Digital Health and Informatics Innovations for Sustainable Health Care Systems
J. Mantas et al. (Eds.)

doi:10.3233/SHTI240711

Analyzing the Efficacy of an Open Access Biomedical Informatics Boot Camp

Skyler RESENDEZ[a,1], Gillian FRANKLIN[a], Rachel STEPHENS[a], Heather MANESS[b], Srikar CHAMALA[c,d] and Peter L. ELKIN[a,e]
[a] *Department of Biomedical Informatics, University at Buffalo, NY, USA*
[b] *Center for Instructional Technology and Training, University of Florida, Gainesville, FL, USA*
[c] *Children's Hospital Los Angeles, Department of Pathology*
[d] *Laboratory Medicine and University of Southern California, Keck School of Medicine, Department of Pathology, Los Angeles, CA, USA*
[e] *Department of Veterans Affairs, Knowledge based Systems and WNY VA, USA*
ORCiD ID: Skyler Resendez https://orcid.org/0000-0002-0422-2335

Abstract. Each summer, the University at Buffalo hosts a free, virtual biomedical informatics (BMI) boot camp. Lectures covering various subject matter areas are offered including, but not limited to: machine learning, natural language processing, programming, database queries, clinical decision support (CDS), and public and consumer health informatics. Once the 2023 boot camp had concluded, an anonymous, voluntary survey was offered to everyone who attended. The results of the boot camp were overwhelmingly positive with 70% of the survey participants indicating that they agreed that their expectations were met. 82% of the participants indicated that our JupyterHub and the educational coding materials stored on it are useful tools for the learning process. Qualitative analyses showed a desire for additional hands-on learning over theoretical lectures.

Keywords. Teaching Innovation, Bioinformatics, Computational Biology

1. Introduction

Education in the fields of bioinformatics and biomedical informatics (BMI) poses a series of grand challenges [1]. Studies have been conducted illuminating these challenges as countries around the world have attempted to include informatics in their biological curriculums [1-3]. In the US, lack of faculty expertise/training and lack of student preparation have contributed toward creating barriers to integrating bioinformatics into education [2]. Boot camps are known for their strategy of improving educational outcomes and may reduce these barriers as they provide crucial information and practice to facilitate the acquisition of necessary skills, overall knowledge, and confidence [4]. Although boot camps are short and intensive, participants can acquire new skill sets [5]. These range from developing data analytic skills that can be used as BMI tools to the ability to undertake research in the field [6]. Scientists must evaluate all educational methods to meet the ever-evolving demands of teaching bioinformatics.

[1] Corresponding Author: Skyler Resendez; E-mail: skylerre@buffalo.edu.

2. Methods

Each summer, the University at Buffalo hosts a free, virtual biomedical informatics boot camp available to everyone. This study evaluates the effectiveness of the 2023 boot camp. The boot camp consisted of 23 courses held between July 5th and August 21st, 2023. The program was led by thirteen instructors. Each course lasted 1.5 hours, totaling approximately 34.5 hours. The lectures were recorded and uploaded to allow asynchronous viewing. Once the boot camp had concluded, an anonymous, voluntary survey was offered to everyone who attended. The survey consisted of eleven questions, three of which had two subsections. These questions concerned the effectiveness of the boot camp/materials used. Such materials include educational codes stored in a JupyterHub available upon request. Counts and averages were calculated for quantitative results. Trends in qualitative results were observed using Microsoft Copilot.

3. Results, Discussion and Conclusions

Over 400 students signed up for the 2023 University at Buffalo BMI boot camp. We received at least partial survey responses from 68 adult students. The results of the boot camp were positive. 70% of the survey participants indicated that they agreed that their expectations were met (47 of 67 ranking 4+ of 5). 82% of the participants indicated that our JupyterHub is a useful tool for the learning process (54 of 66 ranking 4+ of 5). Qualitative analyses showed a desire for additional hands-on learning, e.g. more programming practice over theory. They also indicated that the students wanted more depth for topics such as artificial intelligence/machine learning. While the boot camp was largely successful in its goal of exposing students to many different topics within the field of biomedical informatics, some difficulties were noted within the responses to our survey. It was evident how challenging it is to keep the difficulty level of lectures appropriate while utilizing different instructors across many topics for an audience with varying skill levels. This correlates well with two of the grand challenges outlined by Işık et. al., “supporting lifelong learning” and “training and equipping educators and trainers” [1]. While we did have participants from all over the world, it is also important to note that advertisement methods can greatly affect the diversity of participants.

References

[1] Işık EB, Brazas MD, Schwartz R, Gaeta B, Palagi PM, Van Gelder CWG, et al. Grand challenges in bioinformatics education and training. Nat Biotechnol. 2023 Aug;41(8):1171–4.
[2] Williams JJ, Drew JC, Galindo-Gonzalez S, Robic S, Dinsdale E, Morgan WR, et al. Barriers to integration of bioinformatics into undergraduate life sciences education: A national study of US life sciences faculty uncover significant barriers to integrating bioinformatics into undergraduate instruction. Bianchi C, editor. PLOS ONE. 2019 Nov 18;14(11):e0224288.
[3] Tastan Bishop O, Adebiyi EF, Alzohairy AM, Everett D, Ghedira K, Ghouila A, et al. Bioinformatics Education--Perspectives and Challenges out of Africa. Brief Bioinform. 2015 Mar 1;16(2):355–64.
[4] Blackmore C, Austin J, Lopushinsky SR, Donnon T. Effects of Postgraduate Medical Education “Boot Camps” on Clinical Skills, Knowledge, and Confidence: A Meta-Analysis. J Grad Med Educ. 2014 Dec 1;6(4):643–52.
[5] Tih SH, Hussain WMHW, Hashim NMHN. Innovation and entrepreneurship bootcamp: a descriptive study assessing the effectiveness of entrepreneurship education. Int J Bus Glob. 2019;22(2):240.
[6] Fenton SH, Gottlieb A, Zozus MN. Translational Bioinformatics Curricula in Graduate Biomedical Informatics Programs. In 2020. p. 59–74