No Pain, No Gain? Factors Driving Coding Bootcamp Satisfaction

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Abstract

This study aims to shed light on what students like and dislike in coding bootcamps. A qualitative content analysis of student reviews for coding bootcamps was conducted, resulting in fourteen factors that are proposed to affect coding bootcamp satisfaction. The proposed satisfaction factors and survey instrument include quality of instructors, value of mentors, availability of TAs, access to support staff, provision of career services, rigor of curriculum, appropriateness of pedagogy, development of peer connections, conduciveness of atmosphere, use of appropriate technology, affordability, openness of communication, quality of prep course, and level of post-bootcamp support. Each of the proposed satisfaction factors is measured with three to ten Likert-style variables. The proposed satisfaction factors and survey instrument from this research can be used by administrators and educators in coding bootcamps and traditional universities alike to better understand and ultimately improve student satisfaction in computing education.

Keywords: coding bootcamps, student satisfaction, student reviews, content analysis

1. INTRODUCTION

Commonly associated with military service preparation, the term bootcamp conjures up the image of intense, focused, and disciplined training of new recruits. Thus, the old adage, "no pain, no gain"! No longer just associated with military training, the bootcamp concept found its way into physical fitness in the late 1990s and gained recent popularity with CrossFit®, Fit Body®, and numerous others. Computing joined the movement as coding bootcamps began to first appear around 2011-2012 (Choxi, 2015; Waguespack, Babb & Yates, 2018). Subsequently, the number of coding bootcamps are on the rise worldwide, estimated by Course Report at over 500 (Course Report, 2021). A primary selling point of coding bootcamps is the cost and time savings over a traditional, four-year college degree (Waguespack, Babb, & Yates, 2018).

The purpose of this paper is to construct a research model and survey instrument for examining the factors behind coding bootcamp satisfaction. Given the sparse but growing amount of research related to coding bootcamps, there is little in the extant literature in the way of identifying what "students actually think of the [bootcamp] programs" (Bailey & Burke, 2019, p. 346). To this end, this paper addresses the

following research question: *What are the factors driving coding bootcamp satisfaction?*

2. RELATED LITERATURE

With the growing interest and popularity of coding bootcamps around the world and their potential impact on computing education, there are several perspectives that arise in the research including industry, faculty, administrator, student, and curriculum (Burke & Bailey, 2019; Burke, Bailey, Lyon, & Green, 2018; Waguespack, Babb, & Yates, 2018).

Industry Perspective
Such questions as: "how do employers feel about hiring from four-year universities compared to coding bootcamps?" and "what types of skills are they looking for?" have been addressed (Burke et al., 2018). In relation to the first question, a good number of industry representatives indicated that a four-year degree is a requirement, however, not necessarily in a computing field. Others indicated that in some situations, they prefer hiring coding bootcamp graduates. It should be noted that 82% of coding bootcamp participants in their study already possessed a bachelor's degree (e.g., business, computer science, education, engineering, finance, liberal arts, communications, music theory) or higher, supporting their parallel work (Burke & Bailey, 2019).

For the second question, previous research indicates that "soft" skills were more prominently desired in the discussion with industry representatives (Burke & Bailey, 2020). These included skills such as teamwork, communication, along with ability and desire for continuous learning. While "hard" skills (e.g., programming) are a given, if an applicant is not able to get along with and work with others, the "hard" skills were found to be less important (Burke et al., 2018).

Faculty Perspective
Of the university faculty who participated in a related study (Burke et al., 2018), the consensus stated that their programs provided the necessary development of "hard" skills desired by industry representatives. However, in regard to "soft" skills, which were more highly discussed by the industry representatives, the faculty participants were mixed in their response about where and how these are developed in their curriculum. For a good number, skills such as teamwork, communication, and continuous learning are taught implicitly through specific assignments, team projects, and a capstone experience.

Administrator Perspective
While it is fairly common for academics to push back against the idea of training in higher education, among the coding bootcamp administrators and providers who participated in the study, they quickly recognized coding bootcamps as such and considered their "programs as experiential learning" (Burke et al., 2018, p. 506). With an emphasis on daily projects and assignments representing real-world problems and the workplace environment, administrators and providers felt they were providing students ample development in "hard" and "soft skills".

