The 28th International Scientific Conference
"Educational Research and School Practice"

THE STATE AND PROBLEMS OF THE NEEDS MODERN EDUCATION COMMUNITY

BOOK OF PROCEEDINGS

Editors
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Dragana **GUNDOGAN**
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CONTENT

PLENARY

Daniel Churchill

TRANSDISCIPLINARITY AND WHAT IT MEANS FOR EDUCATION 12

Tímea Mészáro and Vilmos Vass

THE LINKS BETWEEN A CHANGED VISION OF LEARNING AND PROJECT-BASED TEACHING 20

Slobodanka Antić

LANGUAGE IN THE CLASSROOM: HOW TO SUPPORT THE DEVELOPMENT OF FUNCTIONAL LITERACY 29

Slavica Ševkušić

PROFESSIONAL INTERESTS OF FINAL GRADE PRIMARY SCHOOL STUDENTS IN SERBIA: A CASE STUDY 35

Jelena Stevanović

THE STATE MATRICULATION EXAM IN THE REPUBLIC OF SERBIA: THE HIGH SCHOOL TEACHERS' PERSPECTIVE 45

TRANSDISCIPLINARITY AND WHAT IT MEANS FOR EDUCATION

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Introduction

As humanity faces new and significant challenges and problems (e.g., environmental, food and agriculture, cyber security, erosion of democracy, regional and global conflicts, etc.), we need education and research that can adequately prepare and equip us to deal with these. Traditional disciplinary approaches, knowledge and methodologies are approachingthe limits of their potential to serve our needs effectively. Embracing Transdisciplinarity is required.

Transdisciplinarity can be described as a practiceoftranscending across, between and beyond established disciplines and professions in the search for knowledge and applications that cannot be pursued in traditional disciplinary ways. The central argument is that contemporary challenges are complex, and dealing with these requires knowledge and expertise across disciplines, professions and communities. Therefore, collaboration across communities and engagements across disciplines are critical characteristics of a Transdisciplinary effort in dealing with the great questions of our time.

Transdisciplinarity aims to transgress and transcend disciplinary boundaries by focusing on the real-world and complexity and solving problems external to disciplines. Transdisciplinarity involves action and engagement across communitiesin solving significant contemporary issuesand results in translational knowledge through "Mode 2 knowledge production" processes (Gibbons, 2000; Limoges *et al*., 1994). Mode 2 knowledge is produced in the context where it will be applied, where the diffusion of results and new knowledge will occur in practice.It emerges in the *context of the*

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application and beyond disciplinary practices alone. Thus, Limoges *et al.* (1994: 5) argue Transdisciplinarity is the "problem solving on the move" that results in socially robust, accountable, reflexive knowledge. A community, not disciplinary peers alone, evaluates the quality of Mode 2 knowledge.

Bammer (2017) cites an example of Transdisciplinary research focusing on illicit drug use in society. Engaging in such research requiresconsideration of whatdisciplines and community stakeholders have useful knowledge and perspectives to contribute, the interconnection between different problem elementsand how research can be translational and support evidence-based change. Useful knowledge and methodologies in such research might be contributed, for example, by pharmacologists, epidemiologists, criminologists, lawyers, and historians. However, although each of these can bring some critical knowledge to the project, none alone is sufficient for dealing with the full complexity of this research. No existing discipline alone can provide the required knowledge, expertise, and perspectives to allow the illicit drug use problem to be addressed comprehensively.

Theoretical Approaches to Transdisciplinarity

Jean Piaget coined the term Transdisciplinarity as the accommodation of the new knowledge emerging when people work together at shifting edges of disciplines (McGregor, 2015). Today, two primary schools of thought or theoretical approaches concerning Transdisciplinarity are the Nicolescuian and the Zurich approach.

For Nicolescu (2006; 2007; 2010), Transdisciplinarity is a methodology required for developing Transdisciplinary knowledge. Thus, Transdisciplinarity intends to ensure the unity of knowledge from disparate sources and different levels of realities of internal (the Subject) and external (the Object) words mediated by the "hidden third" and the "logic of included middle. "It is a methodology for producing knowledge in the context where it is applied, e.g., when conducting research. This new knowledge cannot be reduced to old disciplinary knowledge.

