

# Exploring the Benefits of the International Baccalaureate Extended Essay for University Studies at the University of Virginia

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## Executive Summary

This mixed-methods case study examined the knowledge, skills, abilities, and engagement attributable to a component of the International Baccalaureate (IB) Diploma Program, the Extended Essay. In particular, this study explored the ways in which the Extended Essay helps to prepare students for university studies. The Extended Essay, required for all IB Diploma Candidates, asks students to engage in independent, in-depth research on a topic relating to one of the six IB areas of study. The University of Virginia (UVA) enrolls a significant number of IB students each academic year. Thus, UVA served as an ideal case study for an inquiry into the utility of the Extended Essay in supporting IB alumni's university studies.

This study focused on four research questions, which were addressed through three types of quantitative and qualitative data collection techniques: 1) survey instrument administration; 2) student records analysis; and 3) individual interviews and focus groups:

1. How well are the documented curricular aims of the Extended Essay achieved and sustained as students continue through university studies?
2. To what extent do students perceive the Extended Essay to be valuable to university preparation and in what ways?
3. What, if any, correlations exist between Extended Essay grade and university success in terms of GPA, continuation rates, post-university destinations?
4. What is the relationship between Extended Essay grade and the overall IBDP score?

Results from the case study show that the Extended Essay is, indeed, having an effect on students' research confidence and willingness to engage in future research. Former IB students at UVA were significantly more likely to indicate that they felt prepared for college-level coursework involving research than former AP students at UVA. Moreover, the IB alumni felt strongly that their Extended Essay experience prepared them to conduct the various facets of the research process, from identifying the research problem to creating the reference list.

The qualitative findings illuminated some specific skills that former IB students identified were augmented by completing the Extended Essay project, including the ability to gather and evaluate sources for their research and the reduction of anxiety around college writing assignments. These skills may have enabled students to continue to conduct research while in college. Seventy three percent of IB alumni in the study had executed a research project during their time at UVA. Furthermore, IB alumni are overwhelmingly excited about their engagement with research: they are more proud of their research, more likely to intend to conduct more research in the future, and more likely to find their research skills to be important to their future success than former AP students. Finally, performance on the Extended Essay does appear to bear a relationship with both 1) overall IBDP scores and 2) college-level performance. This case study found a moderate correlation between IB Extended Essay and IBDP scores among the UVA students. In addition, findings showed a statistically significant relationship between Extended Essay score and first-semester and final-semester college GPAs. Moreover,

this relationship remained significant even after controlling for gender, race/ethnicity, income level, high school grade point average, and SAT score.

While there were some limitations to this study, results of our investigation suggest several implications for practice and assessment, including a need to better understand why some students feel more prepared than others to conduct research in college. In addition, study findings suggest that it might be beneficial for the International Baccalaureate Organization to provide their participating schools with additional resources and guidance regarding specific components of the research process, and support the transfer of research skills from high school to the college setting. Finally, the findings indicate a need for additional research on the advantages and disadvantages of students' participation in professors' ongoing research projects.

## Introduction

The International Baccalaureate (IB) Diploma Program seeks to study the knowledge, skills, abilities, and engagement attributable to the Extended Essay that helps to prepare students for university studies. The Extended Essay, required for all IB Diploma Candidates, asks students to engage in independent, in-depth research on a topic relating to one of the six IB areas of study (Language acquisition, Languages and Literature, Individuals and Societies, Mathematics and Computer Science, the Arts, and Experimental Sciences.) The IB program describes the goals of the Extended Essay to include providing students the following opportunities:

- Pursue independent research on a focused topic
- Develop research and communication skills
- Develop the skills of creative and critical thinking
- Engage in a systematic process of research appropriate to the subject
- Experience the excitement of intellectual discovery

The University of Virginia (UVA) enrolls a significant number of IB students each academic year. Since 2005, 2,515 IB students have requested that their transcripts be forwarded to UVA for consideration for undergraduate admission. From 2009 to 2011, the IB received between 338 to 381 requests per year from students to forward their transcripts to UVA. Thus, UVA serves as an ideal case study for an inquiry into the utility of the Extended Essay in supporting IB alumni's university studies. For this study, we have chosen to focus on four research questions:

1. How well are the documented curricular aims of the Extended Essay achieved and sustained as students continue through university studies?
2. To what extent do students perceive the Extended Essay to be valuable to university preparation and in what ways?
3. What if any, correlations exist between Extended Essay grade and university success in terms of GPA, continuation rates, post-university destinations?
4. What is the relationship between Extended Essay grade and the overall IBDP score?

For several analyses, we also compared data or responses between former IB and Advanced Placement (AP) students at UVA. The AP sample was included in order to form a comparison group of UVA students with similar accelerated academic preparation and motivation; we were interested to know if former AP students' experiences with research while in college were similar or different than their former IB counterparts.

## Background and Conceptual Framework

Undergraduate student participation in research has now become a "coin of the realm" among college engagement activities purported to facilitate positive student outcomes. Student participation in undergraduate research has been associated with: a) greater persistence, even

after controlling for race/ethnicity and high school grades and test scores; b) pursuit of graduate and professional educational opportunities; and c) stronger self-efficacy in “learning how to think like a scientist” (Banta, 2004; Craney, et al., 2011; Hunter, Laursen, & Seymour, 2006; Lopatto, 2006; Russell, Hancock, & McCullough, 2007).

These early studies have led higher education leaders, researchers, and policymakers alike to promote undergraduate research widely. For example, the Association of American Colleges and Universities (AAC&U) has designated undergraduate research as a “high-impact practice,” or a teaching and learning practice that they assert leads to a variety of positive student outcomes, including student engagement and retention (Kuh, 2008). Even more directly, the Boyer Commission on Educating Undergraduates in the Research University (1998) recommended that large research universities reorganize their entire undergraduate curriculum around the notion of a research as teaching model, emphasizing learning activities that are experiential and inquiry-based.

The 1998 Boyer Commission and 2008 AAC&U calls are clearly having an effect on college campuses across the U.S. Results from the National Study of Student Engagement (NSSE) report that, nationally, 20.3% of undergraduates had performed some type of research by their senior year (Hu, 2012). Similarly, a follow-up study of 91 Research I and II universities (according to 1998 Carnegie classifications) by the Boyer Commission in 2003 noted that most or all undergraduates participated in some form of supervised research at 25.3% of the universities in the sample.

What is less well understood, however, is how pre-college (or high school) research activities may relate to successful research experiences and outcomes in college. Thus, this study focuses on how one high school research activity, the IB Extended Essay, relates to UVA undergraduate students’ academic performance, retention, willingness to engage in more research, and future plans. One of the primary foci of the study is to ascertain whether UVA undergraduates had participated in the individual steps of the research process necessary to conduct sound inquiry. In searching for a conceptual framework for the research process that would be applicable to a broad diversity of disciplinary topics, we selected Stokking, van der Schaaf, Jaspers, and Erken’s (2004) ten step process:

1. Identify and formulate a problem using subject-specific concepts;
2. Formulate the research question(s), hypotheses and expectations (if any);
3. Make and monitor the research plan: research design and time schedule;
4. Gather and select information/data;
5. Assess the value and utility of the data;
6. Analyze the data;
7. Draw conclusions;
8. Evaluate the research;
9. Develop and substantiate a personal point of view;
10. Report (describe) and present (communicate) the research



Stokking et al. asserted that the above research skills were appropriate for inquiry in a variety of subject areas, and actually tested their applicability to the following broad range of disciplines: physics, biology, history, geography, economics, Dutch, and mathematics. We are interested in ascertaining the source (e.g., research conducted for a class assignment, research undertaken as part of a professor's project) of the research projects the students were engaged in, as well as the components of rigorous research that they utilized in those studies.

## Methodology

The research questions for this study required different types of data to be collected. Thus, we chose three types of quantitative and qualitative data collection techniques for this mixed-methods case study: 1) survey instrument administration; 2) student records analysis; and 3) individual interviews and focus groups. Mixed methods were deemed to be the most appropriate methodological approach, given that the research questions spanned both relational or deductive and process-oriented or inductive issues. The mixed methods study was conducted in primarily two phases: first, a survey was administered to the IB and AP alumni at UVA, and the records analyses were conducted; second, based in part on results gleaned from the survey, qualitative interviews and focus groups provided more depth and richness to the data.

### The University of Virginia

First, though, the following is a brief portrait of the University of Virginia (UVA). UVA was founded in 1819 by Thomas Jefferson, and opened for classes in 1825. Currently, there are 11 Schools or Colleges within UVA: School of Architecture, College and Graduate School of Arts & Sciences, Frank Batten School of Leadership and Public Policy, School of Continuing and Professional Studies, Curry School of Education, Darden School of Business, School of Engineering and Applied Science, School of Law, McIntire School of Commerce, School of Medicine, and School of Nursing. Total enrollment is 21,106, with 14,591 undergraduates and 6,515 graduate students.

The undergraduate student body is diverse by a number of factors. The majority of undergraduates are female (55% versus 45% male). The racial/ethnic representation encompasses 60% White/Caucasian students, 12% Asian Pacific American students, 7% African American students, 5% Hispanic students, 3% multi-racial or ethnic students, and less than 1% Native American students.<sup>1</sup> Thirteen percent of undergraduates are from countries outside the United States, with the current study body representing all 50 states and 130 foreign countries. Due to its status as a public institution, however, the overwhelming majority of students are from the state of Virginia (69%).

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<sup>1</sup> 6% of current undergraduates declined to report their race or ethnicity.

Finally, one-third of students (both in- and out-of-state) were awarded financial aid through UVA's ACCESSUVa, the university's signature financial aid program. ACCESSUVa offers loan-free packages for eligible low-income students, and caps on need-based loans for all other students, with a commitment to meet 100% of demonstrated need for all students. Nine percent of the undergraduate student body were awarded full-grant packages as eligible low-income recipients.

The University of Virginia enjoys a strong academic reputation for its undergraduate education. Ranked the 2<sup>nd</sup> best public university and the 25<sup>th</sup> best national university (among both public and private institutions) by *U.S. News & World Report* in 2012, UVA undergraduate admissions is highly competitive. Only 33% of applicants to the university are admitted, with 94% of first-year students ranked in the top 10% of their high school class. UVA undergraduates tend to finish their educations as well: the six-year graduation rate is 94%.

Next, we describe the quantitative and qualitative methods employed for this case study. Please note that both portions of the research study were approved by the University of Virginia Institutional Review Board.

### **Quantitative Methods**

Sample. For the survey portion of the study, all former IB students enrolled as undergraduates at the University of Virginia (n=1,045) were selected for participation. This included students who matriculated in the fall of 2008, 2009, 2010, and 2011. To form a comparison sample of UVA students with similar accelerated academic preparation and motivation, we selected 1,046 currently enrolled UVA undergraduates who participated in an Advanced Placement (AP) curriculum while in high school. Thus, the total number of students selected (both IB and AP alumni) for the study was 2,091.

The student records analyses utilized the same sample as the survey instrument, except that the records analyses not involving the merged survey data was conducted using the entire former-IB population. The analyses involving post-university destinations and the comparisons between former IB students and former AP students made use of the final sample of former IB and former AP respondents.

The merging of the three datasets (from IB, from UVA institutional records, and from the survey responses) required two separate data merges. First, IB records were merged to the UVA student records through a combination of students' names and birthdates. Second, the survey data and IB records/UVA student records were merged using unique student email address (e.g., abc1x).

Survey Instrument. The survey instrument was constructed to address the appropriate research questions, and included 29 questions in four sections: 1) background information; 2) high school research experience with the IB Extended Essay; 3) college research experiences in a variety of contexts; and 4) writing, mentorship, and resource usage in relation to research

projects. Background information collected included socio-economic status, perceptions of prior academic preparation, and educational, major, and career aspirations. College research experiences queried included research conducted as part of a class, as part of a cumulative project such as a senior thesis, in conjunction with a job or internship, as part of a professor's ongoing research, and as an independent endeavor. Again, we utilized a conceptual framework from Stokking, van der Schaaf, Jaspers, and Erkens (2004) to differentiate the various facets of research projects undertaken by students (see Conceptual Framework in an earlier section for more information).