Student Perspective
The next perspective is that of the students who participated in a four-year college degree program in computing and those who participated in a coding bootcamp (Burke & Bailey, 2019). Results of the study indicated that for bootcamp students, getting a job during or shortly after completing the program was a primary focus. A large percentage, 86%, felt like hands-on project and peer collaboration was instrumental in learning and was implemented from the very start of the bootcamp. Other notable features of the learning environment included: industry partnerships, demo days, faced paced, innovation, immediate feedback, and a real-world work environment.

University students in contrast had not yet developed a clear plan for their careers. 86% reported a requirement to complete introductory coursework before moving on to advanced classes and completing capstone-type projects. There was less collaboration with industry compared to bootcamp students. The majority of university students reported learning communication and collaboration skills during the coursework, while 50% indicated development of other "soft" skills outside of the classroom. Across the four universities covered in the study, students reported the receipt of consistent feedback, but less immediate feedback when compared with bootcamp students. This was also true of industry collaboration, job acquisition, and practical, hands-on experience. All in all, bootcamp and university students showed very little difference in their perception of themselves as learners (Burke & Bailey, 2019).

Curriculum Perspective
The final perspective addressed in previous research involves the curriculum of coding bootcamps and four-year college degree programs in computing education. As noted by Waguespack, Babb, and Yates (2018), the

majority of four-year college degree programs in computing education are accredited and guided by such organizations as AACSB or ABET. This requires these programs to meet certain standards of quality through assessment and continuous improvement. Coding bootcamps, on the other hand, are not regulated in the same manner. Despite their claims of cost and time savings, this often begs the question of the quality and oversight for coding bootcamps ("Are Bootcamps Booming?", 2016; Rafter, 2017). In an effort to place coding bootcamps within a context of comparison with four-year college degree programs in computing education, they triangulate coding bootcamps within the "curricular geography of CC2005" (p. 50). In doing so, they are able to map the competency target of coding bootcamps along the CC2005 field of computing competency continuum and then compare that mapping to the competency target of various information systems curriculum guidelines.

As the discussion of previous literature related to industry, faculty, administrator, student, and curriculum perspectives has shown, prior work has mostly focused on high-level comparisons between coding bootcamps and traditional university programs. The present work, in contrast, aims to shed light on the factors driving student satisfaction in coding bootcamps. The insights from this work should be able to contribute to the five perspectives mentioned earlier, while also holding implications for computing education more generally.

3. METHODOLOGY

To conduct this study, we collected data by scraping approximately 28,000 student reviews representing over 500 coding bootcamps from the Course Report website (n.d.). We then randomly ordered the student reviews to eliminate bias based upon type of bootcamp, location, length of review, or quality of review. To analyze the student reviews, we elected to use content analysis (Berg, 2001), a qualitative research technique.

Prior to starting the content analysis, we first established our process for evaluating each review to ensure consistency between us. We each then coded individually for a set time of 30 minutes by which to evaluate the process and the number of student reviews we were able to complete. After this initial round of analysis, we discussed any issues with the process and determined this was a reasonable approach for continuing.

As we analyzed the student reviews, we identified aspects of the coding bootcamp that students like and dislike. We continued this process individually until we each reached theoretical saturation. Theoretical saturation was reached when further analysis of student reviews revealed no further unique items for student likes and dislikes. We then began separately to group the "Like" and "Dislike" items into related categories. This led to the emergence of patterns and themes, which is the end result of content analysis. After working independently, we compared our results and began to further group the emerging themes and patterns in an attempt to cull down repeating ideas. After several iterations, we narrowed down the proposed factors driving bootcamp satisfaction for inclusion in our research model. Finally, we developed Likert-style items based on the identified variables. A survey instrument based on the proposed research model is provided in Appendix A.

4. PROPOSED SATISFACTION FACTORS

A total of fourteen satisfaction factors were identified. It is proposed that each factor positively influences coding bootcamp satisfaction. In turn, each factor consists of between three and ten variables. The following figure depicts the proposed success factors and related propositions.

