Author: Kevin Moposita

Title: Are We Doing Enough: An Analysis of Racial Progress Within Astronomy

Research Summary:

The purpose of this research is to examine the existing race gap between White and Black undergraduate students in astronomy. In examining 2007 demographics of White and Black astronomy faculty members in the top 50 US astronomy schools, 90% identified as White while 1% identified as Black or Latinx. Comparing these data to the 2007 US census, 66% identified as White while 12.2% identified as Black and 15% as Latinx. This disparity continues into the graduate level were about 3% of PhDs were awarded to minorities between 2002 and 2012. However, this racial disparity is not as severe in the undergraduate level. Thus, this research focused on analyzing different factors that may contribute to Black undergraduate students quitting astronomy before earning PhDs, leading to the observed race gap. From the mean and standard deviation of data provided by API for each of these factors, mock data were created, and statistical tests were implemented to determine who significantly each factor contributes to the race gap. Results are not available at this time but will be added to the paper once available.

Recommendation: Reject

The research presented definitely has potential, and the topic is very important in the context of the social aspects of astronomy. However, the research presented seemed very chaotic. The goal was not clear, and the results are not reproducible due to lack of detail in the methodology. Even if the methodology itself were fixed, the author presents a different research goal in each section, and none of them correlate with each other. It is unclear what this research was actually trying to achieve (See major points below), and, while the topic itself is significant to the advancement of science, the paper loses merit. The project itself is not well-defined, which makes it difficult to say whether or not it would significantly contribute to science.

Concerns:

Major points:

- All surveys and demographics mentioned as well as anything that is not an original idea or result need citations.
- It is unclear what goal of this research was. In the introduction, it says that there are two objectives: determine where the large racial gap occurs (however, it was already mentioned previously that the gap occurs between the undergraduate and graduate levels) and analyzing the effectiveness of diversity programs at institutions. Then in the methodology, the goal of the project is to identify and define the factors that contribute to the diversity gap at the undergraduate level. However, these factors are not identified as a part of the research and instead cited from AIP, and the rest of the paper discusses statistical tests performed on the data from AIP. Furthermore, I think that the AIP data only represents physics majors considering the

source is called the American Institute of Physics, but the paper is supposed to be about the demographics of astronomy majors. The goal of this project was very unclear, and I am not sure what the research was about.

Abstract:

- In the abstract and introduction, the author needs to highlight the importance of this research. Why is it necessary to determine the factors contributing to race gaps in astronomy?
- The first sentence of the abstract does not accurately represent the research. “The purpose of the study was to determine which factor is most influential towards a student’s decision…” The research did not determine these factors but used another source that determined them. This issue severely compromises the integrity of the research.

Introduction:

- The introduction focuses largely on disparities in representation for Black and Latinx individuals, but the methodology and results focus on only Black students. The introduction should be adjusted to better match the results of the paper, i.e., demographics regarding Latinx individuals should not be mentioned. The introduction should only focus on Black representation compared to White representation.
- The basis of this paper is the 2007 Nelson Diversity Survey compared to 2007 US Census data for the racial demographics presented. However, these data are from 14 years ago, so the author is assuming that the demographics then accurately represent the state of diversity in astronomy in 2021. This is a very large assumption that does not have much merit.

Methodology:

Background:

- “It was of vital importance that each one be introduced with equal importance.” Can this assumption be made? Don’t some factors carry a greater impact than others? This needs further justification.

Data Retrieval:

- This section needs a lot more detail as to what the facts contributing to the race gap is, who the undergrad students interviewed were (any similarities between them) and how the sample of students was taken (random sampling, cluster, stratified, etc.). Also, specific details need to be better explained, such as the Likert scale, which is mentioned but not explained. This needs to be much more fleshed out for the results to be reproducible. Related to this, do the 167 students that were surveyed represent a specific group of students (specific graduation year, area of the country, etc.)? How well does the sample reflect the demographic of all astronomy students in the US?

- The author mentions implementing a linear regression model to check for correlation between factors. However, this is a very large assumption as the correlation, if it exists, can be curved or some other kind of relationship, not necessarily linear.
- This section uses language such as “the scope of this project will shift” or has paragraphs talking about failed attempts to contact AIP or conduct analysis. These have no place in the final report of results, and only the methodology relating to how the final results were actually obtained should be stated.
- In Figure 5, there is a value listed as the “p-value.” P-value determines the statistical significance of a result. I could be interpreting the methods incorrectly, but it seems like all that is needed to understand which factors are significantly contributing to the race gap is the p-value of each factor. If this is the case, then there is no merit for conducting the proposed research project in determining the significance of the factors because the significance is already determined and stated by the study used. However, this could not be the case and I am not understanding the table or methods properly.

