EVALUATION OF THE ADVANCED PLACEMENT TRAINING & INCENTIVES PROGRAM: TEACHERS' PERSPECTIVES

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EXECUTIVE SUMMARY

In order to evaluate the relative effectiveness of seven different components of the Advanced Placement Training & Incentives Program (APTIP) from Virginia Advanced Study Strategies (VASS), the graduate student research team from the College of William & Mary conducted an online survey of teachers participating in the APTIP. Survey results suggest that among the seven components, provision of AP training for teachers is considered the most effective facet of the program, while monetary incentives given to teachers is considered the least effective component regarding student success on AP exams. Survey respondents found the provision of AP exam fees for students to be the second most effective component and monetary incentives to students to be the second least important component of the program. These findings were supported by a case study interview with a school principal, guidance counselor and regional AP programs coordinator about the effects of APTIP in their school and district. Overall, teachers agreed that APTIP was effective in preparing students for STEM-related college programs and careers and that it created a positive impact on school culture.

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INTRODUCTION

Virginia Advanced Study Strategies (VASS) is an educational non-profit organization formed in 2007, in partnership with the Commonwealth of Virginia and the National Math and Science Initiative (NMSI). VASS seeks to increase the participation and achievement of students in Advanced Placement (AP) courses in Virginia High Schools, specifically in the areas of English, math, science and technology to meet the state's growing and changing needs. VASS is focused on schools with historically low numbers of AP class offerings, low AP participation rates, rural designation, and schools in low-income areas.

In 2007, VASS selected its first cohort of high schools to participate in APTIP. Since then there have been four subsequent cohorts of schools, each receiving a five-year grant from VASS. Currently, VASS's Advanced Placement Training and Incentive Program (APTIP) supports 75 Virginia schools with a variety of functions, including teacher training, monetary incentives and AP classroom resources. The focus on Science, Technology, English and Mathematics (STEM) AP courses is geared at increasing the proficiency of Virginia students in these subjects in order to increase critical thinking proficiency and problem solving skills in preparation for advanced college coursework and entry into the Virginia workforce in STEM fields. Within these schools, VASS also partners with NMSI's Laying the Foundation (LTF) program to provide support, classroom materials and a comprehensive training program to teachers of pre-AP classes to improve student performance and a culture of higher academic achievement.

The research team consists of graduate student researchers from the College of William & Mary's Thomas Jefferson Program in Public Policy. The research objective was to evaluate teacher and administrator perspectives on: (1) relative effectiveness of individual APTIP components on student success and interest, (2) effectiveness of APTIP on student success and interest (3) effects of APTIP on school culture.

The team performed a program evaluation of VASS's APTIP. The study included a survey of over 290 teachers from around the state, as well as interviews with school administrators in the state who have directly interacted with APTIP. Evaluating the APTIP from the teachers' perspective gives unique insight into what is necessary to create a

strong and effective program with lasting effects. This study specifically analyzed the comparative effectiveness of seven components of the APTIP grant program, the effectiveness of those components at preparing students for college and STEM careers, and the effects of the grant on school culture more broadly.

BACKGROUND

Virginia's students need to graduate from high school with a strong foundation in critical skills, prepared to do rigorous college coursework and participate in today's technology-driven economy. More than ever, secondary education must focus on STEM-related curriculum. Virginia's increasing demand for STEM careers is the fastest growing in the country. By 2018, the state's demand for STEM-trained employees will grow to around 375,000.[1] Virginia, in particular, needs to ensure high school students are graduating with advanced-level science and math courses to meet the growing STEM-centered market. In addition to preparing students for post-secondary STEM coursework, offering advanced-level STEM-related courses in high school is vital for developing a competitive workforce capable in science and math.

Several studies have proven that students who enrolled in AP course and took AP exams showed more positive outcomes in college performance. A study by Simms showed that students who took AP courses display better academic performance in college than students who took no AP courses. Students with AP backgrounds had higher levels of academic achievement and took more college courses in their AP subjects than non-AP students.[2] When compared to non-AP students, AP students had higher levels of academic achievement in college and tended to take more college courses related to subjects in which they took AP exams.[3] Dougherty, *et al.* also support that students who had AP courses were better prepared and had higher rates of college graduation.[4] Among the

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[1] Anthony P Carnevale, Nicole Smith and Michelle Melton, "STEM: Science, Technology, Engineering, Mathematics," *Georgetown University Center on Education and the Workforce*, 2011, http://www9.georgetown.edu/grad/gppi/hpi/cew/pdfs/stem-complete.pdf (accessed December 12, 2012).

[2] D. Simms, "Comparison of academic performance between AP and non-AP students at the University of Michigan," unpublished manuscript, 1982, cited in Rick Morgan and Len Ramist, "Advanced Placement Students in College: An Investigation of Course Grades at 21 Colleges," Statistical Report No. SR-93-13, February 1998, Princeton: Educational Testing Service.

[3] *Ibid.*

[4] Chrys Dougherty, Lynn Mellor and Shuling Jian, "The Relationship between Advanced Placement and College Graduation," *National Center for Educational Accountability*, 2006, http://w.broadprize.org/symposium/2006BroadSymposiumRelationshipBetweenAPandCollegeGrad.pdf (accessed December 12, 2012).

honors or early college graduates, there were more high school AP students compared to non-AP students.[5]

Historically, Advanced Placement courses have been directed to students of the highest academic achievement levels as a way for college-bound students to improve their college applications. However, research shows that AP courses are valuable to the broader student population who are likely to be successful given the opportunity and support needed to succeed.[6] One research study shows there is no advantage in only placing the highest ability students in rigorous courses such as AP.[7] VASS's APTIP increases opportunity and access to AP courses to students who would not traditionally enroll in them. APTIP seeks to expand AP course offerings to schools with little advance course offerings and low student enrollment.