A copy of the survey instrument can be found in the Appendix.

Data Collection. The preliminary version of the survey instrument was pilot tested for face validity by a few undergraduates (n=5) in late-January 2012. Their feedback and suggestions for revision were taken into account, and the final version of the questionnaire was completed in mid-February. The final version was fielded to the IB and AP alumni sample at UVA from late-February to mid-March via an Internet survey using QuestionPro software. Incentives to participate included the opportunity to win one of the following: one of two iPads or one of eight \$25 gift cards. Meanwhile, IB and UVA student records were merged during early Spring 2012.

Data Analysis. To address research questions #1 and #2, we relied primarily on the survey responses. There was a very low level of missing data in the survey responses; the greatest proportion of non-response to a single item was 4.6% (current major). Given the extremely low level of missing data, all variables except for demographic information and dependent variables were imputed values via mean substitution. The mean scores substituted were the average scores for the respective variable among either the former IB or former AP students, depending upon the respondents' status. Research questions #3 and #4 were examined via student records data. First, however, both the institutional and survey data were readied for data analysis by eliminating duplicate data, purging cases with mostly missing data, and merging appropriate datasets. Research questions were investigated using crosstabulation and chi-square analyses, *t*-tests, Pearson product moment correlations, and ordinary least squares regression analyses.

## **Qualitative Methods**

Sampling Strategy. At the end of the survey instrument that was administered to the selected former IB and AP students in March 2012 (see quantitative methods sampling strategy section), respondents were asked to indicate whether they would be willing to participate in an interview or focus group. Sixty-three IB alumni indicated that they would participate in an interview or focus group. All 63 students were asked to indicate their availability for a group interview and 39 students responded to this request after two reminders.

Interview participants were purposefully selected from this group based on several criteria, including the settings and disciplines in which their described projects were conducted and

their academic year in college. Two students participated in individual interviews and 19 students took part in focus group interviews comprised of three to seven participants each. The two students who participated in an interview were specially selected because they indicated on their surveys that their IB Extended Essay was the research project of which they were the most proud in their academic careers. The remaining students were divided into four different focus groups: the first focus group (n=4) included students who indicated that they had only conducted a research project as part of a class assignment; the second focus group (n=5) included students who indicated that they had conducted multiple research projects in a social science research context; the third focus group (n=3) included students who indicated that they had conducted multiple research projects in a science, technology, engineering, or mathematics context; and the final focus group (n=7) included students who had performed research in a variety of contexts.

Interview and Focus Group Protocol. Both the interview and focus group participants were asked a series of questions developed to probe more in-depth into their IB Extended Essay and college research experiences. First, we asked students about their Extended Essay project, including the nature of the project's topic, their motivation for pursuing that topic, the steps in the research process that they undertook, their perceptions about the finished product, their level of preparation to conduct research prior to the Extended Essay and their confidence with the research process after completing the Extended Essay. We then asked the participants to talk about the research project that they felt more proud of, whether that project was conducted in high school or college. We next transitioned to students' sense of self-confidence and enjoyment with respect to conducting research, and the relationship of those perceptions to their Extended Essay experience. Next, we discussed perceived supports for, and barriers to, their research endeavors, including faculty mentoring, available resources, and skill sets needed to be an effective researcher. Finally, we concluded the interviews or focus groups by asking whether the students planned to continue to conduct research after receiving their baccalaureates, and in what ways they anticipated that research would play a role in their future careers.

A copy of the interview protocol can be found in the Appendix.

Data Collection. Interviews were conducted by a trained postdoctoral researcher and doctoral student in April 2012. Individual interviews each lasted approximately one hour, while focus group interviews each lasted about 90 minutes. All individual and focus group interviews were transcribed verbatim. In order to facilitate the process of storing, organizing, and searching the data (Creswell, 2008), transcribed interviews were uploaded into the qualitative data analysis software program QSR NVivo 9.0.

Data Analysis. Once focus group and individual interviews were completed, we uploaded interview data into the qualitative data analysis software program QSR NVivo 8.0 in order to facilitate the process of storing, organizing, and searching the data (Creswell, 2008). First-level coding, used to summarize segments of data, was guided by our research questions and

included broad categories such as “EE skills used in college” and “knowledge about research” (Miles & Huberman, 1994).

Next, the data within NVivo were given free codes (e.g., supports, barriers) that emerged upon further analysis. Within these free code categories, data were coded with micro codes. For example, micro codes under “EE skills used in college” included “analyze and evaluate” and “writing.” These micro codes formed the basis of a detailed outline that we used to guide the write up of our findings. As we wrote, we often referred to the micro-coded data – as well as the original transcripts from which they were drawn – for detail, clarification, and confirmation.

## Results

### Profile of the Quantitative Obtained Sample

A total of 1,008 UVA undergraduates responded to the survey from the pool of 2,091 students; however, after removing duplicate files and unusable data, the total number of respondents was reduced to 953, resulting in a 46% response rate for the useable data. The obtained sample was majority female (66%) and diverse by racial/ethnic background: 59% White/Caucasian, 17% Asian Pacific American, 4% Black/African American, 4% Hispanic/Latino, 3% Multi-racial or ethnic, 6% resident alien, and 7% unknown. The socio-economic status of the respondents was quite high: the overwhelming majority of respondents’ parents had obtained at least a bachelor’s degree, and 40-50% had earned a master’s degree or higher. In addition, the majority of respondents came from families for which the total household income was over \$100,000 per year. While these demographics are representative of a group with a more advantaged social capital background, it is more-or-less indicative of the type of students who attend UVA.

The survey respondents also had strong prior levels of academic achievement. According to their UVA official records, the average SAT Verbal score was 676 out of 800; the average SAT Mathematics score was 683 of 800; and the average SAT Writing score was 678 of 800. In addition, the average high school grade point average was 4.22, including honors points.

Overall, the survey respondents felt relatively academically prepared for college. As Figure 5 shows, the majority of respondents indicated a 4 or 5 on a 5-point scale, with 5 representing “very prepared” in the subject areas of Math, Science, English, Social Science, and Writing Courses. Interestingly, the only subject area that does not mirror this pattern is perceived preparation for courses that require research, for which the greatest proportion of respondents only indicated “moderate preparation.”

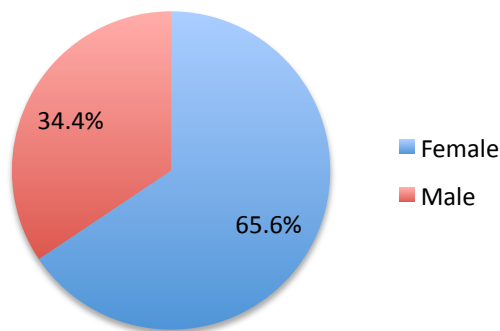
There were 23 broad categories of undergraduate majors represented in the obtained sample. The most popular majors of the respondents included Engineering (n=132); Social Sciences (e.g., Psychology, Sociology, Anthropology) (n=115); Business (n=97); and Undecided/Undeclared (n=90). Not surprisingly, future career aspirations tended to dovetail

with current majors: the most popular career aspirations included the vocations of Medicine, Business, Undecided, and Engineering. Interestingly, though, while Engineering was the most popular major among the respondents, it was only the 4<sup>th</sup> most popular career aspiration.

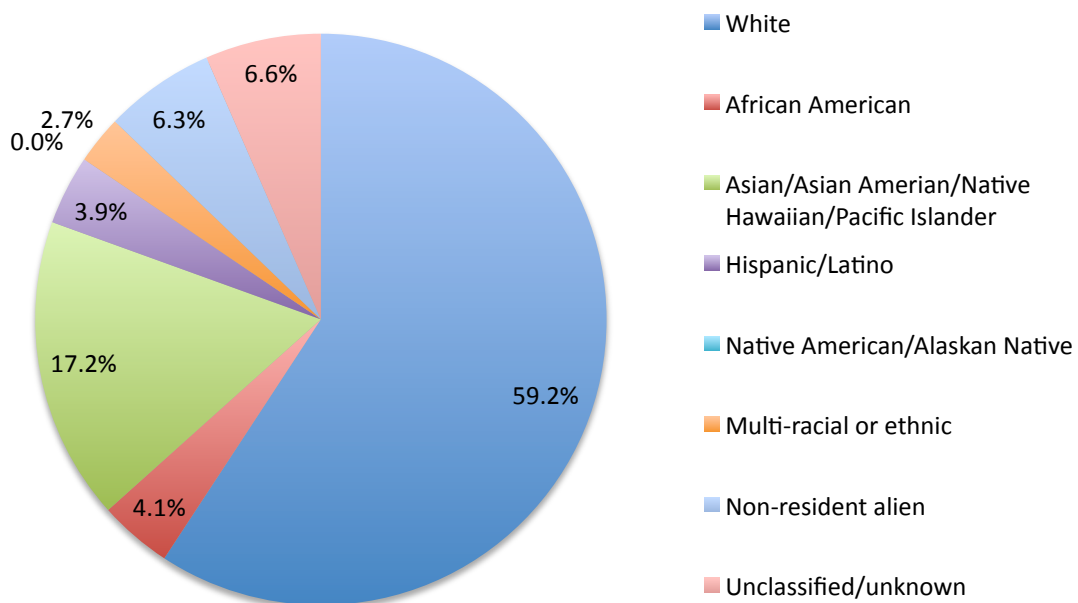
Finally, again as one might guess, the sample had very high degree aspirations: 41% and 37% aspired to at least a master's or professional/doctoral degree, respectively.

See Figures 1-8 for a visual representation of the quantitative sample (both IB and AP) profile.

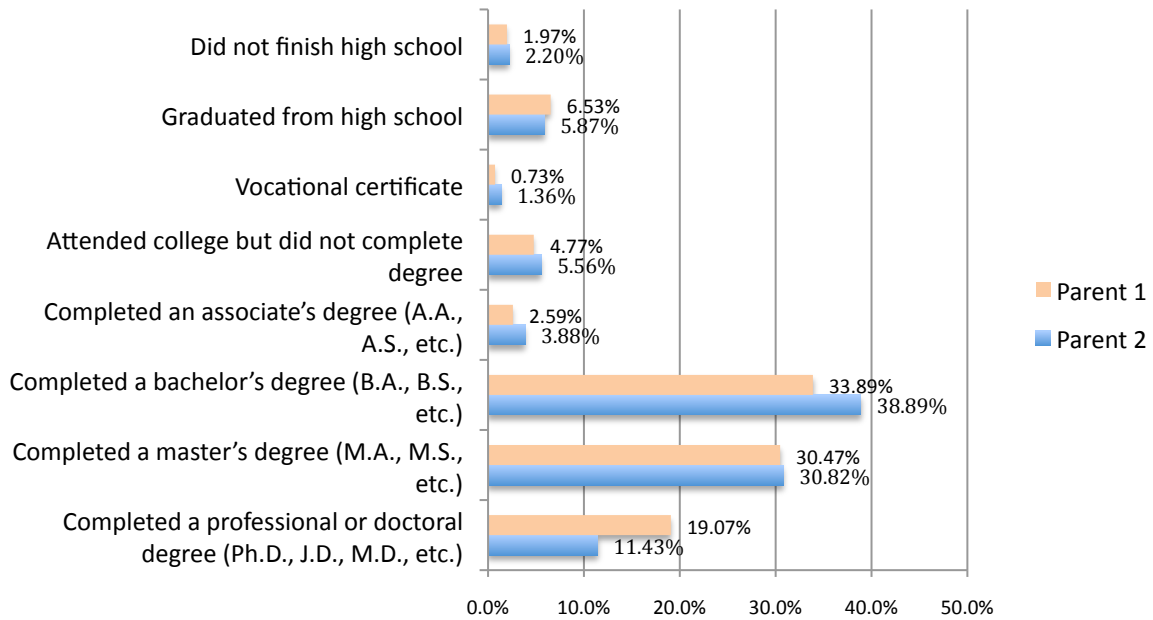
**Figure 1: Gender composition of the quantitative respondents**



