July 15, 2014

Dear Editors,

Thank you for the opportunity to revise and resubmit our manuscript: Mission to Space: Evaluating One Type of Informal Science Education, #13096. In this letter we address the feedback and recommendations that you shared with us. We also read thoroughly the specific feedback from each of the reviewers (particularly the reviewers that you noted) and believe that their feedback has been addressed as well. If you have any questions about our responses, please feel free to contact me, the lead author, at 817-257-4645 or through email at lindy.crawford@tcu.edu. Thank you for your service.

Sincerely,

Lindy Crawford

Editors’ Feedback

Writing style

Although interesting and somewhat complete introductory and literature review sections, they are not labeled as such. Consider using traditional subtitles as they will improve the readability of the manuscript.

We have added subtitles, “left aligned” all subtitles, and repositioned one paragraph under a subtitle to improve readability.

Although there are few evaluations of summer space camp programs, a complete literature review will uncover several, including those under NASA’s auspices, that are relevant to your topic. Also, please consider evaluations of other informal science camps.

In this revised manuscript we have included a much more extensive literature review on the effects of informal science education programs on youth, including diverse youth. Reviewer D mentioned work by Welch and others relating to underrepresented populations and we have now reviewed and included some of that literature (although we have not included Welch directly in our revised manuscript). The revised manuscript includes references from approximately 20 additional studies, most of which are cited in the revised literature review.

“Space camp” is one type of informal science education and the type that we are most interested in researching for our literature review. Surprisingly, however, few of the “space camp programs” that exist have published evaluations on the impact of their programs. Both the National Research Council (2008), and Rulf Fountain & Jurist Levy (2010) have noted this lack of NASA space camp evaluations and references to these
documents can be found in our revised manuscript on p. 5.

To illustrate the lack of evaluations of space programs, we have visited the sites listed below (along with numerous others not listed) and searched for evaluation reports related to these programs but we found nothing:

- Space Center Houston: [http://spacecenter.org/education-programs/](http://spacecenter.org/education-programs/)
- Challenger Learning Center (national): [http://spacecenter.org/education-programs/](http://spacecenter.org/education-programs/)
- U.S. Space & Rocket Center Space Camp: [http://www.spacecamp.com](http://www.spacecamp.com)
- NASA Education: [http://www.nasa.gov](http://www.nasa.gov)

Finally, you identify that 20 years of data exist. Is it possible to obtain this data for analysis?

The “20 years of data” that we reference is a claim made on the national Challenger Learning Center website and it cites the McLain Report. Unfortunately, we have been unable to obtain the McLain Report. A thorough search of various websites, ERIC documents, etc., failed to produce this report. We shared this in the original manuscript as evidence for the need to conduct and publish evaluations that are readily available for others to review. The indirect reference between the relationship between the McLain report and the need for this manuscript has now been made more direct in the revised manuscript (see p. 6).

The introduction makes reference to the “six strands of learning” framework promulgated by the National Research Council. However, these “strands” are not further explicated nor are they specifically tied to the development of your survey.

We have revised sections of the manuscript to include the role the NRC framework plays in program evaluation (see pgs. 5 and 8). Moreover, a subtitle has been added under the introduction related to evaluating ISE programs. The NRC strands are initially introduced on page 5 and those strands to which our items and constructs align (based on the ones reported in the tables) are now identified in the text on page 8. And an additional section (also on page 8) provides a rationale for evaluating the items. Finally, we mention the strands again when discussing results on page 19.

As indicated by one reviewer, be sure that all citations within the body of the manuscript are included as full citations in your list of references. (Corbin & Strauss, 2007; Merriam, 2009).

All citations have been cross-referenced to Reference page (including the two citations listed above) and all References have been confirmed to have a corresponding citation in the text.

Substantive

*Table 1 (Student Demographic Data) indicates that 391, or more than 10% of all students, indicated “Other” as their ethnicity. Although reasoning for doing so is*
presented, is this assumption valid for such a large percentage of your subjects? Perhaps this assumption should be noted on data tables.

Data for students who marked multiple categories are also included in the “other” category, increasing the overall percentage. Due to the age of students it is not unusual to have this percentage of students mark “Other” when it comes to race/ethnicity. It has been noted on Table 1.

Similarly, almost 50% fewer students participated in the pre and post surveys, as compared to the day of mission surveys, as you acknowledge in the Limitations section. Is it possible to identify those who completed all three surveys and analyze that data? This would yield complete data sets and more meaningful findings.

We appreciate this suggestion and considered it carefully. However, because the questions were not similar across all three surveys and because the surveys were designed to measure different things (i.e., day-of surveys measured students initial reaction to mission and pre-post surveys were designed to measure change), we chose not to analyze only the responses of those students who completed all three surveys. As the reviewers noted, we do acknowledge (in the Limitations section) that almost 50% of the students who attended the Center did not complete the post-survey questions. We do not think, however, that to “throw out” their data on the day-of the mission is necessary because we analyze these results separately and looking at half of the students’ data on the day-of the mission would provide an incomplete picture.

You may want to revisit your logic. Two reviewers were concerned with what appeared to them to be circular logic.

The expanded literature review helps eliminate any circular logic. The manuscript now includes additional information about the relationship between formal and informal science education, the benefits of ISE (both short and long-term), the effects of ISE on different subgroups of students, the challenges associated with evaluating ISE programs, and the lack of research in this area (specifically as related to space sciences). The additional information related to the benefits of ISE for all students and specifically for subgroups of students and the expanded information related to a framework for evaluating ISE programs also helps reduce the presence of circular logic, both providing more clarity as to why this study is necessary and how it aligns with the work of others. The conclusion, implications, and future research section now more thoroughly address how the findings from this evaluation study contribute to the field and identifies areas of need as related to ISE program evaluation and future research.

Please check the tables for all information required by APA.

Tables have been edited. Revisions have been made to reporting of Notes, p values, and column specific notes. Statistical abbreviations have been edited to remain consistent across tables.
You describe survey question alignment with thematic constructs: interest and enthusiasm in STEM, content knowledge and teamwork. While you explain the rationale for doing so, it is unclear how you arrived at the 15 question set used to survey students. How did you determine the validity of your surveys? The reviewers would like more information on the validation process.

A “Student Survey Development and Validation” section is now located under the Methods section (see p. 8). This section addresses the literature base used for item development, a more complete rationale as to why items were developed for certain constructs, and the reporting of reliability data for the surveys. Finally, Cronbach’s Alpha scores are now reported for each construct identified on each of the surveys (p. 9).