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Review Article

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Multidisciplinary Research Addressing Emerging Global Challenges of Ensuing Decade: A Review

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Abstract: Multidisciplinary research is the hallmark in 21st century and a way forward towards holistic sustainability. Ancient philosophers viz; Aristotle, Socrates, Confucius, Al-Farabi, Sigmund Freud, Jabar-bin-Hayan, Benjamin Bloom, Karl Marx and Friedrich Nietzsche laid foundations of philosophies based on their intellectual multidisciplinary knowledge approach. The promising impact of multi-scientific disciplines demonstrate the importance of diverse academic and research domains. In fact, every discipline is interrelated and interdependent to each other with a minute hairline difference. MDR unites scientists globally from distinct academic backgrounds to address pressing challenges of next decade, but no doubt cooperation is crucial in scientific study as it stimulates innovation, creativity, and systematic conception. Present review emphasizes importance of transdisciplinary research in diverse meta-problems, tackling future challenges and multi-faceted complexities. Emerging technology has made it possible for scientists and scholars from various purviews around the world to collaborate on projects and research without being at the same location. The most significant recommendation of this article highlights the future scope of transdisciplinary approach by inclusion of collaborative research meeting sustainable development goals (SDG's) through multi research, thereby aligning researchers and scientists towards internationalization.
Keywords: Meta-problems, Holistic Sustainability, Ancient Philosophers

Introduction

Sine early 1970's natural, environmental and social scientists initiated trans-disciplinarity addressing diverse global challenges. Multidisciplinary research involves the search for truth adopting various specialized academic turnoffs. Hypothesis analysis by combining various approaches, fields and academic methods is one aspect of multi-disciplinarity. The evolution of multidisciplinary research paved the way to educationalists, policy makers and evolutionists to provide the integration of natural sciences, life sciences and earth sciences with human sciences, thereby providing a holistic sustainability view based on innovative research. Moreover, it can be defined as a knowledge search by an objective and systematic method for an original contribution to the existing stock of knowledge involving a combination of several disciplines and methods

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(Dalton et al., 2021). Multidisciplinary collaboration is very vital in the 21st century era this is because of the belief that the global world is a culturally and linguistically diverse entity that can best be understood in an integrated way. It enables scholars and researchers to recognize contrasting perspectives, synthesize, think critically, and re-examine the world and opportunities it affords (Ajakaye and Ogunniyi, 2021). It is pertinent to mention that individuals with multidisciplinary background tends to challenge favorable academic placements and upward mobility (Lyu et al., 2024).

As science and technology evolve, research has transitioned from an individual pursuit to a team effort due to a recognition that problems faced by the world today cannot be solved from a single disciplinary perspective. Problems such as drug abuse, preparing for natural disasters, or the influx of refugees seeking entry into wealthier countries are complex and multi-faceted. Collaborating with professionals from other academic domains, multidisciplinary research brings together a range of viewpoints, abilities and approaches (Arnold et al., 2021). This method acknowledges that a lot of issues in the real world have multiple facets and can't be sufficiently handled by a single field. There has never been a stronger need for multidisciplinary research as we tackle problems like climate change, global health crises and technological developments. According to Zhuravlova (2019) multidisciplinary collaboration occurs in the search for a combination of not only similar subject areas, but also those that have no similarity, however, are essential for the knowledge and understanding of the object being studied.

The capacity of multidisciplinary research to stimulate innovation is one of its main advantages. Researchers can explore new ways of problem-solving and break free from conventional thinking by merging insights from multiple fields. For example, solving problems in public health demands not only medical knowledge but also understanding from the social sciences, economics and technology. When statisticians, engineers, sociologists and biologists work together, they can produce complete answers that transcend the specializations of each separate discipline. Furthermore, research that crosses disciplines can hasten the rate of discovery. Conventional research models frequently entail a series of successive steps when research findings from one subject are applied to another (Antonenko et al., 2014).

A multidisciplinary method, on the other hand, enables simultaneous investigation and promotes a synergy that may result in more rapid developments. This faster pace is especially important when dealing with pressing global challenges that call for prompt and efficient solutions. Multidisciplinary research has advantages that go beyond the classroom and have practical applications. Present review focuses encouraging and facilitating multidisciplinary cooperation towards collaborative paradigm shift. Institutions need to foster an atmosphere that motivates researchers and scientists to speculate beyond their areas of expertise and participate in significant joint ventures.

Addressing Meta-problems Transcendence

Multidisciplinary research address diverse issues and contemporary problems in academic domains. Issues in such complex systems are auspicious examples of where conflicting social, environmental and economic needs may be encountered (Vanasupa et al., 2014). Multidisciplinary connection smoothly figures out these meta problems. These concerns refer to the ecosystem of interconnected sub-problems and processes. The initial impetus towards collaborative research lies

in the meta-problems transcendence of individual disciplines, which renders the discipline-specific researcher's conceptualization thereof essentially untenable.

