Revitalizing Climate Education at Phillips Academy: A Statistics Report

By Katherine Wang, Shala Lin, and Irene Kwon

Overseen by Mr. El Alam

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Executive Summary

Our project's overarching mission is to help guide the administration, faculty, and student body of Phillips Academy in their stance and action on climate change and sustainability by assessing the school's current involvement and potential improvements. Our focusing questions were: Is education on Climate Change a sensible addition to Andover's structured curriculum? If so, which disciplines and ways provide the most effective space for learning opportunities? In what ways can dialogue surrounding climate change become a prevalent campus-wide issue? Through our sample, we strove to gain greater insight on the strengths and areas needing growth of Andover as climate change becomes an increasingly prevalent and overdue issue. As an influential educational institution, Andover's stance and involvement is a beacon and example to others; using our statistics class knowledge, we hope to serve our community and global environment by assessing our local community.

The goal of this project was to gain a deeper understanding of the Phillips Academy student community's views on climate and sustainability education. In order to gather a sample representative of the entire student body, we assessed a simple random sample of the student population by creating a digital survey with a comprehensive list of questions. We also aimed to maintain a proportional amount of students per each grade level within our sample population, as we believed there may be a correlation between grade level versus student response on certain questions due to exposure to the topic. Our questionnaire encompassed a wide range of topics related to climate education and sustainability at Andover to fulfill our overarching goals.

Though nearly 60% of respondents agreed that climate change is at least talked about a fair amount on campus with a rating of at least 3 of 5, we found that nevertheless students feel as if they should be more exposed to climate change issues in classes of all subjects than they are now. Most notably, they also agreed that climate change issues should be more addressed in EBI than they are now, but felt like they should address climate change less in dorms, friend groups, advising, and club environments (aside from relevant political and/or environmental clus). From our additional research, however, we found that environmental literacy is crucial to address climate change concerns effectively. Our finding that 60% of respondents would appreciate if climate-related issues were more incorporated into Andover life supports this.

Overall, our findings demonstrated both the effectiveness so far of Andover's climate education as well as many areas for growth. Climate literacy at Andover should be implemented on a more systematic level throughout classes, EBI, and clubs. With this, we hope our involvement with climate literacy as an institution will inspire others to do the same to achieve awareness and action across a greater scale.

Objectives and Purpose

Climate change and justice is an increasingly relevant and alarming topic. Andover is not immune, and as an institution it has the potential to create a positive influence by preventing climate change as much as contributing to the problem. This influence lives through many sources, from its investments to its curriculum and students. For this project, we wanted to focus on climate education, as the environmental literacy Andover implements will thrive in its students. The main issue with our community, and the greater global lack of awareness about climate change, is apathy. We want to address how we can effectively implement education tactics to prevent apathy to learn more about climate change as well as the actions we can take to prevent it.

To do so, we took a stratified random sample across grade levels and the postgraduate class, as we hypothesized that grade level would correlate with prior exposure and involvement with climate awareness. The questions themselves covered an in depth reflection of the role of climate change in classes and student life at Andover. We allowed for students to give their reflection of where Andover stands with its climate change curriculum now as well as their input on areas for growth.

After the survey period, we were left with 48 nonresponses from 115 total chosen students. This is a decent yield, but we must still take nonresponse into consideration upon analyzing our data. The amount of nonresponse we received is only an indicator of climate change apathy and highlights another area for growth in Andover's climate literacy curriculum.

Keys to Success

As climate education becomes integrated into Phillips Academy's core curriculum across subjects and departments, it is essential that we take the student body's views into consideration. We believe that our work can act as a guiding baseline as the faculty, administration, and student leaders consider how to best incorporate climate education into our curriculum in the manner and extent that best fits the student body's needs. We hope that our data and subsequent analysis will be helpful in the way that it provides a direct insight into student perspectives.

Though the survey and analysis were developed by students Katherine Wang, Irene Kwon, and Shala Lin, we were guided by our instructor Mr. El Alam. We also were in discussion with student leaders Claire Brady '20 and Eli Newell '20 as we took their visions for climate education on Andover's campus into consideration when creating our survey questions.

