Application for the Truly Innovative Teaching Award

Section 1: Contact Information
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I will be able to attend the gala on May 11th, 2023.

Section 2: Innovation and Application
The innovation was the combination of **non-hierarchical classroom**, which I implemented in connection with **team-based learning**, **flipped classroom**, and **authentic assignments**. The goal was to improve the performance of Hispanic students and close the achievement gap.

Context. I taught ASTR305V *Life in the Universe*, a Viewing a Wider World course, in the Fall of 2021. The course was open to 80 students, and delivered presentially. About half of the class was students from under-represented minorities (URMs), a demographics that in general attains lower grades and have higher attrition rates, part of the phenomenon known as the *Achievement Gap* -- the closing of which is one of the goals of LEADS 2025 at NMSU.

The gap is a result of systemic disadvantages, which add stereotype threats against the success of URM students, as well as peripheral life stresses and anxieties as opposed to those experienced by their non-URM peers. The negative effect of the added stress on performance is understood in the framework of the Yerkes-Dodson law, whereby the relationship between stress/stimulus, task difficulty, and performance, is nonlinear. For each task, there is an ideal level of stimulus that leads to optimal performance. My working hypothesis teaching ASTR305V was that Hispanic students tend to fall in the high-stress side of the stress-performance curve. For them, performance would be increased by *removing* stress.

To test the hypothesis, and to understand the demographics of the classroom, I gave a voluntary poll where students self-reported gender, race/ethnicity, and answered a few other questions. An IRB was procured and approved to conduct the poll. The result of the poll was that it is more common for Hispanic students than non-Hispanic whites to work while studying, and the average working Hispanic student works 10 hours a week more than the average non-Hispanic white working student. Hispanic students are more likely to be in a difficult housing situation, more likely to undergo food insecurity, more likely having troubles to pay for transportation, housing, and utilities, and more likely to have dependents and family obligations. In short, Latinos and Latinas have a myriad of hardships/responsibilities that the non-Hispanic whites by and large do not share. Considering these results, removing stress was the key to improving their performance.

Non-hierarchical classroom
> "No one teaches another, nor is anyone self-taught. People teach each other, mediated by the world." – Paulo Freire (1970), Pedagogy of the Oppressed.

A non-hierarchical classroom (NHC) draws from a Freirian approach to pedagogy where all members are equal and working towards shared objectives, including the professor. NHC starts from the assertive that every student has the capacity to succeed if given the opportunity to realize their full potential. Its theoretical framework draws from concepts of pedagogy, psychology,

sociology, and cultural studies, bringing to the classroom elements of active learning, collaborative learning, dynamic assessment, inclusivity, and empowerment. This approach, which includes transparency, unpolicing, community building, low stakes evaluations, and authentic assignments, dovetails with my stated goals of reducing stress in the URM students.

NHC works best in connection with **team-based learning** (TBL), which, in turns, is excellently applicable to a VWW course, with students from many majors. The teams would be diverse, combining the skills of students from widely different backgrounds, maximizing peer-learning. In addition to TBL, I also used the **"flipped" classroom** format, where content delivery is removed from the classroom meeting, which is then used for active learning.

Town halls. I started the course by doing a "town hall" with the students, where we talked about the climate of the class. I introduced the notion that we were a **collective**: the professor is not omniscient and cannot formulate all the answers. At that town hall, I surrendered authority by disclosing that was the first time I was teaching that class, and that I would be collecting abundant feedback and adjust the course according to their concerns. I asked them to write on a yellow post-it one thing they were excited about the class, and on an orange post-it, one thing they were concerned about the class. They would stick the post-its on the board, and return to retrieve a random yellow and a random orange post-it. Then we talked about the concerns. This way, students see that they are not alone in their fears. Indeed, most of the concerns of the class initially focused around the grades, and working in groups. Town halls would be repeated every month. I had frequent meetings with the TAs, also equal parts of the collective, to decide on authentic assignments. We focused on essays instead of midterms, and a poster-based symposium instead of a traditional final exam (Fig 1). The idea was presented to the students, who voted on them.

Fig 1. The Astronomy department tweets about my poster-final. The poster session was held at the Trader's Plaza, and the department was invited to see the students' work and ask questions, as in a real conference.