Data Processing:

- This section also suffers from a severe lack of detail. What is the 7 Classical Assumptions of Ordinary Least Squares? This is mentioned as if it were a source that is cited (but has no citation), and if this is the case, seems like a very specific source and needs to be explained and justified a lot more. Also, the statistical tests used all need to be explained in way more detail, and any specific parameters or numbers used need to be mentioned in order to make the results reproducible. Also, what Python packages or libraries were used?

Minor points:

- The title has a footnote that says, “Released on March 1st, 2021”. This is the wrong date.
- The short title and short authors at the top of each page are incorrect.
- There are a few sentences throughout the paper that are phrased as questions, such as “if the disparity persists as early as the graduate school level, how might the undergraduate level look like?” These sentences give the paper a colloquial tone and can be removed from the narrative.
- The tables should be remade into LaTeX tables and references as Tables instead of Figures.

Abstract:

- The results not being listed in the abstract is understandable as the author will determine these results later. However, the parameters/factors used from the AIP report should be listed in the abstract as well (or at least some or the most important factors should be listed).

Introduction:

- In paragraph 1, the author mentions the racial demographic of faculty members in the top 50 US astronomy schools. It should be clear if this represents all faculty, such as post-docs and administrative staff.
- In paragraph 1, in citing the demographics of the US census, it should be clarified if these include only citizens or residents of the US.
- Figures 1 and 2 are unnecessary if the demographics are already listed in the text of the paper.
- In paragraph 2, the second sentence is unnecessary.
- In paragraph 2, the sentence starting “Assuming the undergraduate pool is more diverse…” can be removed. It is explained in the next paragraph that this does not need to be an assumption as it is backed up by data from APS.
- “The trend within both of these graphs indicate that the percentage will only increase.” How can the author make this assumption?
- Figures 3 and 4 do not show astronomy majors on the graph when the paper is about demographics in astronomy. They should be removed, or it should be thoroughly explained how they relate to astronomy majors.
- Figure 4 should be removed since the narrative of the paper only focuses on Black students (see Major Points).

Methodology:

Background:

- This section can be reworded and moved to the end of the introduction as an outline of the paper.

Data Retrieval:

- It says that 187 undergrad students were interviewed in the survey, but the table in Figure 5 says 167. I think this is just a typo.
- Table 1 is referenced, but there is no Table 1.
- The author uses the mean and standard deviation from the AIP data to create mock data. I’m assuming he created Gaussian distributions, and that the sample size is sufficiently large to assume this. This should be explicitly mentioned.

Data Processing:

- What is “correctness of a functional form?”

Discussion:

- In understanding that the author does not have results yet, I cannot comment greatly on this section since it relies on obtaining results.

Evaluation of Criteria:

Is the length appropriate?

The paper is too terse. There is barely any detail given for the methodology used and analysis of the results. The only details that are given are listed in a table or are unnecessary.

Are the title and abstract sufficiently informative?

The title matches the research presented, but the abstract falsely represents the work presented in the paper. The first sentence of the abstract does not accurately represent the research. “The purpose of the study was to determine which factor is most influential towards a student’s decision…” The research did not determine these factors but used another source that determined them. This issue severely compromises the integrity of the research.

Is the contribution to science significant?

This project contributes to issues of diversity, equity, and inclusion and sheds light on the important social aspects present in astronomy. However, the project itself is not well-defined, which makes it difficult to determine the actual impact or contribution that it would have to the scientific community.

Is level of English adequate?

In terms of English proficiency, the author demonstrates some ability to communicate his work. However, there are many inconsistencies or clarifications that need to be made. Each individual sentence by itself makes sense, but when put together, the narrative of the paper is nonsensical.

Is the literature properly cited?

No, the literature is not properly cited. There are barely any sources cited where there should be sources, and those that are cited are cited incorrectly. The in-text citations should be in parentheses unless they are directly in the narrative.

Are the results clearly and accurately presented?

The author will get results at a later date and add them in the paper upon resubmission.

Is the topic appropriate for the journal?

Yes, this is appropriate for the journal.

