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## The Nitty-Gritty of Successfully Completed Doctoral Studies: A Personal Review and Lessons for Prospective, New and Final Year Doctoral Students

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## The Nitty-Gritty of Successfully Completed Doctoral Studies: A Personal Review and Lessons for Prospective, New and Final Year Doctoral Students

### Cover Page Footnote

Conflict of interest The author reports there are no conflict of interests to declare Footnotes 1 In the UK, a thesis refers to a final report submitted by doctoral students in fulfilment of the requirements for the award of doctoral degrees. A thesis as used in this paper equates to a dissertation in the US. 2 A viva in the UK equates to a defense in the US. At the viva, doctoral students defend their research work through oral examinations by a panel of academic experts.

Doctoral students are confronted with many challenges, which can lead to an abrupt end or a late completion of doctoral programs - if not handled properly. For instance, finding the direction for doctoral research can be problematic. Besides, keeping in touch with friends and relatives, and managing one's time effectively can be challenging. Other challenges bedeviling doctoral students and their chance of successfully completing the doctoral programs are lack of motivation, fear of what lies in the future, inability to manage the student-supervisor relationship, financial problem, feeling of loneliness and isolation, exposure to new weather and environment, and stressful situations (10 Biggest Struggles of PhD Students, 2021; Higginbotham, 2022). This paper reviews my doctoral experience and how I successfully completed the doctoral program in a timely fashion with publications in top tier journals. This paper goes further to present lessons that can be drawn from my doctoral experience and can be tapped into by prospective, new, and final year doctoral students. To achieve these goals, this paper begins by exploring how the skills and knowledge I acquired prior to the start of my doctoral program equipped me for the doctoral journey. This paper then look at the tasks I carried out and the events I attended during my doctoral program and how the skills and knowledge I gained therefrom contributed to the timely and successful completion of my doctoral program. Finally, this paper presents lessons and recommendations for prospective, new and final year doctoral students.

### **Background and Pre-Doctoral Studies**

I received my master's degree from the University of Strathclyde, Glasgow, United Kingdom where I attended several courses on image processing and machine learning. Through the courses and events I attended and the projects (both individual and group) which I undertook during my master's studies, I developed and enhanced my communication, problem-solving, programming and research-based skills, and broadened my knowledge and experience of image processing and machine learning, which were all relevant to and aided my research at doctoral level.

As part of my master's project, I developed and implemented a novel flowchart to inspect and monitor livestock. C#, a programming language which I was new to at the start of the project, was needed to develop a mobile application and to implement the developed flowchart. I learned how to code using this language and went on to use it, together with Structured Query Language (SQL) and Xamarin framework to implement the developed approach. My programming skills (coding and development of algorithms and flowcharts) were enhanced and I became more confident with programming and proffering solutions to complex problems through the use of C#, and Structured Query Language (a programming language used for managing stored data). Through the use of SQL, I demonstrated my ability to handle and manage complex databases. This proved to be useful

during my doctoral program as I had to process different large datasets and implement models on them.

During my master's studies, I participated in a host of laboratory sessions. During those sessions, assignments on complex and application problems were given. Some of those assignments were individual while others were group-based. Those assignments required critical thinking and sound understanding of different theoretical concepts. Through these, I was able to come up with solutions and implemented those solutions using tools and functions which are available in MATLAB, one of the two main programming languages I used during my doctoral research. These enhanced my programming, analytic and complex problem solving skills. As part of the assignments, students were required to write and submit reports. I prepared all my reports using Microsoft word. During my master's project, I used Microsoft word for my write ups. These helped me to master some of the key elements of Microsoft word which were needed when structuring and styling reports and theses. In other words, through those assignments and my master's project, I became a better user of Microsoft word. I used Microsoft word to prepare and organize conference papers and journal articles during my doctoral research.

During my master's program, I attended several courses on subjects which are related to my doctoral research. Digital signal processing (DSP) and image processing are examples of those subjects. To better understand what I was thought in those courses, I borrowed several textbooks from the library, got some textbooks online and read a lot of related research papers (journal and conference papers). Through those courses, I came to understand the concepts and elements of signal processing and image processing better. In other words, through my master's studies, I acquired a sound knowledge of signal and image processing which happen to be one of my doctoral research areas. My information seeking and management skills were enhanced. I applied those skills when searching for relevant articles and reviewing the literature during my doctoral program.

During my master's studies, I was able to manage my master's project well through the use of Gantt charts to monitor the progress of the project. I aimed to be organized and was able to effectively manage my weekly activities including those which were project-based and those which were not. For instance, I attended weekly religious events and regularly got in touch with my friends and family members). All in all, the master's project helped me to become a more focused and committed researcher who is able to balance his work and life effectively. Those research management skills I gained while working on my master's project were needed for my doctoral research, and I put them to good use during my doctoral studies.