**Figure 2: Racial/ethnic composition of the quantitative sample**



**Figure 3: Parental education levels of the quantitative respondents**



**Figure 4: Total household income among the quantitative respondents**

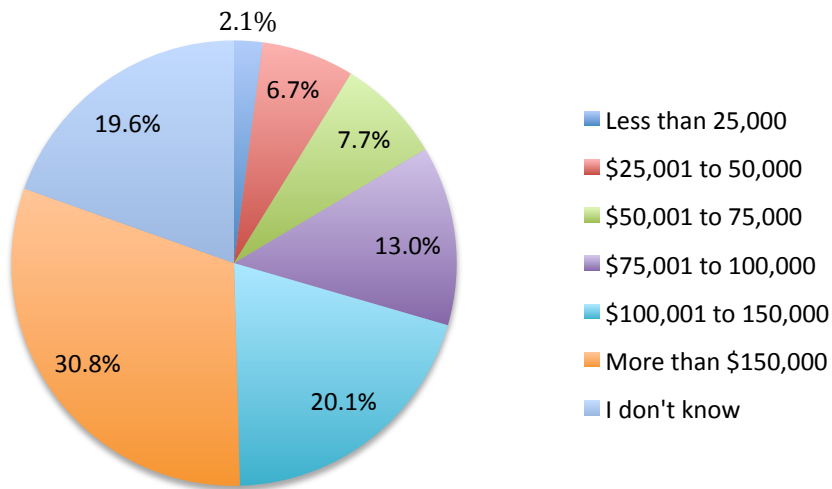
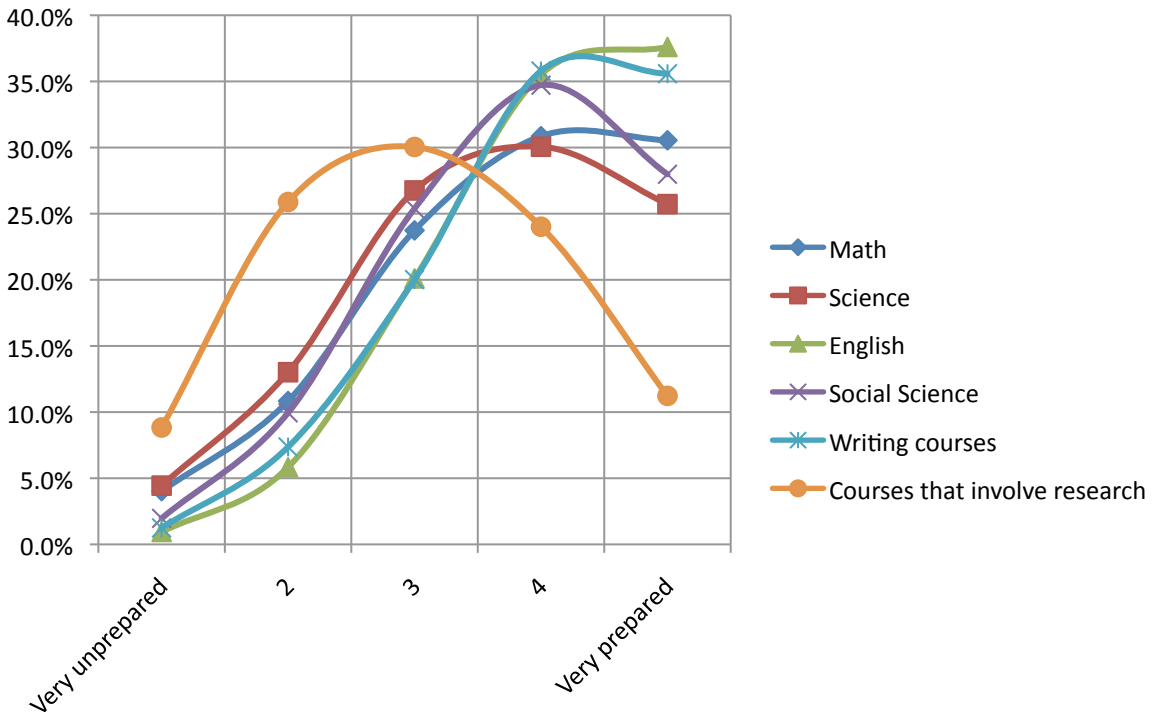
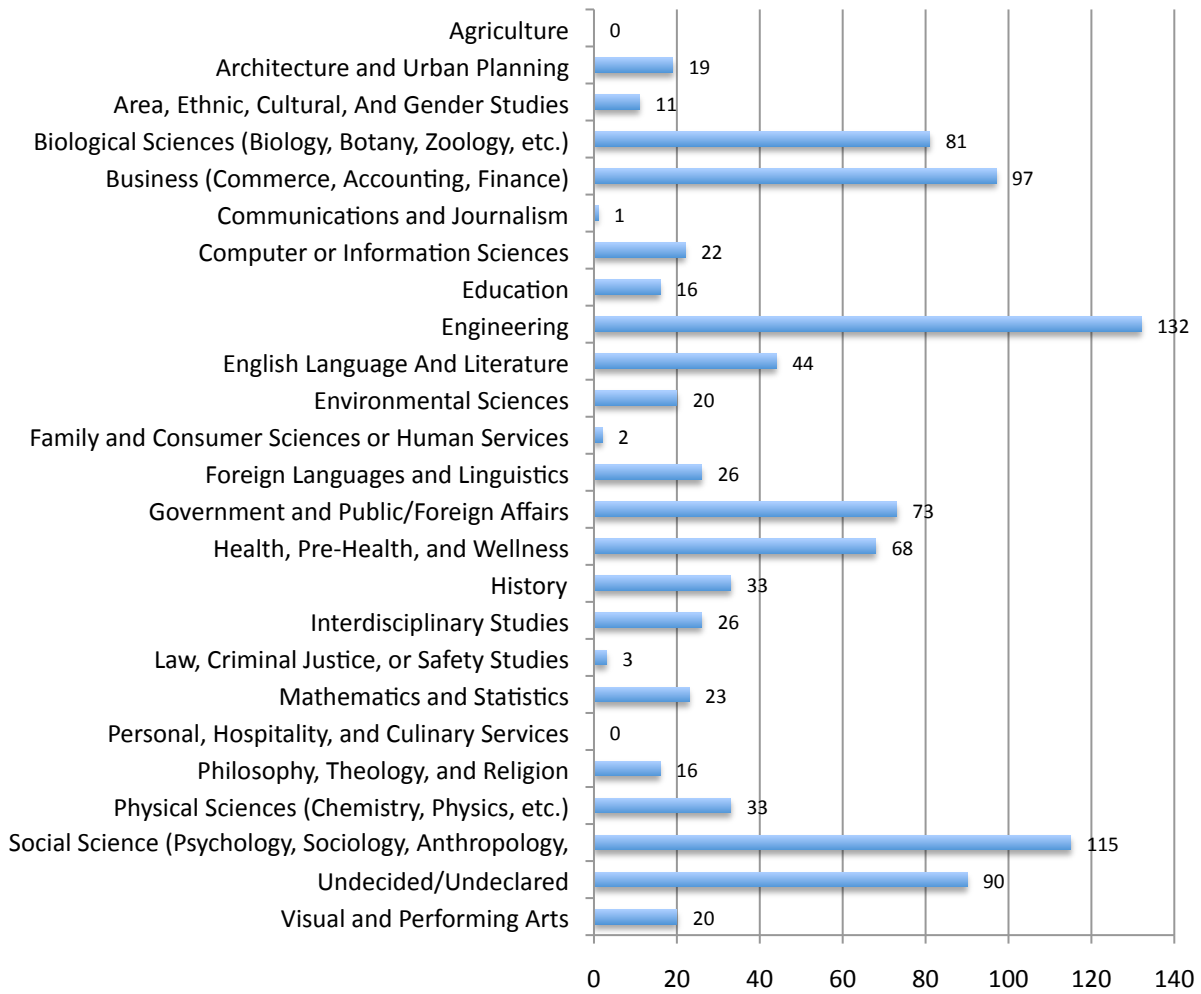


Figure 5: Perceptions of high school academic preparation for college among the quantitative respondents

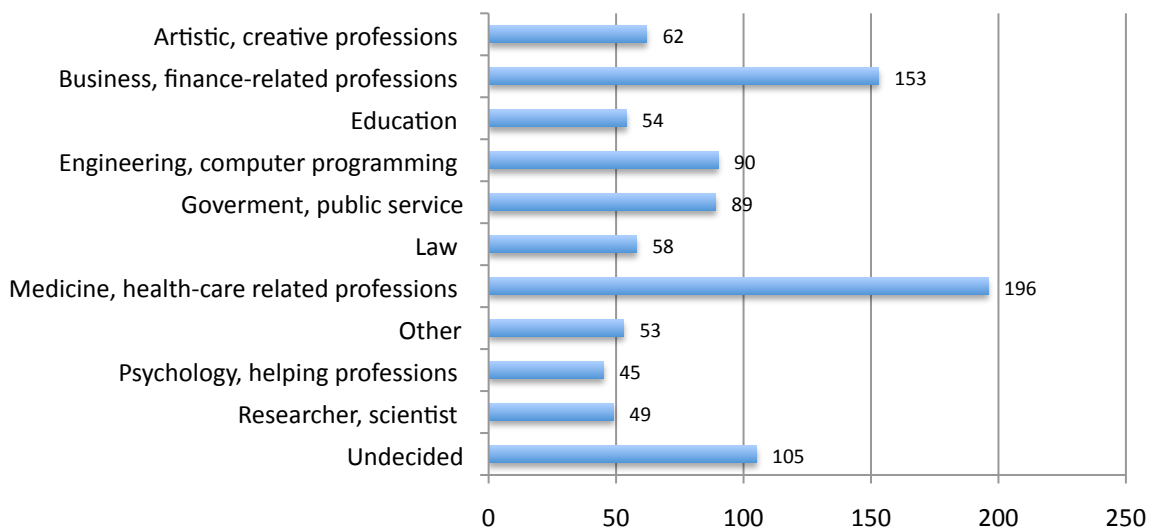




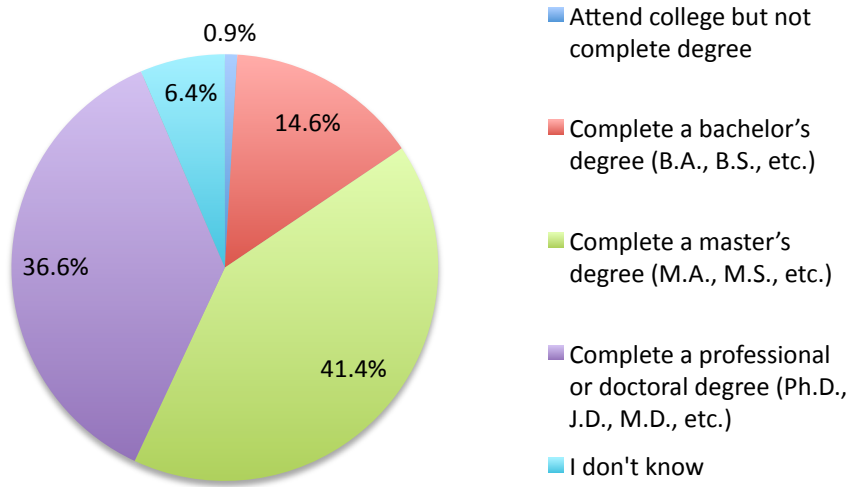
**Figure 6: Major representation of the quantitative respondents**



**Figure 7: Career aspirations among the quantitative respondents**



**Figure 8: Educational aspirations of the quantitative respondents**



**Comparison of the IB versus AP alumni samples**

There were some significant differences between the obtained IB and AP alumni samples for our survey. The IB sample included a greater proportion of women respondents, as well as White/Caucasian students, meaning that men and racial/ethnic minority students were underrepresented in the findings. In addition, respondents in the AP alumni sample had slightly higher SAT scores, but the IB alumni sample had a higher mean high school GPA.

Care should be taken when interpreting results that compare data for former IB versus AP respondents that the sample differ along these characteristics.

