
Preparing Undergraduates for Research and the Workforce

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The ultimate goal of any curriculum, and indeed one of the four major goals of DUE, is to prepare students with the content knowledge, conceptual understanding, and skills that will be necessary in the workplace. In the sciences, that workplace is often a research laboratory.

Preparing students for research is a complex process, and doing it well requires considerations at several levels. There are curriculum concerns. Faculty must design a set of courses that will provide the knowledge and understanding that students need, as well as laboratory experiences that will foster development of the skills and habits of mind required by a research scientist. To ensure that opportunities are available to all, these academic components should be complemented by a variety of supportive activities, programs, and pedagogies that will encourage recruitment and retention of women and underrepresented groups in the sciences.

There are many benefits to incorporating a research experience into the undergraduate curriculum. Engagement of students in research improves their problem-solving and, in the case of engineers, design skills. Thus, preparation of students for a research career helps to develop skills that are valuable in the broader context.

At another level, the university must foster, or in some cases develop, an environment in which undergraduate research can flourish. The goals and objectives of such an environment, as well as the appropriate infrastructure and funding, must all be considered in designing and implementing an active undergraduate research program.

Finally, the faculty role in undergraduate student research must be recognized and rewarded. An undergraduate

research experience should involve high-quality interaction between the student and the faculty researcher. The faculty member is more than a research advisor in this role. He or she is also a mentor, nurturing the students as they struggle to learn needed factual knowledge and apply it through the process of inquiry to the research problem.

The first three chapters in this section address the issues involved in preparing students for a research career. The chapter by Brakke describes the approach of one university to the challenges of designing, implementing, and assessing a curriculum that will prepare students for research. Mateja and Otto discuss features of a successful undergraduate research program, along with the action that a university, its faculty, and its administration must take to ensure the success of the program. Finally, Barton provides the reflections of an early-career faculty member on the role of a research mentor.

The final chapter concerns the preparation of students for a relatively new career in information security. Phillips describes his vision of a curriculum that will prepare information security specialists who can take us into a future in which there are no viruses or worms, data can be transmitted in perfect safety, and personal privacy is assured.

Preparing students for research and the workplace is a continuous, evolving process. Assessment of current programs will lead to further innovations in course and curriculum design. Naturally, the disciplines will respond to the latest discoveries and technologies as they continue to strive to design classroom and research experiences that will provide a diverse workforce with exemplary technological, quantitative, and scientific literacy.