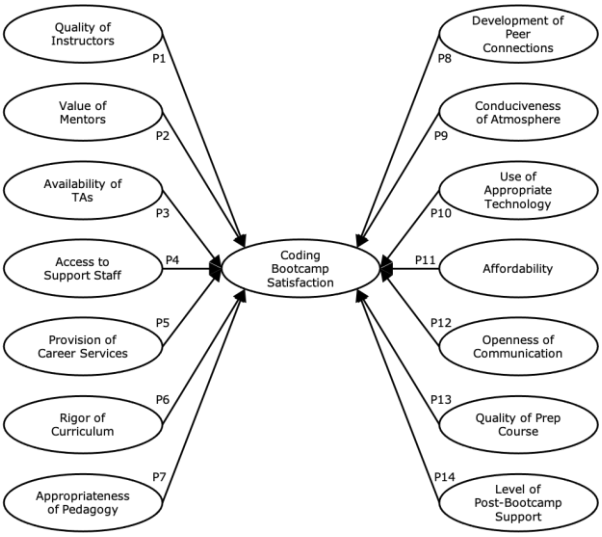

Figure 1: Overview of Proposed Satisfaction Factors

The following sections describe each of the fourteen satisfaction factors along with their associated propositions.

P1: Quality of Instructors
The first proposed satisfaction factor is *quality of instructors*. The resulting proposition can be stated as: *the higher the quality of the instructors, the higher the coding bootcamp satisfaction* (P1). *Quality of instructors* consists of six variables, as shown in table 1.

ID	The coding bootcamp _____.
QI1	Has instructors that are knowledgeable
QI2	Has instructors that are caring
QI3	Has instructors that are passionate
QI4	Has instructors with relevant industry experience
QI5	Has instructors that are inspiring
QI6	Has instructors that are available outside of class

Table 1: Variables Measuring Quality of Instructors

As indicated by the number of variables measuring *quality of instructors*, students appear to value different quality aspects in instructors. Among others, students appear to value the extent to which instructors are knowledgeable in the subject area (QI1). This is hardly surprising. However, other variables that emerged from the analysis are less obvious, such as the extent to which instructors are caring (QI2), passionate (QI3), and inspiring (QI5). This points to the importance of soft skills in instructors. Moreover, it is interesting to note that students appear to care about relevant industry experience (QI4). Lastly, students also wish for instructors to be available outside of class (QI6).

P2: Value of Mentors
The second proposed satisfaction factor is *value of mentors*. The resulting proposition can be stated as: *the higher the value of the mentors, the higher the coding bootcamp satisfaction* (P2). *Value of mentors* consists of three variables, as shown in table 2.

ID	The coding bootcamp _____.
VM1	Has mentors with relevant industry experience
VM2	Has mentors who are dedicated to students
VM3	Offers a variety of diverse mentors

Table 2: Variables Measuring Value of Mentors

In the context of *value of mentors*, students appear to want to have mentors who are dedicated to the students' success (VM2), while also being offered a variety of diverse mentors (VM3). Here, diversity could refer to having mentors with a range of different social and ethnic backgrounds, genders, educational attainment levels, and professional experiences, etc. Moreover, students appear to be valuing industry experience in mentors (VM1), which underlines the primary value provided by mentors being in the area of career and personal coaching.

P3: Availability of TAs
The third proposed satisfaction factor is *availability of teaching assistants (TAs)*. The resulting proposition can be stated as: *the higher the availability of TAs, the higher the coding bootcamp satisfaction* (P3). *Availability of TAs* consists of three variables, as shown in table 3.

ID	The coding bootcamp _____.
TA1	Has sufficient TAs available
TA2	Has TAs that are knowledgeable
TA3	Has TAs that are available outside of class

Table 3: Variables Measuring Availability of TAs

With regards to *availability of TAs*, students appear to place a special emphasis on the number of TAs available to them (TA1). In addition, students appear to value knowledge (TA2) and availability outside of class (TA3) in TAs. The latter two variables suggest that TAs play an important role in deepening the subject-matter understanding of students that should not be undervalued.

P4: Access to Support Staff
The fourth proposed satisfaction factor is *access to support staff*. The resulting proposition can be stated as: *the higher the access to support staff, the higher the coding bootcamp satisfaction* (P4).

Access to support staff consists of three variables, as shown in table 4.