**Table 1: Significant differences between the IB and AP alumni respondents to the survey**

Characteristics	IB sample	AP sample	Sig. Diff.
<b>Gender</b>			
Female	62.8%	54.7%	*
Male	37.2%	45.3%	
<b>Race/Ethnicity</b>			
White/Caucasian	64.0%	51.5%	*
Asian Pacific American	14.0%	18.2%	*
Non-resident alien	4.3%	8.8%	*
Unknown/unclassified	7.0%	6.2%	
Black/African American	3.1%	6.0%	*
Hispanic/Latino	4.9%	5.5%	
Multi-racial	2.8%	3.5%	
Native American/Alaskan Native	<1%	<1%	

Average SAT scores			
Verbal	661	679	*
Mathematics	673	695	*
Writing	667	681	*
<hr/>			
High school GPA	4.24	4.12	*

\* denotes significant difference in IB vs. AP data

While the background characteristics of the IB and AP alumni survey samples differed slightly, their college majors and career ambitions were very similar. The top three majors pursued for both former IB and AP students at UVA were Engineering, the Social Sciences, and Business. Biological Sciences was the fifth most popular major among IB alumni, while it was the fourth most popular among AP alumni. Similarly, the careers of Medicine, Business, Engineering, and Government and Public Service were the top four most popular vocational ambitions for both the former IB and AP students at UVA. Interestingly, the only surprising difference among career ambitions was that the fifth most popular major among former IB students was in an Artistic field (7%), while the fifth most popular major among former AP students was in Education (7%).

**Table 2: Top five majors for former IB and AP students in the survey sample**

IB Students		AP Students	
Engineering	13.0%	Engineering	13.6%
Social Sciences (Psychology, Sociology, Anthropology, Economics)	13.0%	Social Sciences (Psychology, Sociology, Anthropology, Economics)	11.0%
Business (Commerce, Accounting, Finance)	9.4%	Business (Commerce, Accounting, Finance)	10.4%
Government and Public/Foreign Affairs	8.3%	Biological Sciences (Biology, Botany, Zoology, etc.)	8.5%
Biological Sciences (Biology, Botany, Zoology, etc.)	7.7%	Health, Pre-Health, and Wellness	7.0%

**Table 3: Top five career fields for former IB and AP students in the survey sample**

IB Students		AP Students	
Medicine, health-related professions	21.1%	Medicine, health-care related professions	19.7%
Business, finance-related professions	13.8%	Business, finance-related professions	17.8%
Engineering, computer programming	10.0%	Engineering, computer programming	8.8%
Government, public service	9.8%	Government, public service	8.8%
Artistic, creative professions	6.6%	Education	6.6%

Finally, the overwhelming majority of both IB and AP alumni at UVA aspire to a Master's, Professional, or Doctoral degree, 79% and 77% respectively.

**Table 4: Highest level of educational aspirations for former IB and AP students in the survey sample**

Education Level	IB Students	AP Students
Master's degree	42.2%	41.0%
Professional or doctoral degree	36.3%	36.0%
Bachelor's degree	13.5%	15.8%
I don't know	6.7%	6.5%
Attend college but not complete degree	1.1%	0.7%

### Profile of the Qualitative Obtained Sample

Of the 21 interview or focus group participants, 16 were female and 5 were male. Nine participants were seniors, five were juniors, five were sophomores, and two were first-year students.

The 21 participants had conducted a wide-variety of research for different purposes: 16 had completed a class assignment requiring a research project; five had undertaken a cumulative research project such as a thesis; seven conducted research as part of their job or internship; three had worked with a professor on his/her research project; seven performed an independent research project; and two indicated they had done a research project that did not conform to the previous five categories.<sup>2</sup>

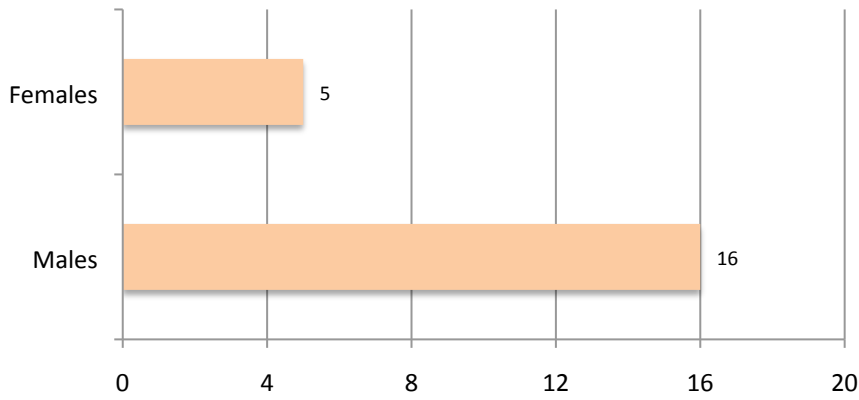
Finally the general disciplinary areas in which the students conducted their research included: nine in the social sciences (e.g., assessment of UVA's impact on the Charlottesville rental housing market; survey of non-governmental organizations and municipalities in rural Guatemala to assess potable water access); five in the science and engineering fields (e.g., design of a plant that produces ethanol from municipal solid waste; design an assay to detect histone methyl transferase activity); and four in the humanities (e.g., the role of sexuality as a technique for intelligence gathering).

See Figures 9-12 for a visual representation of the qualitative sample profile.

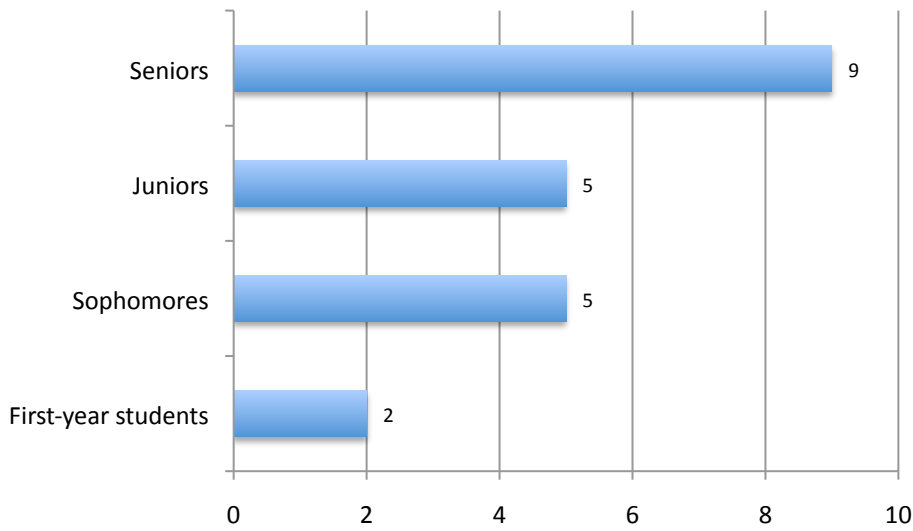
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<sup>2</sup> Please note that individual students had conducted multiple types of research projects; hence, the figures quoted add up to more than 21 types of projects.

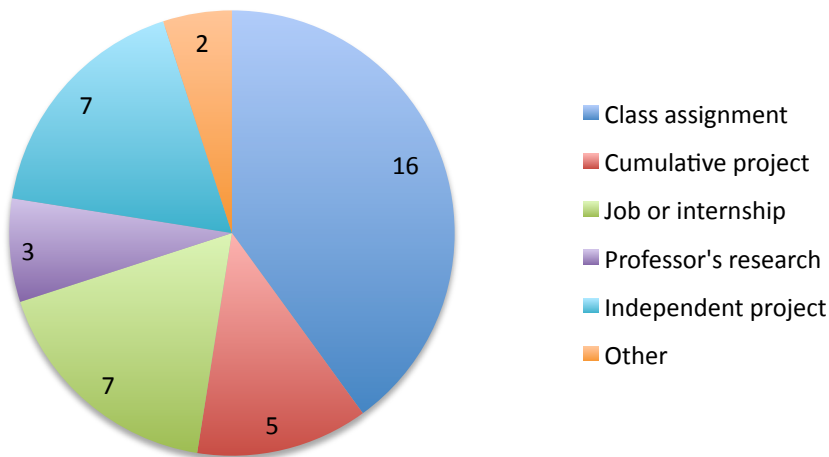
**Figure 9: Gender distribution of qualitative interview/focus group participants**



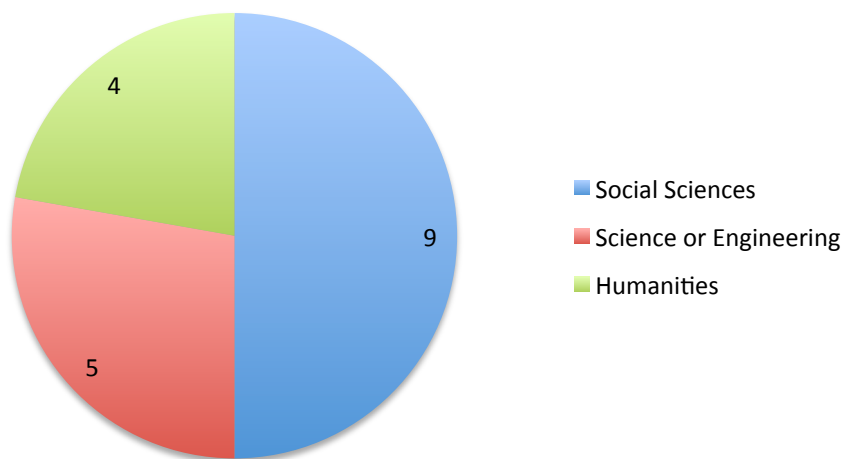
**Figure 10: Academic class level representation of qualitative interview/focus group participants**



**Figure 11: Type of research conducted by qualitative interview/focus group participants**



**Figure 12: Disciplinary focus of research conducted by qualitative interview/focus group participants**



### **Profile of the Student Records Data**

The final sample utilized in this study included student records for all former IB and an equal number of randomly selected AP students currently enrolled at UVA from the entering Fall classes of 2006, 2007, 2008, 2009, and 2010. The total number of student records was 2,091. The student records data included 59% women, which is a slightly greater representation than in the general UVA undergraduate student body. The racial/ethnic distribution of the student records data was slightly overrepresented by Asian Pacific Americans and Multi-racial students, and slightly underrepresented by White/Caucasian and Black/African American students.

Not surprisingly, the average SAT scores and high school GPAs of the students in the records data was higher than that of the general UVA undergraduate student body. Given that the records data included former AP and IB students, one might expect their grades and test scores to be higher than the typical undergraduate at the University of Virginia.

**Table 5: Significant differences between the student records data sample and the UVA undergraduate student body**

Characteristics	UVA UG Population	Combined IB & AP Records Data	Sig. Diff.
Gender			
Female	55.9%	58.7%	*
Male	44.1%	41.3%	
Race/Ethnicity			
White/Caucasian	61.3%	57.7%	*
Asian Pacific American	11.8%	16.1%	*
African American	8.3%	4.5%	*
Unknown/unclassified	6.1%	6.6%	
Non-resident alien	5.7%	6.6%	
Hispanic/Latino	4.9%	5.2%	
Multi-racial	1.8%	3.2%	*
Native American/Alaskan Native	<1%	<1%	
Average SAT scores			
Verbal	652	670	*
Mathematics	671	684	*
Writing	658	674	*
High school GPA	4.11	4.22	*

*\* denotes significant difference in the UVA undergraduate population and the combined IB & AP records data sample*

### Results for Research Question #1:

#### How well are the documented curricular aims of the Extended Essay achieved and sustained as students continue through university studies?

The documented curricular aims of the Extended Essay are to provide students with the opportunity to: pursue independent research on a focused topic; develop research and communication skills; develop the skills of creative and critical thinking; engage in a systematic process of research appropriate to the subject; and experience the excitement of intellectual discovery. Analyses of the survey data reveal that IB alumni at UVA felt strongly prepared for college-level work as a result of their Extended Essay experience, and most continued using their research skills at the college level. Similarly, analyses of the interview and focus group data suggest that these aims were achieved for most students in high school. However, we also found that some were sustained more than others as students progressed through university

studies. Our qualitative findings also revealed that college-level research opportunities enabled students to progressively enhance the research self-efficacy and engagement they first developed through their Extended Essay projects.

