that can have immediate real-world implications.

Moreover, students can work in teams to develop their collaboration, communication, and coordination skills. They learn to exercise different roles, assign tasks connected to their abilities, learn accountability and practice leadership skills. This combination of personal motivation, real-world application, and team work provides students with a competitive edge when they enter the workforce, as employers increasingly seek candidates who are good communications and capable of solving complex challenges in collaboration with others (Antonacopoulou et al. 2023).

Relevant technology experience

In career-connected learning programs, integrating industry-relevant technologies is key to preparing students for modern workforce demands. These tools are essential not only for research and data analysis, but also for project management and effective communication across various professional settings.

Students gain knowledge in technologies for research and data analysis, enabling them to work with complex datasets and produce actionable insights that help organizations and communities make better informed decisions. Additionally, familiarity with data visualization tools allows them to present findings clearly to diverse audiences, from academic peers to industry professionals, niche communities or the general public.

Equipping students with project and time management technologies fosters teamwork and organizational skills, preparing them for collaborative environments common in both research and professional contexts. Finally, communication tools that allow students to adapt their messaging to different audiences ensure that their analyses and recommendations are accessible and purposeful.

Providing Mentorship

Finally, providing mentorship experiences plays a pivotal role in their learning journey. These experiences go beyond skill-building - they help create an ecosystem of trust and mutual learning where students, professionals, and educators can engage in meaningful, intergenerational knowledge exchange.

Furthermore, trust-based interactions create a cycle of learning and growth. As students benefit from the wisdom and support of their mentors, they eventually become mentors themselves, contributing to a culture of continuous development. This intergenerational thread of support fosters an environment where knowledge flows freely, ensuring that each generation builds upon the experiences and lessons of the previous one. Cultivating such an holistic learning ecosystem supports both personal and professional development, preparing students to contribute to the broader community of practice.

Assessment and scalability

Assessment of practical skills

A core component of career-connected learning is the evaluation of students' practical skills. This includes not only assessing subject-specific knowledge and skills, but also competencies like analytic thinking, data project management, and team leadership. Practical assessments typically involve real-world projects where students must demonstrate their ability to analyze complex datasets, manage multifaceted projects, and guide teams towards successful outcomes. For example, a student tasked with managing a data analysis project must not only perform the technical analysis, but also coordinate team efforts, track progress, and meet deadlines. This approach ensures students can apply theoretical knowledge and practical skills, in a way that reflects the expectations of a professional environment.

Assessment of soft skills

Equally important is the evaluation of soft skills such as communication, teamwork, and time management. In today's collaborative workplaces, these skills are often as valuable as technical expertise. Students need to demonstrate their ability to work effectively within a team, contribute to group discussions, and communicate their findings clearly to diverse audiences. For instance, a student presenting data insights to a non-technical client or public sector stakeholder must be able to translate complex information into understandable and actionable recommendations. Assessing how well students manage their time and contribute to team dynamics ensures they are not only technically capable, but also effective contributors in work environments where interpersonal interactions are key.

Assessment of personal and professional growth

Career-connected learning programs should also evaluate students' personal and professional growth over the course of their education. This involves looking beyond skills and knowledge to understand how students' values, behaviors, and aspirations evolve through their experiences. For example, feedback can reveal what aspects of a project a student found most fulfilling or challenging, helping them identify future career paths or personal preferences. Evaluating personal growth helps students gain self-awareness, understanding what they like or dislike in professional roles, what values they prioritize, and where they aspire to go in their careers. This assessment not only supports immediate job readiness, but also fosters their adaptability in their long-term career development journey.

Scalability potential for projects

An important aspects in career-connected learning programs is the scalability of student projects beyond the academic environment. To encourage student work to evolve into impactful, long-term initiatives, programs must offer pathways for funding, mentorship, and collaboration. Scalability involves more than just completing a project within a course that is then put in a drawer and forgotten about - it requires building a structure that allows for continued growth and relevance after the program ends. This can be achieved through three key strategies: (1) providing support for accessing funding, (2) expanding projects through partnerships, and (3) encouraging students to go for entrepreneurial ventures.

Securing funding for continued development

One of the most tangible ways to scale student projects is by helping students secure funding. Career-connected learning programs can guide students in identifying and applying for grants, scholarships, or investment opportunities. This financial support enables students to extend the life of their projects beyond the classroom, turning class projects - often prototypes - into practical, impactful applications. For instance, a student team working on an innovative data analysis tool for public health might apply for a government grant to further develop their work, or attract private investment to develop and commercialize their product.

By providing resources on how to write grant proposals or pitch ideas to investors, faculty programs empower students to take ownership of their projects' futures. Incorporating funding-seeking as part of the learning experience not only helps students understand the financial aspects of project management, such as how to budget their ideas, their team and their time, but also ensures that promising ideas have real opportunities to be realized.

Expanding projects through partnerships and collaboration

Scalability is often achieved through strategic partnerships and collaborations with industry, government, civil society or academic institutions. Students can expand the reach and impact of their projects by working alongside organizations that have the resources and expertise to take their ideas further. For example, a social initiative developed by students in a career-connected learning program might partner with a local nonprofit or government body to implement the project at a larger scale, increasing its social impact.

Programs should cultivate connections with external partners to offer students opportunities to collaborate on real-world challenges. Whether it is research that evolves into a long-term study or a technical project that becomes integrated into an organization's workflow, partnerships provide a pathway for students' work to make a lasting contribution. Mentorship and support from these partners further enhance the scalability of projects by providing professional guidance and resources to bring student ideas to fruition.

Supporting entrepreneurial ventures and startups

For some students, the next logical step for their projects is entrepreneurial. Career-connected learning programs can nurture the entrepreneurial potential of students by offering resources and support for those interested in transforming their projects into startups. This may involve providing incubator or accelerator programs, offering workshops on entrepreneurship, or connecting students with experienced mentors who can guide them through the process of starting a business.

For example, a student project focused on developing a new educational technology could be incubated into a startup, with guidance on business planning, market analysis, and product development. Supporting students through these early entrepreneurial stages allows them to take innovative ideas developed in the classroom and scale them into operational businesses or social enterprises, creating lasting economic and social impact.

