

Survey Insights on the impact of funding on innovation in student led Research

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¹Department of Biotechnology, K. S. Rangasamy College of Technology, Tiruchengode, Tamil Nadu, India.**Abstract**

The present study examines opportunities for funding student research and innovation and how they are organized for funding through local governments, NGOs, institutions, and the private industry. Students, in developing countries, have trouble accessing funding - the application is time- consuming, there is poor funding information, and the environment is highly competitive. This study outlines opportunities for funding, challenges to funding, and opportunities for improving the system of support for student innovation as part of the funding process. The study was designed as a mixed-methods approach and used a cross-sectional descriptive design with a standardized survey completed by students, professors, and academic staff from different institutions. Purposive sampling was used to show variability in opinion from undergraduate (UG), post-graduate (PG), and Professors. Descriptive statistics and thematic analysis were used to analyze the data on accessibility of funding, preference for funding, and financial incriminantes to funding. Within the study, undergraduate students showed the most optimism and accessibility to funding for their projects. They surveyed about 20-29% of the funding sources: university funding, government grants, and private industries. They also used the full range of opportunities for their projects: NGOs, alumni, student associations, and competitions. This study looks at student research funding and innovation funding opportunities and student research and innovation funding opportunities that are locally funded and sponsored by governments, NGOs, institutions, and the private sector. Students, especially in developing countries, struggle in this area. Participation rates of postgraduate students and faculty are much lower than undergraduate student participation rate of 20 – 50%, approximately rates margin is 6 – 15% for PG students and faculty, and funding can be more fragmented and challenging. Students utilize as many options as possible for funding, PG students and faculty have more barriers, and they have to design their own financing and resource allocation.

Keywords: Funding Strategy, Innovation, Knowledge system, Barriers and Awareness

Introduction

There has been considerable research discussing the importance of collaboration between governmental, non-governmental, and educational bodies to empower student research and

innovation. Not only would collaboration between these groups permit a more cohesive method of accessing resources and or funding to support undergraduate (UG) and postgraduate (PG) students, it also allows for funding and resources to be pooled together through multi-party contributions, which can enrich the levels of opportunities (i.e., funding) the student led research platform could establish (Bhatia et al., 2022; Kumar et al., 2021; Sundaram et al., 2023). While many of these opportunities and systems do exist, students are unable to access these various ranges of funding and resources which should be available to them, especially in developing countries. Many students have noted that educational institutions and private industry were often the most typical and accessible forms of funding. Educational institutions often provide funding in the forms of: seed grants, fee waivers, and infrastructure support. In these instances, educational institutions are positioned to provide the right conditions to facilitate research development and innovation (Prasad et al., 2020; Kumar et al., 2021). Funding from government agencies and NGO often provide large funding opportunities, however, eligibility, competition, and the administrative burden limits students access to these funding opportunities. Public funding (meaning scholarships, innovation challenges, research fellowships) was available, however students often spoke of this as a lengthy, difficult and highly competitive process when citing funding sources (Bhatia et al., 2022; Sundaram et al., 2023).

One significant difficulty students face in accessing government funding is the complexity of bureaucratic application processes, along with limited transparency regarding funding decisions. Many public programs are funded (well-funded) and have a lot of money to distribute, but these programs are often targeted and restrictive, which can disqualify students or community-based use or projects from funding. Students encounter layered barriers to funding in addition to this complexity, such as navigating administrative issues regarding available funds, limited knowledge of available funding, and variability in accessing this information. These barriers create benefits for individuals who are comfortable navigating funding systems, and create disadvantages for individuals who represent a background, identity, or class that is not privileged (Bhatia et al., 2022; Sundaram et al., 2023).

Although often neglected, non-governmental organizations (NGOs) and academic research institutions fulfill an important function in regard to student research. NGOs can support funding projects that are specifically community-based, environmentally-based, or socially-based research topics that might get omitted from government continued engagement. Nonetheless, knowledge of scholarship funding in student populations or institutions of higher education, generally, is low (Kumar et al., 2021; Sundaram et al., 2023). Institutions of higher

education typically may offer students support through internal grants, applications, or technology, but do not provide input toward student funded research priorities. In addition, and though it takes time and effort and knowledge of the information existing for such institutional opportunity, many students do not access such institutional opportunity because they lack mentorship.