### Quantitative Results

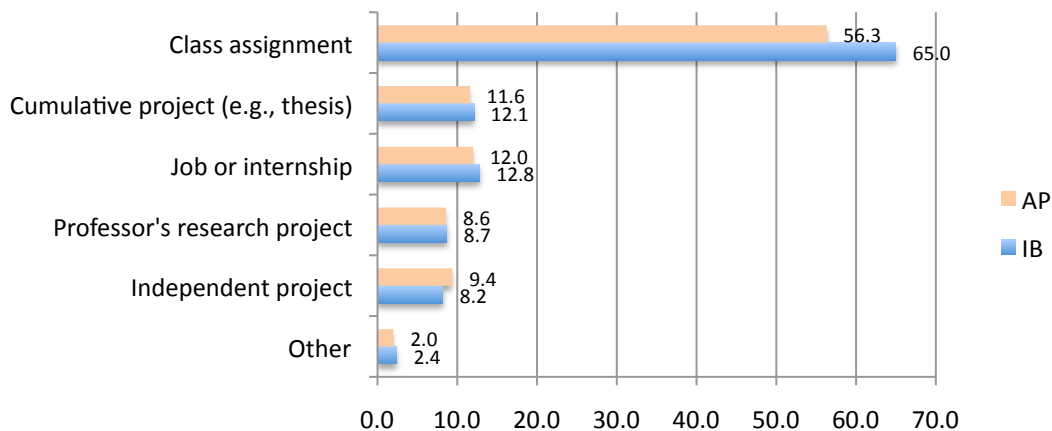
On the survey, we asked UVA IB alumni if they had engaged in research projects of any kind while in college. The vast majority (73%) had participated in at least one research project while at UVA, and the types of research they engaged in varied as well. Sixty-five percent of IB alumni at UVA had conducted a research project as part of a class assignment, and over 10 percent had performed research as either a cumulative project such as a senior thesis or as part of a job or internship requirement. Just under 10 percent either participated on a professor’s research project or developed an independent project. Thus, it appears as though UVA IB alumni sustain their research efforts into college.

**Table 6: Percentage of UVA IB alumni who conducted various types of research projects while in college**

Class assignment	65.0%
Cumulative project (e.g., thesis)	12.1%
Job or internship	12.8%
Professor's research project	8.7%
Independent project	8.2%
Other	2.4%

In addition, we compared the college research experiences of former IB and AP students in our sample. While 73% of former IB students performed some type of research while in college, only 66% of former AP students did. The proportion of students performing the various types of research were largely the same, except when it came to class assignments: while 65% of IB alumni conducted some type of research for a class assignment, only 56% of AP alumni did.

**Figure 13: Proportion of IB and AP alumni who conducted various types of research projects while in college**





Finally, we asked the UVA IB alumni a set of items about their level of excitement and engagement with research, and compared their results to the UVA AP alumni. Using a more conservative  $p$ -value to account for multiple dependent variables measuring similar constructs, we still found that former IB students at UVA were more likely than former AP students to find their research experiences interesting, be proud of their research projects, and be satisfied with their research experiences. However, the eta squared analyses revealed small effect sizes among the constructs with significant differences.

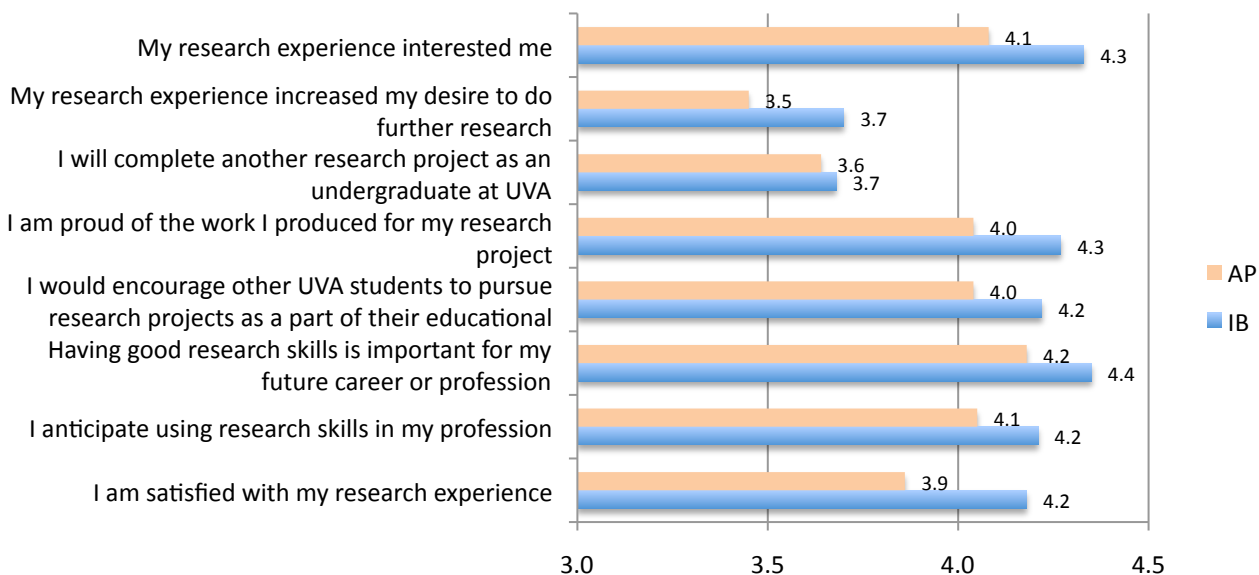
**Table 7: t-test comparisons of IB and AP alumni’s perceptions of excitement and engagement with conducting research**

	Former IB		Former AP		Sig.	Eta sq. <sup>+</sup>
	Mean	Std. Dev.	Mean	Std. Dev.		
My research experience interested me	4.30	0.7	4.08	0.8	*	0.03
My research experience increased my desire to do further research	3.70	0.9	3.45	1.1		
I will complete another research project as an undergraduate at UVA	3.70	1.3	3.64	1.3		
I am proud of the work I produced for my research project	4.30	0.7	4.04	0.8	*	0.02
I would encourage other UVA students to pursue research projects as a part of their educational experience	4.20	0.8	4.04	0.8		
Having good research skills is important for my future career or profession	4.40	0.9	4.18	0.9		
I anticipate using research skills in my profession	4.20	0.9	4.05	0.9		
I am satisfied with my research experience	4.20	0.8	3.86	0.9	*	0.03

\*  $p < .006$  (using Bonferroni adjustment to adjust for potential Type 1 errors:  $p < .05/8$  items)

<sup>+</sup> Based on the formula  $\eta^2 = t^2 / (t^2 + (N_1 + N_2 - 2))$  (Cohen, 1988)

**Figure 14: IB and AP alumni's perceptions of excitement and engagement with conducting research**



### Qualitative Results<sup>3</sup>

While the above data provides a snapshot of students' attitudes and behaviors regarding conducting research, we wanted to delve deeper into how they made meaning of their research experiences through the qualitative portion of our study. The following summarizes the overarching themes we encountered:

When discussing their Extended Essay experiences, as well as their research experiences in college, all participants shared that the Extended Essay played a critical role in familiarizing them with the systematic process of research, which they found valuable to university preparation. With regard to other curricular aims of the Extended Essay, the skills that students said they most often used in college fell under the category of critical thinking and communication skills. In particular, many participants felt that the Extended Essay taught them to effectively: 1) gather and evaluate sources for college-level research projects; and 2) prepare them for college-level writing. In contrast, while most students seemed to have exercised creativity and experienced the excitement of intellectual discovery while working on their Extended Essay projects, these aims were only sustained for some IB alumni as they moved through college.

In terms of *gathering and evaluating sources*, two students believed that they learned more about this skill set in college than they did from their respective Extended Essay experiences. Kelly, for example, said that she had rushed through the process of gathering data for her Extended Essay, while Rachel shared that she had probably been overly reliant on web searches in high school. Yet Rachel acknowledged that the research she did for her Extended Essay

<sup>3</sup> For all qualitative results identifying participants by name, pseudonyms were used to protect the identities of the interviewees.

project had likely served as a “jumping stone” for the development of more sophisticated research skills. Similarly, Min, a second year student, shared that while she first learned to locate and interpret academic journal articles when she was working on her Extended Essay project, she felt that she had refined this skill while in college. Min said that, for the research papers assigned in her college science classes, she was required to review the extant literature on various topics. As she explained, she “had a general idea from high school about how to search for things,” but, she said, “I’m a lot better at researching things now because of all the science papers I’ve done at UVA. I guess once you get into college they assume you know that kind of stuff so it’s just really nice that I had that... I think it was just like practice, or you just know where to look.”

Other students felt more strongly about the skills they acquired through the Extended Essay. Second year student Julie, for example, said, “we got pretty good exposure, knowing where to look for sources and how to know which ones are valid, and just kind of gathering information that’s pertinent to you topic.” Similarly, Catherine, a second year student, shared,

...it’s so useful now because even in classes where we have to write research papers in a technical type field, you need to first know what you’re writing about to then go and make intelligent conclusions or assumptions based off of what you found. I just thought that was probably the most valuable part about that entire [Extended Essay] research process.

Our finding that students’ skill levels with respect to gathering and evaluating sources increase as they advance through college is consistent with prior research (Pascarella & Terenzini, 2005) and is likely due to additional instruction and practice in this area as well as gains in cognitive development. However, it is also possible that participants acquired important foundational skills in this area through their Extended Essay work, which likely enabled them to begin college-level research at a more advanced level than peers who had not yet engaged in the process of locating and critically assessing the value of potential sources.

All focus group and interview participants agreed that the IB curriculum, and the Extended Essay specifically, provided them with *strong writing skills*. These skills, they said, had prepared them well for college-level work. In particular, students shared that they arrived at college knowing how to: 1) manage their time when working on writing projects; 2) structure a research paper; and 3) write in a formal academic style. Students also said that their Extended Essay experience helped them feel less anxious about college-level writing.

With respect to *time management*, some students shared that this was a key writing skill they acquired from their Extended Essay experience. Min, for example explained that her high school’s IB program “gave us deadlines, like have your thesis done by this point,” which later helped her set deadlines for herself when working on college-level writing assignments. Similarly, fourth year student Emma said that the Extended Essay had provided her with “the ability to write at length about a subject and...structure my time a little bit to be able to do that.” On the other hand, Julie, a first-year student, lamented the fact that she was not able to

devote the same amount of time to college writing assignments as she did to her Extended Essay. As she explained, “I think the biggest difference [between high school and college] is that I probably don’t have enough time or as much time to work on my papers here, so I know they’re not as good sometimes.” Nonetheless, Julie said that the writing involved in the Extended Essay had proven “really helpful.”

Indeed, another way in which Julie and others found the Extended Essay helpful was its *emphasis on structure*. As Julie explained, learning to format findings and present them in a logical fashion was a writing skill that she had used in college. Similarly, Shilpa, a fourth year student, said that her Extended Essay experience taught her the importance of developing a thesis, and structuring papers in a way that supported the thesis. As she explained, “Honestly I think one of the things that I got most out of...was being able to write a good thesis statement for any essay. I think that’s probably one of the best things I got out of [the IB program].” Min also shared that she felt “confident about making a thesis” as a result of her Extended Essay work. Her Extended Essay advisor, she said, had emphasized the role of the thesis in the overall structure of her Extended Essay. As Min explained, “I would be like, ‘what order do I put it in?’ She made it very simple. She was like, ‘use a tripartite thesis where you have three things that you focus on,’ so I would do that.” Min said that this training had not only informed her college writing, but also her research, since she used theses as a framework for evaluating potential sources for papers and projects.

Participants said that their Extended Essay experiences informed not only the structure of their college writing, but also their *writing style*. In particular, students said that the Extended Essay had provided them with practice writing in the formal academic style required by college work. As Min explained, “you can’t use contractions and you can’t use ‘I’ and we were like, ‘that’s so annoying,’ but I understand why you would do that now.” She also said that she learned to write in the active, rather than the passive, voice. Similarly, Julie noted that she had learned through the Extended Essay how to appropriately cite sources and document those sources in a bibliography. In addition, she learned how to write an abstract. As she explained, “I had never written [an] abstract before, so that was new. It was kind of hard at first, but I’m glad I learned how to do it.”