Exposure and recognition

Showcasing student work to industry and the public

A critical component of career-connected learning is providing students with opportunities to showcase their work to potential employers, industry professionals, and the broader public. This exposure validates their skills and helps them build professional networks, increasing their employability and visibility in their chosen fields. Public exhibitions, online portfolios, and student presentations at industry events allow students to present their projects in a professional context, demonstrating their ability to solve real-world problems.

For example, a student might present a data visualization project at a local industry conference, allowing them to receive direct feedback from professionals and potentially attract interest from recruiters. Or the professors coordinating the programs can put together a brochure with student projects and send it off directly to employers, for them to browse student profiles and interesting projects. This public exposure provides invaluable opportunities for students to test their ideas in front of real audiences and gain recognition for their efforts. Moreover, it allows them to refine their communication skills by explaining complex projects to a diverse range of stakeholders, from technical experts to the general public.

Recognition through awards

Offering awards for excellence in various categories, such as best data analysis, most impactful project, or strongest team collaboration, creates incentives for high performance and motivates students to push the boundaries of their work. These awards serve as tangible evidence of a student's skills and accomplishments, enhancing their resumes and portfolios. Additionally, projects that use frameworks that align with industry standards can further validate a student's expertise in specific technologies or methodologies, demonstrating a higher level of preparedness to potential employers in the data analytics space.

Building a professional portfolio

The development of a professional portfolio is an integral part of recognizing students' progress and preparing them for the workforce. Throughout the course of their learning, students compile a body of work that showcases their technical and soft skills. A well-curated portfolio reflects a student's ability to deliver results. Whether the portfolio highlights data analysis projects, research papers, or science communication materials, it serves as a comprehensive reflection of their learning journey.

For instance, a portfolio featuring a project that tracks local government spending, complete with data visualizations and policy recommendations, could attract attention from public sector employers or NGOs interested in transparency initiatives. The portfolio is more than just a collection of projects - it is a powerful tool that students can use to differentiate themselves in a competitive job market, offering concrete examples of their ability to deliver impact.

Engaging employers and industry experts in evaluating work

Another important aspect of recognition involves engaging industry professionals in the evaluation of student work. Having potential employers or experts review student projects not only enhances the

credibility of assessments, but also provides students with valuable insights into industry standards and expectations. Feedback from professionals can help students refine their approach, understand how their work fits into broader industry trends, and align their skills with market demands.

This involvement of external evaluators ensures that students' work is both academically rigorous as well as relevant to current professional contexts. It strengthens the bridge between education and industry by giving students direct access to the insights and perspectives of those already working in their field, further preparing them for the transition from education to employment.

Supporting long-term recognition and networking

Finally, another key building block of a career-connected learning program focuses on ensuring that students' achievements continue to be recognized beyond their time in the program. Building platforms for long-term networking and showcasing student work helps sustain recognition and provides ongoing professional opportunities.

For example, it is essential that students are encouraged to participate in relevant professional events, where they can directly meet and network with various types of professionals, such as conferences, to workshops, meetups, and community gatherings. Another examples is engaging the alumni network. Alumni who were recognized for outstanding projects can be invited to mentor current students or participate in industry panels, further solidifying their reputation in the field.

Long-term networking and recognition foster a sustainable ecosystem where students and graduates continue to benefit from their early achievements, and the program itself gains credibility and influence within the professional community.

Case study: ConnecTM – Career-Connected Learning Program at West University of Timisoara

The ConnecTM program at the West University of Timisoara is an example of career-connected learning. Over the past three editions, the program has integrated hands-on learning with partner collaborations, offering students the opportunity to develop essential skills in data analytics, social network analysis, and digital communication. This case study details the structure, teaching methods, development processes, and outcomes of the ConnecTM program, highlighting its impact on student learning and career readiness.

Program structure and objectives

The program was designed to provide students with practical, hands-on experience in data analytics, network science, and digital communication. It is thus connected to the data analysis classes I teach each academic year to different specializations. It launched during the 2021-2022 academic year with *Introduction to Network Science*, *Analysis of Digital Data* and *Online Advertising*, and in the three years it has run students from 10 specializations around the university have benefitted from participating in the program through the transversal courses I offered in two of the three editions, with students in Digital

Media and, to a lesser degree, Advertising, Bachelors first and third year primarily, for whom these courses are core specialization ones.

The courses are part of the program, running the instruction and project development throughout 14 weeks, being evaluated in the exam session, and continuing with the best projects that enter a yearly data visualization exhibition and into Kata.Log, a yearly catalogue of student projects that is made available to potential employers. A select few continue pursuing their projects beyond the classroom, applying for funding, scholarships or employment with relevant organizations.

So far, 14 local, national or international organizations in business, government, academia and civil society have been partnering in different student projects. Collaboration with organizations is optional, and students can either choose an organization they find relevant for their project that I reach out to and invite for partnership, or choose from a list of previous partners who are interested in repeat collaborations with students in our program each year.

The primary objectives of the program each year are:

- **Bridging theory and practice** by engaging students with real-world data and collaboration with relevant organizations.
- **Developing essential technical competencies in data analysis**, while simultaneously developing **soft skills** such as teamwork, communication, and problem-solving, which are essential important in the job market.
- **Career exposure**, by encouraging them to showcase their work to potential employers through exhibitions, online platforms, and interactive presentations, helping them build professional networks and enhance their employability prospects.

The structure of ConnecTM centers around student-led projects that incorporate both individual and collaborative work, ensuring that students create a professional-grade portfolio that reflects current industry needs. Besides the subject specific knowledge and skills developed in each class, such as network science, Big Data, various analysis and visualization software, etc., the program builds the top skills required in the future of jobs: creative thinking, analytical thinking, technological literacy, curiosity and lifelong learning, resilience, flexibility and agility, and systems thinking (World Economic Forum 2023, p. 39).

