Pak. Math. Soc. Newsl.
ISSN 1816 – 2215
Issue No. 3, Vol No. 8, 2024

Pakistan Mathematical Society Newsletter

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Editorial

A mathematical society newsletter, like the London Mathematical Society's, is a vital communication tool that benefits both its members and the wider community. It provides updates on important events such as conferences, workshops, and seminars, fostering collaboration and knowledge exchange among mathematicians globally. The newsletter often features articles and interviews with prominent mathematicians, offering insights into research trends and breakthroughs. This helps keep members informed and inspires students and early-career researchers by showcasing career paths and achievements.

Additionally, it serves as a platform for members to share their contributions, fostering a sense of community and encouraging participation. It includes updates on policy changes, grant opportunities, and educational initiatives, equipping members to navigate their professional landscapes effectively. The newsletter also highlights mathematics' societal impact, demonstrating its relevance to a broader audience, including policymakers and educators. Ultimately, it supports and advances the field by sustaining a vibrant and connected mathematical community.

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The Case for Specialized Mathematical Conferences in Pakistan

Qaiser Mushtaq
Emeritus Professor of Mathematics

Mathematics encompasses a vast array of branches, with the Mathematics Subject Classification 2000 (MSC 2000) identifying 61 primary branches and 3,525 sub-branches. This diversity illustrates the field's depth and complexity, making a generalized mathematics conference increasingly impractical, especially in Pakistan, where there are only about 850 PhDs in mathematics for a population of over 240 million. Such a conference would likely overwhelm participants and lead to a superficial understanding of many areas rather than a deep dive into specific fields of interest.

A general mathematics conference dilutes focus, making it difficult for attendees to find sessions relevant to their expertise. This lack of focus can lower the quality of discussions and networking opportunities, as participants may struggle to connect over common interests. Researchers often specialize in niche areas, and expecting them to contribute meaningfully across unrelated domains is unrealistic. Attempting to cover every aspect of mathematics in one event also presents significant

logistical challenges, requiring extensive resources and potentially leading to scheduling conflicts that prevent effective engagement with preferred topics.

One of the key issues with general conferences is that speakers do not simplify their papers for the audience. This often results in presentations that are too technical for the general audience to understand, making it difficult for participants to engage meaningfully with the content. This creates a barrier to productive academic discourse, as the majority of the audience may struggle to grasp the material being presented.

Specialized conferences, however, offer numerous advantages. By focusing on specific branches of mathematics, these events attract participants with common research interests, fostering more productive discussions and collaborations. Attendees can delve deeply into their areas of interest, leading to valuable feedback and potential partnerships. The focused audience allows researchers to maintain the technical rigor necessary for serious academic discourse, enhancing the quality of presentations and discussions.

In Pakistan, where the mathematical research landscape faces challenges in keeping pace with global advancements, specialized conferences are particularly important. The limited pool of experts must cover a wide

array of topics, making it difficult to achieve significant depth in any particular area. Specialized conferences can help advance mathematical research by bringing together experts to address specific challenges and explore emerging opportunities.

These events also promote international collaboration by aligning with global research trends and facilitating knowledge exchange. Additionally, by focusing on local challenges unique to Pakistan, such as energy optimization or agricultural modeling, specialized conferences can contribute directly to the country's development goals.

To maximize the benefits of specialized conferences, organizers should identify key areas of focus based on local strengths and global trends, engage diverse stakeholders, and foster inclusivity and accessibility. Leveraging technology, such as virtual platforms and interactive tools, can extend the conference's reach and impact.

In conclusion, the vast scope of mathematics makes a generalized conference in Pakistan impractical. Specialized conferences offer a more effective approach, enhancing the quality of research, fostering international collaboration, and addressing local challenges. These efforts are essential for advancing mathematics in

Pakistan, contributing to both academic and industrial progress.