Beyond the specific writing skills that students discussed, several also shared that successfully completing the Extended Essay *reduced their anxiety levels* related to college-level writing. First year student Bradley, for example, said of the transition from high school to college,

I definitely think it helped me kind of learn to put together a paper on that size...I think from there entering into UVA it was a good starting point to kind of build on doing into the papers I’ve done here. I definitely think it did make me comfortable coming into a situation like that, personally, and just being like ‘oh okay I can do this.’ It’s not something that I need to really freak out about because it’s just a paper -- I’ve done that before.”

Others shared that simply knowing they had written a long paper before college significantly bolstered their confidence about their writing skills. Prior experience also helped participants move beyond feelings of intimidation when faced with their first large writing assignments in college. As Michelle, a fourth year student, explained,

[The Extended Essay] was definitely the longest paper I wrote in high school, so I think that in my first year here...I ended up in a class that was exclusively English majors dealing with history and things like that, and it was really overwhelming, but I just stuck with it because I didn't want to withdraw because I didn't know that that was something that's okay to do...But I think that knowing that I had written a long paper made writing those long papers easier.

Mei said that she had a similar experience with her first lab report in a college chemistry class. "I remember they made it sound really, really scary," she said. However, when her instructor started listing the criteria against which lab reports would be evaluated, she realized that the criteria resembled those used for the Extended Essay and other IB writing assignments. "So," she continued, "it was just really similar and wasn't as scary."

Finally, our findings suggest that creativity and autonomy were key factors when reflecting upon their Extended Essay experiences. More specifically, participants were enthusiastic about the level of freedom they had in choosing a topic for their respective Extended Essay projects. As Sarah, a third year student, explained,

So I thought that was interesting, getting to choose -- I'm going to write a English paper, am I going to write a history paper, am I not going to write a math paper - - kind of getting to make that decision, choose the topic that you were most interested in at the time and then having to formulate that research question as opposed to being handed like this is kind of the topic, come up with the thesis...that exploration process was pretty unique.

This freedom, they said, inspired a level of excitement about engaging in intellectual discovery which some of them had not sustained into their college years. Several students said that while they enjoyed the challenge of their Extended Essay experiences, and had developed an interest in conducting research as a result of their Extended Essay experiences, the constraints of college assignments made college-level research less exciting for them. Shilpa, for example, shared, "[Research] hasn't particularly been an interest of mine. I guess if I'm doing it for a paper, if I like the topic, I'll enjoy it." In contrast to Shilpa's experience, several students – most of whom were involved in intensive undergraduate research projects -- continued to feel excitement about intellectual discovery.

In particular, the students who exhibited a level of excitement were those who were involved in projects that: 1) provided them with the freedom to exercise creativity and control; and 2) had real-world applications. Fourth year student Michelle, for example, said that the college research project of which she was most proud was a research paper she wrote for an upper-

level Biology seminar. For the paper, she said, “we had total freedom to pick whatever we wanted to talk about, and had to come up with the narrow question. So it was a lot like the Extended Essay, now that I’m thinking about it...I wrote about melanoma because it’s such a prevalent cancer and it’s something that we’ve got a lot of new work on.” Several students had engaged in research within the context of team projects that were funded through undergraduate research programs at UVA including Jefferson Public Citizens and the Harrison Undergraduate Research Awards, as well as through individual academic departments such as Biomedical Engineering and Nursing. For example, Melissa, a fourth year Nursing student, said that she traveled to Ghana to volunteer with a team of other Nursing students, and developed a research project based on her experience there.

It was awesome. I went and we helped out at an orphanage for children who had lost one or both parents to HIV (or AIDS). It was just something that I was like, you know, I don’t want to just have this information and do nothing about it at this point...So I wrote about implementing a policy to empower women who are HIV positive in this one small village. It was just kind of all about figuring out why the rates are so high and what’s going on in this one little village. Again, I didn’t do an experiment by any means but it was just I guess, again, kind of taking data and looking at it and reading this and that and getting women’s accounts. I called people in Ghana that I knew, that I had met through my experience and just talked to them. It was a really powerful and positive kind of research experience.

### **Results for Research Question #2:**

#### **To what extent do students perceive the Extended Essay to be valuable to university preparation and in what ways?**

#### **Quantitative Results**

On the survey, we asked the UVA IB and AP alumni to rate their perceived level of preparation for college courses involving research, and the former IB students, in general, were significantly more likely to indicate that they felt either “prepared” or “very prepared” than the former AP students. However, it is also important to point out that nearly 29% of former IB students reported that they felt either “unprepared” or “very unprepared” for college courses involving research.

**Table 8: Perceived level of preparation for college courses involving research**

Level of preparation	IB	AP	Stand. Resid.*
Very unprepared	7.3	10.5	1.7
Unprepared	21.4	29.8	2.9
Moderately prepared	29.4	31.0	0.5
Prepared	27.5	20.2	2.6
Very prepared	14.4	8.5	2.8

\* *Standardized residuals greater than 2.0 are considered a major difference.* (Sheskin, D. J. (1997). *Handbook of parametric and nonparametric statistical procedures*. Boca Raton, FL: Chapman & Hall/CRC.)

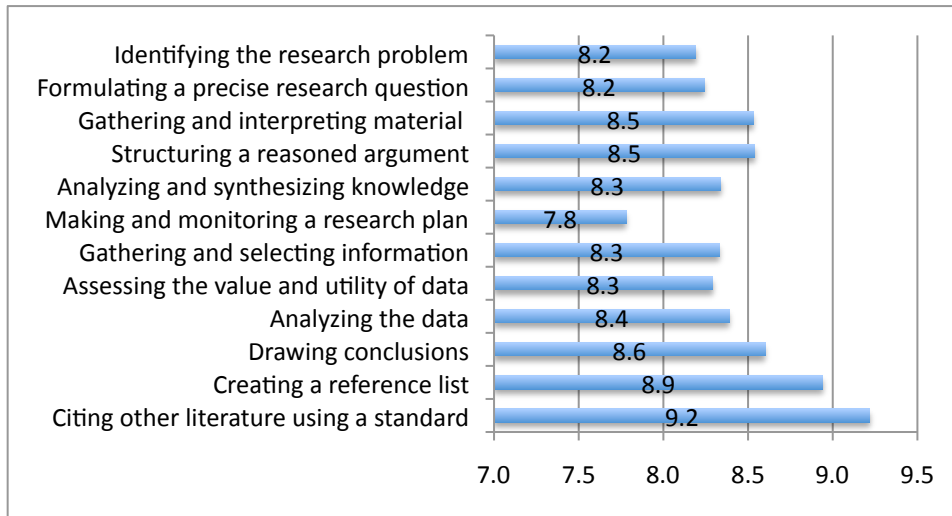
$\chi^2=20.78$ ;  $df=4$ ;  $p<.001$

We also asked the UVA IB alumni how well they felt their IB Extended Essay experience prepared them for college-level work with respect to 12 facets of the research process. Table 9 below shows that, overall, UVA students who were IB alumni felt that their Extended Essay experience prepared them well for college-level work. With response ranges between 1 and 10, most students responded an average of 8.0 or higher for 11 of the 12 facets of the research process. The only facet that students felt less prepared for pertained to making and monitoring a research plan; however, it is important to note that the mean score for that question was still higher than 7 out of 10. Thus, it appears that the former IB students at UVA felt that the Extended Essay prepared them well for college-level work, and engaged them in a systematic process that included most portions of the research continuum.

**Table 9: IB alumni's perceptions that the Extended Essay experience prepared them for college-level work for a variety of facets of the research process**

	Mean	Std. Dev.
Identifying the research problem	8.19	2.18
Formulating a precise research question	8.24	2.16
Gathering and interpreting material from sources appropriate to the research question	8.53	2.16
Structuring a reasoned argument in response to the research question on the basis of the material gathered	8.54	2.13
Analyzing and synthesizing current knowledge regarding the research topic	8.34	2.16
Making and monitoring a research plan (design & time schedule)	7.78	2.40
Gathering and selecting information/data	8.33	2.24
Assessing the value and utility of data	8.29	2.27
Analyzing the data	8.39	2.35
Drawing conclusions	8.60	2.18
Creating a reference list	8.94	2.23
Citing other literature using a standard style (e.g., MLA, APA, Chicago)	9.22	2.26

**Figure 15: IB alumni’s perceptions that the Extended Essay experience prepared them for college-level work for a variety of facets of the research process**



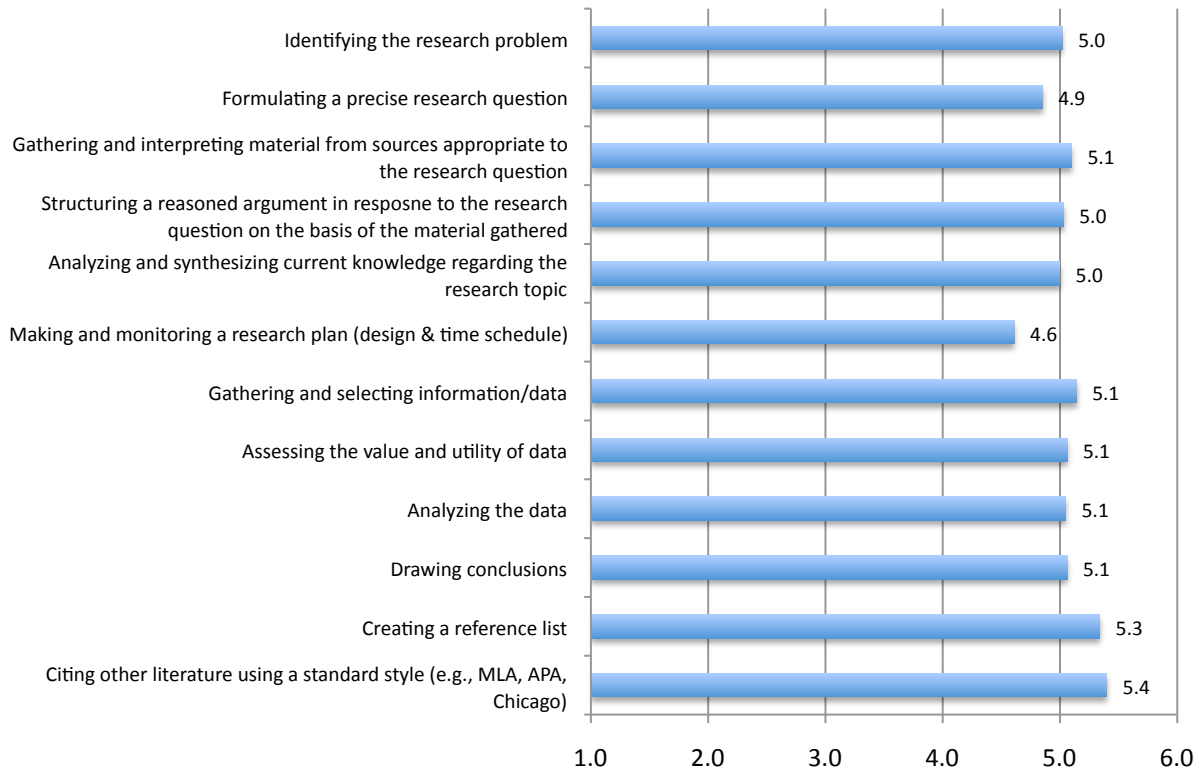
In a subsequent portion of the survey, we asked respondents to describe their current level of confidence with the same 12 research skills. As Table 10 shows, IB alumni at UVA have very high levels of confidence in nearly all facets of the research process. Interestingly, the one area of the research process that remained lower in confidence was “making and monitoring a research plan,” the same area highlighted as one of the skills students felt less prepared to do as a result of their Extended Essay experiences.