The overlapping and uncoordinated nature of overall funding sources, from government, NGOs, institutional funding, and for profit organization, creates duplication and lacks potential. Government and NGO engagement typically happens in isolation leading to inefficiencies rather than building collaborative support for research and initiatives. Ultimately, different organizations with funding systems creates gaps where funding will often get duplicated or lost due to lack of oversight (Sundaram et al., 2023). Students also reported multiple collective barriers to funding for research engagement. Furthermore, there are no mentoring or supports in the grant application writing process, and could be a time that a researcher is not able to submit their application for a specific funding competition, or potentially there are multiple applicants for funding in the same area of interest that are competing for the same limited funding. There are funding inequities for students applying for funding and particularly those students who are socioeconomically disadvantaged and are from under-represented communities who have or experience considerably steeper curves to be able to access research funding opportunities (Prasad et al. 2020, Kumar et al. 2018).

The purpose of this study is to learn about current and existing student research and innovation funding sources, from government, non-federal, institutional and private funders, to examine aspects on funding in the public and private funding landscape, and to examine how to better coordination in the funding system has the potential to develop strengths and weaknesses in funding and thematic priority areas (Bhatia et al., 2022; Sundaram et al., 2023).

The specific goals include:

- Looking at and analyzing preferred access points and opportunities utilized by students based on their higher education experience.
- Finding barriers to student access to governmental and NGO funding after undertaking research
- Considering the role of higher education institutions and private sponsors as key stakeholders in the student innovation ecosystem.

In summary, supporting student-led research and innovation is a "wicked problem" that requires a cross-sectoral approach to the structure student-led research and innovation where

some government agencies provide structure and provide larger funding streams, and NGOs provide complementary and social-driven project support, and universities provide access and mentorship with building capacity, and the private sector commercialization and long-term partnerships (Bhatia et al., 2022; Prasad et al., 2020). Improving student research and innovation at a national and international context could be furthered by better collaborating these funding stakeholders through pooled funding, transparent communication, and coordinated engagement.

Methods

The various support roles, reachability, and effectiveness of governmental and non-governmental organizations in promoting student research and innovation were examined in this study using a mixed-methods methodology. In order to learn how academic staff, students, and professionals felt about financing possibilities, we collected both qualitative and quantitative data (Kumar et al., 2021).

Research Design

The study used a cross-sectional descriptive design that included quantitative survey-based data gathering as well as qualitative theme data analysis. We were able to see a wide spectrum of stakeholders thanks to the use of this type of design, which also demonstrated changes in financing accessibility and utilization among institutions (Prasad et al., 2020; Sundaram et al., 2023).

Data Gathering

A structured questionnaire can be used to collect data from primary sources in certain institutions that pride themselves on their strong commitment to research and innovation. The survey-style questionnaire focused on topics including institutions, private sponsorship, government backing, and funding from non-governmental groups that are associated with student research funding arrangements (Bhatia et al., 2022).

Identify the funding sources to the student(s) (private sector, governmental sources, educational institution/bursary, non-governmental organization/research foundations, etc). Types of project specifically funded (community/social project, a piece of research tied to industry, innovation grants). Respondent type by levels and roles (undergraduate, postgraduate, professor, and other). The study was conducted both on-paper and online with the proposed sampling being purposive sampling of students and staff to provide a measure of variation across disciplines and institutional context. The survey found a couple of hundred respondents, which was adequate to complete the analysis, and I believe provides enough confidence to provide an economic meaning associated with the results (Sundaram et al.,

2023). Staffing strategy A purposive sampling strategy was used to build the institutions, and participants who engaged student research and innovation activities. The sampling provided at least some obligation that at a minimum the participants understood or had some informed experience of the funding systems being discussed. The eligibility requirements for participation; current UG and PG students . with engaged/project (component) professors acting as mentor of the student projects; administrators that were aware of the institution's funding process (Prasad et al., 2020).

