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Abstract
This essay aims to capture the nuances of the unique transition from undergraduate to post-graduate life in the science world. It explores the crucial dynamic between students and their mentors, while also presenting common assumptions and misunderstandings that are associated with academic success and failure.

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Socialization of Science—The Acquisition of Skills and Values

Throughout the long journey of secondary and higher level education, scientists undergo a meticulous socialization to their specific fields. It is through this socialization that they learn how to interact with their peers, interpret data, and truly understand the scientific method. While some decide on a scientific career based on an early experience such as a dissection performed in middle school, others may not choose to pursue a career in science until their undergraduate years. Regardless of when someone chooses to become a scientist, all scientists must undergo a socialization process that familiarizes them with the world of academia. This socialization process provides scientists with an empirical lens through which they can view their own work and the work of their peers. Additionally, the socialization process allows young scientists to accept the reality that science is not always as straightforward as it was in their undergraduate years. When postgraduate students realize that the results of their research for their doctoral degree are unpredictably volatile, they have to rely on the guidance of their supervisor and peers to cope with this feeling of uncertainty. A closer inspection of the initial uncertainty of postgraduates, the mentorship of scientists in training, and the tenacity of scientists through the learning process reveals that the socialization process provides a foundational framework of skills and values for scientists today.

One of the first influential experiences in the career of a postgraduate student is when one discovers that research in the laboratory does not always engender reliable, consistent results. Sara Delamont and Paul Atkinson, two professors of sociology at Cardiff University, elucidate this phenomenon: “The doctoral student in biochemistry quickly learns that practical activities at the bench do not necessarily work in the research

laboratory—as opposed to the classroom laboratory" (Delamont and Atkinson 89). Consequently, postgraduate students initially harbor concerns that their PhD requirements will never be met. Furthermore, the learning curve associated with the acquisition of tacit knowledge—knowledge that cannot be effortlessly written down or transferred conversationally—amplifies the anxiety of postgraduate students. Delamont and Atkinson explain:

> …If all equipment worked, all tacit skills had been mastered, and all the blind alleys eliminated, producing usable results would not take very long. In the real laboratory, these conditions are rarely met…[postgraduates] therefore expressed their problems in terms of personal competence and the adequacy of prior training, rather than seeing them in terms of the everyday contingencies of scientific work. (91)

Thus, an essential part of the socialization process is the adjustment postgraduates make to their new research laboratory environments by understanding that a lack of solid results in the lab is not necessarily correlated with personal inadequacies.

This adjustment is made easier once postgraduate students assume "identities which reflect the systems of meaning that have been established by the existing members" (Campbell 900). As students transition into their postgraduate laboratories, they start to adapt to the guidelines established by their supervisors and past scientists in their academic communities. Robert Campbell, a professor of humanities at the University of Toronto, clarifies this notion: "As students acquire the perspectives of the group with which they are involved, they also undergo a transition from being a student to achieving an identity as a scientist" (Campbell 910). Therefore, when students start

seeing things from the perspectives of their peers, confidence supplants their initial uncertainty. This confidence is strengthened by the supervision of a postgraduate student's research mentor and laboratory peers.

Mentorship is an essential element that provides many values a postgraduate acquires during the socialization process. Both the research group and the supervisor of the research project provide solid support to a young scientist in training. Because pedagogic continuity is "a fundamental element in the lives of doctoral students of science [that] enables them to come to terms with the vagaries of experimental research," postgraduate students rely on their mentors and research group to fulfill this continuity (Delamont and Atkinson 92). Consequently, the research group serves as an invaluable resource to the postgraduate in training as it nurtures the student both intellectually and pedagogically. It is through the research group and the supervisor that a student acquires a sense of what works and what does not work in the research laboratory. Furthermore, supervisors play integral roles of guidance in the socialization process as they steer postgraduate students in the right direction if students encounter problems with their research. Campbell explains: "At the same time, the supervisor may provide the student with alternate research paths in order to compensate for potential setbacks or difficulties that may arise" (916).

The significance of mentorship can even be applied in a clinical setting. Atul Gawande, an Associate Professor of Surgery at Harvard Medical School, relates how his supervising resident helped him place a central line in a patient when he was first starting his surgical training: "When I failed with a third patient a few days later, though, the doubts really set in. Again, it was stick, stick, stick, and nothing. I stepped aside. The

resident watching me got it on the next try" (Gawande 55). Accordingly, having the supervision of a mentor is necessary for a resident physician's emotional stability and for a resident to have someone to fall back on if things go awry. Although mentorship is an integral element of the socialization of a scientist, ultimately it is the tenacity of a scientist that contributes to one's foundational set of values.

Perseverance and tenacity play a great role in shaping a young scientist's foundational values. During the unpredictable postgraduate years, scientists in training must cope with the uncertainty of their data. Even after one has acquired the majority of tacit knowledge associated with a particular area of science, a postgraduate student still has to tenaciously work in the laboratory until one obtains reliable, consistent data. Delamont and Atkinson highlight an example in which tenacity has played a great role in shaping the student's outlook on science: "I work at the bench most of the day. I always start off between eight and eight-thirty in the morning and stay according to how much I've got to do. Usually I stay all day and sometimes much longer" (101).

Postgraduate students learn quickly that in order to graduate successfully and on time, they must be willing to go above and beyond the typical work requirements set forth by their mentors. Furthermore, postgraduates must persevere when initially acquiring the tacit knowledge associated with their fields. Campbell clarifies: "The focus in scientific training, then, is on 'how to do science' and, as with the approach advocated in this project, process takes precedence over products" (910). As students learn the skills associated with their fields they must also actively engage their peers in their work: "Here, we see that much of becoming a scientist has to do with learning to interact with other scientists, and learning to interpret what goes on in the scientific enterprise in a way

that might reflect the expectations of a number of different groups" (Campbell 911). All of these processes, though foreign at first, require tenacity on the student's part as one becomes accustomed to academia. Lastly, tenacity is especially important to physicians in clinical settings. Gawande describes the time he successfully placed his first central line in a patient:

> I still have no idea what I did differently that day. But from then on my lines went in. That's the funny thing about practice. For days and days, you make out only the fragments of what to do. And then one day you've got the thing whole. Conscious learning becomes unconscious knowledge, and you cannot say precisely how. (56-57)

Consequently, without tenacity, physicians would not be able to successfully advance in their careers. It is this quality of perseverance that is one of the most essential elements in the framework of values that a scientist gains through the socialization process.

The transition from the undergraduate to postgraduate years is quite an arduous process for many students. While learning that data in the postgraduate laboratory is not always reliable, students have to simultaneously understand that acquiring unreliable data is not always a result of their personal inadequacies or inexperience in the lab. Additionally, they have to start to identify with the ideas already established by previous members in the lab, while learning to see things from the perspectives of their peers. At the same time, postgraduate students learn to depend on their research group for intellectual and pedagogic continuity and their supervisors for guidance when things go awry. To compound their difficulties, postgraduates are expected to acquire the tacit knowledge associated with their field before they are able to produce consistent, reliable

data. However, the framework of values that they gain through socialization balances all of these processes. Without socialization, postgraduate students would not learn the importance of perseverance, the necessity of seeking help in times of confusion, or even the significance of being able to clearly share their ideas with their peers. It is the socialization process that gives postgraduate students this foundational framework of skills and values and allows them to progress from being students to being scientists.

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