With the difference, the Zurich approach rejects that Transdisciplinarity is a methodology for creating new knowledge (Häberli *et al*., 2001). Essentially, it

is argued that a new approach to science, research, and politics, rather than a new methodology for knowledge creation, is the central purpose of Transdisciplinarity. Not disciplines but grand and complex problems of the world must be the focus of Transdisciplinary research and practices. The existing disciplinary knowledge should be repurposed through a socially useful and accountable format. Thus, Transdisciplinary research ensuresdisciplines are useful in managing complexity. To address such complexity, universities should promote Transdisciplinarity and establish strategic initiatives and supportive structures. The Zurich approach is practically more useful in advancingTransdisciplinary education and research today.

Goals of Transdisciplinary Initiatives in Education and Research

Different stakeholders hold different perspectives on why Transdisciplinarity is needed in education and research. The first is the perspective of a government and critical actors in the economy. Although critics question such a view as politically motivated by neoliberalism, as a danger to academic freedom and intellectualism erosion, we must carefully consider what it might offer us in education.

The goal of Transdisciplinarity from the perspective of establishments is to stimulate and advance economic development. This might mean that industry and the Government might want more Transdisciplinary scientists and technologists ready for the local industry and more significant and strategic collaboration between industries, Government and universities, with investment in the research on key areas identified as economic drivers. For example, the Australian Government identified several key economic growth areas within which jobs can be created, global companies attracted to invest in Australia, the collaboration between industry and universities would flourish and fostering entrepreneurial activity in the economy will be boosted. These areas include Advanced Manufacturing, Cyber Security, Food and Agribusiness, Medical Technologies and Pharmaceuticals, Mining Equipment, Technology and Services, and Oil, Gas and Energy Resources (Australian Government, 2022). Each of these is interdisciplinary at least, and advancement could be taken forward through Transdisciplinary education and research.

Such a conception of a goal of Transdisciplinarity has an intense impact on universities and academics (Russell, Wickson & Carew, 2008). In addition to the traditional activities of teaching and research, the so-called '3rdRole' of universities is emerging as critical. That includes knowledge transfer to economic growth and knowledge exchange with key partners outside of universities. Despite the common dissatisfaction of academics with such development, knowledge has been reconceptualised as a tradable commodity, and academic research emerges to be valued and seen by universities' leadership, the Government and industries in terms of its commercial potential. As a result, the Australian Government's key economic growth areas have been taken by local universities and translated into priority areas. In turn, funding is available for projects within identified research strengths supporting the national knowledge-based economy. Such development emphasisespartnerships of university–industry–government, a kind of space that Transdisciplinarity holds as critical and required for dealing with important challenges of today's world.

Although this development and focus on the knowledge economy strongly impact universities, other educational institutions and academics, it is limited in that it fails to look at the needs of individuals and our world more broadly. From the perspective focusing on the developments and education of individuals in our society, the goal of Transdisciplinarity should be to help members of society to realise their aspirations, create more opportunities for individuals, reduce the gender gap and participation of minorities, indigenous people, and other underrepresented groups to have opportunities to participate in shaping the future,for example, in through STEM or participation in democracy. In addition, Transdisciplinarity should prepare children and young people to take place in a changing, complex, competitive, and interconnected world.

Although our governments focus on national economy drivers and strategies and engagementof universities and industry in priority areas, limiting our action to such a goal is against principles of multilateralism and creates closed, inward-looking priorities which ignore the needs of individuals and the world. Although universities are very good at packaging their global impact through various university-ranking programmes, their thorough implications should also be measured in terms of contribution to locally and globally significant challenges and betterment of our environment, members of society and the world.

Thus, a third perspective on the goals of Transdisciplinarity can be identified as“creating a better world. ” Transdisciplinarity should help us to actively engage in the complex issues that define the future of humanityand respond to challenges and problems of global significance for humanity, such as, for example, sustainable development, climate change and destruction of natural resources, large-scale conflict and wars, eradicating poverty, government accountabilityand corruption, the rule of law,political freedom and political instability, safety, security, and well-being, and food and water security. Such agenda is most evident in the UN Sustainable Development Goals, which articulates 17 areas for intervention dealings with significant challenges humanity faces (United Nations, 2022).