Data Management Plan:

The results in this paper are not reproducible because the methodology needs to be much more specific (see above). However, the data used are presented in a table and are accessible from AIP.

Additional Comment: I know this seems like a lot of corrections, but you got this! I believe in you!

Peer review report

Title: Are We Doing Enough: An Analysis of Racial Progress within Astronomy

Author: Kevin B. Moposita

Summary

The author focuses on determining the most influential factor that affect a student's decision to persist astronomy study and how that factor relates to the prevalent racial gap within the field. The data of the study comes from the 2020 survey of the American Institute of Physics. The survey questions 187 undergraduate physics and astronomy students about their college experience. It consider various factors such as financial status or peer interaction and let the participant rate each factor. However, the author could only obtain the average responses but not the individual answers from the survey. Therefore, the correlation between each factor could not be analyzed. Instead, the author create the individual mock responses that matches the mean and standard deviation for each factor. The author is still in the process of analyzing the mock responses, therefore, no conclusion is yet stated.

Recommendation: accepted with major revisions.

Justification

a. Major points

- Data retrieval:
  - "*With this information, python was utilized to create individual mock student responses that followed those constraints.*": I was concerned with how this mock responses can be representatively enough to study the correlation in each factor. It seems like the survey does not specify the distribution of the data (if yes, the author should state that in the text), thus it is even harder to produce the individual mock responses accurately. I suggested the author should try to get the actual answers from AIP and then use those data to continue.
  - "*Table 1 contains ...*" : there is no Table 1 in the paper. Also, if the author uses the parameters from the survey, he should refer to Figure 5 rather than making a new table repeating the numbers.
- Data processing, discussion and conclusion: these sections are not finished yet, so no comments can really be made.

b. Minor points

- Abstract:
  - "*… a series of questions.*": the author should specify what types of questions.

- Introduction
  - "*… racial diversity among their demographics.*": need citation.
  - "*The 2007 Nelson Diversity Survey highlights …*": needs citation.

- *"Figure 2 is of the U.S census throughout the years..*: needs citation. Also, I suggest that only the year 2007 in the Figure is needed, because the Nelson Diversity Survey only has data in 2007.
- Figure 2: the "number (in thousands)" term should be in the middle of the line.
- *"As suspected, the racial disparity is not as severe in the undergraduate level."*: needs citation, or the author should refer to Figure 3 and 4.
- *"… bachelor degrees than in the two previous areas."*: the author should specify what type of bachelor degrees that are mentioned here.
- *"Figure 3 displays … same for the Latinx group."*: this should be stated in the beginning of the paragraph. Also, the author should state where those these figures are adopted from (or if he make it, the author should specify what data he uses).
- *"... creating task forces meant to place importance on diversity and inclusion."*: need citation.

- Methodology - Background
  - I think the author can combine this subsection with the next subsection (Data Retrieval). I think there is no need for a separate section for the background of methodology, given that it is relatively short.

- Data Retrieval
  - *"… the American Institute of Physics was utilized."*: a short description of the data is needed.
  - *"... but is also backed up by various literature."*: some citations are needed to illustrate this point.
  - *"… will shift to these two racial groups."*: if the scope of the project only focuses on the White and the Black students, the introduction should not mention too much on the Latinx student as it is right now, but rather only focuses on the Black students.
  - *"Figure 5 displays…"*: the author should state that it is adopted from the report.
  - *"A Likert scale was utilized …"*: explanations and citations for this scale are needed.
  - *"The AIP report presented…"*: the full phrase of AIP should be stated first (for example, in the beginning of the section, the author should add "(AIP)" after the phrase "American Institute of Physics".)
  - *"Statistical tests are then performed with…"*: the author should specify which tests he uses.
  - Figure 5: citation is needed in the caption.

- Data Processing
  - *"To ensure this, the 7 Classical Assumptions of Ordinary Least Squares was consulted."*: need citation

Evaluation

The topic is appropriate for the journal. The length of the paper is too short and more should be discussed. The title convey the content of the studies. Since the paper is not finished yet, it is not possible to evaluate the abstract, the results, and its contribution to science. The paper has a good potential and a good goal, however, a lot more work needs to be done. Therefore, I give the paper the recommendation of “accepted with major revision”, but the author needs to provide the result as soon as possible. The English in the paper is easy to follow, however, many citations are missing in the paper. Regarding the Data Management plan, the author uses the data provided by another papers, and those data were already published. Also, if the author could obtain the individual responses from the American Institute of Physics survey, he should make a table in the paper or publish the data online.