A team of researchers in 2011 conducted an analysis of APTIP's impact on student enrollment in AP classes, in terms of enrollment rates and demographics. The study also looked at APTIP's impacts on AP exam scores. They discovered: (1) the average percentage of students enrolled in AP increased from 6% to 13% with the implementation of APTIP; (2) enrollment in AP courses increased substantially from 2008-2011 in all schools; (3) the number of African American students who took AP courses increased more noticeably than other student racial groups; (4) students in APTIP schools are taking multiple AP exams more than in non-APTIP schools; (5) program schools demonstrated steady growth in the average number of qualifying scores compared to non-program schools; (6) both gender and race are statistically significant factors for a student's probability of earning a qualifying score, and currently white students have a higher probability of earning qualifying scores than all other racial groups; (7) students who took only math and science courses have a lower probability of earning a qualifying score than students who took

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[5] Warren W. Willingham and Margaret Morris, "Four Years Later: A Longitudinal Study of Advanced Placement Students in College," College Board Report No. 86 (1986), http://research.collegeboard.org/sites/default/files/publications/2012/7/researchreport-1986-2-longitudinal-study-advanced-placement-students-college.pdf (accessed December 12, 2012).

[6] Maureen Ewing, Wayne J. Camara and Roger E. Millsap, "The Relationship Between PSAT/NMSQT Scores and AP Examination Grades: A Follow-Up Study," College Board Research Report No. 2006-01, http://research.collegeboard.org/sites/default/files/publications/2012/7/researchreport-2006-1-psat-nmsqt-scores-ap-examination-grades-follow-up.pdf (accessed December 12, 2012).

[7] *Ibid*.

English courses; (8) sophomores and juniors have a greater chance of earning qualifying scores than seniors. This research informed the scope of the present study design.[8]

[8] Bernard Karcher, Laura Parker and Becca Wittenstein, "Outcomes-Based Evaluation of AP Training and Incentives Program," Thomas Jefferson Program in Public Policy at the College of William & Mary, 2011, http://www.wm.edu/as/publicpolicy/documents/prs/vass.pdf (accessed December 12, 2012).

METHODOLOGY

In order to pursue the research objective, the research team generated two main instruments: an online survey and a case study interview questionnaire. First and most significant was the online survey. In both of these instruments, the research team described seven APTIP components:

- AP class training for teachers
- Laying the Foundation (Pre-AP class) training for teachers
- Provision of classroom equipment
- Monetary incentives to students
- Monetary incentives to teachers
- Subsidy of AP exam fees for students
- Additional tutoring sessions by teachers (including Saturday sessions)

Online Survey to Teachers

In order to gain teacher perspectives, the research team created an online survey with the survey software *Qualtrics*. The College of William & Mary provided *Qualtrics* to the team. Once the survey design was complete, VASS e-mailed the link to the survey to a list of 744 teachers, all of who were instructors of AP courses and who received VASS-sponsored trainings. The e-mail to teachers included an introductory and explanatory description of the survey, including the time frame for the survey: teachers were e-mailed the link on the morning of Tuesday, November 6, 2012, and were asked to complete the survey before 5:00 P.M. on Monday, November 19, 2012. On Thursday, November 15, 2012, a second e-mail was sent by VASS to the list of teachers, reminding them to please complete the survey by the following Monday.

The survey consisted of 34 questions. Not all questions were asked to each recipient; survey logic in *Qualtrics* was used to present follow-up questions depending on answers to certain questions. For example, question number 19 asks, "Are you satisfied with the level of teacher training and support throughout the school year? Does it adequately prepare you to teach the AP course?" Respondents were to choose "yes" or

"no;" if they chose "no," they were presented the additional question, "What additional type of training do you believe would be effective?" This was a free response question. The full list of survey questions is provided in the appendix to this report.

The majority of questions on the survey were multiple-choice questions, although approximately one-third of the survey consisted of free response questions. The penultimate question consisted of a series of statements that respondents were to select how much they agreed or disagreed with the statement using a five-point Likert scale, ranging from "strongly agree" to "strongly disagree." The survey began with demographic information questions, including the school where the respondent works and the classes he or she teaches. The next group of questions focused on how the respondent feels about each of the seven listed components of the APTIP: which component does the respondent feel is the most important? Which two components are the least important? This section also included specific questions concerning AP exam fee subsidies from the APTIP versus monetary incentives to students and to teachers: which did respondents feel was more helpful to their school? The survey ended with questions concerning culture changes in the school since the implementation of the APTIP, and also the interest and preparedness of students in STEM fields. This section included the Likert scale described above.

After the survey was closed, *Qualtrics* provided an initial report of the survey results that included how many respondents answered each question, which answer was chose at what frequency, all the free response answers, and so on. This report was exported from *Qualtrics* into Microsoft Excel, and from Excel it was converted in the statistical software package *Stata* into an appropriate data file. This data file contained all responses provided by survey respondents.

Case Study Interview Questionnaire

In addition to the online survey, the research team created a case study interview questionnaire for use during additional interviews with school principals and other administrators. This list of questions formed the basis of the interviews, but was intentionally left open-ended and generic, because the case study interviews were to be free conversations about VASS and the APTIP within a particular school. The questionnaire

focused on the same subjects as the online survey: what were the most effective or important components of the APTIP, how has school culture changed since the implementation of APTIP, and so on. The case study interview was intended to be supplemental to the online survey, and help fill in any potential information gaps that occurred because of the multiple-choice nature of the survey.