Data Analysis

The quantitative portion of the data included descriptive statistics, frequency distributions, and percentages to show results for: relative frequency of various funding/money sources accessed by students. the level of access and satisfaction regarding government and NGO funded supports reported by a sample of respondents. variation for access to or preference of funding to be attributed to the respondents' role and/or level. From the numerical representation, we deduced a count of the majority of secured funding sources were monopoly partners educational institution, private business and, to a lesser extent, government and NPOs (Kumar et al., 2021; Sundaram et al., 2023).

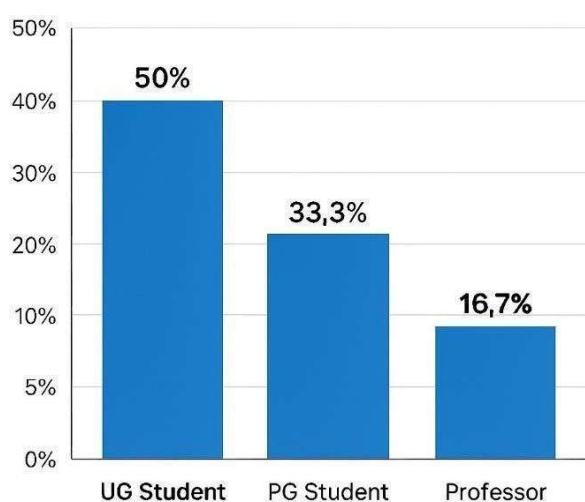


Figure 1: Percentage of Respondents

In the figure 1 presented in graph, UG Students accounted for 50% of responses, meaning they had strong undergraduate representation. PG Students accounted for 33.3% of responses which shows that there was still a significant postgraduate representation, just smaller worse than UG students. The other group, Professors, were represented by just 16.7% of respondents indicating that they least likely represented by respondents. This shows the responses suggest student voice, especially student voice from the undergraduate level is the distinguishing voice from

the respondents. The low number of responses from faculty suggest that there might be room to increase faculty participation in any academic or survey engagements

Ethics

Extra ethical measures were put in place to protect confidentiality, as well as confidentiality. Different kinds of information were given to participants at the time and prior to the introduction of data collection to ensure they were aware of what the study would entail. They received informative documents about their rights as participants, such as anonymity and their right to withdraw, at the beginning of the academic year and during the term in which the data collection took place([Prasad et al., 2020](#)).