All my comments are constructive reviews and sometimes they can come from personal preference or personal experience. Please understand if I misunderstand the author in some points. Also, please send my congratulation on the author’s work. Good luck on continuing working on the paper.

Author: Kevin B. Moposita

Title: Are We Doing Enough: An Analysis of Racal Progress Within Astronomy

Summary

This study highlights the racial diversity issue which plagues astronomy programs across America. The tables and plots displayed in the introduction make the issue clear, minority racial groups are severely under-represented in astronomy. The project aims to analyze which factors contribute to the racial gap within undergraduate astronomy departments. The data is obtained from the AIP TEAM-UP Team which was a survey conducted to try and find the major causes of under-representation. The author is still waiting for a response from the AIP to obtain the actual responses to this survey, but in the meantime, mock data points were created using the mean and standard deviation provided by the AIP survey. After the data points are created, several test will be applied, including the BREUSCH, Breusch & Pagan and the Ramsey tests. Once these tests are complete, the author will be able to determine which factor was most influential in leading minority undergraduate students to drop astronomy as a major. Once the author has determined the most influential factor (or factors), they can comment about potential solutions that might help alleviate the diversity issues in astronomy.

Rating: Accept with Major Revision

Minor Revisions:

- The table in Figure 1 should be enlarged since the inputs are hard to read
- The plots displayed in Figure 3 and 4 do not contain astronomy as one of the degrees. These plots do highlight the racial disparity in other STEM fields and thus still demonstrate the racial diversity issues in STEM, but the focus of this project is astronomy. Plots depicting the diversity issues for astronomy degrees would be beneficial to the reader.

Major Revisions:

- There are some formatting issues that must be fixed. On the first page, the footnote mentions that the paper was released March 1st, 2021, this must be removed. Also, the header on each page which should alternate between the author's name and the title of the paper are incorrect. These need to be corrected.
- The introduction does not seem completely connected to the rest of the paper. The goal of the paper is to use results from the AIP survey and use different tests to determine the most influential factors that lead black astronomy students away from the major. The objectives set at the end of the introduction are not the objectives completed in the rest of the project. The introduction needs to be re-worked to better encapsulate the goals of the project and give a better background. There should be more background given on the literature and previous studies.
- In section 3.3, the 7 Classical Assumptions of Ordinary Least Squares and the three tests need to be explained more. The reader does not know what these tests do or how they

work. The author also needs to explain how they used these tests, their methods need to be clearly explained in the paper.

- There needs to be an explanation for how this study differs from the AIP survey study. It seems that this project utilizes different tests than the AIP study, but what makes these tests different from the ones employed by AIP? It needs to be clear to the reader how this study is different from past studies.
- Overall, the project is not finished. The tests need to be finished and the most influential factor (or factors) need to be decided before the paper can be accepted. Once these factors are decided, they should be commented on. How can astronomy departments adjust to keep black astronomy students in the major given that certain factors are extremely influential in their decision to leave?

Evaluation of Criteria:

Is the length appropriate?

- The paper is very short. As discussed before, there needs to be more in section 3.3 to explain the tests used and how they were carried out. The discussion section is also too short, but this is mainly due to the fact that the study is not finished. Once the author can decide which factors are most influential, these sections will contain much more

Are the title and abstract sufficiently informative?

- The title is good. Once the most influential factors are decided from the tests performed, they should be listed in the abstract.

Is the contribution to science significant?

- Yes, however, this paper is important not due to the scientific merit but due to the need to highlight racial disparities in astronomy. Studies like this are desperately needed to help alleviate the under-representation of minority racial groups in astronomy.

Is the level of English adequate?

- Yes

Is the literature properly cited?

- There is a lack of cited literature in the paper. All the surveys and data tables used by the author are properly cited but there is not much mentioned on previous studies. In the introduction, there needs to a better description of previous studies and what others have found about the radial diversity issue in astronomy.

Are the results clearly and accurately presented?

- Unclear. The study is not completed and therefore it is hard to comment about how the results are presented when there are no results yet. In the discussion and conclusion, there is an outline presented and it is clear how the results will be presented in these sections. A table would probably be beneficial to display the results of the tests applied to the AIP study.

Is the topic appropriate for this journal?

- Yes

Data Management Plan?