ID	The coding bootcamp _____.
SS1	Has support staff that ensures students stay on track to graduation
SS2	Has support staff that helps students with administrative questions
SS3	Has support staff that is caring

Table 4: Variables Measuring Access to Support Staff

When it comes to *access to support staff*, students appear to value the help they can receive regarding staying on track to graduation (SS1) and regarding administrative issues involving the coursework and/or the bootcamp overall (SS2). Lastly, the extent to which support staff is caring towards students and their success in the bootcamp has been frequently mentioned by students (SS3). Thus, the role of support staff should not be solely focused on administrative efficiency but also have a strong personal support aspect.

P5: Provision of Career Services

The fifth proposed satisfaction factor is *provision of career services*. The resulting proposition can be stated as: *the higher the provision of career services, the higher the coding bootcamp satisfaction* (P5). *Provision of career services* consists of seven variables, as shown in table 5.

ID	The coding bootcamp _____.
CS1	Helps find appropriate job openings
CS2	Prepares students for technical and non-technical interviews
CS3	Provides resume tips and reviews
CS4	Facilitates networking with industry professionals
CS5	Offers interesting company site visits
CS6	Hosts relevant guest speakers
CS7	Provides dedicated support for international job searches/applicants

Table 5: Variables Measuring Provision of Career Services

The *provision of career services* includes multiple aspects that are valued by students. Some of these aspects involve career services reaching out to industry, such as by facilitating networking with industry professionals (CS4), offering interesting company site visits (CS5), and hosting relevant guest speakers (CS6). Other aspects focus more on preparing students for the job search process, such as helping to find appropriate job openings (CS1), preparing students for technical and non-technical interviews (CS2), providing resume tips and reviews (CS3), and providing dedicated support for international job searches/applicants (CS7).

P6: Rigor of Curriculum

The sixth proposed satisfaction factor is *rigor of curriculum*. The resulting proposition can be stated as: *the higher the rigor of the curriculum, the higher the coding bootcamp satisfaction* (P6). *Rigor of curriculum* consists of six variables, as shown in table 6.

ID	The coding bootcamp _____.
RC1	Teaches skills that are in demand
RC2	Teaches industry best practices
RC3	Gives a comprehensive introduction to a discipline
RC4	Provides an accelerated induction to a discipline
RC5	Balances soft and hard skills
RC6	Structures topics logically

Table 6: Variables Measuring Rigor of Curriculum

The *rigor of curriculum* in a coding bootcamp is determined by the curriculum's alignment with the needs of industry. This is reflected by the needs to teach skills that are in demand (RC1) and industry best practices (RC2). This requires coding bootcamps to maintain close industry contacts, to anticipate changes in industry demand, and to rapidly adjust their curriculum accordingly. In addition to teaching hard skills, students mentioned the importance of soft skills in a curriculum (RC5). As a whole, the curriculum should have enough breadth and depth to provide an introduction to a discipline that is both comprehensive (RC3) and accelerated (RC4), while progressing logically (RC6).

P7: Appropriateness of Pedagogy
The seventh proposed satisfaction factor is *appropriateness of pedagogy*. The resulting proposition can be stated as: *the higher the appropriateness of the pedagogy, the higher the coding bootcamp satisfaction* (P7). *Appropriateness of pedagogy* consists of ten variables, as shown in table 7.

ID	The coding bootcamp _____.
AP1	Allows for learning at different speeds
AP2	Supports varying levels of prior knowledge
AP3	Balances conceptual and hands-on learning
AP4	Helps students become independent learners
AP5	Fosters collaboration among students
AP6	Challenges students without being overwhelming
AP7	Facilitates work on relevant, real-world exercises/projects
AP8	Incorporates appropriate assessments with timely and detailed feedback
AP9	Gives students individualized instruction
AP10	Encourages students to fully immerse themselves in a discipline

Table 7: Variables Measuring Appropriateness of Pedagogy

Clearly, *appropriateness of pedagogy* is an important and multi-faceted factor in determining coding bootcamp success. Some of the pedagogical aspects can be implemented through scaffolding, such as allowing for learning at different speeds (AP1) and supporting varying levels of prior knowledge (AP2). Moreover, students mentioned the need to balance conceptual and hands-on learning (AP3), fostering collaboration among students (AP5), facilitating work on relevant, real-world exercises/projects (AP7), and incorporating appropriate assessments with timely and detailed feedback (AP8). Other pedagogical aspects appear to be broader in scope than a single lesson, such as helping students become independent learners (AP4), challenging students without being overwhelming (AP6), and encouraging students to fully immerse themselves in a discipline (AP10). Lastly, students mentioned the wish for getting individualized instruction (AP9), which is a pedagogical aspect that could be implemented by changing the instructor-to-student ratio or leveraging adaptive learning technology, for example.