Teaching methods – theory and technology

In terms of teaching them the core theoretical knowledge and basic technologies, in each class, I integrate both theoretical and practical content to ensure students understand key concepts, but also apply them in real-world contexts. The learning process includes several strategies:

- **Short thematic games**: These games are designed to boost individual and team motivation, enhance classroom dynamics, and improve the learning process of the technical knowledge. They help students engage with theoretical concepts in an interactive way, reinforcing their understanding of course materials. For examples, for Introduction to Network Science, each class starts with a 20-minute game that illustrates the core theme of the day, that might involve drawing, building, threading, writing, ideation (e.g., degrees of separation to various people, illustrating network structures – small worlds, scale free, core-periphery ecosystems, path

lengths to career success, key network positions – popularity, influence, bridging – and their role and impact in their lives).

- **Technology and applications demonstrations**: I showcase various technologies and applications relevant to the course topics. This may include demonstrations of software tools such as R, Gephi, or Excel for data acquisition, cleaning, analysis and visualization; how to build interactive dashboards or visual data stories in Tableau or Flourish, or how to use digital tools for project, team and time management, such as Trello, Miro or Notion. These activities teach them the basics of data handling, visual communication through data, and data-driven decision-making, for all the different stages of project development.
- **Structured repositories with multimedia resources**: To support self-directed learning, I provide access to comprehensive repositories containing readings, lecture slides, handouts, data repositories, software tutorials, and additional helpful links. These resources are organized logically and sequentially to match the course outlines and help students deepen their understanding and practice using different tools inside and outside the classroom.
- **Professional and networking events**: I actively invite and encourage students to participate in local and virtual professional events to connect with industry experts and stay up-to-date with industry standards. Events such as Women in Data Science (international data science conference), PROW (product development conference), InnovationLabs (startup incubator program), Media Culture Days (national students' competition), Banat IT Barbeque (IT and tech community event), Creative Mornings (creative community event), Invest in Moonicorns (startup investment community), startup community events, thematic meetups, and virtual conferences, provide invaluable networking opportunities and expose students to current debates and technologies as well as networking and mentorship opportunities. Students also have the opportunity to engage differently with these events, from participants to volunteers, facilitators, speakers, depending on their current level of expertise and interest in a particular niche.

The instructional part of teaching is essential for getting them interested in the field of network and data science, making them understand the topics they study and spark curiosity in them to explore more.

Teaching methods - project development

In terms of project development, the teaching methods in ConnecTM are designed to foster independent as well as reflective-collaborative learning, critical thinking, and personal and professional development. The program emphasizes:

1. **Project-based learning**: Students work on complex projects from start to finish, involving data collection, analysis, interpretation and presentation. They learn how to handle public data, build visualizations, and interpret statistical results.
2. **Mentorship**: Industry professionals, alumni and myself act as mentors, guiding students in project development, offering feedback, and providing career advice, either through project work, or as guests in the classroom.
3. **Collaborative learning**: Group projects encourage students to work together, mimicking the teamwork required in real-world environments.
4. **Use of industry tools**: Students are trained on analytic tools such as R, Gephi, Tableau, and Flourish, ensuring they graduate with a skillset that is immediately applicable to the workforce.
5. **Exposure to professional networks**: Public exhibitions, partnerships with industry, and online platforms like ConnecTM's digital presence provide students with visibility to potential employers and a chance to showcase their work beyond the academic setting.

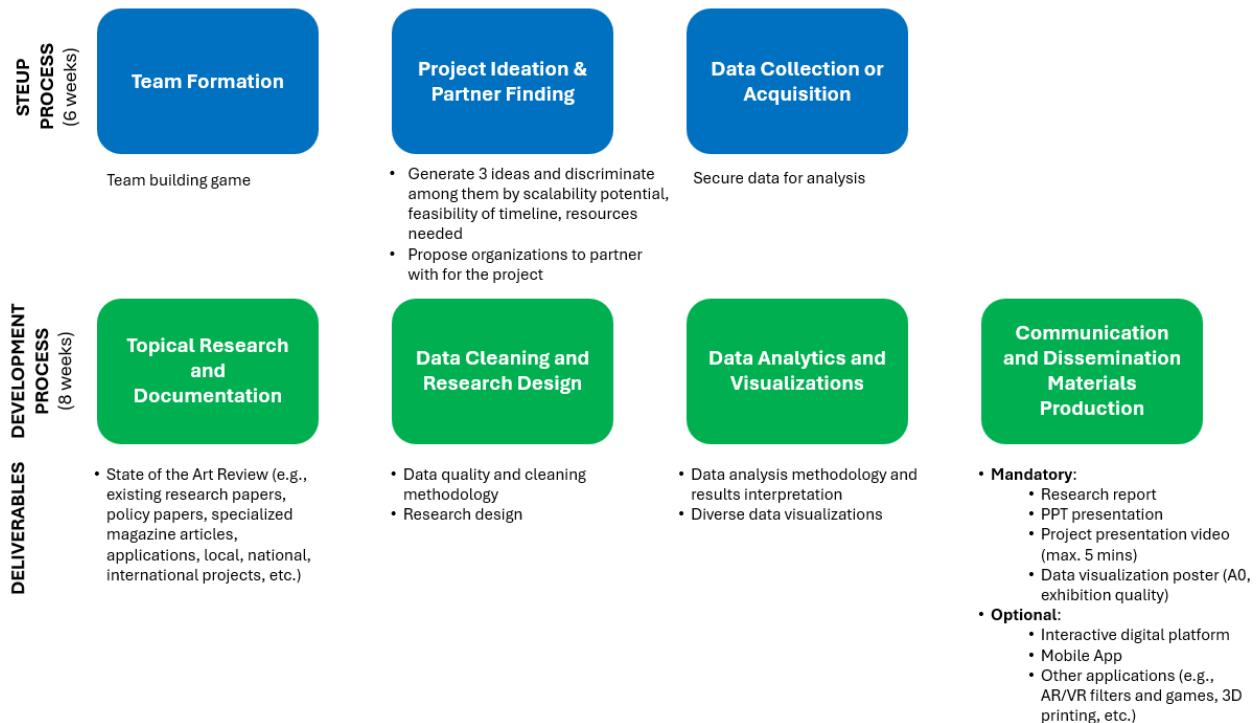## Process and evaluation methods

Figure 1. Project development process and evaluation materials (Fierăscu 2021)

A distinctive feature of ConnecTM is its structured project development process, which follows a waterfall project management methodology across the 14 weeks of instruction. This ensures that each phase builds on the previous one in a logical sequence, while the development within each phase

follows an agile methodology, allowing for iterative refinement over approximately two-week periods and constant progress towards the final outcomes of the projects. The process is very well documented and made transparent from day 1 of instruction, so students are supported to follow the process even if they miss a few classes.