- As stated before, it is hard to comment on how the results will be presented when the results are not determined yet. See above for comments related to this. The mock data is derived from the AIP survey, which is displayed in the paper, so the source of the data points is clear. If AIP sends the individual responses to the author and they allow the author to publish the individual responses then they can be appended to an online table with the online version of the paper.

Additional Comments:

This study is extremely interesting and eye opening. I would like to thank the author for all their hard work. A study like this is direly needed to highlight diversity issues in astronomy. This paper has a lot of potential to help undergraduate astronomy programs better assist minorities in their departments.

Note to the Editor – Kevin

To the Editor-

While I stand by my review of this paper, I would request that the editor maintain my anonymity to the author. I found truly significant issues with this paper. While it is my personal opinion that this paper should likely be rejected from the Journal, the research contained is important and critical enough to the field of astrophysics that I would actually recommend that the author make major modifications to their paper but still ultimately be accepted. Major modifications would include discussion of the methodology used to conduct analysis, inclusion of data (even mock data) to present actual results, and a discussion of the factors which are being analyzed. I am of the opinion that the framework for this research is laid out and evident, but the actual results and implications are not at all existent. By working with the author to complete this research and the proposed paper, it would prove greatly beneficial to both the Journal and the field of study as a whole.

Best regards,

Danielle Mortensen

Kevin Review

Summary:

The author conducts research involving the racial disparity as is evident between black and white persons in the field of astrophysics. By utilizing means and standard deviations evident from the American Institute of Physics data set, the author creates a mock set of data in lieu of the inaccessible real, raw data. The author ensures that the survey data was impartial by using the 7 Classical Assumptions of Ordinary Least Squares. From this mock data, they are then able to conduct a statistical analysis using three separate tests- the Breusch-Pagan test, the Breusch-Godfrey test, and the RESET test. Between these three tests, it will become evident which of the factors which cause minority undergraduate astronomy students to drop the field of study is the most prominent. By discovering this primary factor, the author will suggest a course of action to assist in the mending of this racial disparity in astronomy.

Recommendation:

I would recommend that this paper be **accepted with major modifications**.

Justification:

- *Major Points:*
    - The three major tests used on the potential data (Breusch-Pagan, Breusch-Godfrey, and RESET) are not at all explained in depth.
        - These tests are the foundation of this research and should likely be given more consideration than a single sentence each.
        - An explanation of their inner workings would fill the paper out more and give the reader an idea of the methodology used to consider the data in question.
    - Lack of data.
        - Despite a clear methodology for the research presented, the lack of data (even mock data) presents the issue that there are no results. Even with mock data, there can be clear indications that certain issues were more prevalent in students' decisions about continuing studies of astronomy.
    - Lack of discussion on the actual factors.
        - A section that goes through all of the factors listed in the AIP survey would be beneficial. A discussion of the findings of the AIP survey would have also been helpful. Despite their lack of statistical analysis and interpretation, it is important to summarize their findings in prelude to the author's own.
- *Minor Points:*
    - "Schwarz et al." listed at the top of each page instead of the author's name.
    - Introduction: "…and approximately 1% identified as Black or Latinx."
        - Although it is important that we acknowledge the plight of Latinx people in the field of astrophysics, perhaps since the focus of the study has turned to

the disparity between white and black, the mention of specific Latinx data makes the introduction convoluted with unnecessary data.

- Section 2.2: "A Likert scale was utilized for the participants to record…"
  - Perhaps beneficial for the author to explain the meaning of a Likert scale.
- Section 2.3: "…as a checklist that the survey data must satisfy so as to yield the best possible estimates."
  - The author does not explain this "Classical Assumptions of Ordinary Least Squares" test. A list of these questions and their results may be beneficial.

Evaluation:

- *Is the paper length appropriate?*
  - The paper could use significant improvement in terms of explanation, discussion, and conclusion. The introduction is appropriate in length and goes over previous results and context, however, each of the other sections could use some additional thought and ultimately lengthen the paper.
- *Are the title and abstract sufficiently informative?*
  - The title is a very catchy summation of the material presented in this research and clearly states the author's intentions. I might suggest changing the subtitle to "An Analysis of Racial Progress Within the Field of Astronomy" but this is to the author's taste!
  - The abstract is a complete summation of the material presented in the paper, however incomplete the research was.
- *Is the contribution to science significant?*
  - Yes! The results from this research will be extremely beneficial to the field of astrophysics and have significant impact on its future.
- *Is the level of English adequate?*
  - Yes. Easy to read and understand.
- *Is the work properly grounded in literature?*
  - Yes. It seems that while the author may have found difficulty in finding a wide range of data and literature, it is clear that they were thorough in investigating what little there was available on the subject.
- *Are the results clearly and accurately presented?*
  - There are no results in this paper at the moment. It is assumed that once the results are managed that the author will clearly present their findings.
- *Is the topic appropriate for the Journal?*
  - Yes. The author's research is a clear fit for this Journal being on the topic of racial disparities in astrophysics.
- *Is the data management plan good?*
  - The author clearly lists the sources of their data, but they do not go into detail about their resources for statistical analysis, therefore it is unknown whether or not the research could be repeated.