Illegal Collaborations in Doctoral Theses in Mathematics

Qaiser Mushtaq
Emeritus Professor of Mathematics

In the realm of doctoral theses, the ethical principles of original research and individual authorship stand as the cornerstone of academic integrity. However, in Pakistan's academic landscape, the systemic issues surrounding thesis supervision in mathematics and university oversight have led to a distressing trend of unethical collaborations and compromised academic integrity.

Supervisors of mathematics researchers, entrusted with guiding and mentoring them through their doctoral research, wield considerable influence. Many PhD supervisors in Mathematics Departments in Pakistan actively pressure students to publish multiple research papers before thesis submission. This undue emphasis on publication metrics disregards the essence of scholarly research and misguides students, pushing them toward unethical practices.

The emergence of numerous research papers, each featuring multiple co-authors and mirroring identical content, raises two distinct possibilities. Either the thesis itself is a collaborative effort among multiple authors, contrary to the solitary authorship mandated, or the dissemination of content through various research papers, attributing multiple authors, signifies a fabrication of authorship. In either scenario, the integrity of the thesis and the authenticity of the research outputs demand scrutiny to uphold the fundamental principles of scholarly pursuit and academic honesty.

The role of supervisors, who should uphold ethical standards and nurture academic integrity, becomes questionable when they compel students to engage in expedient practices to fulfil arbitrary publication quotas. This pressure often compels students to employ unethical means to accelerate the publication process, tarnishing the integrity of their research and compromising their academic journey.

Universities, as custodians of academic standards and guardians of intellectual integrity, bear responsibility for upholding ethical norms. However, the apparent failure of universities to monitor and regulate the practices surrounding doctoral theses in mathematics exacerbates the issue. By allowing the prevalence of unethical

collaborations and turning a blind eye to the pressure exerted on students, mathematics departments become complicit in eroding academic integrity.

The legality of these practices further compounds the issue. Collaborative publications that misrepresent individual authorship and original contributions raise significant legal concerns. When an author of a thesis on a topic in mathematics claims sole ownership of research work in their thesis while concurrently publishing papers sourced from it with multiple co-authors, ethical and legal boundaries are breached.

Such actions may constitute academic misconduct and copyright infringement, as the reproduced content often overlaps substantially with the thesis. The misrepresentation of sole authorship in the thesis, while collaborating with others for sake of publications, raises serious ethical and legal questions regarding intellectual property rights and academic honesty.

Universities and academic institutions have a legal obligation to ensure compliance with ethical standards and intellectual property laws. By condoning or overlooking these unethical practices, they potentially expose themselves to legal repercussions and undermine the credibility of academic degrees conferred based on compromised research integrity.

Addressing these systemic issues necessitates a comprehensive overhaul of the supervisory system, rigorous enforcement of ethical guidelines by universities, and stringent adherence to intellectual property laws. PhD supervisors must prioritize mentoring and guiding students ethically, emphasizing the significance of original research and individual contributions.

Universities should establish robust mechanisms to monitor thesis supervision, enforce ethical guidelines, and conduct thorough investigations into suspected academic misconduct.

Furthermore, legal frameworks must be reinforced to explicitly address academic misconduct related to misrepresentations of authorship and intellectual property violations. Universities need to collaborate with legal experts to ensure that ethical guidelines align with existing laws and provide recourse for addressing breaches.

In conclusion, the pervasive unethical collaborations in doctoral theses in mathematics in Pakistan underscore the need for immediate intervention at multiple levels. The role of supervisors, universities, and legal frameworks in upholding academic integrity cannot be overstated. Upholding ethical standards, fostering a culture of integrity, and ensuring legal compliance are imperative to

safeguard the sanctity of academic research and restore trust in scholarly pursuits. Failure to address these issues risks perpetuating a culture of unethical conduct, compromising the credibility of academic degrees, and eroding the foundations of scholarly pursuit.

Rethinking Research: Quality Over Quantity

In the ever-evolving landscape of academia, the pursuit of research stands as a cornerstone of intellectual inquiry and progress. Yet, amidst the drive to produce groundbreaking discoveries and advance knowledge, a concerning trend has emerged—one that prioritizes quantity over quality in research output. Today, we delve into the fundamental question: Why do we do research, and how can we ensure that its essence is preserved in an era dominated by metrics and benchmarks?