The research team chose potential schools to contact for the case study interviews based on several factors. The team considered the school classification as to its regional population density (*i.e.*, urban or rural), the school's cohort (*i.e.*, the year it began the APTIP), and its geographic distance from the College of William & Mary. After a list of schools was made, the research team discussed them with Paul Nichols of VASS, who then contacted the two schools on behalf of the team. Because of time and scheduling constraints, the team conducted only one case study interview. This interview is described further in the Results section of the report below.

Additional Data Preparation

Following the completion of the online survey, the research team added three additional variables to the dataset. Each of these variables was a further description of the 75 VASS schools included in the survey.

First, the team coded each school according to its regional population density. Schools were coded as either "urban" or "rural." The information for each school was provided by the National Center for Education Statistics (NCES). The team utilized the NCES "Search for Public Schools" tool available on their website. Second, the research team coded each school according to its size (by number of students). The NCES "Search for Public Schools" feature also provided these statistics. Third, the team coded each school according to its VASS cohort, one through five. This information was provided by VASS.

RESULTS

The results section of the report is split into three subsections. The "Summary Statistics" subsection provides basic information about the online survey: how many respondents completed the survey, how many schools were represented, and so on. The "Survey Results" subsection describes the information gleaned from the answers to the online survey questions. The third subsection, "Case Study Results," describes the results of the informational interview at Richmond Community High School.

Summary Statistics

The survey contained 34 questions, although not all questions were asked to every respondent; survey logic was used to gain more information on certain topics (*i.e.*, if you said "no" one a particular multiple choice question, you would be given a follow-up question with a free response field in order to provide more information). The survey contained multiple choice and free response questions as well as a single Likert-scale question. The full list of survey questions can be found in the appendix to this report.

The link to the online survey was e-mailed by VASS to 744 teachers. Of these 744 teachers, 297 clicked on the link and began taking the survey. This represents approximately 40% of the population of teachers trained by VASS. This is an exceptionally high response rate; the response rate for customer satisfaction surveys, for example, is usually around 15%. From this sample, 73 out of 75 schools had at least one respondent; one school had as many as 13 respondents for the survey. The survey shows 97% of the schools were represented in the survey by at least one respondent. These 75 schools are the first five cohorts of the VASS APTIP program. Regarding cohorts, teachers trained in 2011 and 2012 constituted 53% of survey respondents. A significant majority of survey respondents were trained only for AP courses (71%), while only 3 respondents were trained only for Laying the Foundation (Pre-AP) courses; 27% of respondents received training for both AP and Laying the Foundation.

Our survey received a low drop-out rate . Drop-out rates measure the number of respondents who begin but do not finish taking the survey. For the final question, the

drop-out rate was about 42% (on question 34, 172 answered out of 297 respondents); however, this final question was a free response question, and an answer was not required to complete the survey. This does mean that the majority of respondents chose to leave additional, written feedback at the end of the survey (58% did so). The drop-out rate for the final non-free-response question was only 7% (on question 33, 277 answered out of 297 respondents).

The majority of respondents to this survey were female (70%). A large majority of respondents chose "white" to describe their race (89%). A slight majority of respondents said they had not taught in other public schools in Virginia (54% answered "no"), while a significant majority of respondents said they had not taught schools other than Virginia public schools (73% answered "no"). A vast majority of survey respondents were citizens of the United States (99%).

Survey Results

The research team investigated three broad research objectives. VASS wanted to understand teacher and administrator perspectives on: (1) relative effectiveness of individual APTIP components on student success and interest, (2) effectiveness of the APTIP on student interest and preparedness in STEM, and (3) effects of APTIP on school culture.

Understanding more about the relative effectiveness of the various components of its program could inform crucial business decisions and improve VASS's efficiency.

Summary of Survey Results

- **63% of teachers identified teacher training as the most effective component of APTIP-Monetary incentives to teachers was chosen least often as the most effective component of APTIP**
- **In a pairwise comparison between AP teacher training and Pre-AP teacher training, teachers found AP training more effective**
- **In a pairwise comparison between student and teacher monetary incentives and AP exam fee subsidies, teachers found fee subsidies more effective.**
- **Provision of classroom equipment was given as the most effective component, after AP training.**
- **Demographic Factors do not influence the choice of most effective component**
- **Teachers agreed, on average, that AP encourages interest in STEM careers and college programs Teachers agreed, on average, that AP positively impacts school culture**
- **VASS teacher training, resources and equipment, and subsidy for exam fee are vital to AP programs in school**

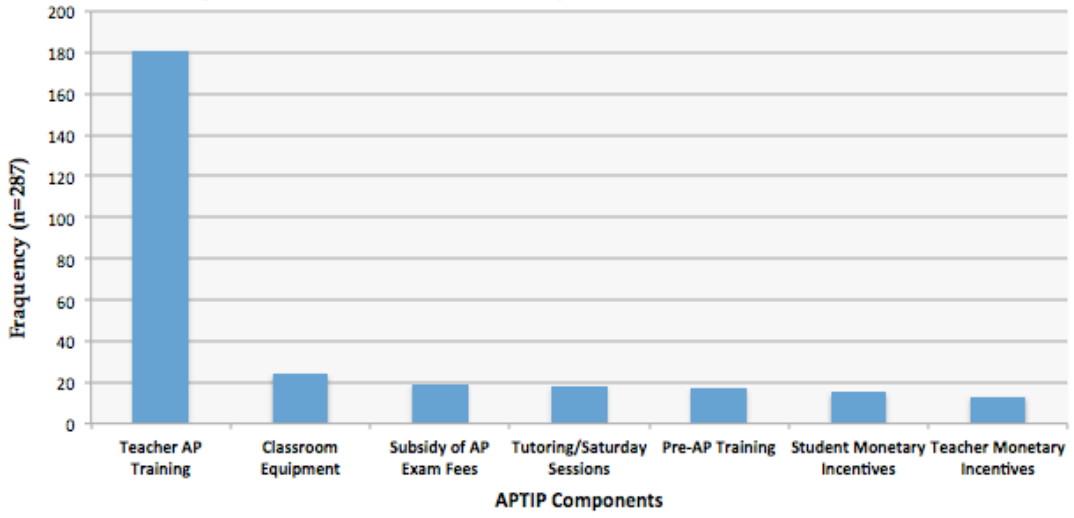
Evidence of AP's success in preparing students for college and STEM careers and its positive influence on school culture will be equally beneficial to VASS decision makers.