P8: Development of Peer Connections
The eighth proposed satisfaction factor is *development of peer connections*. The resulting proposition can be stated as: *the higher the development of peer connections, the higher the coding bootcamp satisfaction* (P8). *Development of peer connections* consists of three variables, as shown in table 8.

ID	The coding bootcamp _____.
PC1	Ensures peers have comparable prerequisite knowledge and skills
PC2	Fosters social bonding among peers
PC3	Maintains appropriately sized cohorts

Table 8: Variables Measuring Development of Peer Connections

The *development of peer connections* factor aims to ensure that social bonding is supported among students (PC2) in an appropriately-sized cohort (PC3). The latter depends on the modality and facilities of the coding bootcamp, as there probably isn't one cohort size that fits all coding bootcamps. While having a heterogeneous cohort in terms of background and experiences is probably beneficial, students specifically mentioned the desire for peers to have comparable prerequisite knowledge and skills (PC1), thus ensuring that peers will be able to collaborate well.

P9: Conduciveness of Atmosphere
The ninth proposed satisfaction factor is *conduciveness of atmosphere*. The resulting proposition can be stated as: *the higher the conduciveness of the atmosphere, the higher the coding bootcamp satisfaction* (P9). *Conduciveness of atmosphere* consists of three variables, as shown in table 9.

ID	The coding bootcamp _____.
CA1	Maintains a positive and supportive atmosphere
CA2	Fosters a community feeling
CA3	Instills confidence and professionalism

Table 9: Variables Measuring Conduciveness of Atmosphere

Conduciveness of atmosphere is an interesting success factor that isn't easy to put into practice as it requires varying degrees of cooperation between staff and students. The aspect which probably requires the least amount of support from students is instilling confidence and professionalism (CA3). This aspect is solely the responsibility of the instructors and to a lesser extent the TAs and support staff. However, maintaining a positive and supportive atmosphere (CA1) along with fostering a community feeling (CA2) are both aspects that require both role-modeling from the entire staff along with cooperation from the students.

P10: Use of Appropriate Technology
The tenth proposed satisfaction factor is *use of appropriate technology*. The resulting proposition can be stated as: *the higher the use of appropriate technology, the higher the coding bootcamp satisfaction* (P10). *Use of appropriate technology* consists of five variables, as shown in table 10.

ID	The coding bootcamp _____.
AT1	Supports collaboration among students with appropriate technology
AT2	Enables socialization among students via appropriate technology
AT3	Facilitates Q&A sessions and discussions using appropriate technology
AT4	Presents and shares learning materials through appropriate technology
AT5	Uses appropriate technology for assignment submissions and feedback

Table 10: Variables Measuring Use of Appropriate Technology

With regards to the *use of appropriate technology*, it appears that students desire appropriate technology for every aspect of their student experience. This includes technology used for learning in lessons, such as to present and share learning materials (AT4) and to facilitate question and answer sessions along with discussions (AT3). In addition, students look for appropriate technology to support them collaborating (AT1) and submitting assignments (incl. receiving feedback on assignments) (AT5). Lastly, students value having appropriate technology that enables them socializing within the cohort (AT2).

P11: Affordability
The eleventh proposed satisfaction factor is *affordability*. The resulting proposition can be stated as: *the higher the affordability, the higher the coding bootcamp satisfaction* (P11). *Affordability* consists of three variables, as shown in table 11.

ID	The coding bootcamp _____.
AF1	Prices its offering competitively
AF2	Offers attractive tuition reimbursement options
AF3	Provides flexible tuition loan options

Table 11: Variables Measuring Affordability

Given the rising cost of higher education, the *affordability* of coding bootcamps is certainly a factor that is on students' minds. In this realm, students look for competitive pricing (AF1) along with flexible tuition loan options (AF3), the latter of which is typically provided by the bootcamp in collaboration with third-party financial organizations. The ability to receive tuition reimbursement after the start of a bootcamp (AF2) is another aspect that students look for when evaluating coding bootcamps.