Setup Process (3 weeks)

The initial stage of the project focuses on preparing students for collaborative work and project ideation:

1. **Team formation**: The process begins with a team-building game to create cohesive groups and encourage collaboration. This fosters communication and lays the groundwork for effective teamwork.
2. **Project ideation & partner finding**: Students are tasked with generating three project ideas and evaluating them based on scalability potential beyond the classroom, timeline feasibility during the course, and required time and other types of resources. This step allows them to envision the future of their work, the myriad ways in which it can develop, while also grounding this reasoning in pragmatic and practical realities. Additionally, students propose potential partner organizations to collaborate with on the project.
3. **Data collection or acquisition**: Students secure relevant data for analysis, which will serve as the foundation for their project work. Since they have only two weeks in the process, most students go for available public data. Some, who already have coding skills, are able to collect large data in a short amount of time, while others receive data from partner organizations.

Development Process (8 weeks)

In this phase, students focus on research, data analysis, and creating final deliverables:

4. **Topical research and documentation**: Students conduct a State of the Art Review on the topic of their projects, analyzing existing research papers, policy documents, specialized articles, and other relevant sources to familiarize themselves with what we know and do not yet know about the topic. This process provides context and direction for their projects, allowing them to ask relevant research questions and come up with relevant hypotheses to test in their data.
5. **Data cleaning and research design**: Students ensure data quality by employing data cleaning methods and techniques, and develop a research design to guide their analytical work. I offer tailored instructions and guidance for the specificities of each project.
6. **Data analytics and visualizations**: This phase involves applying data analysis methodologies and creating diverse visualizations to interpret and present the results clearly and effectively. Each project is somehow unique, so I provide instructions for each project's unique analytic and visualization needs.
7. **Communication and dissemination materials production**: Students are responsible for producing several deliverables to present their findings. Mandatory deliverables: (1) A short research report presenting briefly the project context, motivation, state of the art, data, research design and methodology, findings, conclusions, implications and recommendations; (2) a PowerPoint presentation of the project for a general audience, (3) a short project presentation video (max 5 minutes) for the general public, and (4) an exhibition-quality A0 data visualization poster to be displayed in the ConnecTM exhibition and Kata.Log, provided it passes the

evaluation criteria. Optional deliverables: (5) Interactive digital platforms, (6) mobile apps, or (7) other applications (e.g., AR/VR filters, 3D printing, games).

This structured teaching methodology emphasizes a balance between independent and collaborative learning, as well as real-world applicability and professional development. In each phase of the process, students benefit from my guidance in class and outside class hours, as well as from people close to the program: other researchers, partner organizations, alumni of the program, either directly in one-on-ones, or group sessions, lectures or workshops.

This methodology ensures that students experience the full cycle of project development, from ideation to final presentation, while honing both technical and communication skills in an iterative and adaptive learning environment. The agile methodology used within each phase allows for flexibility, feedback, and continuous improvement, ensuring that students can refine their work based on real-time learning and insights.

While the process may be complex, the support system is robust. With the guidance of mentors and access to industry tools, students are given all the resources they need to succeed. The key to thriving in this program is consistency - students who dedicate time and effort to their projects, engage with the resources provided, and take the program seriously are well-positioned to excel. By the end of the course, students can confidently present their projects and contributions, showcasing both their technical knowledge around data, as well as their ability to navigate real-world challenges that not only increase their employability prospects, but differentiate them as candidates on the job market.

Development and evolution of ConnecTM

In every edition, ConnecTM features, on average the work of over 100 students, minly from the Digital Media specialization program, but two editions involved students across multiple disciplines, including Digital Media, Advertising, Sociology, Applied Informatics, and Public Administration. The program features on average 40 projects that range from statistical analyses of public datasets to online communication campaigns in collaboration with local, national, or international partners. The aim is not to increase the number of projects featured in the exhibition, but rather to improve the complexity and quality of the projects that are publicly presented.

They key elements of the program are as follows:

Courses involved:

- *Introduction to Network Science* (core course for Digital Media students in 1st and 3rd year in 2021-2022, only for students in 1st year in the following two academic years; and transversal course to students from all other faculties in the university, years 2 and 3, in academic years 2021-2022 and 2022-2023);
- *Digital Data Analysis* (core course for Digital Media students 3rd year), and
- *Online Advertising* (core course for Advertising students in 3rd year).

Specializations: Students from various disciplines were involved, including Digital Media, Advertising, Sociology, Applied Computer Science, Computer Science (English), Computer Mathematics, Management, Marketing, Public Administration, Fashion Design, contributing to interdisciplinary collaborations.

Organizational partners: Several partners were involved with students' projects. Faculty of Governance and Communication Sciences, Timisoara Community Foundation, Digital Transformation and Smart City Division of Timisoara Municipality, Făgăraș Research Institute, Timisoara Blood Transfusion Center, ZenLand Massage Therapy, Maven7 Network Research Inc., Women in Data Science Central and Eastern Europe, Polytechnic University of Timisoara, eQuiVox, MV SciArt, ONE.shirt, OilRight, Center for Projects Timisoara.

PhD student Alexandra Florea from Paderborn University joined as a teaching assistant for *Analysis of Digital Data*, further supporting student development and project coordination, and Ianis Rusitoru, while a 3rd year Digital Media student has become a student mentor for his peers in the *Introduction to Network Science* and *Analysis of Digital Media* classes, helping them with data-specific issues.