Diverse teams. Following the first town hall, the students were divided in teams of 4 or 5 students. Each team was as diverse as we could make them, with axes of diversity being *gender, major,* and *ethnicity*. The exception was for African-American students, since there were only two of them, it made sense to have them together in the same group, so they could support each other. Some groups had female majority, but no group had male majority. Likewise, some groups had Hispanic majority, but no group had a majority of non-Hispanic whites. On the second town hall, I asked the students what they thought was working, in a yellow post-it, and what was not working, on an orange post-it. Whereas on the first town hall most students said that their concern was working in groups, in this second town hall *the majority of the students wrote on the yellow post-it that the team-based approach was working.* A very heartening outcome.

Section 3: Relationship with the Teaching Academy

A non-hierarchical classroom necessitates putting together many individual concepts: active learning, team-based learning, dynamic assessment, problem-based learning, situational interest, engagement, group investigation, etc. It was the teaching academy that introduced me to many of these individual concepts. I attended a flipped classroom workshop, *How flipped classes can transition seamlessly to remote instruction*, external, at the recommendation of the academy. Relevance and engagement were taught in the workshop *Teaching Gen Z in a Pandemic: Data-Based Strategies* and *Small Teaching Online: Strategies to Help Students Engage and Learn*. I learned about making the class more inclusive in the workshop *Fostering an Inclusive Class Environment Where all Students can Thrive*. I learned how to foster a learning community from the teaching academy workshop *Teaching STEM in the time of covid-19*. Authentic assignments, as I used for the poster symposium, was learned from *Authentic Assessment in STEM*. And my very first introduction to active learning was from the workshop *Active learning: What is it, how do you implement it, and why would you want to?* I combined these ideas into the non-hierarchical classroom implemented.

Section 4: Evidence of Effectiveness on Student Learning

At the final week I gave a quiz, which consisted of all the canvas quiz questions given in the course, for extra credit. This exit quiz was given closed book and closed notes, impromptu – the students only knew that there would be an extra credit activity. The idea was to measure retention, and I suspected that in this high-stress activity, the achievement gap would manifest itself. Indeed, it is clearly seen (Fig 2a). Non-Hispanic white females scored a median of 85 +/- 14, non-Hispanic white males 83 +/- 13, Hispanic Males 76 +/- 17, and Hispanic Females 64 +/- 9. The 21% difference between non-Hispanic white females and Hispanic females is beyond the error margin.

I report also the grades from the 1st essay (Fig 2b), as example of grades for a low-stress written-based evaluation, and representative of the final grades in the course. The median grades show that **the achievement gap between non-Hispanic white women and Hispanic women was closed**, a relevant achievement for a Hispanic-Serving Institution. Here the grades were: non-Hispanic white females 81 +/- 13, non-Hispanic white Males 84 +/- 15, Hispanic Males 70 +/- 17, Hispanic Females 80 +/- 18. These graphs were shown to the students, anonymously.

Below I show selected quotes from my end-of-semester anonymous evaluations, that illustrate student perception of the innovative method.

The graphs at the end which showed great progress towards equal scores across gender and ethnicity identity was a really great thing to see. It was evident that changes were made during the semester to make this possible. I think this is something that should be done much more and the progress was genuinely really impressive. I hope to see more of this at NMSU.
I really enjoyed this class and the way that you 100% cared about the opinions of your students. I think all teachers should try to be like you
This class was definitely one of my favorites since it was interesting and not stressful. I also really appreciate how you truly took all of our opinions to heart and made changes based on those, thank you for that.