P12: Openness of Communication
The twelfth proposed satisfaction factor is *openness of communication*. The resulting proposition can be stated as: *the higher the openness of communication, the higher the coding bootcamp satisfaction* (P12). *Openness of communication* consists of three variables, as shown in table 12.

ID	The coding bootcamp _____.
OC1	Communicates openly and transparently with students
OC2	Regularly asks for students' feedback
OC3	Makes changes based on students' feedback

Table 12: Variables Measuring Openness of Communication

Openness of communication is a success factor that requires coding bootcamps to pay attention to the openness and transparency with which they communicate with students (OC1). Given the impact of COVID-19 on coding bootcamps, openness and transparency in communication was especially valued by students during that time. Moreover, students expect to be asked for feedback regularly (OC2) and for coding bootcamps to make appropriate changes based on their feedback (OC3). While the practice of asking for teaching evaluations is wide-spread in higher education, the desire of students to see the impact of their feedback is something that is frequently overlooked.

P13: Quality of Prep Course

The thirteenth proposed satisfaction factor is *quality of prep course*. The resulting proposition can be stated as: *the higher the quality of the preparatory course, the higher the coding bootcamp satisfaction* (P13). *Quality of prep course* consists of three variables, as shown in table 13.

ID	The coding bootcamp _____.
QP1	Provides a thorough preparatory course
QP2	Has a preparatory course that is well-designed
QP3	Sets appropriate expectations with the preparatory course

Table 13: Variables Measuring Quality of Prep Course

The *quality of the preparatory course* takes place before the start of the bootcamp, but appears to be important for students' success. As such, students want a preparatory course that is thorough (QP1), well-designed (QP2), and sets appropriate expectations (QP3) for the remainder of the bootcamp.

P14: Level of Post-Bootcamp Support

The fourteenth proposed satisfaction factor is *level of post-bootcamp support*. The resulting proposition can be stated as: *the higher the level of post-bootcamp support, the higher the coding bootcamp satisfaction* (P14). *Level of post-bootcamp support* consists of three variables, as shown in table 14.

ID	The coding bootcamp _____.
PS1	Offers ongoing career coaching after completing the bootcamp
PS2	Provides continuous skill development after completing the bootcamp
PS3	Fosters the development of alumni relationships after completing the bootcamp

Table 14: Variables Measuring Level of Post-Bootcamp Support

Given the existence of the *level of post-bootcamp support* factor, it appears that students view their learning experience in the bootcamp from the perspective of lifelong learning. As such, students value receiving ongoing career coaching (PS1), continuous skill development (PS2), and the development of alumni relationships (PS3) after the completion of the bootcamp.

5. DISCUSSION

The purpose of this study is to understand what students like and dislike about their experience in a coding bootcamp. As new entrants in the computing education space, coding bootcamps hold the potential to disrupt and improve the student experience in post-secondary education. Thus, the ultimate goal of this work is to provide insights about how to improve the student experience in coding bootcamps and in computing education more generally. To this end, a qualitative content analysis of student reviews for coding bootcamps was conducted, which led to the development of fourteen satisfaction factors and an associated survey instrument (see Appendix A).

Some of the satisfaction factors are probably interrelated, such as the expected impact of *quality of the preparatory course* on the *development of peer connections* (by ensuring that peers have adequate prerequisite knowledge and skills). Another potential interrelation between satisfaction factors is the expected impact of *use of appropriate technology* on the

conduciveness of the atmosphere (by ensuring that students are able to socialize remotely within the cohort).

Looking at the number of variables associated with each satisfaction factor, it appears that five satisfaction factors are particularly complex: *appropriateness of pedagogy* (10 variables), *provision of career services* (7 variables), *rigor of curriculum* (6 variables), *quality of instructors* (6 variables), and *use of appropriate technology* (5 variables). In fact, one could argue that pedagogy, career services, curriculum, instructors, and technology make up the core offering of a coding bootcamp. Thus, it is possible that these five satisfaction factors will show a particularly strong association with coding bootcamp satisfaction in future research.

