

## **Policy for Promotion of Research and Facilities**

### **A Multidimensional Framework for Achieving Excellence**

As an institution to improve and then excel, attention should be directed across many of its dimensions and activities: teaching, research, human capital, infrastructure, funding, and administration, to name a few.

Best practices captured in academic research include the following as key attributes of educational institutions operating at the highest level:

- A high concentration of talent, both faculty and students
- Abundant resources to foster a rich learning environment and support advanced research
- Governance procedures that value foresight, strategic vision, and the flexibility to make changes without excessive reliance on bureaucracy.

These are characteristics of a ‘World Class Institution’ but are desirable aspirations for any institution seeking to develop and advance.

This document focuses on how research activities can contribute to the overall quality of an institution and enhance its stature. It describes how to fashion, support, and sustain a culture of research, even if such a culture has not existed or has not been emphasized previously.

Moreover, there is good evidence that research supports and improves teaching, helping to build excellence in this dimension as well. Therefore, perceiving that an institution is teaching-only or vocationally oriented and not in need of a research component is incorrect. A research program can have salutary effects on faculty, on the nature of their teaching, and on their students, undergraduate and postgraduate. A mentality of ‘teaching-only’ inhibits opportunities for institutional growth and improvement.

Evidence is accumulating that students do benefit in significant ways from having researchers as instructors, if the institution balances resources spent and rewards assigned between research and teaching. This positive view, which has been consistently detected in recent studies, sees the benefits of ‘research-led teaching.’ In this approach, the experience of the researcher is integrated into teaching. Instead of offering cookbook experiments, faculty members present students with fundamental research problems, perhaps ones in which they are engaged that have not yet been solved. In such a classroom, students report more interest in their coursework and more confidence in their teachers. They may even more often consider careers in the field of instruction than those who do not experience this type of teaching.

Incorporating research at every stage of a degree program is a must to ensure developing a research culture and growth of institutions. Thus, research can be directly incorporated into teaching, making use of the instructor’s own research to benefit student learning and outcomes.

At the undergraduate level, research is most easily integrated into the curriculum. The various ways that research might be integrated into classroom based teaching include:

- Creating exercises that help students to develop research skills (i.e., literature reviews, critically reading articles, publishing to a publicly accessible site)
- Encouraging students to use research tools such as software, research equipment etc.
- Involving undergraduate students in research seminars, visits of guest speakers and in symposia.
- Providing hands-on laboratory training to students and encouraging them to do original research (internships, projects etc.). Independent laboratory exercises or special projects will help promote research creativity if students are encouraged to explore the problem from multiple angles
- Educating students on evidence based research and on how to draw inferences and make empirical observations.
- While designing lessons, lectures and activities, highlight recent research that is relevant to course material.

Use texts or readings that focus on the “how” (strength of particular approaches) and the “why” (societal or other relevance) when addressing problems

- Emphasizing how to critically read and interpret scientific texts and encouraging students to formulate hypotheses. Introduce students to a sequence of articles that reports a single line of research from one laboratory. Students will receive each article in sections (Introduction, Results and Methods, and Discussion), and will be asked to work through the data as if they had generated it themselves. This would allow the students to see if the experiments they proposed are those selected by the authors, both helping them understand the role of creativity in scientific progress and creating a “lab meeting” atmosphere in the class.
- Teaching students to develop an experimental plan and implement the same in a laboratory setting.
- Encouraging students to work in groups to address novel scientific questions aimed at generating and testing new hypotheses. This will foster a spirit of collaboration and team work.
- Finally, all students should be required to report their findings in a journal style manuscript outlining research methodology, results, and inferences.

The above approaches will lead to an increase in critical thinking ability, experimental design ability, and self-rated abilities such as navigating the literature, thinking like a scientist, and understanding research in context. Thus, incorporating research into classroom-based teaching ultimately leads to a) stimulation of student interest, b) creating a classroom environment of lifelong learning for both student and teacher, and, finally, c) striving to achieve optimum outcomes for the society.

These are generalizations, certainly. Specific environments count, including availability of required resources, as well as the capability and motivation of the researcher-teacher. The argument advanced here is that research activity within the institution has many benefits, including its potential to improve the quality of instruction.

Taking a cue from the above points, this paper follows a three-part framework to guide institutions in driving research excellence:

- Developing and executing a robust research program that includes long term planning, building human capital, deploying requisite resources, sourcing funding and leveraging the right collaborations
- Establishing governance mechanisms to track and promote research
- Ensuring continuous improvement and sustainability

### **Developing and Executing a Robust Research Plan**

An institution seeking to grow its research activities should proceed step by step. Good intentions and an ambition to succeed are not enough. Success requires planning. An institution intending to build a robust research program will need to develop a long-term research plan with short-term and long-term objectives. The following activities are key in building such a plan:

- Assessing and reviewing research activity
- Defining and refining research focus
- Developing a talent recruiting, recognition, and retention plan
- Driving collaboration to improve and extend research impact
- Deploying infrastructure and resources
- Developing a comprehensive funding plan