**Implementing Accountability in the Flipped Classroom**

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**Introduction**

This study investigates 11th and 12th grade students in Advanced Placement Environmental Science (APES) classes, a combination of high achievers taking multiple AP courses and students from a population who traditionally have not taken an AP course. The school population is 48.4% White, while 49.7% are minorities, mostly Hispanic. The APES curriculum integrates concepts and skills across science and math. With such a wide range of content, the course is designed using a Flipped Classroom approach to teaching content: time in class is spent applying teaching content: time in class is spent applying content in order to conduct experiments, design projects, and further consolidate content understanding. Thus, much of the content acquisition occurs outside of class where students are assigned one chapter to read from the textbook each week and are assigned lectures to watch online in preparation for class.

**Research Question**

- First-time students taking AP courses face difficulties with the challenging content and the expanded workload of the class.
- Students lacked skills to acquire difficult content in a self-paced manner.
- How can students who are at a disadvantage compared to peers who have taken AP courses be supported?

How does implementing increased accountability measures in flipped lessons improve content mastery for first time AP students and minority students?

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**Intervention**

**Goal:** Students will be more prepared to understand lessons in class and increase participation and self-directedness during lessons since they have notes to reference during the lesson.

**Action:** Students submitted Cornell Notes, after watching lectures or reading the book, to be graded using a rubric with 4 categories:

- Quality of Notes
- Completion of Notes
- Cornell Summaries
- Questions in Margin

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**Qualitative Data Analysis**

<table>
<thead>
<tr>
<th>Students who have never taken AP or Honors classes before. (LEAST EXPERIENCED)</th>
<th>Students who took Honors and AP classes before in Science. (MOST EXPERIENCED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minority Students</td>
<td>75%</td>
</tr>
<tr>
<td>Students who improved study habits after Intervention</td>
<td>38%</td>
</tr>
<tr>
<td>Students who report the Intervention helped them understand APES better</td>
<td>63%</td>
</tr>
<tr>
<td>Students who report they can understand and follow along with what is being discussed in class after Intervention</td>
<td>38% MORE</td>
</tr>
<tr>
<td>Students who report the Intervention helped them participate and collaborate better in class</td>
<td>50% NO DIFFERENCE</td>
</tr>
</tbody>
</table>

**Quantitative Data Analysis**

- **Observed:**
  - Increased mastery of content from reading, as evidenced by higher quiz scores overall.
  - Decreased completion of homework (due to increased workload and extra time needed to take Cornell Notes?)

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**Conclusions and Implications**

**Big Picture**

There are fewer minority students taking advanced Science classes altogether.

**Was the Intervention Right for the Target Group?**

Most minority students were comfortable with the Cornell Notes, implying that they are a good target group for implementing this Intervention.

**Who Benefited Most?**

Students who were less experienced in advanced coursework had increased understanding of lessons in class and improved participation and confidence compared to other students.

**Future studies:** How can students improve study habits? Students who have never taken advanced coursework did not improve study habits as much as those who had taken at least one Honors course.

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