Combination of Two or more Academic Disciplines

Currently, several emerging academic fields are a result of transdisciplinary research. As biomedical engineering covers biology, medical and engineering domains, biochemistry is a combined discipline of biology and chemistry, biotechnology is a combined discipline of biology and technology, mathematical psychology is a combined discipline of mathematics and psychology, organizational behavior & management sciences deal with diverse behavioral groups and implication of management strategies, mathematical philosophy is a combined discipline of mathematics and philosophy, biostatistics is a combined discipline of biology and statistics etc., these fields combine two or more disciplines and a new multidiscipline emerged (Hall et al., 2018; Ramani and Sikdar, 2018). The need for human resources (HR) is now undergoing substantial changes. Numerous tasks that were formerly completed by people have been taken over by machines, robots, and high-tech devices. Along with fact that since the start of the industrial revolution 4.0, changes have been made in how people work and live. In the end, there will always be need for human resources who can think, communicate and collaborate continue to increase (Thana, 2022).

Encouraging Critical Thinking

Interdisciplinary education encourages critical thinking and problem-solving skills. When students are exposed to a range of different perspectives and approaches, they are forced to think beyond their own discipline and consider alternative solutions. This can lead to more creative and effective problem-solving, as well as a greater appreciation for the complexity of real-world issues (Dhadphale and Baughman, 2018). The world today is interlinked as countries, businesses, industries, all have emerged from their silos and now exist in an increasingly mixed world. This world throws up problems as complex as its make-up and therefore, no single field of study can provide all the solutions to these problems we face today except multidisciplinary research.

Multidisciplinary Research (MDR) Addressing Worldwide Complexities

Global trailblazers are facing complex, dynamic challenges and wicked problems. Projects that aim to support policy making in such wicked situations ideally employ transdisciplinary approach that integrates organizational, humanistic, agriculture, biophysical, social, and economic sciences. While interdisciplinary research offers great promise, it is inherently more complex to manage and facilitate and evaluate research that integrates disciplinary knowledge (Dozier et al., 2014). Most existing literature addresses issues related to the process of integration, such as communication challenges between disciplines, epistemological differences, lack of clarity around project objectives, and how best to promote ownership of doing science in an integrative way (Bark et al., 2016). Moreover, in today's era of AI and advanced technology researchers and scientists from diverse disciplines increasingly need the capacity for holistic academic collaboration and a multidisciplinary outlook to effectively navigate globally (Dwivedi et al., 2023; Odugbesan et al., 2023).

Multidisciplinary Research & Global Sustainability

Sustainable development is a concept that appeared for the first time in 1987 with the publication of the Brundtland Report, warning of the negative environmental consequences of economic growth and globalization (Edwards, 2019). The sustainability concept has been at the center of both the natural environmental sciences (physics, biomedical engineering, green chemistry, and microbiology) and a wide range of sub-disciplines in management sciences, psychology, sociology, economics, law, and philosophy (Fazey et al. 2014). It is pertinent to mention that various studies emphasize that multidisciplinary researchers are viewed favorably in elite organizations & institutes. Sounds like integrating knowledge from diverse fields is impactful and constructive enhancing positive change in coming decades (Fontana et al., 2022; Petersen et al., 2021; Xiao et al., 2022; Leahey et al., 2019; Li and Yin, 2023).

Challenges in Multidisciplinary Collaborations

- Conflict of interest arises as scientists, researchers and scholars from diverse domains seeks for a goal that will boost their image in particular disciplines.
- Communication and linguistic hurdles are a daunting task as creating mutual grounds among researchers with diverse thinking strategies towards problem-solving is quite challenging.
- Strategic support challenge.
- Challenge of a shared theoretical framework and open discipline.

Conclusion

This article seeks to develop a fundamental ontology for a multidisciplinary research system, drawing from complexity and systems theory, organizational dynamics and certain concepts within the philosophy of science. No doubt the system externalities strongly influence the individual researcher, stigmergy between researchers within the system remains weak due to disciplinary restrictions of language codes, which is an essential feature of the system's robustness in maintaining its purpose. Therefore, disciplinary silos are often criticized for their restrictiveness, are somewhat paradoxically seen as instrumental in maintaining the researcher's autonomy and the system's robustness. It is anticipated that an improved understanding of multidisciplinary research systems would provide scientists with insights into certain strengths particular to less integrated and self-organized forms of collaborative research fostering smooth multifaceted complexities.

Recommendations

The foremost suggestion of this review emphasizes that the institutes and organizations creating a virtuous circle between disciplinarity and interdisciplinarity, in education, research and innovation, are well positioned to reap major benefits and smoothly accomplish global achievements. Merging diverse academic fields makes otherwise impossible goals achievable, often in a timelier manner. This has led universities, granting agencies, academic and commercial institutions to encourage the development of multidisciplinary resaerch. Moreover, the institutions perhaps minimize obstacles for multidisciplinary researchers via numerous avenues viz; hosting research networking

events to introduce researchers across disciplines or providing pilot funding mechanisms that specifically incentivize multidisciplinary effort.

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