Real-world passion projects: Projects provided students with opportunities to apply network and data science methodologies to cultural, social, and urban challenges. The table below lists the projects accepted in the exhibitions in the three years of the program. The colors represent that class they were developed in:

- Purple: Introduction to Network Science (core course Digital Media, BA years 1 and 3)
- Green: Introduction to Network Science (transversal course other specializations, BA years 2 and 3)
- Orange: Analysis of Digital Media (core course Digital Media, BA year 3)
- Red: Online Advertising (core course Advertising, BA year 3)

No.	2021-2022	2022-2023	2023-2024
1	Lugoj Civil Society Network	British Monarchy Travel Network	Romanian Trains Network
2	Game of Thrones Network	Crypto Transactions Network	Timisoara's Public Spending Network
3	Urban Mobility Innovation Network	God of War Video Game Network	Minions Films Network
4	Marvel Universe Network	Research Institute Network	Romanian Film Industry Network
5	Biking Community Network	Company Ideas Network	Bid Book Collaborations for Timisoara European Capital of Culture Network
6	Beauty Influencers Network	Overwatch Video Game Network	Dead by Daylight Video Game Network
7	Civic Initiative Groups in Timisoara Network	Teen Wolf TV Show Network	Romanian YouTubers Collaboration Network
8	Timisoara Civil Society Network	UX-UI Industry Network	Java Structure Network
9	UI/UX Software Network	Valorant Video Game Network	Breaking Bad TV Show Network
10	The #GTA6 Twitter Spread Network	Music Collaborations Network	Avatar the Last Airbender TV Show Network

11	Highschool Network	Adventure Time TV Show Network	Mortal Kombat Video Game Network
12	Jazz Network	Marvel Heroes Universe Network	Scooby Doo TV Show Network
13	Trump's Twitter Network	Company Motivation Network	Lord of the Rings Films Network
14	Les Miserables Network	Romanian Movies and Actors Network	Marvel Avengers Movies Network
15	Timotion Network	Genshin Impact Video Game Network	Adventure Time TV Show Network
16	YOU TV Show Network	Starcraft Video Game Network	Marvel Contest Of Champions Network
17	Football Transfer Network	Harry Potter Books Network	Fifa World Cup Final 2022 Network
18	Sherlock Network	Squid Game TV Show Network	Active News - Digital Propaganda in Romania Analysis
19	Shadow of War: Middle Earth Video Game Network	House of the Dragon TV Show Network	Global Amazon Buying Analysis
20	Minecraft Recipe Network	LGBTQIA+ Who Supports You After Coming Out? – Ego Networks	Rentals in Timisoara Analysis
21	Women's March Hashtag Network	ML & Data Science Industry Network	Romanian Electric Vehicles Market Analysis
22	Who trusts whom on Bitcoin Network	Company Role Model Network	Global Mental Health Survey Analysis
23	Fake News: The Associated Press Scandal Network	Romanian Festivals Network	Billionaires Analysis
24	Naruto Character Network	Genshin Impact Culinary Network	Holywood Film Accidents Analysis
25	Gold Rush Quakers Network	Total Drama Island TV Show Network	Pokemon Video Game Analysis
26	Met Gala Fashion Network	MA Class Students' Network	Global Suicide Rates Analysis
27	Water Quality in Timisoara	Timișoara Public Spending Network	Titanic Analysis
28	Tourism in Timisoara Analysis	Company Trust and Feedback Network	Respirabil_2.0 - Air Quality in Timisoara Analysis
29	Covid-19 in Timisoara Analysis	Disney Movies Analysis	Romanian Mansions Analysis
30	Air Quality in Timisoara Analysis	ML & Data Science Survey Analysis	
31	Institutional Spending in Timisoara Analysis	Serial Killers Analysis	
32	Public Transportation in Timisoara Analysis	Music Virality Analysis	

33	Blood Donor Loyalty Campaign "Put the world on the move"	Romanian Festivals Analysis	
34	Education of the Future Recruitment campaign	Romanian Human Trafficking Analysis	
35	Massage as a wellbeing therapy Promotion campaign	Food Insecurity in Romania Analysis	
36	ONA Summit 2021 professional conference Promotion campaign	Recycling in Romania Analysis	
37		MV SciArt Campaign	
38		OilRight Campaign	
39		ONE.shirt Campaign	
40		Faculty of Political Science, Philosophy and Communication Sciences Campaign	
41		Spotlight Heritage of Timisoara Campaign	
42		Regional Center for Blood Transfusion Timis Campaign	

Student participation and award rates

Every year, I engage partners and collaborators to join me in evaluating the quality of the projects and I propose award categories for different types of projects. The criteria to enter the exhibition is to have all the required deliverables per project, and those deliverables to be complete and correct. Not all projects entering the exhibition were marked with a 10 (the maximum grade in the Romanian grading system). There were differences among team members and projects based on also the quality of the final materials. Projects that were awarded are mostly projects graded with 10 or 9 in some exceptions, if a few of the deliverables were outstanding, and the rest could benefit from further improvements.

Students are informed at the beginning of the semester, in the first class, about the program, its structure, outcomes, timeline and ambitions. Students who pass the class after the evaluation of the final projects and selected for the exhibition are informed in advance about the possibility to exhibit their project and are asked for their explicit consent to make public their project materials in the exhibition, on online platforms and in Kata.Log. The awards are symbolic diplomas, and their aim is to acknowledge the top performers' sustained effort and participation, that help boost their motivation and continued interest in pursuing data-driven challenges.

Below are the descriptive statistics for the participation and awards for each of the three years of the program, for the two core courses of the Digital Media specialization.

Table 1. Student participation and awards across ConnecTM editions

Core Digital Media Courses	**Introduction to Network Science (1st year Digital Media)**	**Analysis of Digital Media (3rd year Digital Media)**

ConnecTM Editions	1st Ed.	2nd Ed.	3rd Ed.	1st Ed.	2nd Ed.	3rd Ed.
Total Students	92	92	93	35	55	73
Students ConnecTM	51 (55%)	48 (52%)	73 (78%)	21 (60%)	23 (42%)	47 (64%)
Awarded Students	20 (24%)	16 (33%)	25 (34%)	15 (71%)	9 (39%)	31 (66%)
Total Projects ConnecTM	18	14	17	11	8	12
Awarded Projects	6 (33%)	5 (36%)	6 (35%)	5 (45%)	3 (38%)	7 (58%)

In the *Introduction to Network Science* course, participation in the ConnecTM program steadily increased from 55% in the 1st edition to 78% by the 3rd edition. This growing involvement indicates that first-year students are increasingly recognizing the value of hands-on learning. Despite being in the early stages of their academic journey, they are drawn to the opportunity to apply theoretical knowledge in practical projects, engaging deeply with data projects.