Final Comments:

The framework for this paper is clearly thought out, and it would seem that everything will fall together once the data is managed. I very much appreciate the author's means of giving meaning and focus on the data as not just numbers but people. It makes the research all the more important and allows the focus to shift to a means of fixing this racial disparity rather than just analyzing numbers. I hope these comments are accepted as constructive criticisms and the author finds them helpful. My best wishes in their success!

Summary:

This paper describes an analysis method of determining the factors that have the greatest influence over the disproportionality of diversity in undergraduate astronomy. The paper describes how the demographics of students at every level display disparity among the races. The data to be used in this study comes from the AIP TEAM-UP 2020 report. The author states that response from AIP regarding the full data rather than the summary of the data is pending so they construct a mock sample with the same average parameters as listed in the report. The data will be processed using linear regression models to determine correlation for each factor listed in the report. Additional statistical tests will be run on the data to fully determine the most accurate correlation values. At this stage, the official data has not been received and the mock results have not been described.

Recommendation:

Accept with major revision

Points of Consideration:

Major:

Many values in the introduction are not cited

The introduction spends time talking about Latinx but the project later focuses on Black only

Data has not been acquired

Results not mentioned for both real world data as well as mock data

At this stage there is no conclusion and the paper has no results

Minor:

Figure 1 is small and hard to read

Figure 5 is blurry

§2.1 an explanation of why the factors need to be introduced with equal importance. Could they not be unbalanced in their nature?

§2.2 author mentions a Likert scale was utilized but no explanation of what a Likert scale is is provided

The Breusch-Godfrey and RESET tests are mentioned in §2.3 but never referred to earlier as being used

The BREUSCH and Ramsey tests are stated to be used but never acknowledged

There might be more than one main factor to take into account for the conclusion

Paper would benefit from an additional proofread

Evaluation:

Length:

The paper is incomplete. Upon finishing the paper will be longer and of more proper length

Title and Abstract Sufficiency:

The abstract does not contain any results of the project

Contribution to Science:

The project provides a much needed look into the racial disparity in undergraduate astronomy programs.

Level of English:

Paper is easy to read, and language used is understandable

Literary Citations:

Values in the introduction are often uncited or citations are placed well after the mark without acknowledging the fact

Clarity and Accuracy of Presentation:

The paper has no results to present at this stage

Topic Appropriate for Journal:

The topic of this paper is appropriate for this Journal

Data Management Plan:

No comment is made about the availability of the data and software used in the analysis of this project

Additional Comments:

In its current state, this paper hold no results. If real world data cannot be acquired, the analysis may still be tested on the mock data to assess the viability of the analytical methods. The topic presented in this paper is of high importance and relevance and should certainly be seen to completion of the highest quality. When the project is completed it should certainly be resubmitted. I compliment the author on their hard work and dedication to such a pressing topic.

Title: Are We Doing Enough: An Analysis of Racial Progress Within Astronomy
Author: Kevin B. Moposita

Summary: The author provides an overview of the major issues in astronomy related to racial diversity. He shares various statistics that demonstrates how astronomy departments in the United States fail to reflect the general population's racial percentage. At some point in an astronomer's career, there exists a place where the large racial gap begins because the gap is not as large for undergraduates. The author works to investigate where that place is along an astronomer's path to tenure along with the effectivity of programs working to combat racial inequalities. However, the effectivity of these programs must be analyzed because the programs do not resolve the issues presented by the author. The author analyzes the racial disparity in the path to tenure by identifying factors that might contribute to the gap. He first attempted to do so by gathering data from the *American Institute of Physics* surveying 187 undergraduate students and applying statistical tests to look for correlations. However, the author is waiting for a response from AIP to obtain the original student responses. He instead uses the means and standard deviates of the survey questions to create mock student responses. He plans to run various statistical tests on the data to determine the presence of correlation in the factors from the survey.