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| Professor Wladimir [Lyra] way of teaching his class is made with the consideration and feedback of us students. Him and his TA's were very helpful and caring they made the course fun. |
| When I started falling behind, Wlad reached out to see if I needed help |
| I always struggled working on a team because other peers do not put the effort I did I have had bad experiences since I came to college, that I had given up on team classes. That was one of my fears with this course but the way the professor guided this course, it ended being one of my favorite courses. |
| I was very skeptical of the team based activities, however, I learned a lot during the class and my group were all worked well together. I love learning about space, and I feel like learned a lot in this class. |
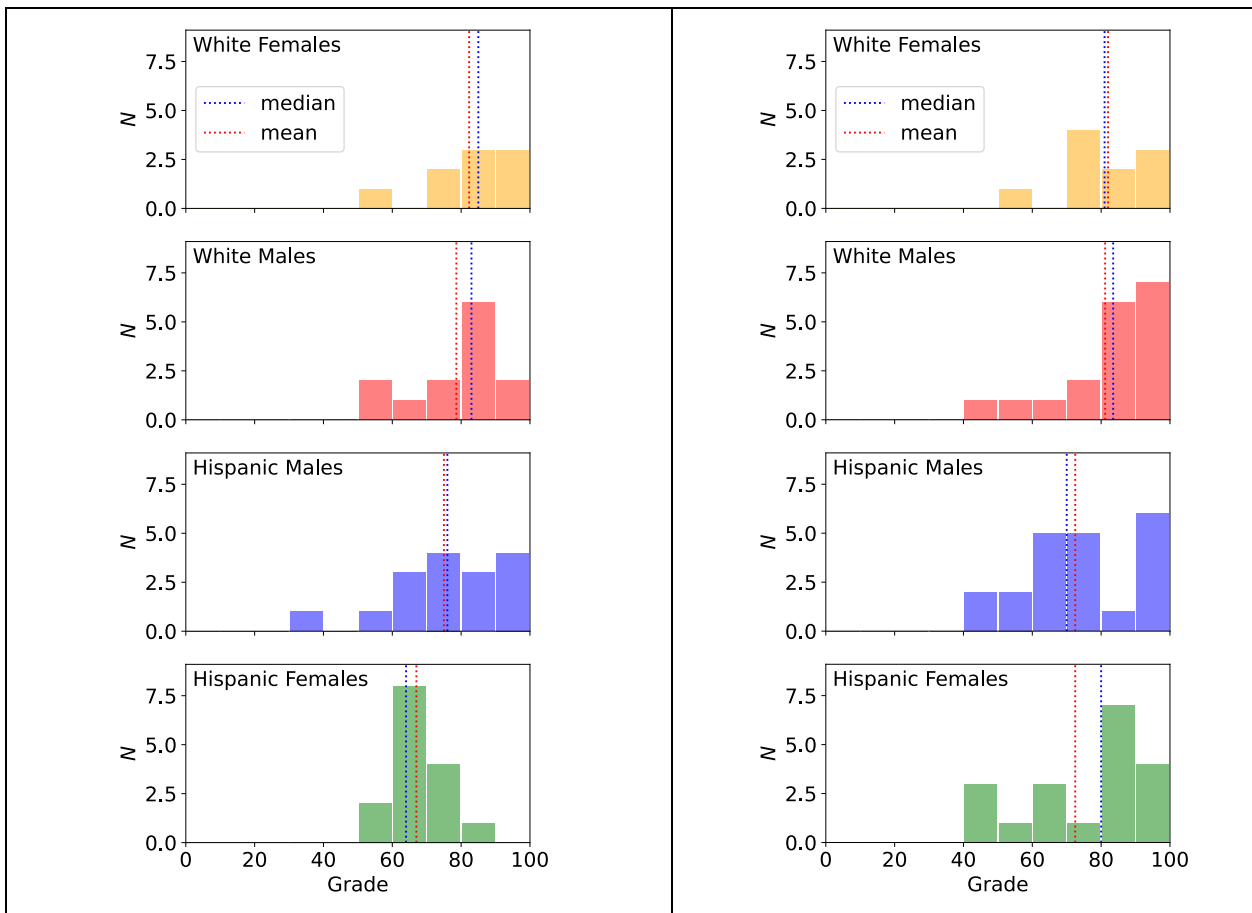
Fig 2a. Grades for closed-notes exit quiz, disaggregated by gender and ethnicity, illustrating the achievement gap. A 21% difference appears between Hispanic and white females.

Fig 2b. Grade for the 1st essay disaggregated by gender and ethnicity. The achievememnt gap for latinas is closed.

Based on this data, I conclude that Non-Hierarchical Classroom is a promising tool for closing the achievement gap, especially for a Hispanic Serving Institution such as ours. I am grateful to NMSU Teaching Academy for introducing me to the individual elements that allowed me to develop this innovative technique.