I was aware that researchers must be able to communicate their research to the public. One of the activities I engaged in during my master's project was presentation of a research poster. I prepared the poster using Microsoft PowerPoint which helped me to master some of the key elements of Microsoft PowerPoint. In other words, through the presentation of a research poster, I became a better user of Microsoft PowerPoint and my communication skills were

enhanced. During my master's studies, I developed and enhanced my communication skills through the writing of laboratory reports; my participation in small group meetings under the tutelage of a small group leader; submission of my master's project work for publication in a journal; and my interaction with fellow master's students, teaching assistants, lecturers and other members of the university community. I applied the gained communication skills (verbal and written) when presenting at conferences and sending out articles for publications during my doctoral program.

I worked on team projects during my master's program. Through those projects, I was able to enhance and demonstrate excellent team playing skills. Examples of such projects are "Bio-Inspired Ultrasonic Technology" and "Automatic Number Plate Recognition with Neural Networks and Support Vector Machines." During my doctoral studies, I applied those skills while working on research projects which involved a number of collaborators. For instance, my work on rice seeds and remotely sensed data analysis, which led to the publication of two journal articles, was carried out in collaboration with co-authors from different universities.

The skills and knowledge discussed above were acquired in the department of Electronic and Electrical Engineering with specialization in areas that are related to my doctoral research areas and therefore contributed immensely to the success of my doctoral studies.

### **Communicating My Research Work and Ideas to the Public**

I attended a three-day program which was titled, 'Writing and Presenting Research.' I chose to attend the program because I was convinced it would equip me with the skills required for making effective presentations at conferences and effectively preparing my thesis<sup>1</sup> and articles for publications. Participants at the event listened to different speakers who provided explanation on how to critically review the literature, structure one's thesis, use appropriate writing styles, write for the media and make oral presentations at conferences. The speakers explained how the review process works and the factors that one needs to consider when selecting appropriate journals for article publications.

I worked on two assignments as part of my participation at the event. In the first assignment, participants were asked to write a 200-word paper for a conference. I was glad when the organizers asked us to write a conference paper because it was an opportunity I had been looking forward to. I wrote the paper using my ongoing research work at the time. I made sure the paper was well styled and structured as advised by the speakers and event organizers. Consequently, I became more confident in communicating my research ideas and work to the public. I applied that knowledge while preparing a conference paper

and two journal articles during my doctoral program. Secondly, I prepared a text and an image about my work for publication on a web page; a draft outline of my thesis (showing proposed headings and subheadings); timelines for my doctoral research; and a summary of the three papers (showing the titles of papers and details of targeted journals) that would likely result from my doctoral research work. The two assignments were submitted to the event organizer for examination and graded by my supervisor.

The experience I gained from attending the program made a positive impact on my thesis and preparation for my viva<sup>2</sup>. The thesis outline I prepared during the program gave me an overview of how my thesis would eventually look like. That was helpful when I started writing up my thesis. I learned how vivas are conducted in the UK (who and what to expect at vivas in the UK). I learned a lot from the speakers on how to show confidence and conduct oneself when making oral presentations. I remember one of the participants was asked to come forward to make a short presentation. The program anchor at that time then asked the presenter if he was nervous at the outset of the presentation. The presenter answered, 'yes' but none of the other participants even noticed that. The anchor then clamored on the need to be confident throughout during inevitable anxious situations as the audience might not even be aware. The anchor spoke a lot about how the type and color of one's attire and shoes could influence listeners' attention. My presentation skills were enhanced, and I had the opportunity to demonstrate that when I presented a conference paper in Ghana, and an abstract at a symposium in Glasgow during my doctoral program.

Another important thing I learned during the program is how to critically review the literature and the working of journal article peer review process. Emphasis was laid by one of the speakers on the need to build arguments and present structured literature reviews which identify what has been done in the literature and research gaps. I applied that knowledge when conducting literature review during my doctoral program. I received lecture on how journal articles are peer reviewed. This helped me to better understand comments which were provided by peer reviewers of journal articles and how to respond to those comments. I had the opportunity to respond to peer reviewers' comments on submitted manuscripts during my doctoral program. Besides, I reviewed a paper for a journal during my doctoral program. I used the knowledge I acquired at the program to peer review other people's work and provided constructive feedbacks. I will be using these skills when submitting articles for publication and responding to comments given by peer reviewers of those articles in the future.

## **Professional Development, Self-management and Leadership Development**

I attended a one-day induction organized for postgraduate research students in the early weeks of my doctoral program. Prior to the kick off, participants were allowed to chat and eat. I used the opportunity to network and established friendships with fellow doctoral freshmen. This enhanced my interpersonal skills and my ability to network with colleagues. During the event, I listened to speakers who took turns to orientate the participants on the importance of taking part in societies' activities and attending events which were aimed at researchers' professional and career development.