Objective 1: Relative Effectiveness of Individual Components

Which of the Seven Components of APTIP Support to Schools is Most Effective?

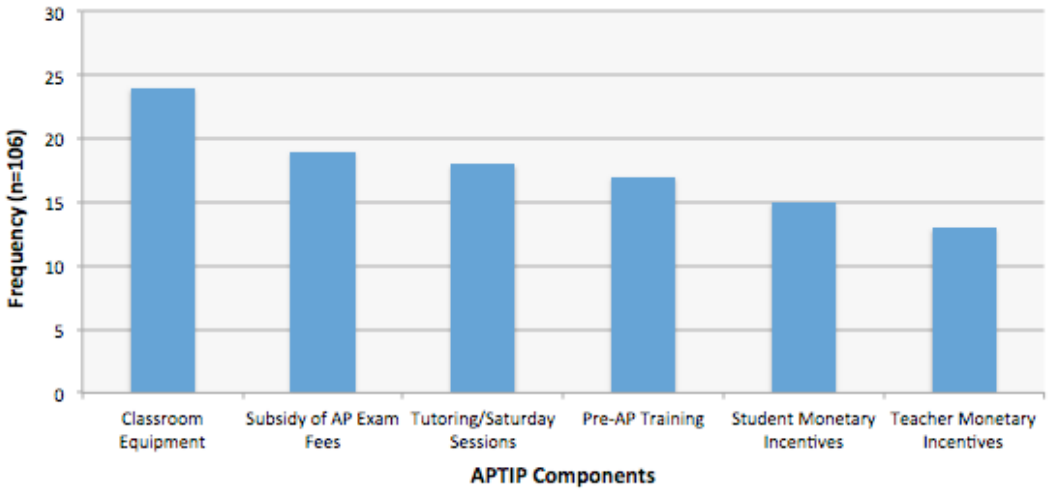
To address objective 1, we questioned teachers about their opinions on the effectiveness of the seven components of the support they receive from the APTIP (AP Training, Laying the Foundation or Pre-AP training, provision of classroom equipment, monetary incentives to students, monetary incentives to teachers, subsidy of AP exam fees, additional tutoring sessions). Specifically, the study was interested in which component was viewed as the single most effective, out of a list of all seven components. Figure 1.a depicts the results of this survey question. The figure shows that 63% of teachers chose AP training as the most effective component of the seven. The component chosen second-most frequently was provision of classroom equipment, chosen by only 8% of teachers as the most effective component.

Figure 1.a: Which APTIP Component is Most Effective?



The remaining six components, after AP training, were chosen by 33% of respondents as most effective components of APTIP. In order to get a better picture of the

Figure 1.b: Which APTIP Component is Most Effective, Excluding AP?



relative effectiveness of those six components, the research team wanted to observe those responses separately from the responses that chose AP training. Figure 1.b depicts the data for the same question as Figure 1.a, but without the responses that indicated AP training. As stated previously, more respondents chose provision of classroom resources as the most effective component of APTIP when not considering AP training. Out of the respondents who chose a component other than AP training, 22% chose classroom resources as the most effective component. Monetary incentives to teachers was chosen as the most effective component least frequently, in 12% of responses.

Demographic Factors Do Not Influence Component Choice

The research team conducted regression analysis on the responses to this question and several demographic variables in order to determine if any interesting trends emerged from amongst the responses that chose components other than AP training as the most effective component. We created a dummy variable to use as the dependent variable that indicated 0 if teachers chose AP training and 1 if teachers chose any response other than AP training. The distribution of the dummy variable logically reflected the distribution explained above: 63% of responses in the dummy variable were 0 and 33% were 1.

Independent variables were: gender, age, number of years teaching, year trained by VASS, school size (number of students), cohort and whether the school was in an urban or rural geographical location.

All independent variables were statistically insignificant to explain the variation in the dependent variable, except for the cohort variable. The results for cohort indicate that, all else held equal, being in a later cohort increases the response to the dummy variable by 0.07, on average. The extremely small magnitude of the effect of cohort, plus the insignificance of the other independent variables, allow us to conclude that none of these demographic factors influence component choice significantly, or by a meaningful magnitude.

In order to look more closely at the effects of cohort on component choice in the first question, we looked at the distribution of responses across the cohorts (see Table 1). Table 1 is consistent with the regression results that Cohort effect on component choice was virtually non-existent, as can be seen by the similar distribution of choices of the components when comparing the cohorts to each other.

Table 1: Which Component is Most Effective?