On the other hand, participation in the 3rd-year *Analysis of Digital Media* course fluctuated over the editions. Starting at 60% in the 1st edition, it dipped to 42% in the 2nd before rising again to 64% in the 3rd edition. This dip may be due to the competing academic pressures faced by final-year students, as they balance multiple priorities. Nonetheless, the recovery in participation highlights that senior students continue to value the program as they approach the conclusion of their studies, eager to hone their skills and showcase their work.

The percentage of students receiving awards followed an encouraging trajectory, especially in the *Introduction to Network Science* course. In the 1st edition, 24% of students were recognized for their outstanding work, a figure that grew to 34% by the 3rd edition. This increase reflects the program's ability to support and guide students toward producing higher-quality work as they engage more deeply with the material and the project development process.

For the more advanced students in the *Analysis of Digital Media* course, the rate of awarded students was consistently high, although it fluctuated slightly over the three editions. In the 1st edition, an impressive 71% of participants received awards, demonstrating the high level of output from senior students. While this number dropped to 39% in the 2nd edition, it rebounded to 66% in the 3rd edition, reflecting the ongoing commitment of students to deliver high quality projects, even under the pressures of their final year.

Project quality remained robust throughout all editions of the program. In the *Introduction to Network Science* course, the percentage of awarded projects held steady, ranging from 33% to 36%. This stability suggests that despite the growing number of participants, the program maintained rigorous standards, and students consistently met the expectations for quality, completeness, and innovation in their work.

In the *Analysis of Digital Media* course, the percentage of awarded projects was even higher, particularly in the 3rd edition, where 58% of projects received recognition. This highlights the advanced skills of 3rd-year students, who were able to take on more complex and sophisticated projects, delivering work that not only met the criteria but often exceeded expectations.

Overall, the program has fostered increasing student participation and improved project quality over time. Despite the inherent challenges of producing complex deliverables, students have consistently risen to the occasion, aided by clear guidelines, mentorship, and the program's focus on practical

application. The award process celebrates top-performing students and encourages all participants to strive for excellence in their work.

Outcomes and impact

Over its three editions, the program has produced important outcomes. However, I have not been fully diligent with tracking the impact of students' involvement in a systematic way. I only have direct student testimonies and my direct participation in witnessing their academic achievements, job navigation process and career development opportunities after they exit the program. I lay down my participant observation notes below:

- **Top performing students achieved higher academic grades throughout their studies**. My observations of first years students involved in the ConnecTM program throughout their three-year study program showed top grades across disciplines. Students in 3rd year showed top grades in the final degree examinations, namely their thesis defenses and professional portfolio presentations. The best Bachelors theses and professional portfolios were of students involved in the program who built from first to third year, sequentially, for the research of their final thesis, as well as connecting their professional portfolios with relevant, complex and high quality research and multimedia projects.
- **Top performing students were offered more jobs than their peers**. My observations were that top performing students, by the end of their Bachelors degrees had, on average 3 to 4 more job offerings than their peers, all in relevant fields connected to their specialization. Most of the alumni of the programs are currently employed in the field of their expertise, in positions that match their level of experience or higher, and with salaries that are around industry standards or above average for their experience level.
- **Top performing students continued their education**. My observations are that top performing students in the program continued their education pursuing connected masters degrees either in the faculty, in programs such as Advertising Communication in Digital Media or Mass Media and Public Relations, quoting the supportive environment and practical experience they gain in our department, or in the university, in other specializations, pursuing complementary knowledge and skills in marketing, business administration, arts or psychology. Or, they pursued top master's degrees in the broad field of Communication Sciences abroad, in Portugal, Italy, Netherlands, Germany, France or South Corea.
- **Top performing students engaged in more volunteering, more complex projects, and more professional networking than their peers**. My observations are that top performing students from the program engaged in more activities, at higher levels, and with more grit and curiosity than their peers. They quickly learned that professional networking is key in career development, and pursued their ideas further, beyond the classrooms and after their studies.

The program's success can be seen through several key dimensions, including student visibility and employability, awards and recognition, real-world applications, and the scalability of both student projects and the program itself.

One of the most important outcomes of the ConnecTM program has been its ability to significantly enhance student visibility among potential employers. My ideas was to turn the career fair concept on its head. If typically employers gather in an exhibition-like way and students browse through, I wanted

ConnecTM to turn the model around – a place where students showcase their work and employers browse through looking for talent. Over 65% of participating students have gained direct exposure to industry professionals, which has led to internships, job offers, and professional networking opportunities. Through public showcases, collaborative projects, and direct engagement with industry partners, students have been able to present their work in professional settings, translating their academic achievements into career prospects.

Three student-led projects have secured external funding worth €27,000, enabling further development and expansion of their work. Additionally, several students have earned scholarships and (paid) internships with key industry partners, further extending the impact of their work beyond the program.

Each edition has been marked by high levels of student achievement, with a significant percentage of participants receiving awards for their projects. These awards validate the quality of student work and reflect the rigorous standards maintained by the program. Recognition has been given in categories such as data analysis, social impact, innovation, and collaboration, across different applications, from policy-making to video games. This public acknowledgment of student excellence enhances their professional credibility and provides a competitive edge in the job market, while also raising the profile of the program itself.

As ConnecTM has evolved, it has demonstrated its capacity to be replicated and adapted in other institutional settings, making it a model for career-connected learning in higher education.

Project Case Study: Cinema Nodes

Finally, I will end this case study with an example of a project that illustrates the innovative, complex and impactful nature of projects that start in the classroom but may develop well beyond the classroom doors.