**Table 10: IB alumni’s current level of confidence with research skills**

	Mean	Std. Dev.
Identifying the research problem	5.0	0.8
Formulating a precise research question	4.9	0.9
Gathering and interpreting material from sources appropriate to the research question	5.1	0.8
Structuring a reasoned argument in response to the research question on the basis of the material gathered	5.0	0.8
Analyzing and synthesizing current knowledge regarding the research topic	5.0	0.8
Making and monitoring a research plan (design & time schedule)	4.6	1.2
Gathering and selecting information/data	5.1	0.8
Assessing the value and utility of data	5.1	0.9
Analyzing the data	5.1	0.9
Drawing conclusions	5.1	0.8
Creating a reference list	5.3	0.9
Citing other literature using a standard style (e.g., MLA, APA, Chicago)	5.4	0.9

**Figure 16: IB alumni’s current level of confidence with research skill**





Interested to see if perceptions of preparedness due to the Extended Essay experience were related to students' current level of confidence with research skills, we correlated the former data with the latter. We found that the correlations ranged between .24 and .47, indicating that the relationships were modest at best. These results suggest that students' confidence levels with research skills were only partially explained by their perceived level of preparedness due to the Extended Essay experience, and were instead explained to a larger extent by other factors in their backgrounds or college experiences.

### Qualitative Results

The qualitative analyses shed additional light on the extent to which students perceived the Extended Essay to be valuable to university preparation. As described by participants, the Extended Essay prepared them for university studies in two key ways: 1) familiarization with the research process; and 2) confidence. In terms of familiarization with the research process, participants discussed their approach to the research process in college, and how this approach was shaped by their Extended Essay experiences. With respect to confidence, participants described the impact of Extended Essay participation on their feelings about the transition to college-level research.

When describing their approach to the research process in college, students at all stages of their college careers shared that their Extended Essay experiences served as an introduction to research, as well as a roadmap of sorts when conducting research projects across disciplines.

Most participants said that while they had been introduced to individual steps of the research process throughout middle or high school, the Extended Essay was the first time they had been required to combine these steps and perform the research process in its entirety. As Lian, a second year student, said, “I guess writing the Extended Essay helped me to learn what the structure of research is.” Min, a second year student, agreed. She said that for her, the Extended Essay was an “opening...into the world of research.” As a result, beyond the specific skills students acquired from the Extended Essay and applied in college, students’ Extended Essay experiences provided them with an understanding of how to begin a research project and navigate each step involved in completing it. As Courtney, a fourth year student, explained,

That’s what I’ve noticed the biggest difference between the way that I view a problem or an assignment and the way that people who have done different programs is – that I can look at it and be like, “I don’t know anything about this subject and it was kind of overwhelming to me. Let’s just start at Point A and start going.” Whereas other people will be like, “I don’t understand this”...I’m like, “I don’t know it...but I can use these different resources.”

In addition to understanding how to identify and use resources in the process of research, students also said that they learned how much time was required in order to complete research projects. As fourth year student Rachel explained, the Extended Essay “teaches you to spread out your time because...you’re writing your extended essay and your two English papers and your [other IB-related work] at the same time. That’s hard. How are you going to do it all? You’d better learn how to balance.” Other students echoed Rachel’s remarks, sharing that the process of completing the Extended Essay gave them a sense that they were capable of managing the demands of college, and more specifically, college-level research projects.

Indeed, this sense of not being overwhelmed by college-level research was a recurring theme throughout all of the focus groups. Time and again, students said that completing the Extended Essay fostered their self-efficacy with respect to completing college-level research projects. Thus, in addition to familiarizing participants with the research process, another way in which students found the Extended Essay valuable to university preparation was that it provided them with a sense of confidence as they transitioned from high school to college.

Several students attributed their confidence to the qualities of character they demonstrated in the course of completing the Extended Essay. Courtney, for example, noted that the Extended Essay helped her realize that she possessed a certain level of self-motivation. As she explained,

It doesn’t matter how much your parents wanted you to or anybody wanted you to. You have to want to write it or you would never do it. It was probably one of the first kind of assignments that you have where you’re kind of on your own and you’re still going to graduate high school if you don’t do it and no one, your parents – they don’t even really know what you’re writing about...As much

as they might want you to do it, you have to sit down and do all of that work and do it. So you have to want to do it.

Others agreed, saying that completing the Extended Essay showed them that they were capable of seeing a challenging project through to fruition. Rachel, for example, said that the Extended Essay required “drive” on her part:

The extended essay I think in general just taught me that I can do it...You're like, I did all of this work in high school and I know I must be prepared for college type thing. It's like that drive of an attitude...no one is really forcing you to write this paper. I think that once you do write it and you accomplish that you just feel good yourself. I can do this in high school, I can do this any time in my life.

The confidence that participants developed through the course of completing the Extended Essay therefore imbued them with a sense that they possessed not just the skills necessary for college, but rather the makings of a college student.

Through the Extended Essay, students not only developed confidence in terms of their own motivation and persistence, but also in their capacity for college-level work. Some students noted that had it not been for their Extended Essay experience, they might have been more intimidated by college assignments. For example, Julie, a first-year student, shared that completing the Extended Essay made research and writing assignments “less scary, because now that the papers that I've written had to be as long as that one was, I did once so I can do it again...so that's nice.” Third year student Sarah, too, said of the Extended Essay, “I think there is some reassurance in it that you wrote a long paper that didn't suck.”

Some third- and fourth-year participants contrasted this level of reassurance with that of their non-IB peers, noting that in their early college years, they were less overwhelmed by college-level research projects than peers who were not IB alumni. Fourth year student Shilpa, for example, recalled,

I remember getting my first research paper first year for a sociology class. I remember the professor was like...I think it was like 10 to 12 pages and he was just kind of going on about it and he was making it seem like it was a really big deal. A lot of students seemed to be freaking out about it. I just remember feeling like oh, this is fine. I can do this. I've done something similar to this. I remember thinking back, yes, I felt like the extended essay had prepared me to a certain extent.

Similarly, Julie shared that the Extended Essay experience inspired a sense of camaraderie among fellow IB alumni. As she explained,

I've only actually had a couple of classes that I had research papers in, and actually both of them I was in with people who also were in the IB program even at different schools or at my school, too, so...all of us were kind of like, we wrote an extended essay, this isn't going to be that bad.

The Extended Essay experience thus seems to function as an important support for students as they make the transition from high school, instilling a sense of self-efficacy as well as a sense of confidence that carries through to college-level work.

### **Results for Research Question #3:**

**What, if any, correlations exist between Extended Essay grade and university success in terms of GPA, continuation rates, and post-university destinations?**

#### **Correlations between Extended Essay grade and cumulative college GPA**

This research question is best addressed through quantitative methods. Accordingly, first, we correlated Extended Essay scores with college grade point averages (GPAs) for the IB alumni in the classes entering Fall 2006 to Fall 2010. The results in Table 11, below, show that—with the exception of the entering class of 2008, students' IB Extended Essay score shared a statistically significant positive correlation with their cumulative GPA, as measured through subsequent semesters of enrollment. However, the correlation between Extended Essay score and cumulative college GPA is modest at best. The highest single correlation for these two measures occurred with the Fall 2007 cumulative GPAs of the 2006 entering class ( $r=.40$ ). Yet, a correlation of .40 yields a percent variance explained for these two constructs of .16, or 16% of the variance explained, not holding any other construct constant. Indeed, the modal correlations fall between  $r=.25$  and  $.30$ , which imply  $r^2$  values of 6% to 9%. Thus, it appears that the Extended Essay score does correlate with cumulative college GPA, but there remains the possibility that several other constructs are more vital in this relationship than the Extended Essay score.

**Table 11: Correlations between Extended Essay score and Cumulative GPA**

	2006	2007	2008	2009	2010
	Ent Class	Ent Class	Ent Class	Ent Class	Ent Class
Fall 2006	0.29				
Spring 2007	0.38				
Fall 2007	0.40				
Spring 2008	0.36	0.23			
Fall 2008	0.33	0.24			
Spring 2009	0.34	0.24			
Fall 2009	0.37	0.23		0.26	
Spring 2010	0.34	0.23		0.28	
Fall 2010		0.23		0.30	0.20
Spring 2011		0.23		0.30	0.19
Fall 2011				0.32	0.18

*Note: all correlations significant at  $p < .05$*

### **Relationships between Extended Essay grade and first and final semester GPA**

For IB alumni entering in Fall 2006, 2007, 2008, 2009, or 2010, we conducted an ordinary least squares regression analysis with the dependent variable being first semester GPA, and the independent variables represented in two blocks:

- Block one: gender, White (referent: non-White), high school GPA, SAT verbal+math, and Pell eligibility (to represent low income); and
- Block two: Extended Essay grade.

The independent variables were entered in two blocks in order to ascertain the unique variance explained by students' Extended Essay grade, after key background characteristics had been entered. Collinearity diagnostics (VIF < 1.3; Tolerance > 0.8) revealed no severe inter-correlations among the independent variables (Cohen, Cohen, West & Aiken, 2003) and with very little missing data among the independent variables, the analysis utilized a listwise deletion.

**Table 12: Predictors of first semester GPA among UVA IB alumni**

	Block 1		Block 2	
	$\beta$	Sig	$\beta$	Sig
Gender (female)	.06	*	.05	
White/Caucasian (Referent: non-White)	.08	**	.08	*
High school GPA	.12	***	.12	***
SAT verbal+math score	.32	***	.30	***
Pell eligibility	-.06		-.06	
Extended Essay score			.12	***
$R^2$	.16		.17	
F	36.20	***	32.98	***

\*  $p \leq .05$ ; \*\*  $p \leq .01$ ; \*\*\*  $p \leq .001$

The results of the regression analysis (see Table 12) show that students' Extended Essay scores did significantly predict their first semester college GPA, but the EE score only contributed 1% of the variance explained, after student background characteristics were entered into the model. Among the background characteristics, unsurprisingly, high school GPA and SAT verbal+math score predicted first semester GPA as well.

Moreover, the results from Table 13 reveal that students' Extended Essay scores also significantly predicted their final semester college GPA, and this relationship contributed to 4% of the variance explained, after student background characteristics were entered into the analysis. Thus, like high school GPA and SAT scores, students' Extended Essay scores do correlate with their college academic performance, and those relationships are predictive of students' early and cumulative performance while in college.

**Table 13: Predictors of final semester GPA among UVA IB alumni**

	Block 1		Block 2	
	$\beta$	Sig	$\beta$	Sig
Gender (female)	.16	**	.14	**
White/Caucasian (Referent: non-White)	.10		.09	
High school GPA	.13	*	.13	*
SAT verbal+math score	.30	***	.27	***
Pell eligibility	-.05		-.05	
Extended Essay score			.19	***
$R^2$	.15		.19	
F	13.01	***	13.52	***

\*  $p \leq .05$ ; \*\*  $p \leq .01$ ; \*\*\*  $p \leq .001$

### Relationships between Extended Essay grade and first and on-time graduation

Because there was such little variation in the persistence rates of IB alumni at UVA (for example, of IB alumni, first to second semester persistence for the fall 2006 entering class was 100%; for the fall 2007 entering class, it was 98%, etc.), we only examined on-time graduation rate as the persistence measure. Assuming eight semesters for an on-time four-year graduation rate, we only included data from the fall 2006 and 2007 entering classes, which enjoyed a four-year graduation rate of 90%.

Chi-square analyses (see Table 14) show that there were no statistical differences ( $p > .05$ ) in on-time graduation rates among students with varying Extended Essay grades.

**Table 14: Chi-square distributions of Extended Essay scores and on-time graduation rates (in percentages)**

Extended Essay score	On-time graduation	
	No	Yes
2	13.8	86.2
3	8.5	91.5
4	12.6	87.4
5	6.8	93.2
6	5.1	94.9

$\chi^2 = 3.72$ ;  $df = 4$ ;  $p = .45$

## Comparisons of post-university plans among high, medium, and low Extended Essay scorers

Correlations among Extended Essay scores and both 1) career aspirations and 2) educational expectations showed no significant relationships. Thus, Extended Essay score appears to bear no relationship to UVA students' career or educational aspirations.

## Comparisons of post-university plans among former IB and AP students

Multiple regression analyses were conducted in order to test whether IB or AP alumni status bore any relationships to career or educational aspirations of the respondents to our survey. Other independent variables (which served as controls) included in the analysis were: gender, race/ethnicity, SAT verbal and mathematics score, total test credits waived, and socio-economic status (parents' education and Pell grant eligibility). The multiple regression analyses revealed no statistical association between IB or AP alumni status and any specific career trajectory or final educational aspiration.