	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Cohort 5
AP	14.1%	8.7%	13.6%	17.1%	8.7%
LTF	1.4%	0.7%	1.2%	2.8%	0%
Classroom Resources	1.4%	1.2%	1.4%	2.1%	2.4%
Student Incentives	0.3%	0.3%	1.4%	2.1%	1.2%
Teacher Incentives	0.3%	0.7%	1.4%	2.1%	0%
Exam Fee	0.3%	2.1%	1.7%	1.4%	1.2%
Tutoring	0%	1.2%	1.7%	2.8%	0.7%

Pairwise Comparisons of Similar Components

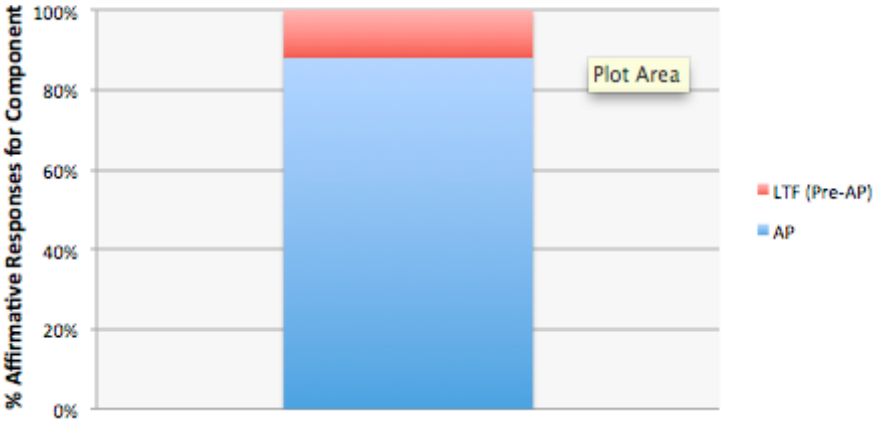
The research team was further interested in the comparative effectiveness of certain pairs of components that provide similar benefits to students or teachers. Specifically, we were interested in: (1) comparing AP training to pre-AP, or "Laying the Foundation,"

training, and (2) monetary incentives (to both students and teachers) to the provision of AP exam fees. Each component in both of these pairs provides a similar benefit or incentive to teachers and students as its counterpart, so it will be valuable to understand if one component is more effective than the other.

AP versus Pre-AP Training

Laying-the-Foundation training is training provided to teachers of classes that are considered preparatory for subsequent AP classes a student might take. In order to evaluate the components, teachers were given two options and asked to identify which was the more important component to them as teachers, when compared to the other. Figure 2 displays an expression of the comparison of teachers' opinions on the effectiveness of AP training and pre-AP training. Teachers were given two options and asked to identify which was the more important component to them as teachers, when compared to the other. AP training was chosen in 88% of 278 responses as more important than Laying-the-Foundation. Twelve percent of teachers identified Laying-the-Foundation training as the more important component.

Figure 2: Which Component is More Effective: AP or Pre-AP Training?



In Figure 2, it is reasonable to assume that all teachers can make informed choices between AP and Laying-the-Foundation training when choosing the most important training, regardless of whether they received both types of training. This is reasonable to

assume because teachers are made aware of both types of training through receiving one of the trainings. Teachers also interact with students who have received instruction from teachers with both types of training, allowing them to observe the effects of both types of training in students. Hence, these teachers can make an informed decision on the training's importance regardless of if they received one type of training or the other.

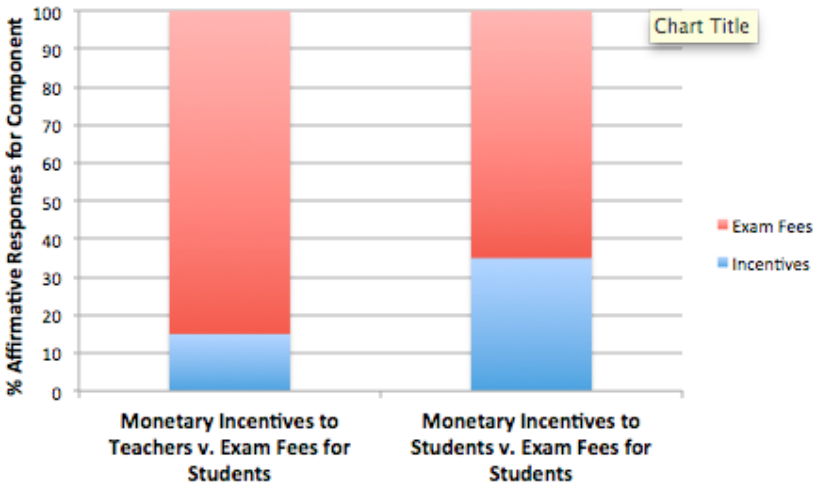
However, we can contextualize Figure 2 by examining the demographics of the respondents – namely, whether respondents were trained in AP, Laying the Foundation or both. Eighty percent of teachers who were trained in both AP and Laying the Foundation training, identified AP training as the most important component of the two, while 20% of that group identified Laying-the-Foundation as more important. Of teachers only trained in AP, 91% of them identified AP as the most important. Only one percent of our survey respondents were trained in Laying the Foundation alone, so we did not analyze their responses to this question separately.

Monetary Incentives versus Exam Fees

The second pair of similar components analyzed was monetary incentives (to teachers and to students) and subsidy of the AP exam fee for students taking those exams. Teachers were asked in two separate questions to identify, if VASS could only provide one, which is more important (monetary incentives to teachers v. exam fees, and monetary incentives to students v. exam fees).

Figure 3 shows a breakdown of responses to these questions. Eighty-five percent of teachers identified provision of exam fees as the more important APTIP component, when compared to monetary incentives for teachers. When compared to monetary incentives for students, provision of exam fees were still seen as more important by most teachers, but only among 65% of teachers. On this question 35% of teachers identified monetary incentives for students as more important than exam fees, as compared to 15% of teachers who thought monetary incentives to teachers were more effective than provision of student exam fees.

Figure 3: Which Component is More Effective: Incentives or Exam Fees?



