

## Doing a PhD – Preparing for a Career in Research

PhD is a unique degree in that it is not focused on acquiring more knowledge. A Masters essentially provides more knowledge or more in-depth knowledge in a subject. But doing a PhD is oriented around research.

Due to the focus and importance of research in PhD, it is often believed that creating new knowledge is the main goal of PhD. Though creating new knowledge is part of the PhD training, the main objective of doing PhD degree is to become a competent researcher who can conduct independent research in his or her chosen area.

If we go by the premise that the purpose of a PhD program is to produce competent researchers, then the research done during PhD is primarily for contributing towards this goal and the nature and sophistication of the research output is less important. What is important is to learn to properly formulate a problem and apply suitable techniques to produce results that further the state of understanding about that problem.

The ability to conduct research in an area requires deep knowledge in that area, knowledge about related areas, and the experience of working on research problems, i.e. problems whose outcomes are not known. To develop these critical abilities, most PhD programs have three components in them – some course work to provide the breadth of knowledge, some methods to develop the depth of knowledge in the chosen area of study, and a thesis that provides the experience of working on research problems. Through these components a PhD candidate should expect to develop the following abilities, which form the foundation of a career in research:

- Breadth in the discipline – can be provided through courses.
- Expertise in a vertical area in which the PhD candidate can say “I am an expert in this”. I.e. an area in which he has full knowledge of what is known, what is missing, etc. Developing this expertise requires ability to search for relevant work done in an area, as well as the ability to critically read and understand research papers, reports, and monographs and appreciate the subtle or complex issues that may be involved.
- Ability to identify research problems. This is one of the most important abilities for a researcher. This ability requires a good knowledge of the recent developments in the area, and the ability to create a bigger picture and see how the different work fit and what might be missing. Formulating a problem properly is half the research done. In fact, most PhD candidates spend much of their time in defining the problem. This skill is strengthened as the person develops the subjective ability of judging results and problems. This skill is also needed by a PhD person as a member of the research community where one is called upon to review other peoples work.
- Ability to actually do the research. Behind every research there is some new idea, some hypothesis, which forms the foundation of the research work. But doing research is much more than getting an idea. The idea has to be developed using the established paradigms of scientific research, through which the researcher shows the value of the idea. Spending time grappling with research issues, actually doing research, and studying research work of others can help in developing this ability. That is the main reason why doing independent research is always a part of a PhD program.
- Ability to write and present the results. This is very important and very difficult. Not only are issues of communication involved, but one has to convince a group of peers (who review it and later read it, if published) that the work is worthy of their time, the results

have been put in context, the value is clearly articulated, etc. Publishing the results of research has been the time honored tradition and benchmark, and perhaps the only reliable method to subject a research work to scrutiny as well as use by others.

Developing these abilities should be the objective of a PhD program. Note that these abilities do not discuss the actual research results. Those are the outcome of developing these abilities. A PhD degree should result in some research results, which should be peer reviewed and published. Without this, there is no effective method to demonstrate that the ability to do research and communicate the results has been developed. However, in the overall research career, it is possessing these abilities that is more important, particularly if one wants to work in industry where the needs may change and problems that a researcher works on may be quite different from the ones chosen in PhD. For a career in academics, however, the actual results are equally important as the evaluative processes often focus on the quality and quantity of research work that has been done during the PhD.

All of these abilities are important to become a competent researcher. As should be clear many of these skills cannot really be taught but are learned largely through commitment, dedication, and perseverance. This makes PhD a mostly self driven and self taught degree with the PhD program and the supervisor gently aiding the process. The program and supervisor help mostly in creating an atmosphere and environment in which the scholar gets motivated to excel.

Hence, while doing a PhD, the scholar should be self motivated and committed, and willing to work hard and long on problems. Research is often a lonely business (except in disciplines where group activity is more common) and PhD is a preparation for a career in it. Research is tough career, but with development of these skills by doing a PhD, it can become easier and more satisfying.

***Pankaj Jalote is a Professor of Computer Science at IIT Kanpur. Other articles he has written on related topics are available on his website [www.cse.iitk.ac.in/users/jalote](http://www.cse.iitk.ac.in/users/jalote).***