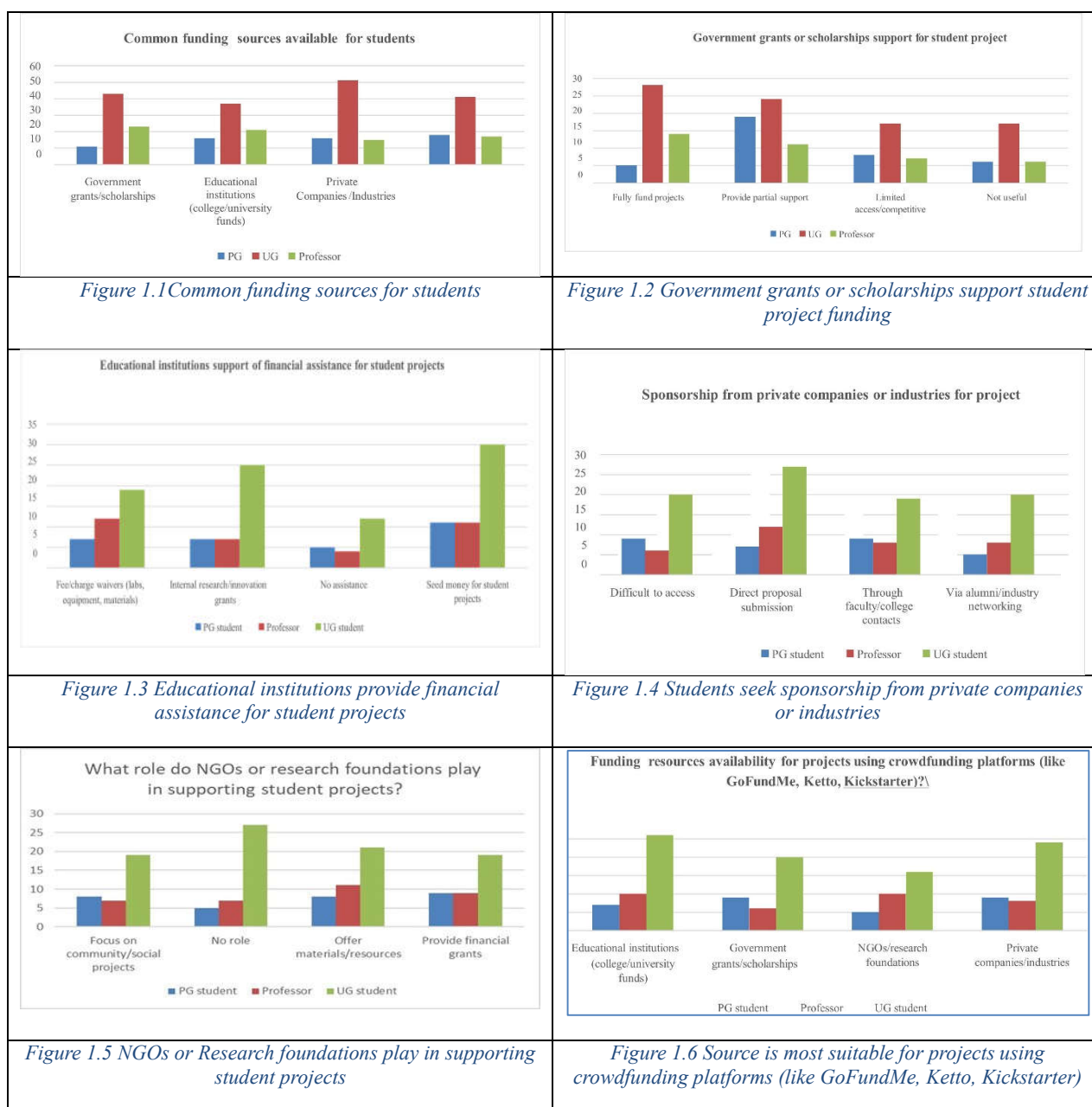
Limitations

While purposive sampling produced good participants there is a limit to generalizability to all institutions, or all places. Also, self-reporting means self-reported perceptions only, along with the possibility of bias related to those perceptions. However, given the nature of mixed-methods understandings which were important to the study, the number of study respondents, and the fact that whatever bias existed is controlled within this panel with and contributes to the overall trustworthiness of the findings([Bhatia et al., 2022](#)). Many respondents indicated that they had accessed organizational supports (seed grants, lab access, fee waivers, bursaries), and private sector funded supports (e.g., corporate social responsibility funds, partnerships with corporations, sponsorships), as indicated in the survey. Students indicated that they were unaware of the government funded schemes (which were required for university and college students), and expressed that government schemes were less accessible of including factors such as a highly competitive selection process (having to reapply, long and detailed proposal, and lack of knowledge of the government funded schemes at all) ([Sundaram et al., 2023](#)).