One of the standout projects from the third edition of the ConnecTM program is *Cinema Nodes*, an initiative that began as a classroom assignment and has since evolved into a significant, data-driven exploration of the international film industry. The only other significant mapping at scale of the film industry is the well known example of the Hollywood movie network that sparked the famous Kevin Bacon game, whereby one can check how many degrees aways are actors from around the world from the actor Kevin Bacon. The mapping looks at collaborations of actors who co-starred in films.

The novelty that the Cinema Nodes project brings is three-fold. First, it maps all the roles involved in film production, from directors and producers, to actors and technical staff. Second, it captures both popular and well-funded production studios, as well as the independent film sector. And third, the ecosystems mapped are analyzed - their dynamic structures over time, their groups and communities, and their key nodes, to understand the complexity of film production collaboration patterns.

The project's network science approach revealed intricate patterns of collaboration and influence, offering a visual and analytical representation of different trans-national film ecosystem that had previously been difficult to quantify. By examining these interdependencies, Cinema Nodes sheds light on how creative networks are formed and sustained, helping stakeholders understand the underlying dynamics of the industry.

After just one semester, the Cinema Nodes project expanded through partnerships with a local and an international film festival, and its team has organized data visualization exhibitions and developed interactive 3D network exploration games of the film ecosystems they mapped. They conducted interviews with key people identified in the ecosystems and presented them their own ego networks, encouraging them to reflect on their perceptions of influence and innovation potential. The team's innovative approach blends multimedia production with network and data science, demonstrating the creative potential of the synergies our program fosters.

As the project grew, its ambitions expanded to encompass the broader European film industry. The team began drawing from large public databases to map film production networks across Europe, with the goal of creating a comprehensive view of the entire European film production ecosystem, from its inception to present day. This expansion allows Cinema Nodes to not only highlight local and independent international production trends, but also examine cross-border collaborations and the diffusion of creative talent across Europe.

The project has far-reaching applications beyond academia. One of its primary goals is to provide strategic insights for industry professionals, policymakers, and independent filmmakers. The data and network visualizations generated by the project can help shape industry policy by highlighting key trends, identifying influential networks, and pointing to underrepresented or emerging talent pools. For instance, by analyzing patterns of collaboration in the Romanian industry, the project can offer recommendations on how local film communities can position themselves within the larger European market.

The project also fosters strategic collaborations that drive innovation within the film industry. By mapping the networks of professionals and their connections to various films and festivals, the project reveals opportunities for partnerships between established and emerging filmmakers. These collaborations can strengthen local production communities, connecting them with European networks and helping them access shared infrastructure and resources. Such connections are crucial for the sustainable development of local film industries, empowering them to thrive in a highly competitive work environment.

Cinema Nodes stands as a prime example of how student-driven projects can expand beyond the classroom and provide real-world solutions. With its focus on network analysis, strategic collaborations, and industry empowerment, the project highlights the transformative potential of data science and multimedia research in the creative industries.

Challenges encountered

Like any other ambitious project, ConnecTM has also encountered challenges along the way. I categorize them into three buckets: (1) student and partner engagement, (2) financial support, (3) monitoring impact.

Although from a teacher's perspective, this program sounds like the dream of any student, at least in my context, I put continuous effort into educating my students to engage with the initiative and the opportunities offered. Data analytics projects, in the way I work with them, are complex and requires effort. In the end, we compete for their time and interest in a very crowded space. Our chances are limited, our pitch must be attractive, and we must deliver on the promise.

Most of the complaints I heard from students were around team work. They are not very well equipped from previous high school contexts or even from previous BA courses to work effectively in teams, and tensions arise around individual members' level of effort and engagement with the project's timeline and outcomes. Over time, I experimented with different team management approaches, from rotating team management roles in the teams, to assigning specific roles akin to real-world contexts (e.g., project manager, business analyst, communications specialist, etc.). The most successful one to date has been the team building games. Games that allow them to get to know each other better in the team, and that increase their trust and collaboration around small but interesting tasks, creating shared experiences and tokens of their collaboration to ground them around the support the team offers to each member. I have thus incorporated these from the start of the program and I insert such games whenever I see the need throughout the entire process, encouraging them to celebrate their success and work together.

At times, I face challenges engaging partners to take students' work seriously. Culturally, I see some organizations that do not trust the ability of youngsters to contribute in meaningful ways to real-world problem-solving. Besides my argumentation, I challenge that with the examples from the work my students have produced. Over time, this aspect has improved, especially thanks to the strong support of some key organizations who repeatedly engage in our program and measure the impact our students' work has made in their operations. And the best examples are always the best projects which demonstrate that students, when encouraged and supported, can deliver high quality work.

Another interesting learning for me was to see that they pick up the technical aspect of data science very quickly, but they have harder times interpreting results, understanding implications and formulating appropriate recommendations. I support them as much as I can throughout the process, but these abilities come also with practice. The more they work on this, the better they become, so I try to encourage them to get involved in as many data analytics projects as they can, to get exposure to different types of real-world challenges and to see data-driven decision-making in practice with the partner organizations. Another way I try to offset this challenge is that as soon as we start the program, I give them data-driven challenges around their own life, from tracking their health to understanding the potential of their social connections, so they develop an understanding personal data and the impact such information has on their own decision-making.

The second category of challenges is the financial support for such career-connected learning programs. The yearly costs to fully develop the program the way we have done it so far implies costs for printing and installing the exhibition and the costs of maintaining the digital platform with students' projects. The amount is not large, but it must be taken into account. Additionally, one can brand the project offering students and partners branded kits with the program, further supporting the dissemination of the wonderful work that happens in the program. Finding the right category of funding is crucial for the long-term sustainability of the program, as outside grant calls are rarely dedicated for programs like this. Sponsorships are complicated from a positioning perspective. Institutional funds could be the easiest way forward, if the university has internal budgets for such initiatives.