The most significant challenge we faced was the nonresponse from our survey recipients, which was 48 respondents. However, the total survey responses that we received were just under 10% of Andovder's entire study population, which is the ideal sample size, had it not been for the nonresponses. This observational study was also not double-blind. We selected the survey recipients directly, and the sample population received emails from us, which meant both parties were aware of the identities of the other. However, the survey recipients were not aware of the other members of the same population. Though this most likely did not have a significant impact on the results, considering the survey questions were not self-incriminating or provocative in nature, it is a component to keep in mind when analyzing the project results.

In order for this project to set a precedent for future initiatives that take the student body's views into consideration when developing curriculums, we would recommend that similar samples be taken on a regular basis. By altering the questions slightly, the administration and faculty can receive up-to-date information about the student demographic's views on changes to our education and curriculum.

Management Team

Our team was composed of Katherine Wang, Irene Kwon, and Shala Lin. All three members worked to develop the questions that best fit the needs of the focusing question. Katherine Wang wrote the executive summary, objectives and purpose, and chi-square analysis, Irene Kwon wrote the keys to success and management team and conducted the chi-square test, and Shala Lin worked to create the conclusion that best summarized our observational study. Shala contributed most significantly to data analysis, with the additional help of the other two members. In terms of contact with the study participants, Irene was the primary liaison between the team and the student body. The team also received guidance from Mr. El Alam throughout the process.

Research

The first step of our project was to have a conversation with the coheads of Climate Cafe, Claire Brady '20 and Eli Newell '20, to get their input and visions for climate education on Andover's campus and ways to bring more awareness on campus. We also used outside research to direct the focus of our project to find what would be most useful for the scope of our campus. With the information we gathered from speaking with Claire and Eli as well as the additional research. we chose to direct the focus of our project on understanding student awareness and the effectiveness of current climate education outreach at Andover, from Climate Cafe events to classroom discussions. From there, we also investigated areas in which climate education could be improved. The connection we have with the climate leaders on campus allows our data to be used in Andover's efforts to improve student participation, as well as get a better overall understanding of the Phillips Academy student community's views on climate and sustainability education beyond just our survey respondents. These sources supplement our analysis and data from our statistical study to inform our findings on Andover's current standing on climate change issues and the potential ways to continue improving our institutional actions.