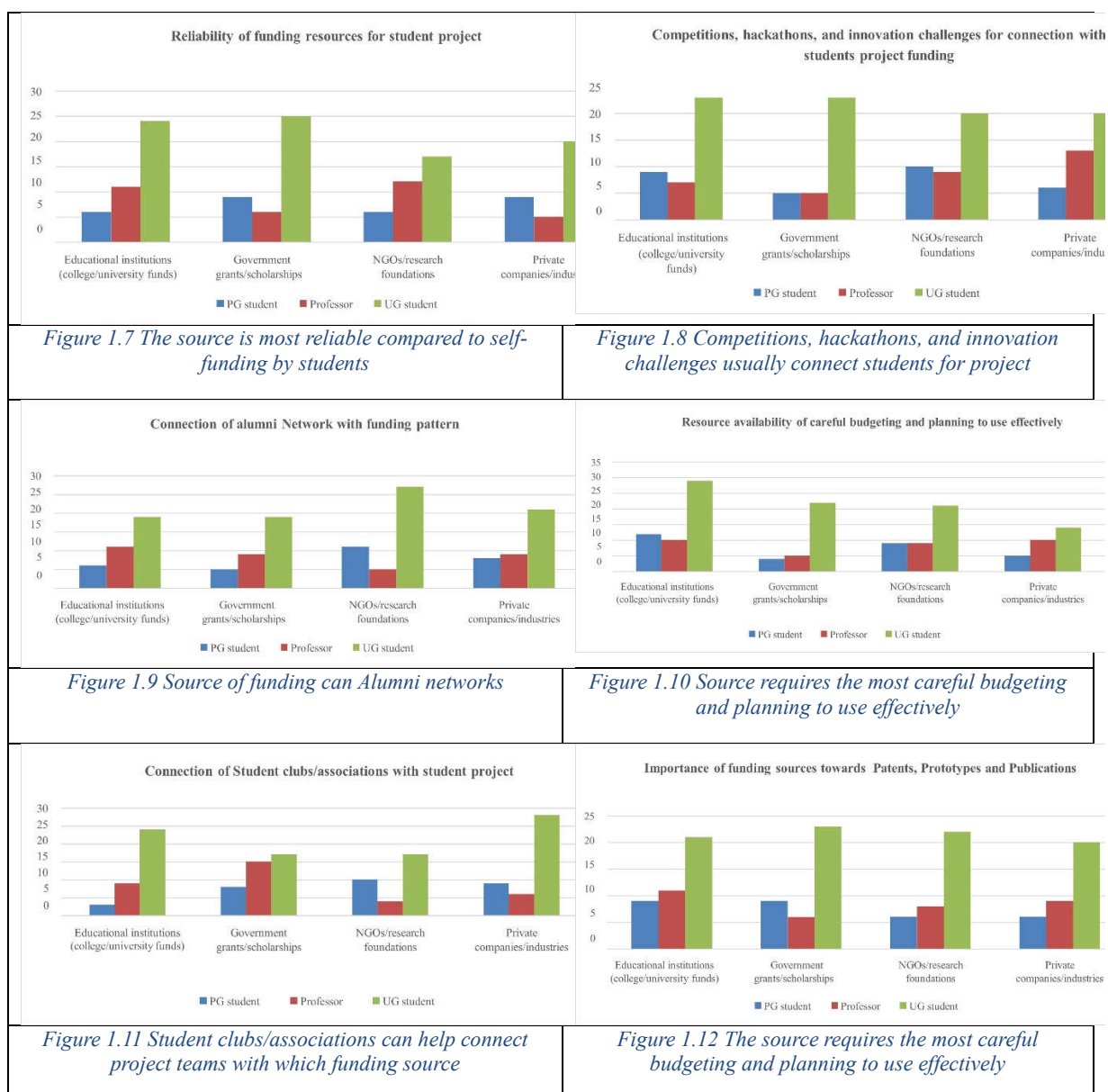
Results

Undergraduates receive most funding, mainly from private industry and government. Professors rely on government and institutional funds, while postgraduates have the least funding but may see growth in future research support (Fig 1.1). Government grants provide most of the funding for undergraduate projects; professors and postgraduates only receive additional or partial funding. Because there is less funding available and sufficient at higher academic levels, competition is heightened and some people come to feel that grants are insufficient (Fig 1.2). Undergraduate students tend to receive the bulk of funding from educational institutions, mainly through seed money and internal research grants. In contrast, postgraduates and professors get some support, but it's much more limited and about the same

for both groups. Many emphasize that funding does not typically include funding for items such as lab fees and other materials, which are gaps that still need to be filled (Fig 1.3).



Undergraduate students have been the most active in seeking private sponsorship, mainly through submitting proposals and using their connections via alumni, faculty, and colleges. Still, many struggled to access these opportunities because of barriers to access to outreach. Post-graduate and professors who engage less often rely on institutional funding and relationships for private funding (Fig 1.4).