The three perspectives outlined all have something important to offer. However, each of these is limited, and efforts should be placed to create an optimal balance between these perspectives by removing contradictions and embracing the most impactful Transdisciplinary practices for the benefit of everyone.

Transdisciplinarity and Teaching

Bringing Transdisciplinarity to teaching at all levels involves identifying strategic initiatives and themes within which disciplines and communities can be brought together to assist students indeveloping competencies and dispositions for addressing significant challenges of our world. I propose that educational institutions might and should embrace these four themes, creating curriculum, projects and learning possibilities for students in Transdisciplinary ways. These teams are:

(i) Democracy Education – Prepare the student for future participation in democratic society and institution, understand and embrace issues affecting social justice, equity, rights, access, participation, and inclusivity (e.g., racial, multicultural, gender, people with disabilities), understanding and uphold collective and active citizenship responsibilities, government accountability, the rule of law, and separation of power, etc.

(ii) Sustainable Developments Education – Transdisciplinary education opportunities for students todevelop knowledge and values and act in ways that contribute to sustainable living, protecting the environment

and participating in essential sustainability drives, such as climate change, sustainable cities, green industries, etc.

(iii) Digital Humanities – Transdisciplinary education that involves applying digital tools and methods and humanities disciplines such as literature, history, media, archaeology, anthropology, and philosophy in addressing significant challenges of today.

(iv) STEM+ Education – Transdisciplinary education that moves across and beyond natural sciences, technology, applied sciences, engineering, and mathematics, witha focus on addressing significant challenges and problems of today through innovation, future technologies, entrepreneurship, computation and design thinking, climate science, etc.

Such a comprehensive Transdisciplinary education agenda would prepare students for the future world and contributions across all 17 areas of UN Sustainable Development Goals.

Transdisciplinarity and Research

The critical aspect of Transdisciplinarity is creating knowledge within an application and communities. Unity of knowledge emerges as useful knowledge owned by communities involved in addressing and responding to the significant challenges of today. This, Transdisciplinary research required translation or implementation to be an integral part of its methodology. In addition to involving communities early in the research and jointly identifying significant research to pursue, Transdisciplinarity requires that "diffusion of innovation" (Rogers, 1983) occurs as an outcome of projects. Such requirements demand Transdisciplinary projects include methods to promote the systematic uptake of research outcomes. A scientific study of uptakes of research findings and other evidence-based practiceis Implementation or Translational Science (Eccles & Mittman, 2006; Nilsen, 2015).

Thus, the Implementation Science examines the optimal implementation and sustainability strategy in addition to the full impact of the innovation by the end of the study. An implementation scientist should support traditional disciplinary expertswith skills to bringtheirexpertiseto a complete understanding of the research problem

and effective options for implementation. Thus, an implementation scientist is an essential partner in Transdisciplinary research projects, contributingby assisting teams in understanding the best approach to the problem and its interconnected elements, determining disciplines and stakeholders to be involved, and action and diffusion of outcomes through translation (Bammer, 2017). However, as Eccles and Mittman (2006) write, a significant challenge forimplementing Transdisciplinary projects remains the lack of a unified academic community required forthe diffusion of innovation.

Conclusion

Transdisciplinary is best described as a methodology for moving between and beyond established disciplines, professions, and communities in the search for solutions that cannot be articulated in traditional disciplinary ways. Institutions should initiate Transdisciplinary research, which addresses questions and grand challenges of our time in collaboration with communities. Also, we must engage with society to collaboratively and strategically focus on advancing Transdisciplinary education to develop an equitable, sustainable and resilient future. Furthermore, institutions should develop implementation science capacity to lead translational research to benefit the economy, society, individual citizens, and a better world.

Key words: transdiciplinary science, research methodology, stem education, democracy education, sustainability education, digital humanities education.

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