Our Findings

How many Climate Cafe events have you attended?
67 responses

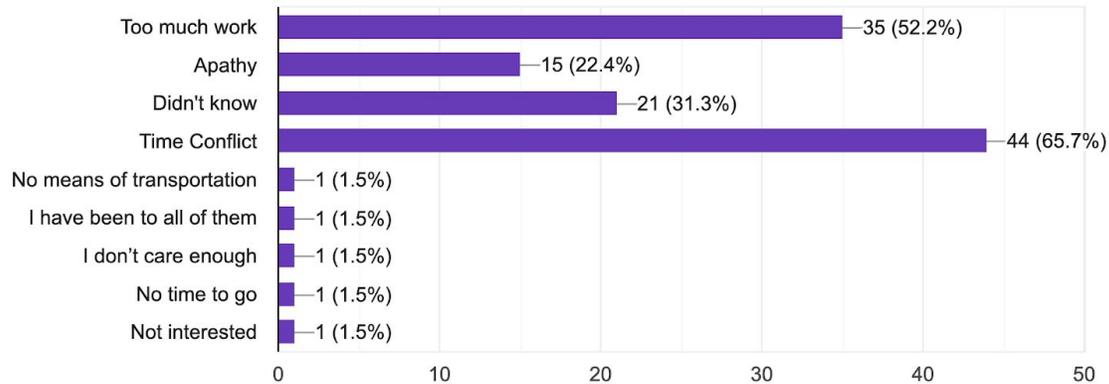Legend:
- 0
- 1-3
- 4-7
- 8+

34.3%
62.7%
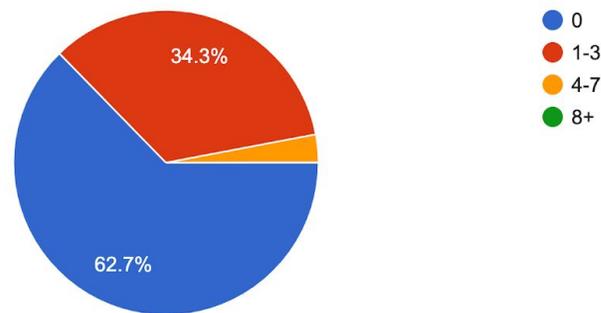
Graph #1: Pie chart of Climate Cafe attendance.
This pie chart presents raw data of current Climate Cafe attendance. As evidenced clearly, the majority of respondents have not attended a Climate Cafe event. In addition, of those

who have attended, most only attended 1-3 times, indicating a lack of consistent attendance. Through this, we can see a lack of participation in a consistent climate forum on campus, despite constant outreach efforts.

**What are your reasons for nonattendance? (select all that apply)**
67 responses

Reason	Value
Too much work	35 (52.2%)
Apathy	15 (22.4%)
Didn't know	21 (31.3%)
Time Conflict	44 (65.7%)
No means of transportation	1 (1.5%)
I have been to all of them	1 (1.5%)
I don't care enough	1 (1.5%)
No time to go	1 (1.5%)
Not interested	1 (1.5%)

Graph #2 : Primary reasons for Climate Cafe nonattendance.

This bar graph presents raw data of motives for Climate Cafe nonattendance. Multiple selections were allowed for the most fruitful grasp of the overall motivators of nonattendance. The main factors were time conflict and abundance of work. However, these responses could be biased due to judgement for apathy. Even so, the reasons listed above are useful for adapting future Climate Cafe events to boost student attendance. Another potentially interesting supplement to this would be to see online Climate Change attendance for recent events over Zoom. This would be useful in targeting the potential reasons for lack of attendance, such as time conflicts or location.

Classes in which students DO engage with climate change issues and Classes in which students believe they SHOULD engage more with climate change issues

■ Classes in which students DO engage with climate change issues
■ Classes in which students believe they SHOULD engage more with climate change issues
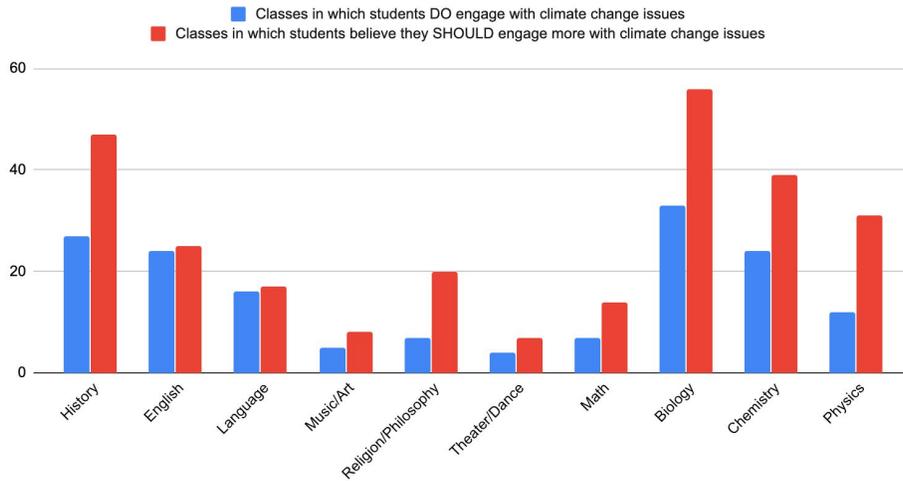
Graph #3: Students most strongly felt that they should engage with climate change issues more than they already do in history, religion/philosophy, and science classes.

From the graph above, we can conclude that students feel as if climate change issues should be talked about more in all classes overall, with most increases in history, religion/philosophy, and all science classes. When looking at where students currently do engage in conversations about climate change vs. where they believe they should, it is clear that the classes which already engage in these conversations are also the classes where most students voted they should. This shows that though Andover is taking the right step towards the direction of incorporating and implementing climate change issues into the preexisting curriculum, these departments should continue increasing exposure to climate issues.