Contributions

The present study makes contributions to each of the five perspectives mentioned in the literature review. Specifically, in terms of industry perspective, this study points to the need to provide well-rounded career services and valuable mentors in order to build pathways from coding bootcamps to industry. In terms of faculty perspective, which can be broadened to include all instruction-related matters, this study suggests that the quality of faculty, the availability of TAs, and the appropriateness of pedagogy play an important role in determining coding bootcamp satisfaction. In terms of the administrator perspective, there are several aspects that need to be paid close attention to, including ensuring affordability, access to support staff, use of appropriate technology, openness of communication, quality of the prep course, and the level of post-bootcamp support. The student perspective should include a focus on the development of peer connections along with creating a conducive atmosphere. Lastly, the curriculum perspective should be extended with the insights from the rigor of curriculum factor, which requires close interaction with industry.

Limitations

The study is not without limitations. First, while we believe theoretical saturation was reached during our analysis, considering the sheer number of student reviews in the dataset, there is a possibility that analyzing more student reviews could potentially reveal additional factors contributing to student satisfaction. Second, although the Course Report website (n.d.) includes student reviews from over 500 coding bootcamps, it was the only data source used for the study. It is possible that gathering data from other sources such as the SwitchUp website (n.d.), which also contains a large number of student reviews, might yield more satisfaction factors.

Future Research

As noted in the limitations, the data for the study derived from a single source. For future research, we plan to gather coding bootcamp student reviews from additional sources. One such source is SwitchUp (n.d.), which reports to have over 20,000 verified student reviews. As the purpose of the study is to understand the factors driving coding bootcamp satisfaction, future research should follow-up with a quantitative evaluation of the research model. For example, researchers may wish to contact coding bootcamps in order to conduct a survey among students and/or alumni of coding bootcamps using the proposed survey instrument (see Appendix A). This would allow for testing of the proposed survey instrument as well as provide rich results for both academic purposes and to the coding bootcamp providers. A final area of future research is to investigate how the identified satisfaction factors might apply to higher education degree programs in computing education more generally.

6. CONCLUSION

While there are those who have been predicting the eventual demise and extinction of coding bootcamps, the opposite seems to be the case, at least for the time being. Thus research aiming to better understand student satisfaction in coding bootcamps constitutes a timely and relevant endeavor. To this end, this study developed a research model and survey instrument consisting of fourteen satisfaction factors. Future research is needed to evaluate the statistical properties of the proposed survey instrument.

Like the military and fitness industries before them, the concept of the coding bootcamp with its intense focus on providing a relevant, up-to-date, real-world educational experience in a timely manner and at a reasonable cost is causing many to reconsider a traditional four-year university degree. And although participants of coding bootcamps commonly talk about the challenges and difficulties they encountered, a common theme is that it is worth it in the end and you get out of it what you put into it. As one bootcamp participant stated, "This is one of the most challenging and rewarding things I've ever done" (Course Report, n.d.).

7. REFERENCES

Are Bootcamps Booming?. (2016). *BizEd*, 15.

Berg, B. L. (2001). *Qualitative Research Methods for the Social Sciences* (4th. ed.). Boston, MA: Allyn and Bacon.

Burke, B., & Bailey, C. S. (2019). Camp or College? SIGCSE '19: Proceedings of the 50th ACM Technical Symposium on Computer Science Education, 345–350.

Burke, B., & Bailey, C. S. (2020). Becoming an 'Adaptive' Expert. *Communications of the ACM*, 63(8), 56-64.

Burke, B., Bailey, B., Lyon, L. A., & Green, E. (2018). Understanding the software development industry's perspective on coding boot camps versus traditional 4-year colleges. SIGCSE '18: Proceedings of the 49th ACM Technical Symposium on Computer Science Education. 503–508.