In 2018, I was elected as the public relations officer of a university based society and I later became the president of the same society in 2020. As an influential member of the society, I served as a key member of many teams and committees that organized several events (including events organized in collaboration with societies at other universities). I was able to effectively combine those roles with my research activities and family life which demonstrate my ability to manage my time effectively and maintain good work-life balance. I was able to demonstrate excellent planning skills and my ability to network with students, colleagues, and external organizations. As president of the society, I oversaw the affairs of all the units that made up the society, took responsibility for most of the organized events and devoted extra hours to ensure that the events were successful. This demonstrates my ability to work well as a team member and enhanced my development as a responsible leader.

In October 2018 and October 2019, I served as a volunteer at a graduate fair where I assisted the organizers to carry out activities such as data entry, verification, and provision of directions. The event was organized by the Association of Graduate Careers Advisory Services (AGCAS) in Scotland. I used the opportunity to acquaint myself with the various employment stages in the UK by interacting with the representative of different organizations at the event. This allowed me to compose my curriculum vitae appropriately, thus enhancing my professional development. It demonstrates my commitment to attending relevant events for continuing professional development.

In 2019, I attended an online event which was tagged, 'PG Essentials' where PG stands for Postgraduate. During the program, I learned about all the important requirements to be a successful doctoral student. Specifically, I learned about how to organize my work, relate with my supervisor, search and write the literature review and manage my research data. What impressed me the most was the part that discussed how doctoral students can effectively write the literature review. It introduced me to various approaches that can be adopted in structuring the literature review and linking various work in the review together. This helped me to effectively prepare a conference paper, two journal papers and my thesis. What I learned during that program helped to develop professionally and career-wise as I will be reviewing the literature in future and supervising the work of other students as an academic. It further demonstrate my commitment to attending relevant courses for continuing professional development.

Through my attendance and engagements at the events described in this section, my networking skills, and commitment to attending relevant courses and events for continuing professional and career development were enhanced. My ability to plan and prepare effectively, maintain a good work-life balance, and manage my time well was enhanced. This was important for my self-development as a doctoral student. Finally, through the enhancement of my personal leadership qualities, I become a more responsible leader.

### **Skill Acquisition for Collaborative Research**

I attended a three-day program which was titled, 'Engaging in Collaborative Interdisciplinary Research.' I chose to attend this program because I was convinced that by taking part in the program, my ability to engage in collaborative research with people who are working in my fields and those who are working in other fields would be enhanced. Participants were introduced to the program by the organizers and listened to speakers who took turns to provide explanation on what interdisciplinary research is, the importance of interdisciplinary research, how interdisciplinary differs from multi-disciplinary research, and identified key drivers and barriers of interdisciplinary research. Participants had lunch breaks and used the lunch breaks to establish connections. We had a session where participants were asked to provide feedbacks on those connections. Participants were divided into groups based on the connections made. I was part of a group of four students. Each group was asked to come up with an interdisciplinary research idea and develop a proposal using the idea. Each group was allowed to give a short presentation of their ideas and how the contributions made by members of the group would be integrated to achieve the desired project outcomes.

It was during the process of developing the interdisciplinary research proposals that I came to better appreciate the need for people from different fields to work together on projects to achieve common projects' goals. I have since become more interested in identifying collaborative opportunities and engaging with people in other fields or researchers working in different areas. I now believe we can combine our diverse skills to solve key problems. Going forward, I will be taking part in projects which will require the integration of contributions made by people with different skills and from different fields.

I was a member of a group of people from different fields and cultural backgrounds. We set up a WhatsApp group and used the WhatsApp platform to share ideas and files. That provided me with the opportunity to appreciate our diverse research and cultural backgrounds and the need to carry every member along in the decision-making process. This enhanced my ability to work with people from diverse fields and backgrounds. I used the opportunity provided to learn about my fellow doctoral students' interest and ongoing work. Consequently, I became more confident in communicating with people from different fields. From there, I resolved to confidently approach colleagues who are



working in other areas in future to discuss the possibility of embarking on projects which will require the application of our diverse skills and developed techniques.

I had a meeting with the other members of my group to decide on a project that we could implement using our diverse skills and expertise. Finding how the research area and skills of each member would be useful during project implementation was the first challenge we encountered. We eventually settled for one that would allow all members to make impact using their research skills. Another challenge we encountered was how different components (like objectives and methods) would be integrated. This was important to us, because we were told by one of the speakers at the event that effective integration of different components is what truly defines interdisciplinary research. We opted to employ the divide and rule approach to overcome that challenge. To achieve the project's aim, we identified four different objectives which was shared equally among the group members. This work provided me with an opportunity to work on a collaborative project and show excellent team working skills. I comfortably and confidently worked with people from different research fields. My ability to conduct myself professionally in research environments and settings was enhanced.