Where students DO engage in climate change issues vs. Where students believe they SHOULD receive information regarding climate change

■ Where students DO engage in climate change issues
■ Where students believe they SHOULD engage in climate change issues
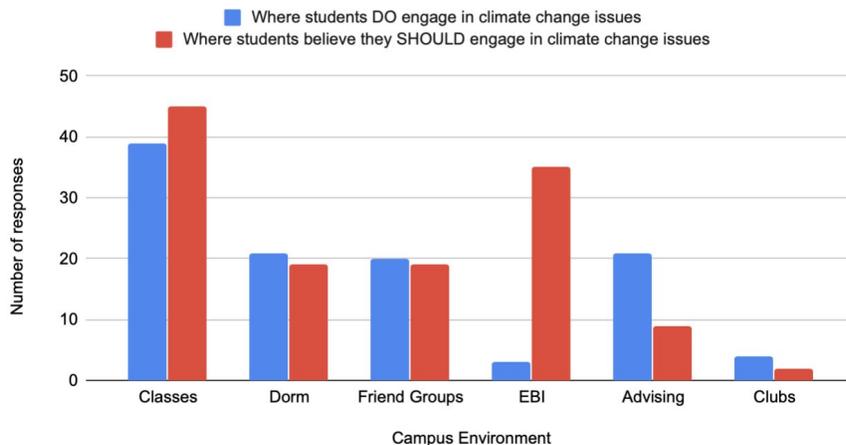
Graph #4: Students most strongly believe they should engage more with climate change issues in EBI than they already do.

The graph above shows that students feel as if climate change issues should be talked about more in classrooms, EBI, dorms, and friend groups. As of now, students primarily engage in conversations about climate change in their respective classes, dorms, friend groups, and advising groups. They felt significantly, however, that more could be done in the EBI curriculum. We would suggest Andover to focus on implementing more climate change related material and lesson plans in EBI. Andover should also continue to incorporate climate change issues in the classroom environment, though this displayed a less dramatic increase.

χ^2 Test for Independence Between Amount of Exposure and Effectiveness

How much does Andover expose you to climate-related issues (rows) versus how well does Andover expose you to climate-related issues (columns)?

H_0: There is no association between effectiveness and amount of exposure to climate-change issues at Andover.
H_a: There is an association between effectiveness and amount of exposure to climate-change issues at Andover.

This is a chi-squared test for association.

Conditions of χ^2 Test:
1) Randomness: The sample is a "good sample," taken via Simple Random Sampling.
2) Expected Counts: Not all expected counts exceed 5, so we must proceed with caution when performing the test.

Observed Values					
	Effectiveness of Exposure				
Amount of Exposure		5	4	3	2	1
	5	2	1	0	0	0
	4	1	13	7	1	0
	3	2	4	21	2	0
	2	0	0	2	5	0

	1	0	0	2	2	2

Expected Values					
Effectiveness of Exposure					
Amount of Exposure		5	4	3	2	1
	5	0.22388	0.80597	1.4328	0.44776	0.8955
	4	1.6418	5.9104	10.507	3.2836	0.65672
	3	2.1642	7.791	13.851	4.3284	0.86567
	2	0.52239	1.8806	3.3433	1.0448	0.20896
	1	0.44776	1.6119	2.8657	0.89552	0.1791

$\chi^2 = 76.2642$
$p = 7.7844 * 10^{-10}$
$df = 16$

Due to the small p-value below our significance level of alpha = 0.5, we have sufficient evidence to reject our null hypothesis. There appears to be an association between amount and effectiveness of climate education at Andover. From this finding, we can see that students found a general relation between the amount and effectiveness of climate education so that students had a similar experience with climate education at Andover in terms of their reception to the information. From observing the data, we can also see how overall, most students felt as if they received a satisfactory to good amount of and effectiveness of climate education. This presents a positive reflection of Andover's climate education right now, but given other factors such as lack of Climate Cafe attendance, more must be done to spur students to incorporate climate issues into their Andover experience. Additionally, more effective education must always be the goal to effectively tackle this increasingly prominent issue.