NGOs are typically viewed by undergraduates as providing significant support for student projects, particularly when it comes to community service and supply provision. However, professors and postgraduate students believe that NGOs play a less important role. These disparate viewpoints most likely result from each group's distinct experiences and comprehension of the day-to-day activities of NGOs (Fig 1.5). Undergraduate students rate funding from educational institutions and government grants much higher than postgraduate students and professors, reflecting their greater familiarity and reliance on these sources. Whereas professors and post graduates had given the moderate and consistent level of rating towards all types of funding (Fig.1.6). Undergraduates had much aware and interest in knowledge about various funding opportunities at school level. They show moderate level of

confidence and awareness in funding opportunity from industry sources as well as NGO's, whereas post graduate and faculties were much aware and cautious associated with different aspects of funding opportunities in India. It helps to identify and mentor the under graduate students in a proper way (Fig 1.7). Undergraduate students frequently mention competitions and innovation challenges as effective ways to secure funding from schools and government grants, sharing many success stories. In contrast, postgraduates and professors mention these opportunities far less and report fewer funding successes. This indicates that the other undergrads have a more optimistic mindset and feel greater comfort with these kinds of funding than graduate students and faculty who have faced more challenges (Fig 1.8). Faculty and graduate students tended to be more cautious in participating, while undergrads were much more explicit about valuing funding from their institutions and alumni, prefacing that they needed contingencies to use that funding. This difference is partially attributable to the funding and financial experiences over time for each of the groups. Support systems ought to be specifically designed to satisfy the particular requirements of faculty, postgraduates, and undergraduates (Fig 1.9). Undergraduate students see funding from educational institutions and government grants as requiring the most careful budgeting, rating them higher than postgraduates and professors. Both groups view NGOs and private companies as less demanding sources. Postgraduates and professors have a more cautious and consistent perception of funding complexity across all categories (Fig 1.10).

Undergraduate students place high importance on support from company project teams and institutional backing from colleges, rating them between 20 and 30. Postgraduate students and professors, however, rate these sources much lower, usually between 2 and 10. Government grants, scholarships, and funding from non-governmental organizations (NGOs) were viewed relatively lower by both groups, and postgraduates and faculty rated them lower than undergraduates (Fig 1.11). In their excitement about any source of funding, undergraduates deflate the source; graduate students and faculty will, naturally, express some resistance, if only from the bureaucracy associated with it. Undergraduates may find that school money for college-related projects and presentations is always available; however, graduate students and faculty who have been in the field longer understand what is coming when they apply for government and/or NGO funding. Many remain unaware or unsure how to navigate these complex funding opportunities. (Fig 1.12).

Discussion

Findings indicate that undergraduate students reported the largest involvement and access to research funding opportunities through all major funding pathways for student project funding, with rates approximately 20% to 29% across funding pathways. Funding pathways included university funding, government funding, nonprofit funding, private industry funding, alumni funding, student organizations, funding competitions, and crowdfunding. Undergraduate students perceived the most significant benefits of funding received both institutionally, or from government and private sector (from non-profit) and also keen to have the various activities associated with campus (hackathons). In contrast post graduate students and professors have lower rates of involvement in various funding pattern – approximately 6% - 15% of participants have the knowledge and success rate in funding pathway. In addition to that, both faculty and post graduate students engaged in a cautious approach towards funding requirements. It concluded that professors and post graduates demonstrated the low level of optimism and critical implications in facing the funding eco system in terms of budgeting and planning the project implementation.

This pattern of distribution clearly indicated that there is lot of opportunity involved with funding eco systems for both post graduates and professors. In case of undergraduate students had clear ideas and much readily available funding patterns, while PG students and faculty are potentially more cognizant of structural complexity and limitations, and therefore perceive the funding ecosystem as fragmented and difficult to navigate. Survey respondents elaborated on overlapping and intersecting barriers including: not enough communication around funding programs, difficult and discouraging grant application processes, competition for a limited amount of research space and equipment, and persistent inequities with respect to any underrepresented or disadvantaged group.