Objective 2: Effectiveness of AP on Student Success and Preparedness

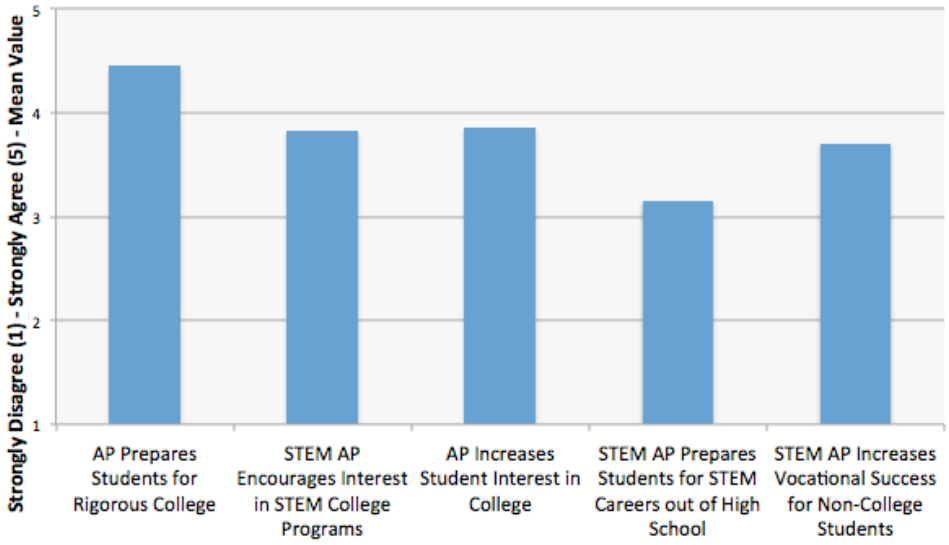
Our survey asked teachers to agree or disagree with a series of statements about AP's effectiveness at improving student success in college, STEM careers and other areas. Response options were given in a five-point Likert scale: 1 indicated "Strongly Disagree," 2 indicated "Disagree," 3 indicated "Neither Agree or Disagree," 4 indicated "Agree" and 5 indicated "Strongly Agree."

For the analysis, we looked at the mean values of the responses to gain an understanding of average level of agreement or disagreement among teachers with each statement. Figure 4 is an overview of the five statements from the survey regarding student interest and preparedness for STEM vocations and college programs. All statements were positive, allowing us to interpret any mean response above three as indicating some level of agreement.

On student interest and preparedness for STEM, as a result of AP, teachers agreed or strongly agreed with all statements, on average. The statement that AP prepares students for rigorous college programs received the highest level of agreement, with a mean response of 4.45 that indicates moderately strong agreement on average. The statement that STEM AP prepares students for STEM careers out of high school (without attending

college) garnered the lowest level of agreement, with a mean response of 3.15. The graphic also shows that mean response was 3.82 for the statement that STEM AP encourages interest in STEM college programs, 3.85 for the statement that AP increases student interest in college, and 3.7 for the statement that STEM AP increases vocational success in students who do not attend college.

Figure 4: Teacher Opinions on AP Effects on College/Career Preparedness and Interest

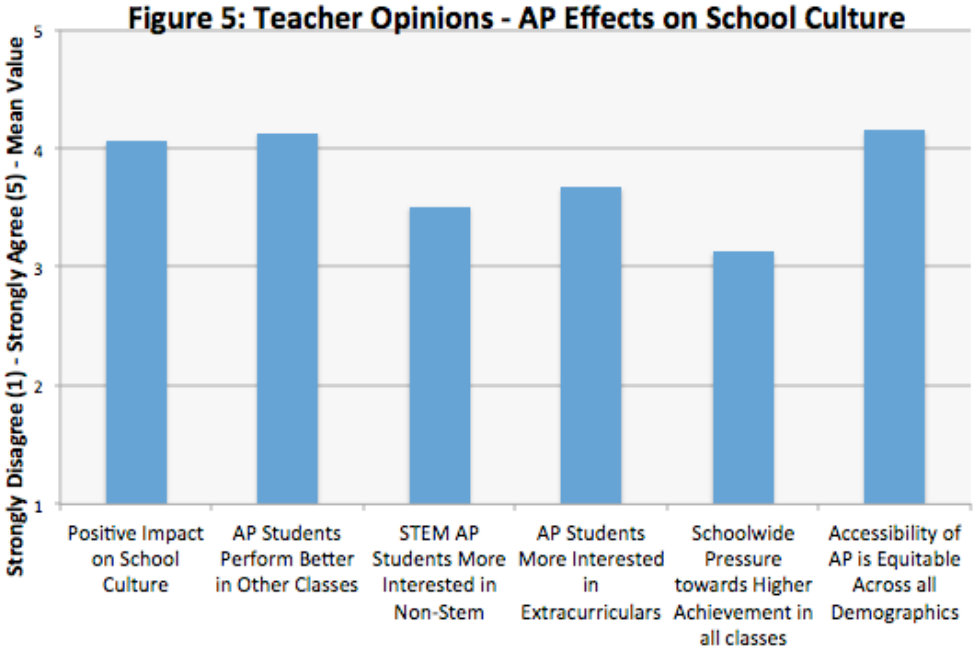


Objective 3: Effects of AP on School Culture

We also asked teachers to agree or disagree with a series of statements about AP's effects on school culture, using the same Likert scale described in section B above. Response options were: 1 to indicate "Strongly Disagree," 2 to indicate "Disagree," 3 to indicate "Neither Agree or Disagree," 4 to indicate "Agree" and 5 to indicate "Strongly Agree."

