Responses to Reviewers

Data Science Journal submission #574

"Effective Data Science Education: A Project-Based Case Study Perspective"
Daniel Turek, Anthony Suen, Dav Clark

We first wish to thank the reviewers for their time, and their insightful comments. We sincerely believe their suggestions have led to a substantially improved submission.

Each of their suggestions has been addressed in our revised manuscript. Explanations of our changes are included below alongside the reviewers' original comments.

Reviewer A

1. Originality

While all research builds upon existing knowledge and evidence, do you believe this submission progresses knowledge on this subject? Are there original findings, or do conceptual arguments provide a somewhat new perspective on established thinking? Select one of the options below, and feel free to elaborate in the comment box.

Somewhat original

Comments/Explanation

I think its important to examine and discuss the education of data science. This article used a conceptual approach by examining current theories of science education.

Yes, we have provided a review of the recent major trends in tertiary education in Section 2, and explained how they relate to the educational practices of the BIDS Collaborative.

2. Methodology

Please assess the clarity and overall appropriateness of the methodology, keeping in mind that different criteria may be applied in assessing empirical versus more theoretical or conceptual articles. Are the methodology and data sources noted in the article, and are methodological weaknesses addressed? Overall, do you find the methodology appropriate for the subject matter being examined in the

submission? Please briefly explain your response in the comment box, and provide suggestions to the author for bolstering the methodology, if appropriate.

Sufficient methodology

Comments/Explanation

I think a case study is sufficient to use.

We agree, our case study provides an empirical analysis of the various educational methodologies addressed in our manuscript. We also provide a post factum analysis of the successes and shortcomings that were experienced in the Lessons Learned (Section 4).

3. Clarity

Do you find the writing to be clear and structured in a logical manner? Please keep in mind that, if an article is accepted, we will work with the author to strengthen the prose and structure. In the comment box, please offer suggestions for strengthening the writing AND/OR the structure of the piece.

Somewhat unclear

Comments/Explanation

At the beginning of the paper, I held a clear understanding of the direction of this paper (i.e. This is case study of data science. U.C. Berkley Bids Collaborative . Successes, failures and recommendations, used theories to add context to the study).

The description of the projects should be discussed earlier in this paper. In the section header: Lessons Learned, I was unsure why the author included We now discuss several of these lessons learned. I was looking for a clear description of the outcomes of this study. Specifically stating what the successes, failures and recommendations were. Perhaps organizing the paper in this manner will provide more clarity and structure to the writing.

We agree with your comment entirely.

First, our revision includes a major restructuring of the case study presentation (Section 3), in which the project descriptions now appear first. In addition, there is improved analysis of the GitHub commits and project workflows we observed.

Second, we have re-organized and reframed the lessons learned (Section 4) to pose these as successes and failures experienced in the BIDS Collaborative, the resulting lessons learned, and how these lessons will be incorporated into the next Collaborative. We consider this a major improvement to the manuscript.

4. Ethical approval

If human or animals have been used as research subjects, are statements of ethical approval by a relevant authority present? Where humans have participated in research, informed consent should also be declared. If not present, please detail where you think a further ethics approval/statement is required.

n/a

5. Other Comments

Please use the box below to provide other comments, which do not fall into the categories above, to the author.

Reviewer C

1. Originality

While all research builds upon existing knowledge and evidence, do you believe this submission progresses knowledge on this subject? Are there original findings, or do conceptual arguments provide a somewhat new perspective on established thinking? Select one of the options below, and feel free to elaborate in the comment box.

Not original

Comments/Explanation

Lessons learnt are rather obvious and superficial, e.g. "Projects must be well-posed, and have a well-defined goal which students could work towards", "relevant data must be available in advance". These are very much true, but without more concrete data behind them and innovative solutions to mentioned issues, they do not constitute a scientic contribution. The paper really misses better evaluation of the ways to define project milestones, use of Github and Slack. If these aspects were quantified, possibly on a bigger group, the paper would become useful.

The lessons learnt (or best practices) determined by authors, are definitely correct but I would argue that they are also well know already to most of educators.

We have undertaken an original and experimental project-based initiative in data science education. There is no existing scientific literature on this subject or of this nature, and therefore our work constitutes an original contribution.

Yes, some of our conclusions and lessons learned are obvious in hindsight. Our work would be incomplete if these lessons were not included, alongside the less-than-obvious and truly novel insights specific to data science education. Furthermore, we consider how our conclusions might apply in the broader context of tertiary education.

The "concrete data" backing our research is clearly presented, and takes the form of experiential observations. This is a case study perspective on education, and is presented as such. Where possible, we have included quantitative backing of our observations and conclusions.

Finally, our research study pertains to one academic semester, which we feel provides the appropriate amount of content for a study of tertiary-level education.

2. Methodology

Please assess the clarity and overall appropriateness of the methodology, keeping in mind that different criteria may be applied in assessing empirical versus more theoretical or conceptual articles. Are the methodology and data sources noted in the article, and are methodological weaknesses addressed? Overall, do you find the methodology appropriate for the subject matter being examined in the submission? Please briefly explain your response in the comment box, and provide suggestions to the author for bolstering the methodology, if appropriate.

Weak methodology

Comments/Explanation

The discussion on traditional and non-traditional approaches to teaching is missing reference to constructive alignment. While project based learning can be considered a form of constructive alignment, it is only a small subset. It seem that this omission influences the whole paper, where discussion is focused a bit too much around technicalities and less so on major conceptual differences between various teaching and learning tasks with related grading practices that should motivate higher levels of learning. See works of Biggs for more information. Possibly failure of traditional instruction model is also missing some references to e.g. https://lup.lub.lu.se/search/publication/1691321 (I realize it's not in English, but it's worth it).

There is no quantitative data in the paper, which is a major negative point for a paper that attempts an evaluation of experience in a course. One exception is graph from github, but it's not analyzed in much depth.

We thank the reviewer for bringing the subject of constructive alignment to our attention. We have added a discussion of constructive alignment to our overview of educational techniques, and included appropriate references.

3. Clarity

Do you find the writing to be clear and structured in a logical manner? Please keep in mind that, if an article is accepted, we will work with the author to strengthen the prose and structure. In the comment box, please offer suggestions for strengthening the writing AND/OR the structure of the piece.

Somewhat clear

Comments/Explanation

No major comments here.

4. Ethical approval

If human or animals have been used as research subjects, are statements of ethical approval by a relevant authority present? Where humans have participated in research, informed consent should also be declared. If not present, please detail where you think a further ethics approval/statement is required.

Students are subjects, but only indirect, so probably no consent is necessary.

5. Other Comments

Please use the box below to provide other comments, which do not fall into the categories above, to the author.

In my opinion the paper needs to provide more quantitative data and deeper analysis to be considered for acceptance.

As addressed in a previous comment, we have improved the analysis of what quantitative data is available from our experiential case study. We politely encourage the reviewer to fully re-read our substantially revised manuscript.