At the heart of research lies the quest for knowledge, understanding, and innovation. It is a journey of exploration, driven by intellectual curiosity and a desire to uncover truths about the world around us. From the pioneering work of historical figures like Euler, Ramanujan, and Abel to the modern-day endeavors of researchers worldwide, the spirit of inquiry has fueled some of the most significant advancements in human history.

However, in recent years, the landscape of research has undergone a profound transformation. Academic institutions, funding agencies, and researchers themselves have increasingly come to equate success with publication metrics—specifically, the number of research papers produced. This emphasis on quantity has led to a proliferation of papers that prioritize output over impact, quantity over quality.

In countries like Pakistan, India, and China, where academic appointments and promotions are often tied to publication quotas, this trend is particularly pronounced. Despite modest requirements for advancement, researchers are producing an excessive number of papers, raising questions about the integrity and credibility of academic research.

The consequences of this quantity-driven approach are manifold. It undermines the value of individual research contributions, dilutes the integrity of academic discourse, and perpetuates a culture that prioritizes quantity over quality. Moreover, it fails to recognize the nuanced contributions that researchers make to their fields and may inadvertently incentivize superficial or incremental research over transformative and impactful endeavors.

So, how do we reclaim the essence of research and ensure that it remains true to its purpose? The answer lies in a fundamental shift in academic culture—one that values quality, originality, and impact over sheer publication volume. Academic institutions must reevaluate their evaluation criteria, moving away from arbitrary publication quotas and embracing a more holistic assessment of researchers' contributions. This entails recognizing the value of innovative ideas, rigorous methodologies, and substantive impact on knowledge and society.

Moreover, researchers themselves must resist the temptation to prioritize quantity over quality, instead focusing their efforts on meaningful and impactful research endeavors. By fostering a culture of integrity, rigor, and ethical conduct in research, we can uphold the principles of scholarship and merit that lie at the heart of academia.

In conclusion, the pursuit of research is a noble endeavor—one that transcends metrics and benchmarks. It is a journey of exploration, driven by intellectual curiosity, passion, and a commitment to advancing knowledge for the betterment of society. By reclaiming the essence of research and prioritizing quality over

quantity, we can ensure that its true value is preserved for generations to come.

Late Professor Graham Higman said in Interview by Qaiser Mushtaq in Visitor's Book on 16th August 1987, Pakistan Television, we do fundamental research, not only to acquire results solely but because the process is ennobling one; it is one that makes you more worthwhile than before; it is something that if you cut yourself off, you are making yourself less human than you ought to be.

Jack of All Trades in Pakistan: A Rising Concern

Qaiser Mushtaq
Emeritus Professor of Mathematics

Universities have long been at the forefront of intellectual progress, serving as breeding grounds for innovative ideas and pushing the boundaries of knowledge. A crucial aspect of their mission is the development of curricula that not only disseminate existing knowledge but also foster the creation of new concepts. This is particularly true in mathematics, where a well-crafted curriculum balances foundational education with opportunities for specialized exploration. According to the Mathematics Subject Classification 2020, mathematics includes 61 primary

subjects and 3,520 sub-subjects, highlighting the vastness of the field.

The American Mathematical Society's Mathematical Reviews annually examines over 60,000 research papers, categorized by these subjects. This systematic classification underlines the importance of specialization in mathematics, where researchers dedicate their careers to specific areas, advancing knowledge within those domains. Historically, mathematicians like James Clerk Maxwell, Évariste Galois, and Srinivasa Ramanujan have made significant contributions by deeply focusing on particular branches of mathematics.

Despite the tradition of deep specialization, recent trends show a shift in the way mathematical research is conducted, especially in some countries. Increasingly, mathematicians are moving away from their original specializations soon after completing their Ph.D.s. This trend of rapid shifting, where researchers produce a few papers in one area before moving to another unrelated topic, raises concerns about the depth and quality of the research being produced.