We analyzed the mean values of the responses to gain an understanding of average level of agreement or disagreement among teachers with each statement. Figure 5 shows a mean agreement above a 3 for all responses. The statement that the addition of AP in a school creates school-wide pressure towards higher achievement, even in non-AP classes, received the lowest mean agreement (3.13). Teachers agreed most strongly (mean value 4.15) with the statement that accessibility of AP is equitable across all demographics as a

result of VASS. The graphic shows that mean response was 4.06 for the statement that the addition of AP created a positive impact on school culture, 4.13 for the statement that AP students also perform better in non-AP classes, 3.51 for the statement that students who took STEM AP courses are more interested in non-STEM AP courses as a result, and 3.67 for the statement that AP students are more interested in extracurricular activities than non-AP taking students.



Case Study Results

Summary of Case Study Interview Results

- **APTIP has increased awareness of AP courses**
- **Student financial incentives successful at motivating students**
- **Before VASS, school had only 19 qualifying AP exam scores; now 75 qualifying scores**
- **Qualifying scores boost self-esteem and self-perception of students, creating a culture where students are motivated to challenge themselves**
- **VASS provisions have allowed schools in the district to focus resources on other AP course development**
- **VASS teacher training, resources and equipment, and subsidy for exam fee are vital to AP programs in school**

The research team conducted a focus group interview at Richmond Community High School (RCHS) on November 15, 2012. The team met with the school's guidance counselor, Ms. Bonita Reynolds, principal Mr. J. Austin Brown, and Richmond's regional coordinator of AP programs, Mr. Nelson Colbert. RCHS is an alternative high school that requires students to apply and take tests in math and English prior to admission. It is a relatively small school with 260 students, 16 full time teachers and 8 part time teachers. All curricula are taught at the honors level and parents and students must be committed to academics from the time they transfer.

RCHS is a Cohort 1 school, and VASS grants will be expiring after this school year. Ms. Reynolds stated that APTIP has "lit a fire," increasing AP awareness and motivation to enroll in AP classes through student monetary incentives. There were only 19 qualifying AP scores the year before VASS entered RCHS in 2007. In the spring of this year, RCHS had 75 AP qualifying scores. The school holds "AP celebrations" that increase competition and positive peer pressure to enroll in APs and strive for qualifying scores. Adding to the generated excitement, Mr. Brown said students regularly drop by his office asking if VASS incentive checks have arrived.

The students enroll in APTIP classes must make a significant time commitment to additional tutoring sessions. While the students are required to attend Saturday sessions, Mr. Brown and Ms. Reynolds told us that their students really enjoy them. They really appreciate the national speakers that VASS brings in for the Saturday sessions and enjoy networking with other regional students involved in the APTIP program.

The interviewees spoke a lot about how VASS's APTIP program has changed the school culture. Ms. Reynolds said that the qualifying AP scores boosted self-esteem and self-perception, creating a culture where students are self-motivated to challenge

themselves. The principal noted that most of their students are minorities and many will be first generation college students, and participating in APTIP has allowed the students to realize their ability to handle and succeed in college level work.

On the subject of APTIP component effectiveness, the focus group interview found that teacher training, classroom resources and equipment, and the student exam fee subsidy are vital to the success of the program. The exam fee subsidy from VASS is critical for RCHS students because of the low socioeconomic status of many families at the school who simply would not be able pay the fee causing many students to have to opt out of taking AP classes. The interviewees agreed that the provision of monetary incentives to teachers is the least important component of APTIP.

The interviewees also found the provision of resources and equipment to be very important. Mr. Colbert stated that STEM-related AP classrooms tend to be the most expensive and difficult to implement not only because of the high level of training the teacher needs but because the laboratory equipment is expensive. Colbert told us that RCHS would like to offer an AP Physics class, but starting it would require at least $11,000 for equipment, which would constitute fully half of RCHS general operating budget for the entire year.

VASS's APTIP provisions have allowed schools in the district to focus resources on other AP course development. Mr. Colbert stated that because of VASS's funding, schools can direct resources to AP classes that are not VASS-supported, such as History and Art. Such AP course development is modeled after the APTIP. The APTIP has subsequently increased student enrollment in non-STEM related AP courses because students understand and are aware of the importance of AP.

RCHS is an alternative school and in some ways is a "best case" scenario of commitment to academic achievement. One might think it an extraordinary example of APTIP's success; however, the administrator focus group provided the same sentiments as were found in the survey results. VASS grant at RCHS is expiring this year, but the administrators say that VASS has helped create a culture of increased AP demand and the school will strive to keep the VASS-generated momentum going. The region is already budgeting for the two main expenses to keep up this momentum, namely providing

students' AP exam fees and keeping up with technology. All interviewees agreed that VASS's teacher training, equipment, and affect on the culture will last for years to come.

RECOMMENDATIONS

Evaluating the APTIP program from the teachers' perspective provides unique insight into what is necessary to create a strong and effective AP program. It is essential to understand the perspectives of the teachers involved in this program because they understand the complexity and uniqueness of their classroom and students and are most closely connected to implementing the goals. There is a general consensus of positive feeling for each of the components. However, based on our research results of teachers' and administrators' perspectives, we offer the following recommendations:

I) Since the demand for AP courses in high schools in Virginia is growing at such a high rate, VASS may need to refocus resources for the APTIP. Going forward, we suggest VASS maintain efforts on teacher training because it is overwhelmingly viewed as the most important component. We suggest eliminating teacher monetary incentives as necessary, because both teachers and administrators found this component the least important factor of the program for student success.

II) VASS is interested in comparative effectiveness of specific pairs of components because they provide a similar benefit and incentive to students or teachers. This includes AP teacher training versus pre-AP training (Laying the Foundation) and student and teacher monetary incentives versus AP exam fee subsidies. Teachers found AP teacher training was much more effective to the APTIP than LTF training, and that AP exam fee subsidies are much more effective than monetary incentives. Because these provide similar benefit and incentive, we suggest VASS focus on AP-teacher training and AP exam fee subsidies over Laying the Foundation training and student and teacher monetary incentives.