Government grants remain necessary and important funding opportunities for developing high-impact, ambitiously-focused research projects. The issue becomes that, often, the criteria used to assess grant applications do not seem to value grassroots, exploratory, or community-based projects, which are precisely the types of projects that fit most naturally with NGOs. Additionally, a conspicuous lack of linkage between NGOs and the academic network at the institutional level further limits student awareness, and especially without that awareness being established among undergraduate students as a cohort. Consistent with the survey data, these researcher findings are quite similar to findings reported in past studies that centered on the same systemic issues around limited accessibility, coordination, and inequities in funding distribution ([Bhatia et al., 2022](#); [Kumar et al., 2021](#); [Sundaram et al., 2023](#)).

Earlier research has consistently pointed out issues with the coordination of funding mechanisms, a lack of awareness about opportunities for NGOs to undertake research, and a lack of formal communication methods between funders and universities (Prasad et al., 2020; Kumar et al., 2021; Sundaram et al., 2023). A significant gap identified in previous literature is the lack of a clearer comparison of UG and PG student engagement in the funding environment and whether there are any differences related to accessibility, awareness, or usage (Bhatia et al., 2022; Gonsalves & Roy, 2021). Finally, a limitation of earlier works is that they primarily focused on sources of funding in isolation rather than taking into account how multiple funding sources work in tandem or disrupt students' experiences.

This research tackles this gap through a comparative multi-level analysis of undergraduate and postgraduate students' involvement with various funding sources; differences are relevant with regard to funding access and different barriers - communication, mentorship and structural barriers of access - to funding, similar or different experiences to each group. The funding sources sample captures government, NGO, private sector, alumni, student clubs, and competitions, allowing for more description and a full understanding of the funding context of student-based research. The study also found limited linkages between institutions and NGOs barrier awareness, thereby contributing to the access opportunity gap that has been noted in this paper, but without empirical research on funding barriers noted in previous studies (Prasad et al., 2020; Gonsalves & Roy, 2021).

Survey participants and existing research indicated an urgent call for better grant-writing ability, changes in institutional (administrative) policy, and more timely, predictable access to information about funding programs. All respondents pointed to the need for standardised, universal application forms, improved communication in the promotion of visibility and access to funding schemes, and ongoing engagement across both sectors for collaborative work (Prasad et al., 2020; Gonsalves & Roy, 2021). This supported the wider literature but also provided empirical evidence to support how these gaps were experienced differently by UG and PG students, toward supporting case-based strategies. Lastly, the findings from this study offered evidence for an urgent need for additional mentorship and administrative support for post-graduate students who faced a greater financial and logistical burden to proposal writing and project initiation stage of research. While earlier literature has described mentorship as an additional support component (Kumar et al., 2021; Sundaram et al., 2023), this study presented additional context in demonstrating how gaps in mentorship shaped access to funding and experiences of project implementation.

Conclusion

The research uncovered a consistent gap in accessibility to student research funding, especially in comparison to undergraduate students, who benefited most from institutional grant funding, government scholarships, and private partnerships, with each category of funding aided by strong institutional networks, alumni networks, and a variety of informal extracurricular programs to bolster early-stage innovation. In contrast, postgraduate students and professors are significantly hindered by limited awareness of funding options, bureaucratic processes, and intense competition for the funding offered resulting in low-scoring applications or no funding for research to occur at a higher institutional level. These gaps are also relatively exaggerated in pathways involving applications of great length or cross-sectoral collaboration, including low uptake of government and NGO funding due to bureaucratic delays. The institutions level of projects should encourage both Undergraduate and postgraduate students for carrying out the sustainable project in successful way. It will be much supportive for students especially those from underrepresented backgrounds or in interdisciplinary fields. To change this scenario, coordinated reforms are needed simplifying application processes, supporting mentorship and information programs and creating standardized and transparent selection criteria. This will start to bridge the gaps and enable a larger and more diverse group of students and early career researchers. Reforming the research funding ecosystem in India will take the proactive inter engagement of universities, funding agencies, NGOs, policy makers, and industry to build a more transparent, equitable, and authentic support for research funding for Indian researchers. This inter engagement will be the only way to start chipping away at unlocking Indian students' and researchers' full innovative capacity toward scientific and societal advancement.

Conflict of Interest

The authors not having any conflict of interest

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