Choxi, R. (2015). Coding Bootcamps are Replacing Computer Science Degrees. *VentureBeat*. Retrieved June 3, 2021 from https://venturebeat.com/2015/11/08/coding-bootcamps-are-replacing-computer-science-degrees/

Course Report (n.d.). Retrieved June 3, 2021 from https://www.coursereport.com/

Rafter, M. V. (2017, May 25). Camp for Coders. *Computerworld*. Retrieved June 3, https://www.computerworld.com/article/3191988/is-a-coding-boot-camp-right-for-you.html

SwitchUp (n.d.). Retrieved June 7, 2021, https://www.switchup.org/

Waguespack, L., Babb, J. S., & Yates, D. J. (2018). Triangulating Coding Bootcamps in IS Education: Bootleg Education or Disruptive Innovation?. *Information Systems Education Journal*, 16(8), 48-58.

Appendix A: Proposed Survey Instrument

Dependent Variable: Coding Bootcamp Satisfaction
On a scale from 1 (very dissatisfied) to 5 (very satisfied), how satisfied are you with the coding bootcamp?

Independent Variables
On a scale from 1 (strongly disagree) to 5 (strongly agree), please indicate your agreement with the following statements:

The coding bootcamp _____.

Quality of Instructors (QI)
QI1 Has instructors that are knowledgeable
QI2 Has instructors that are caring
QI3 Has instructors that are passionate
QI4 Has instructors with relevant industry experience
QI5 Has instructors that are inspiring
QI6 Has instructors that are available outside of class

Value of Mentors (VM)
VM1 Has mentors with relevant industry experience
VM2 Has mentors who are dedicated to students
VM3 Offers a variety of diverse mentors

Availability of Teaching Assistants (TA)
TA1 Has sufficient TAs available
TA2 Has TAs that are knowledgeable
TA3 Has TAs that are available outside of class

Access to Support Staff (SS)
SS1 Has support staff that ensures students stay on track to graduation
SS2 Has support staff that helps students with administrative questions
SS3 Has support staff that is caring

Provision of Career Services (CS)
CS1 Helps find appropriate job openings
CS2 Prepares students for technical and non-technical interviews
CS3 Provides resume tips and reviews
CS4 Facilitates networking with industry professionals
CS5 Offers interesting company site visits
CS6 Hosts relevant guest speakers
CS7 Provides dedicated support for international job searches/applicants

Rigor of Curriculum (RC)
RC1 Teaches skills that are in demand
RC2 Teaches industry best practices
RC3 Gives a comprehensive introduction to a discipline
RC4 Provides an accelerated induction to a discipline
RC5 Balances soft and hard skills
RC6 Structures topics logically

Appropriateness of Pedagogy (AP)
AP1 Allows for learning at different speeds
AP2 Supports varying levels of prior knowledge
AP3 Balances conceptual and hands-on learning
AP4 Helps students become independent learners
AP5 Fosters collaboration among students

AP6 Challenges students without being overwhelming
AP7 Facilitates work on relevant, real-world exercises/projects
AP8 Incorporates appropriate assessments with timely and detailed feedback
AP9 Gives students individualized instruction
AP10 Encourages students to fully immerse themselves in a discipline

Development of Peer Connections (PC)
PC1 Ensures peers have comparable prerequisite knowledge and skills
PC2 Fosters social bonding among peers
PC3 Maintains appropriately sized cohorts

Conduciveness of Atmosphere (CA)
CA1 Maintains a positive and supportive atmosphere
CA2 Fosters a community feeling
CA3 Instills confidence and professionalism

Use of Appropriate Technology (AT)
AT1 Supports collaboration among students with appropriate technology
AT2 Enables socialization among students via appropriate technology
AT3 Facilitates Q&A sessions and discussions using appropriate technology
AT4 Presents and shares learning materials through appropriate technology
AT5 Uses appropriate technology for assignment submissions and feedback

Affordability (AF)
AF1 Prices its offering competitively
AF2 Offers attractive tuition reimbursement options
AF3 Provides flexible tuition loan options

Openness of Communication (OC)
OC1 Communicates openly and transparently with students
OC2 Regularly asks for students' feedback
OC3 Makes changes based on students' feedback

Quality of Preparatory Course (QP)
QP1 Provides a thorough preparatory course
QP2 Has a preparatory course that is well-designed
QP3 Sets appropriate expectations with the preparatory course

Level of Post-Bootcamp Support (PS)
PS1 Offers ongoing career coaching after completing the bootcamp
PS2 Provides continuous skill development after completing the bootcamp
PS3 Fosters the development of alumni relationships after completing the bootcamp