

Executing a Business Start-Up Model to Refine Biomedical Engineering Training Tools

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Introduction: The “Valley of Death” refers to the fact that most science/technology innovations wither before translation into products. Accordingly, the National Science Foundation launched the Innovation Corps (I-Corps) program to guide the entrepreneur past the common perils that doom translation, mostly lack of understanding of the market for the innovation. Most entrepreneurs fail to answer the basic questions of i) who will use my product (customer)?, ii) how will they use it (form)?, iii) how will they find it (customer acquisition)?, and iv) how much will they pay (cost)? The I-Corps program follows the evidence-based customer discovery process, coined “Lean Startup”, to answer these questions by refining assumptions made about a business model surrounding an innovation. A key element in the training is to talk with more than 100 people that have an opinion about the potential product.

“Valley of Death” also refers to the withering of most Science, Technology, Engineering, and Mathematics (STEM) education tools before widespread adoption. The I-Corps for Learning (I-Corps L) program was developed for educators because the same questions must be answered in order for a new educational tool to be widely adopted (even if the tool is free!). We participated in the August 2015 I-Corps L program, with the goal of identifying methods of propagating an instructional approach to improve the experience for new undergraduate researchers. The educational innovation was a curriculum of “mix and match” research training modules for research mentors and undergraduate mentees that addresses both research fundamentals and professional development.

Methods: Over the course of the 7-week program, we completed 108 interviews with individuals from academia, industry, government, and professional organizations, in order to learn about current methods of undergraduate research training, oversight of training, and means of influencing training. Information gathered during the 7-week program was used to create, augment, delete and, ultimately, evolve hypotheses about content and form needed by educators.

Results and Discussion: We started with the naïve belief that the learning modules worked well for us so everyone would want to use them. We found that many faculty members believed they were providing good mentoring for their students. Several had developed “one-off” training approaches, but had not validated or shared them with others. It was also found that graduate students commonly perform the role of research mentor and are often times not trained for this position. Both groups enthusiastically welcome readily accessible training tools, but desire them in a form that the mentees and graduate student mentors could use without intensive faculty oversight. We learned by talking with commercial entities that there are direct competitors as well as channels that could be used to deliver content quickly and efficiently. We learned from talking with faculty members that they have full autonomy to adopt new teaching tools but scarce resources to pay for them. On the other hand, in talking with administrators, we learned that they have budgetary power but that power is generally limited to shifting resources between programs (and not creating new ones). Administrators are interested in “increased STEM undergraduate retention and graduation rates”; hence, a training program meeting this objective would be worthy of investment. From these interviews, it was found that in order to have successful adoption of educational innovations, a “bottom-up” approach that starts with faculty and student buy-in and moves to a request of administration must be followed.

Conclusions: The I-Corps process allowed us to re-evaluate our educational program with unbiased viewpoint and to refine the technical content and delivery. We highly recommend that this line of inquiry be a regular part of biomedical education.

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