Conclusion (Summarized Findings)

We recommend that Andover continue to target its climate change and education messaging towards the whole population of the student body as we have found through our chi-squared test that there is an association between the amount and effectiveness of climate education at Andover. When asked how many Climate Cafe events each student has attended, the majority of respondents said that they have not attended a Climate Cafe event. There is a clear lack of participation in a consistent climate forum on campus, despite constant outreach efforts. As for the primary reasons for Climate Cafe nonattendance, our data showed that the main factors were time conflict and abundance of work. We would recommend that Andover continues to focus on making Climate Cafe as engaging and accessible to the students as possible. This could include making these events online via Zoom due to the current position we are placed in. Overall, the students most strongly felt that they should engage with climate change issues more than they already do in history, religion/philosophy, and science classes. When looking at where students currently do engage in conversations about climate change vs. where they believe they should, it is clear that the classes which already engage in these conversations are also the classes where most students voted they should. This signifies that Andover is doing a good job in taking the right step in terms of which classes they should be implementing climate change issues into the curriculum. In addition to this, students also believe that they should engage with more climate change issues in EBI. We recommend Andover to focus on incorporating more climate changed material and lessons in the EBI classes. Andover should also continue to incorporate climate change issues in the classroom environment, though this displayed a less dramatic increase. Due to our response percentage of 58.26%, we proceed with caution in our findings and recommendations to Andover, as non-response bias may have skewed our results.

Further Steps

When considering changes to academic curriculum, it is important to have a holistic approach that includes the perspective of the student body. This project was an important step in incorporating the views of the students themselves through an analysis-driven study. In order to

maximize the potential of our results, we recommend that this report is distributed to campus student leaders, school administrators, and faculty members who will be involved in changes to the curriculum regarding climate education. We also recommend that subsequent surveys be taken in a similar manner in order to build off the foundation set by this project. By continuing to monitor and take into account the student body perspective, the school can ensure that the new direction of climate education is viewed favorably by the student population.

Addendum: Survey Questions

How many Climate Cafe events have you attended?
>0
>1-3
>4-7
>8+

What was your reason for nonattendance? *(select all that apply)*
>Too much work
>Apathy
>Didn't know
>Time Conflict
>No means of transportation
>Other:

On a scale of 1-5, to what degree do you think climate change events talked about on campus? *(select all that apply)*

In what classes have you discussed or engaged with the idea of climate change?
>English
>Religion/Philosophy
>History/Social Sciences
>Biology
>Chemistry
>Physics
>Mathematics/Computer Science/Statistics
>Foreign Language
>Music/Art
>Theater/Dance

In what classes do you think it is the most appropriate to discuss or engage with climate change? *(select all that apply)*
>English
>Religion/Philosophy
>History/Social Sciences
>Biology
>Chemistry

Physics
Mathematics/Computer Science/Statistics
Foreign Language
Music/Art
Theater/Dance

On a scale of 1 to 5, how much exposure do you have to climate-related issues on a regular basis?

On a scale of 1 to 5, how much do you think Andover exposes you to climate-related issues?

On a scale of 1 to 5, how well do you think Andover exposes you to climate-related issues?

Would you enjoy/appreciate if climate-related issues were more incorporated into your classes/academic life?
Yes
No
Maybe

Where do you receive your information about climate-related issues? *(select all that apply)*
Classes
News
Climate Cafe/Climate Events
Social Media
Friends
Other:

In which campus environments do you engage in issues regarding climate change? *(select all that apply)*
Dorm
Classes
Friend Groups
Athletic Teams
EBI
Advising
Clubs
If you selected clubs in the previous question, please specify in which club.

Which campus environments should climate change and justice be more addressed?

Dorm
Classes
Friend Groups
Athletic Teams
EBI
Advising
Clubs (specify in the next question)

     If you selected clubs in the previous question, please specify in which club.

Citations:

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