In contrast, developed countries have maintained the tradition of specialization. Renowned mathematicians such as John von Neumann in functional analysis and Paul Erdős in number theory are celebrated for their sustained

contributions to specific fields. The prestigious Fields Medal further emphasizes the importance of deep, impactful research in particular areas of mathematics.

In developing countries, a new trend is emerging-researchers producing a high volume of papers across diverse topics, often at the expense of developing deep expertise. This "Jack of All Trades" approach is partly driven by market demands and the pressure to demonstrate versatility and productivity. While versatility can be beneficial, the current trend raises significant concerns about the quality of mathematical research in these regions.

The rapid production of research papers, without cultivating strong expertise in a particular specialty, risks leading to superficial investigations that do not meaningfully advance mathematical knowledge. This approach also sets a problematic precedent for the next generation of mathematicians, who may prioritize quantity over quality in their academic pursuits.

Addressing the challenges posed by the "Jack of All Trades" phenomenon requires concerted efforts from academic institutions, funding agencies, and the mathematical community at large. The focus should be on reinforcing the value of deep specialization, fostering a balanced academic environment, and implementing

supportive policies that nurture meaningful research contributions.

Universities must design academic programs that offer a strong foundation in core mathematics while encouraging deep exploration of specialized topics. Mentorship programs and research seminars focused on specific branches can help students develop robust expertise.

Funding agencies should prioritize grants that support long-term research projects, enabling comprehensive studies and significant contributions to specific fields. Recognizing and awarding researchers for sustained efforts in particular areas can further promote deep specialization.

The mathematical community must cultivate a culture that values expertise over superficial productivity. This can be achieved by providing professional development opportunities, promoting ethical research practices, and strengthening peer review processes to ensure quality and originality in research outputs.

By prioritizing deep specialization and fostering an environment that values expertise, the mathematical community can uphold the integrity of research and ensure its continued impact on science, technology, and society.

Zoya Science Schools

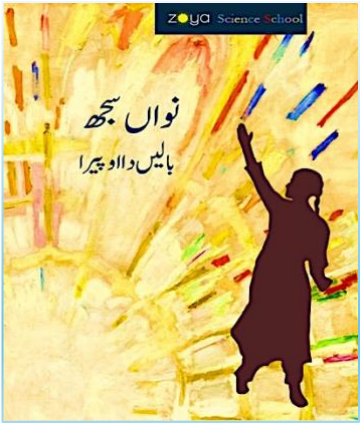
Eight Zoya Science schools serve 3,100 underprivileged children--of landless workers and peasants in poor, rural villages of South Punjab along the Indus-places dominated by large feudal land holdings and thick with peasants and landless workers deprived of justice.

Zoya schools are built next to the villages so little girls can walk to school (photo of the recently constructed 8th Zoya Science school on the right).

The children get free education and free textbooks. In one school we give all 300 children a free hot meal daily. And in their homes and nearby government schools, we dig water wells and set up hand pumps to provide them with potable water--so far 346 benefitting over 41 thousand children.

Education for liberation: We link education with the children's awareness of the socio-cultural reality that shapes their lives, and their capacity to change that reality. We give them insights into the basic structures of science/math and train them to think logically and rationally. An example of this effort is our Nawan Sij (New Sun), a rock opera for children in their mother

tongue Seraiki with music from around the world, including Beethoven's Ode to Joy for the finale.



It is the story of a girl who wishes to know how big the Earth is (its circumference) and finds out about it at Zoya Science School. It is a commentary on the socio-cultural reality that shapes the lives of the children; It is an effort to make them aware of their capacity to change that reality. And it teaches them the fundamentals of science/math.

Nawan Sij book, our posters, poems, videos, and songs are the teaching materials we use to promote science/math. Once every week we teach the science/math fundamentals with these materials and during celebrations of special days, such as Pi Day (March 14).