OPPORTUNITIES FOR FUTURE RESEARCH

An important area of further research is exploring the relationship between the involvement of the APTIP and its impact on students in the future. Research evaluating the benefits of the APTIP program to colleges and universities in Virginia would be very valuable. In order to evaluate the student level impacts after high school, one would need to obtain student performance data from the Virginia Department of Education and the State Council of Higher Education in Virginia. Student performance metrics to study include high school and college GPA, participation in AP classes, college completion rates, whether the student went on to choose STEM majors and careers, *etc.* for high school students in Virginia who went on to universities and colleges in the Commonwealth. One could also evaluate the effects of APTIP on high school GPA and the college admissions process.

In this evaluation, we were able to evaluate the components of APTIP in isolation, but we were limited to findings based purely on the teachers' perspective in the form of surveys. An area of further research on component evaluation would be to gather more specific data on teacher training attendance, student tutoring attendance, and demographics. Assessments should be documented before and after VASS enters a school to further understand the impact of teacher training for understanding the content and lesson planning. It would be valuable to see how these factors impacted the success of the program. Another area to assess would be the total amount of money each component costs in each school, and compare it to the relative effectiveness of each. A similar but separate avenue of further research is to study Laying the Foundation and how it can be improved to more effectively impact AP participation.

In this report, we saw the positive environment of one school with an expiring grant. However further analysis should be conducted after VASS's five-year grants expire in each school to see the APTIP's effect academically in AP achievement as well as on the schools' overall culture. This is an important area of further research to see how the schools adjust after APTIP grants expire.

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APPENDIX: QUESTIONS FOR ONLINE SURVEY

The following is a list of all questions asked on the online survey, in the order they were given on the survey itself. Answers have been truncated for the sake of space and for ease of reading. Survey logic was used to limit certain questions based on responses to previous questions (*e.g.*, if answered "no" on question 19, question 20 will be displayed).

NO.	QUESTION	ANSWER
1	What is your school?	[List of 77 participating schools and "Other"]
2	If you chose "other," please specify at which school you work.	[Free response field]
3	What is your gender?	Female, Male, Other, Prefer Not to Respond
4	What is your age? Please choose the appropriate age bracket (given in years).	[Eight age brackets, ranging from 18 to 75 and older]
5	Are you a citizen of the United States?	Yes, No
6	How many years have you been teaching? Please choose the appropriate time bracket.	[11 time brackets, ranging from 1 to 54 or more]
7	In which year were you first trained by VASS?	2007, 2008, 2009, 2010, 2011, 2012
8	What training did you receive through VASS's AP program?	Only for AP courses, Only for Laying the Foundation, Received Both
9	Which AP courses have you taught in the last five years, including the current school year? Select all that apply.	[List of all 31 AP courses]
10	What other courses have you taught in the previous five years, including the current school year?	[Free response field]
11	Have you taught in other public schools in Virginia?	Yes, No
12	Have you taught in any schools other than Virginia public schools?	Yes, No
13	What is your ethnicity or race?	[16 ethnicity and race options, including Multi-racial, Other, And prefer not to respond]
14	If you chose "other" for race, please specify:	[Free response field]
15	What do you feel is the most effective component of APTIP?	AP training for teachers, Laying the Foundation training for teachers, Provision of classroom equipment, Monetary incentives to students, Monetary incentives to teachers, Subsidy of AP exam fees for students, Additional tutoring sessions by teachers (including Saturday sessions)
16	Which APTIP component is the second most effective?	[List of seven components as for question 15]
17	Which four components of VASS's AP program are the most important? Select four.	[List of seven components as for question 15]
18	Which one of two components of VASS's AP program are the least important? Select up to two.	[List of seven components as for question 15]
19	Are you satisfied with the level of teacher training and support throughout the school	Yes, No

	year? Does it adequately prepare you to teach the AP course?	
20	[If answered "no" to question 19] What additional type of training do you believe would be effective?	[Free response field]
21	Do you believe that monetary incentives to students have increased interest and enrollment in AP classes at your schools?	Yes, No
22	[If answered "no" to question 21] In what ways could the monetary incentives be improved to increase interest and enrollment in AP courses?	[Free response field]
23	Has the monetary incentives to you as a teacher impacted your teaching in any way?	Yes, No
24	[If answered "yes" to question 23] How has your teaching been affected?	[Free response field]
25	[If answered "no" to question 23] How could the monetary incentives be changed to positively impact your teaching?	[Free response field]
26	Are the classroom resources and equipment beneficial to students learning AP material?	Yes, No
27	[If answered "yes" on question 26] Which classroom resources are most effective? Which type of equipment is most helpful?	[Free response field]
28	[If answered "no" on question 26] How could these provided resources be improved?	[Free response field]
29	Which of the following program components is more important for you as a teacher?	AP training for teachers, Laying the Foundation training for teachers
30	If VASS could only provide one of the following components of the AP program, which would be more helpful at your school?	Monetary incentives to students, Subsidy of AP exam fees for students
31	If VASS could only provide one of the following components of the AP program, which would be more helpful at your school?	Monetary incentives to teachers, Subsidy of AP exam fees for students
32	In your opinion, what could be changed about the APTIP to improve AP education in your classes and at your school?	[Free response field]
33	[Question 33 consisted of 14 statements related to student interest in STEM and other general culture changes at the school]	[Five-point Likert scale]
34	In what areas have you seen school culture affected in a positive or negative manner since the expansion of AP offerings via APTIP?	[Free response field]