Recommendation: Accept after major revisions.

Justification of Recommendation:

Major points:

- The data analysis is incomplete. The results from the proposed data analysis must be completed and discussed in order for the paper to be considered for publication.
- The paper lacks a discussion of the results because of the incomplete data analysis section.
- Although the paper will be easier to understand once the author completes the data analysis, more explanation on the statistical techniques could be given even without results. The exact plan of action needs more explanation.
- Some terms need more explanation to avoid confusion for the reader. These terms include: the Likert scale, the 7 Classical Assumptions of Ordinary Least Squares, the BREUSCH test, the Breusch & Pagan test, and the Ramsey test. Again, some of these might become

clearer once the data analysis is complete as long as the author provides a detailed explanation of how he applied the tests.

Minor points:

- The first page states that the paper was released on March 1st, 2021. This needs to be removed until the paper is released.
- The tables should be enlarged. It is difficult to read some of the numbers, especially in the first table from the *2007 Nelson Diversity Survey.*

Evaluation:

1. Is the length appropriate?
    a. Yes – the length is appropriate for what the author has written already, but the data processing and discussion sections should be made longer once he completes his proposed work.
2. Are the title and abstract sufficiently informative?
    a. The title poses an intriguing question. The abstract could be expanded upon to give the reader a better understanding of the data analysis involved in this study.
3. Is the contribution to science significant?
    a. Yes – the project addresses an area that in need of change in the field. This provides social merit that will be backed up by a statistical analysis once the author finalizes the data.
4. Is the level of English adequate?
    a. Yes – the level of English is adequate.
5. Is the literature properly cited?
    a. No – the author should include more citations throughout the introduction to support the statistics he presents. The author should also cite previous literature pertaining to racial diversity in astronomy to show what has already been done.
6. Are the results clearly and accurately presently?
    a. No – the results are not presented. The study is incomplete. Once the author finishes the data analysis, he must clearly show his results.
7. Is the topic appropriate for this journal?

a. Yes – the topic is appropriate for this journal.

8. Data management plan?
    a. The data management plan is unclear because the author has not yet obtained results. He does not state what his plan is for releasing the results to the public.

Additional Comments: Kudos to the author for investigating a question in need of attention in the field of astronomy. Thank you to the author for his contribution to any changes that this project may inspire.

Summary

The purpose of this project is to determine what most influences a student to stay in the astronomy major and how it relates to diversity gaps within the field. The author first talks about how undergrad astronomy departments are lacking diversity and do not reflect the level of diversity in the country by comparing US census data to faculty diversity data. He goes on to claim that graduate school is the “turn-off” level when the underrepresented groups stop pursuing an advanced degree. He states his objectives as determining where the large racial gap occurs along an astronomer’s path to tenure and realizing the effectiveness of diversity programs. The author then focuses on a report from the American Institute of Physics (API) that compares undergraduate Black and White students studying physics and astronomy. He uses this report to try to determine the statistical significance of the factors listed in the API report in order to have the results about where the racial gap occurs on the path to tenure be as accurate as possible. He is currently awaiting the results from this test.

Recommendation

Accept with major revision.

Justification of Recommendation

Major Points:

1. In the abstract, by saying that the biggest factor which causes people to drop is related to the racial gap, the author is assuming right off the bat that race has to do with the biggest factor which generally causes a student to stay or drop the major. This can honestly be an entire other research project in itself. It is very important to first determine the significance of race in how often people drop rather than just stating that they are not mutually exclusive.
2. There is barely any literature cited in this entire paper. There are dozens of unsupported claims the author makes which have no basis at all since they are not cited. And the few citations that the author does have are not in the correct citation format.
3. The introduction is the most informative part of the paper. Even though the results did not yet come in, it seems like the only real contributions in the paper are described in the introduction.
4. One very large thing that was not considered in this process was the percent of people who actually reported their diversity information. In the 2007 Diversity Survey for example, he says it takes into account every faculty member. It is tough to believe this if I do not know a quantitative percentage, with a source, of people that reported their own data. Also, how many people are in these top 50 astronomy schools? If I do not have reason to believe that they are representative of the entire population of astronomy schools then the argument somewhat becomes invalid and insignificant.
5. There is a big issue with the 2007 Nelson Diversity Survey. The author uses this study and assumes that diversity has not changed over the last 14 years, which is incredibly difficult to believe. Unless he can find a similar survey done within the last 5 years or so, I think that this section of the paper should be taken out because it is so outdated and likely not at all representative of the current day diversity statistics.