The third and most important challenging category, at least for me, is measuring the impact of the program in a systematic way. I usually use institutional student surveys, tailored surveys, tracking their grades over time, and informal monitoring with students over time. Most importantly, the success of our students is the outcome of a dynamic pool of contextual factors, always changing and moving - from a students' mindset, to the contextual opportunities offered by professional and networking events, a

students' own social network, their support and dependencies in their families, their grit and passion, their financial constraints, and so on. So far, I did not yet find systematic ways in which to monitor and evaluate the progress of students and graduates over time. My next mission is to institutionalize as much as possible of this process though the alumni community, university's stakeholder partnerships, and systematic instruments of impact evaluation. The next section of the paper reflects on these experiences into a call for action and support for programs like ConnecTM.

The Future of Career-Connected Learning in Data Analytics

As the field of data analytics continues to evolve at a rapid pace, educational programs must adapt to ensure students and professionals alike are prepared to meet the demands of an increasingly data-driven world. Career-connected learning programs like ConnecTM are uniquely positioned to support this shift by offering students the tools, experience, and mentorship needed to succeed in their professional careers. The future of career-connected learning in data analytics will hinge on three key factors: continuous learning, a hybrid approach blending academic and vocational learning, and global collaboration. Additionally, scaling these programs across regional, national, and international institutions can broaden their impact.

To broaden the impact of a career-connected learning program, a plan for upscaling is needed at three levels: within the university, across universities in a country, and across an international consortium.

First, securing long-term support from university leadership to expand the program into additional faculties will create more interdisciplinary collaborations. Providing professional development for faculty members to integrate data analytics and career-connected learning into their courses is necessary, so the professors themselves are well equipped to orchestrate and facilitate dynamic interactions with a complex approach to teaching and evaluation. Expanding classroom partnerships with local organizations and government bodies to involve them with student projects will benefit both parties.

Second, expanding career-connected learning programs across other universities in the country would need developing a national consortium of institutions focused on data analytics education. This could create a platform for resource sharing, joint events, and student exchange. This consortium could collaborate with national government agencies and industry leaders to create a data science network that supports data-driven policymaking and innovation. This network would facilitate student internships and collaborative projects on a national scale. Encouraging projects developed through the programs could also be scaled into national initiatives. For example, data-driven public procurement and transparency initiatives could expand to other cities, creating a larger impact on governance.

Third, cross-border or trans-national collaborations could focus on shared regional challenges, such as sustainable development, digital inclusion, or migration, providing a rich context for data analysis. Creating shared online platforms where students and faculty from different universities can access training materials, toolkits, and collaborative opportunities, teaching practices, data analytics tools could foster innovative opportunities.

Conclusions, Implications and Recommendations

This paper has explored the potential of career-connected learning programs, specifically through the lens of the ConnecTM initiative at the West University of Timisoara. By integrating academic rigor with real-world experience, ConnecTM exemplifies how universities can better prepare students for the modern workforce. The program's focus on practical application of network and data science, stakeholder collaboration, and the development of both technical and soft skills has proven effective in supporting the potential of different types of students in the area of data analytics for social scientists.

I have showcased key components of ConnecTM, including real-world passion projects, like Cinema Nodes, collaborations, and exposure to new technologies. These elements enable students to not only gain proficiency in their chosen fields, but also to translate that knowledge into real-world impact. A holistic approach to education - one that includes hands-on projects, industry involvement, and opportunities for personal and professional development - offers significant advantages over traditional academic models. This type of learning equips students with the skills, confidence, and adaptability needed to thrive in today's fast-evolving job market, while also contributing meaningful solutions to societal and industry challenges. By scaling and adapting programs like ConnecTM, educational institutions can foster the next generation of professionals who are prepared to innovate and lead in their respective fields.

Implications

The program underscores the need to shift from theory-centric instruction to an education model that integrates hands-on learning, real-world problem-solving, and collaboration with stakeholders from across sectors. Universities must adapt their curricula to reflect the evolving demands of the labor market, prioritizing practical experience alongside academic learning. Programs like ConnecTM can serve as blueprints for how institutions can create more robust, career-focused educational experiences.

The program highlights the value of engaging with academic institutions to shape the skills of the future workforce. Employers benefit from collaborating on projects, offering mentorship, and providing real-world challenges for students to tackle. These partnerships can lead to a pipeline of well-prepared graduates who are equipped with both the technical expertise and the soft skills necessary to excel in a professional environment.

The outcomes of programs such as ConnecTM signal the importance of investing in education systems that align with labor market needs. Policymakers should support initiatives that encourage collaboration between across the quadruple helix, including funding for student-led projects with real-world applications. Fostering ecosystems where students can access resources, mentorship, and networking opportunities is crucial for ensuring a sustainable, adaptable workforce.

Recommendations

Finally, based on my experience with the continuous development of the ConnecTM program, I put forth several recommendations for scaling and improving career-connected learning:

1. **Expand partnerships between academia and industry**: Universities should seek to establish more formalized collaborations with stakeholders from across sectors – business, government,

and civil society, ensuring students gain exposure to real-world challenges early in their education. This will not only improve their employability, but also provide fresh insights for organizations through innovative student projects.

2. **Support student-driven projects with funding and resources**: To allow student projects to scale and reach their full potential, institutions and policymakers should provide funding and infrastructure. Programs like Cinema Nodes demonstrate how impactful student projects can become when given the right support to evolve beyond the classroom.

3. **Incorporate lifelong learning pathways**: Given the rapid pace of technological advancement, continuous learning should be embedded into educational models. Universities and employers should collaborate to offer ongoing professional development opportunities for alumni, ensuring that the skills they acquire remain relevant as they progress in their careers.

4. **Promote scalability and adaptability of successful models**: Programs like ConnecTM have the potential to be replicated across other institutions and regions. Universities should consider adopting adaptable frameworks that allow for customization based on local industries and student needs, ensuring broader impact and scalability.

In conclusion, the future of career-connected learning in data analytics depends on collaborative efforts between universities, industry, and policymakers. Programs like ConnecTM show that with the right support, educational institutions can produce graduates who are ready to tackle the challenges of a data-driven world. By addressing scalability, resource access, and sustained collaboration, institutions can ensure that career-connected learning remains a powerful tool for shaping the future of education.

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