The work was concluded by the submission of a written interdisciplinary research proposal. My ability to integrate my contributions with those made by other researchers to solve a problem was enhanced, as evidenced by an indicative score of 80 which was awarded to my group by the assessor.

I can now confidently interact with people from other disciplines to solve problems. My ability to relate well with people from different research fields and backgrounds have been enhanced. These skills were useful while I was working with collaborators and co-authors during my doctoral program. In future, I will be networking and liaising with colleagues who are working in other areas to embark on interdisciplinary and multidisciplinary research projects.

### **Transitioning From a Doctoral Candidate to an Academic**

I attended a conference in Ghana in my first year as a doctoral student. My attendance at the event got me used to how international conferences are structured. There were different rooms for different categories of the conference and a main room where all the attendants gathered to discuss. I went from one room to the other, trying to see what others were presenting. I used the opportunity to meet people and talked with them about their work. I presented my work and attended to questions from other attendants. By attending the program, I got acquainted to the process required for taking part in conferences and preparing papers for such venues. I prepared some slides and sent them to the conference organizers ahead of my presentation. My presentation and communication skills were therefore enhanced. I used the opportunity provided by the conference organizers to demonstrate my ability to discuss my research work and complex ideas with the public. Going forward, I will be using these skills when attending conferences and making presentations at such conference as an academic.

I produced two journal articles in the second and third year of my doctoral program. These journal papers underwent different review processes with comments provided by different peer reviewers. I used those opportunities to learn how to improve my work using the reviewer's comments and hone my ability to effectively respond to the peer reviewers' comments. This experience helped me when I was reviewing a paper for a journal. As an academic, I will be reviewing the work of other people in my field. The first journal paper is the result of a high-impact international collaboration. I used this collaborative opportunity to enhance my ability to work well in a research team. While working on the work that led to the publication of the first journal paper, I was able to demonstrate my ability to work independently, contribute to a team, take initiative on projects, and meet deadlines. Hence, I was able to demonstrate my ability to network with colleagues, and external organizations. I will be using these skills to relate with collaborators in my field and colleagues in the industry to identify and embrace potential research funding opportunities.

During my doctoral program, I worked as a teaching assistant at the University of Strathclyde. As a teaching assistant, I had the opportunity to meet and relate well with students from different cultural backgrounds and worked with other members of the teaching team online via Zoom. As a teaching assistant at the University of Strathclyde, I was always happy and ready to provide necessary support whenever my attention was needed by the students. I always got my notes ready ahead of the teaching sessions. I used to be punctual and arrived on time. During those sessions, I used to be proactive, going around and checking to see if any of the students had one issue or the other. I made it a point of duty to be prepared before the sessions. So, on my own, I made sure that I clearly understood the materials and solved all the tutorial questions before I attended each session. I used to avoid telling the students the answers. Instead, I guided them and helped them to think in ways that would allow them to figure out the solutions themselves. I had the opportunity to assess the assignments submitted by the students using rubric. I remember one of the lead lecturers allocated some assignments to me and wanted me to finish marking those assignments at a particular date. So, I calculated the number of days I had to finish the marking and decided to mark a particular number of assignments daily. That way, I was able to meet the deadline. I attended a training organized for teaching assistant at the University of Strathclyde. My teaching skills were enhanced during my time as a teaching assistant at the University of Strathclyde. I am currently working as an academic at a University and going forward, I will be using these skills when contributing to teaching and attending to students.

My communication skills (verbal and written) and ability to effectively work in a research team, network with colleagues, and make presentation at public events were enhanced. These knowledge and intellectual abilities that have been enhanced are needed to be able to carry out excellent research in my field. Secondly, I gained and demonstrated the skills, understanding and knowledge required for academics to engage with students and colleagues at university level.

## Conclusion

This paper has explored the author's doctoral research experience, and the skills and knowledge which contributed to the successful and timely completion his doctoral studies. Some lessons can be drawn from the author's account of his doctoral research experience. Prior to the start of their doctoral programs, doctoral students should take their time and advantage of available opportunities to acquire skills and knowledge which are relevant to their potential doctoral research areas. Doctoral students should develop an appreciation for literature review as a key component of doctoral research and learn how to conduct a critical review of the literature with the purpose of identifying research gaps. During their programs, doctoral students should aim to attend events where they can interact with fellow researchers and learn new skills. This will aid their career and professional development not only as a researcher but also as a potential academic. Doctoral students should participate in societies' activities either as volunteers or elected members. Their participation in such activities will help them become responsible leaders in their fields, and enable them to take responsibility for and ownership of their doctoral research. It is important for doctoral students to work towards becoming a better communicator of their research ideas and findings to the public since they cannot do without it. Other things doctoral students should take cognizance of is how to relate well with their supervisors and their ability to work in a research team and collaborate with others.

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