6. The focus of the study is very inconsistent in a variety of ways. First of all, if the author did not end up focusing on Latinx data, why mention it at all in the introduction? I was prepared to see an analysis based on Black and Latinx students, and then he mentions that the study will no longer focus on Latinx students, which is very misleading. Also, the point of the paper is to look at students in astronomy, but then the focus seems to shift to physics. Figures 3 and 4 don't even mention astronomy at all, and physics and astronomy departments are likely quite different. Finally, the paper is inconsistent because the author does not seem to really understand his own objectives. It seemed like the purpose of this paper ended up being to use statistical tests to determine which factor is the most important in explaining why people drop their degrees in astronomy, even though the objectives were stated as determining where the large racial gap occurs on a path to tenure and looking at the effectiveness of the current diversity programs in place. I am generally just very confused on what the point of this project was actually supposed to be. Even though there are more results that need to come in, it seems like this project was a little bit scattered and that the author was trying to figure out what he was doing as he went along, but he did not leave enough time to actually figure it out.

Minor Points:

1. Many sentences are worded in ways that make the ideas they want to convey very unclear. Some sentences have to be more concise and it often took a long time for me to decipher what the main point was.
2. What is the citation on the title that says released on March 1?
3. I think the title is too broad. It needs to be more representative of what he is actually analyzing, the race gap within undergraduate and graduate astronomy departments.
4. There are a few things that are quite vague. For example, in the abstract he says "series of questions." What do the questions entail? What are they asking? What aspects are being compared?
5. There are some formatting things that should be fixed, like it says Schwartz et al at the top of page 2, and in Figure 1, there is already a caption saying "Table 4."
6. At the end of the introduction, the author talks about social programs in departments to help combat the race gap. The social programs should be stated here so that the reader has a good idea of what he is talking about.
7. One of the objectives mentions tenure, however, that is the only time tenure is brought up in the entire paper. I am not sure if one of the objectives was actually supposed to be tenure or if it was a mistake to include that.
8. Figure 5 seems to be very important, however, I do not really understand what it is saying. What are the units of the mean and standard deviation (what is being measured)? What does each category in the Table actually mean? Also, the Table says that 167 undergraduate students were surveyed. How significant is that compared to the total number of physics and astronomy students in the country? How do I trust that this pool of students is big enough to represent everybody and every department?
9. Some of the tests should be defined, like the Likert Scale.
10. At the end of the data retrieval section, the author talks about some issues that he had in the process of completing the research. I do not think that these issues are necessary to talk about. Everybody has issues and runs into roadblocks with their projects, but they

do not need to be stated in the paper since they are not necessary for the understanding of the results.

11. At the end of the data retrieval section, the author says that Table 1 talks about the parameters used to create mock data points, but there is no Table 1 and no description of this process at all.

Evaluation Questions

1. Paper length
    a. The paper is very short. Even when the results come in, it is missing a lot of detail and clarification of things like goals, figures, purpose, etc.
2. Title & abstract
    a. The abstract does not reflect the results yet because there are no results. The title is too broad for the project, it should be more along the lines of “Are We Doing Enough: An Analysis of the Racial Progress within Undergraduate and Graduate Astronomy Departments.”
3. Contribution to science
    a. I think the project has some potential to contribute to science. It is important to pinpoint where the racial gap begins and what some of the main struggles are within this field, but the project is far from doing that. If it extends the results of the statistical significance test and applies them to this concept so that it has a legitimate broader impact, then it will turn into something quite important. But as of right now, the project is essentially just analyzing whether or not the data on a chart is statistically significant enough to be useful, and this does not contribute that much to science at all.
4. Level of English
    a. The level of English is not very adequate. I have a lot of trouble understanding what the author tries to say at times and it is often difficult to determine the main points of each sentence and paragraph.
5. Literature
    a. There was rarely any literature cited. Most claims were unsupported or were likely taken from other sources not cited.
6. Presentation of results
    a. There were no results that were presented.
7. Topic appropriateness
    a. The topic is appropriate for the journal.

Data Management

In the current state with no results, it is not possible for others to reproduce them.

Additional Comments

I think this project is something that is very important, especially in the modern day. Studying diversity within the process of receiving astronomy degrees is essential so that there can be programs put in place to correct any inherent bias or present racism.