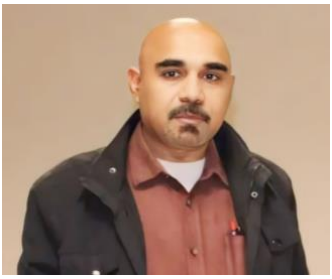
Pakistan's Pi Champion: Hafsa Khan of Zoya Science School

Hafsa Khan has calculated 1,000 Pi digits in 4 minutes. Her achievement draws attention to good teaching practices at Zoya Science Schools, which center on math, and rightly so because math is a mighty weapon to master the sciences--but way harder to teach because math is all about abstraction, which is hard to grasp. To teach abstraction we take children to the time and place where the abstraction took place, such as measuring the Earth's circumference, Pythagoras theorem, etc.

Professor Dr. Khalid Saifullah Retires

Professor Dr. Khalid Saifullah has been a specialized in the fields of relativity and astrophysics. He embarked on his journey in mathematics and theoretical physics by pursuing a Ph.D. at Quaid-i-Azam University (QAU), Islamabad, Pakistan. Under the guidance and mentorship of Professor Asghar Qadir.

Dr. Saifullah's doctoral research was a remarkable exploration of the intricacies of relativity, focusing on the dynamic and intricate problems within astrophysics. His work has been pivotal in advancing our understanding of gravitational theories and celestial phenomena. His research contributions during this time was an important step forward to develop subject of relativity.



After successfully completing his Ph.D., Dr. Khalid Saifullah joined the Mathematics Department at Quaid-i-Azam University as an Assistant Professor. This marked the beginning of a long association with QAU, where he devoted his entire academic career until his retirement as a Professor on 12th June 2024.

His research has been published in numerous international journals, covering a wide array of topics in relativity and astrophysics.

In addition to his work at Quaid-i-Azam University, Professor Saifullah was able to obtain the prestigious Fulbright Scholarship, which allowed him to conduct postdoctoral research at Harvard University for a few months.

Soon after his useful stay at Harvard, Dr. Saifullah continued his research at the University of Massachusetts, where he engaged in collaborative projects in theoretical physics. His work during this time was instrumental in fostering international collaborations and enhancing the global visibility of Pakistani scholars in the scientific community.

The Pitfalls of AI Curricula and Teaching, Without Experts

Muhammad Toheed Jillani
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Artificial Intelligence (AI) is currently selling like hotcakes in Pakistan, especially within the educational sector. Unfortunately, this rapid adoption has led to a troubling trend: amateurs, without adequate expertise, are pretending to be AI specialists. In many mathematics departments across the country, AI is being integrated into the curriculum. However, these departments often lack properly trained instructors, which means that AI may soon be taught by amateurs, having devastating effects on students who pursue AI courses. Curricula must not be developed by non-experts to ensure that students receive a proper education.

Students might find themselves disillusioned when their AI skills fail to meet industry expectations. Therefore, those opting to study AI must heed the warning that "a half-doctor is a danger to your life." Mathematics students improperly trained in AI could inadvertently damage the reputation of both AI and mathematics, contributing to misconceptions about its value and harming the future of mathematical sciences in Pakistan.

Preserving Integrity of a Mathematician

Dr Sarwar Saeed
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In Pakistan, it is common to refer to MPhil or PhD holders and early-career lecturers as "mathematicians," even when their contributions to the field are minimal or just beginning. This practice should be reconsidered, as it inflates titles and undermines the distinction earned by those who have made significant, recognised contributions to mathematics. Overusing such terms dilutes their meaning, diminishes the value of real accomplishments, and creates unrealistic expectations. The title "mathematician" should be reserved for individuals with a proven track record of impactful research or contributions to the field, ensuring academic integrity and respect.

A mathematician is someone highly skilled in mathematics, actively contributing to the field through research, theory development, or practical application. Mathematicians make significant contributions that advance our understanding of mathematical principles, often publishing in reputable journals and solving complex problems.