### Results for Research Question #4:

#### What is the relationship between Extended Essay grade and the overall IBDP score?

In order to examine this question, Extended Essay grades needed to be transferred into numeric data. The scale used in this analysis for the Extended Essay evaluations was: A=6; B=5; C=4; D=3; E=2, and N=1. The distribution of Extended Essay scores for the UVA IB alumni is depicted in Table 15.

**Table 15: Distribution of Extended Essay scores among the UVA IB sample**

IB EE letter grade	Numeric code	Percentage
A	6	9.7
B	5	19.6
C	4	39.2
D	3	26.7
E	2	4.7
N	1	0.2

Meanwhile, the distribution of overall IBDP scores among the UVA IB alumni is described in Table 16.



**Table 16: Distribution of overall IBDP scores among the UVA IB alumni**

Percentile	Percentage
10%	25
25%	28
50%	31
75%	34
90%	36

Finally, the bivariate correlation between Extended Essay score and overall IBDP score for the UVA students was  $r=.44$ ;  $p<.001$ , indicating a moderate relationship. However, it is important to note that the Extended Essay score comprises a small part of the overall IBDP score

### Other Notable Findings

In addition to examining the four research questions we identified for this case study, we discovered some interesting findings from the data that we felt would be of interest. These findings are summarized in this section.

#### Not all college research experiences are created equal

We conducted an exploratory quantitative study to examine if different types of research projects undertaken by undergraduates encompass similar kinds of research processes. In other words, are students equally as likely to progress through the various phases of a research study (e.g., form a research question, conduct a review of research, design an appropriate methodology, collect and analyze data, form conclusions) no matter what type of research they are conducting—be it for a class project, for a cumulative project like a senior thesis, for an internship/work experience, or for a project they are working on with a professor. We found that students participating in a professor’s ongoing research project may not be exposed to or gain experience in some critical elements of the research process, such as formulating a research question or drawing conclusions from the data. Instead, their experiences may be somewhat disjointed—perhaps only gathering materials for a literature review or collecting data—and thus offer these students an incomplete snapshot of the research process. Yet, the predominance of the empirical and scholarly literature strongly promotes working on a professor’s research project as a high-impact endeavor, thus forcing the question as to whether this type of research experience is, really, the most optimal—at least in terms of learning about the entire research process or becoming socialized as a scientist.

#### Future plans

When discussing their future plans, many interview and focus group participants planned to attend graduate school, and among these students, some aspired to careers in which their primary activity would be conducting research (e.g., academia, science). These students directly

attributed their career interests to their research experiences in high school and college. Other students also traced their research interest to their earlier research involvement, and said that they would likely utilize their research skills in graduate school, as well as in aspects of their future occupations (e.g., law, medicine). Even among those who either were not sure about their future plans, or who planned to enter the workforce directly after college, students anticipated using their research skills in some way. David, for example, said of his future work in the corporate world, “I expect that all of the work I do forever will be research in some sense.” These findings therefore suggest that for many students, the curricular aims of the Extended Essay were sustained not only as students continued through university studies, but also potentially beyond students’ college years.

## Conclusion

### Summary of findings

The results from our case study on the role of the International Baccalaureate Extended Essay requirement on undergraduates’ perceptions of and experiences with research at the University of Virginia has shown that the Extended Essay is, indeed, having an effect on students’ research confidence and willingness to engage in future research.

First, former IB students at UVA were significantly more likely to indicate that they felt prepared for college-level coursework involving research than former AP students at UVA. Moreover, the IB alumni felt strongly that their Extended Essay experience prepared them to conduct the various facets of the research process, from identifying the research problem to creating the reference list.

The qualitative findings illuminated some specific skills that the former IB students identified were augmented by completing the Extended Essay project, including:

- The ability to gather and evaluate sources for their research
- Growth in writing skills (e.g., constructing an argument) and styles (e.g., MLA, Chicago) necessary for college-level work
- The capability of managing their time efficiently
- The reduction of anxiety around college writing assignments
- Bolstered creativity and autonomy with pursuing a personally-chosen research topic.

These skills may have enabled the former IB students to continue to conduct research while in college. Seventy three percent of the IB alumni in our study had executed a research project during their time at UVA, a significantly higher proportion than among AP alumni. The greatest percentage of the IB alumni conducted a research project in conjunction with the class assignment (65%), but between 8% to 12% worked on a research study involving either a cumulative project like a thesis, an assessment for a job or internship, an ongoing project

related to a professor's line of research, or an independent inquiry. Furthermore, the IB alumni are more likely to find their research experiences to be interesting, be proud of their research projects, and be satisfied with their research experiences.

Finally, performance on the Extended Essay does appear to bear a relationship with both 1) overall IBDP scores and 2) college-level performance. We found a moderate correlation ( $r=.44$ ) between IB Extended Essay and IBDP scores among the UVA students. In addition, we noted a statistically significant relationship between Extended Essay score and first-semester and final-semester college GPAs. However, we found no relationships between Extended Essay scores and college retention or career or educational aspirations.

### **Limitations of the study**

As with all research, though, there were a number of limitations associated with this study. First, there were significant differences in the background characteristics (namely: gender, race/ethnicity, SAT scores, and high school GPA) of the former IB and AP students in our survey sample. There were more women and fewer racial/ethnic minority students in the IB sample, and while average SAT scores among the IB sample were lower than the AP sample, the average high school GPAs among IB alumni was higher than that of the AP alumni.

Second, the choice to use former AP students as the comparison sample for this study resulted in a comparison sample that was not representative of the UVA undergraduate student body. In general, the AP sample was less racially and ethnically diverse and had higher SAT scores and high school GPAs than the UVA undergraduate student body at-large. However, we felt it more appropriate to use a comparison sample with similar academic motivation and preparation to the IB sample than one that mirrors the UVA undergraduate enrollment in general.

Third, there were limitations involved in the analytical decisions regarding research questions three and four. Although the Extended Essay (EE) scores were ordinal in nature, when the analyses were deemed appropriate to do so, letter grades were converted to numeric scores. However, it is important for the reader to understand that EE scores cannot be considered to be continuous measures, except in a rather imprecise fashion. In addition, for research question four, given that the overall IBDP score is comprised in a small part by the respective student's EE score, the moderately strong correlation found between EE and IBDP score may be somewhat due to the two measures' shared variance.

Despite these limitations, the results of this study suggest several implications for practice and assessment, which are discussed below.

### **Implications for practice and future assessment**

Although former IB students were significantly more likely to indicate that they felt prepared for college-level research than former AP students, nearly 30% of IB alumni reported that they felt "unprepared" or "very unprepared" to take courses involving research in college. It would

be important to follow-up with this group of students in order to better understand why they felt so unprepared to conduct research in college, and what, if anything, could improve their confidence with research in conjunction to the Extended Essay requirement.

In addition, while the former IB students felt fairly confident in their abilities regarding 12 different facets of the research process, they were significantly less likely to feel confident in their abilities to make and monitor a research plan. Not surprisingly, the ability to make and monitor a research plan was also the area for which they felt they were the least well prepared vis-à-vis their Extended Essay experiences. Thus, the International Baccalaureate Organization might consider focusing their attention to this critical aspect of the research process by providing their participating schools and respective mentors more resources and tips that can be shared with the IB students regarding the management of a research plan.

Third, for some former IB participants, their excitement about conducting research started to wane when they began college and were forced to perform a study on a pre-chosen topic, instead of one that they developed and cultivated on their own. Because the Extended Essay project is self-initiated in terms of topic, the International Baccalaureate Organization could possibly help students transition to this type of college phenomenon by enabling the students to think creatively about how they can take empirical ownership of a pre-determined topic for a college requirement. For example, as a follow-up to the Extended Essay experience, IB mentors might show students how they can turn a required topic like water filtration systems into something more meaningful for them by adding more applied research questions such as examining the cost effectiveness of such systems in comparison to commercial water consumption. Or, mentors might encourage their IB students to learn and try new research methods when in college, so that even when the research topic may not be as personally interesting to the student, he or she could at least add to his or her research skills toolkit as a result of the assignment.

Fourth, although our exploratory study on different ways in which undergraduates participate in research was not directly related to the research questions for this study, our preliminary finding that students participating in a professor's ongoing research project may not be exposed to or gain experience in some critical elements of the research process, such as formulating a research question or drawing conclusions from the data is important and worthy of future study. Because working on a professor's research project is highly touted as a beneficial college experience by universities across the nation, it is critical that we learn more about the advantages and disadvantages of this type of research engagement for students so that we do not unintentionally encourage students to participate in an activity that may have negative consequences.

What is clear, however, is that the Extended Essay project does contribute to participants' research and overall academic efficacy, and that those once "bitten by the research bug" through the Extended Essay tend to continue to engage with research in college, and—potentially—beyond. Given the outcry for higher order cognitive skills among tomorrow's workforce that are assumed to be cultivated by research expertise, such as critical thinking,

inquiry and analysis, written communication, quantitative literacy, and creative problem-solving, the head start that the IB Extended Essay project gives to its participants in research experience and confidence will, in the end, help contribute to a more advanced and effective economy and society.

## References

- Banta, T. W. (2004, Jul/Aug). Assessing outcomes of undergraduate research programs. *Assessment Update*, 16(4), 3-15.
- The Boyer Commission on Educating Undergraduates in the Research University. (1998). *Reinventing Undergraduate Education: A Blueprint for America's Research Universities*. Stony Brook NY: State University of New York,.
- Cohen, J., Cohen, P., West, S.G., Aiken, L.S. (2003). Applied multiple regression/correlation analysis for the behavioral sciences. Lawrence Erlbaum Associates: London.
- Craney, C., McKay, T., Mazzeo, A., Morris, J., Prigodich, C., & de Groot, R. (2011, Jan/Feb). Cross-discipline perceptions of the undergraduate research experience. *Journal of Higher Education*, 82(1), 92-113.
- Creswell, J.W. (2008). *Educational research: planning, conducting, and evaluating quantitative and qualitative research*. Upper Saddle River, NJ: Pearson Education.
- Guba, E.G. & Lincoln, Y.S. (1982). Epistemological and methodological bases of naturalistic inquiry. *Educational Technology Research and Development*, 30(1), 233-252. doi: 10.1007/BF02765185
- Hu, G. (2012, Spring). Using the National Survey of Student Engagement to measure undergraduate research participation. *Council of Undergraduate Research Quarterly*, 32(3), 9-14.
- Hunter, A.B., Laursen, S.L., & Seymour. E. (2006). Becoming a scientist: The role of undergraduate research in students' cognitive, personal, and professional development. *Science Education*, 91(1), 36-74.
- Kuh, G. (2008). High-impact educational practices: What they are, who has access to them, and why they matter. Retrieved April 30, 2012 from <http://www.aacu.org/leap/hip.cfm>.
- Lopatto, D. (2006, Winter). Undergraduate research as a catalyst for liberal learning. *Peer Review*, 8(1), 22-25.
- Marshall, C. & Rossman, G.B. (2006). *Designing qualitative research* (4th ed.). Thousand Oaks, CA: Sage.
- Miles, M.B. & Huberman, A.M. (1994). *Qualitative data analysis: An expanded sourcebook* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage.

Pascarella, E.T. & Terenzini, P.T. (2005). *How college affects students*. San Francisco, CA: Jossey-Bass.

Russell, S.H., Hancock, M.P., & McCullough, J. (2007). Benefits of undergraduate research experiences. *Science*, 316, 548-549.

Stokking, K., Van der Schaaf, M., Jaspers, J., & Erkens, G. (2004). Teachers' assessment of students' research skills. *British Educational Research Journal*, 30(1), 93-116.

## Appendix A

### Survey of High School and Undergraduate Research Experiences



## **Introduction**

Hello: You are invited to participate in our survey on UVA Undergraduate Academic Experiences. The purpose of the current survey is to understand more about students' academic experiences while in college. Please consider taking approximately 8-10 minutes to complete the survey. There is no anticipated risk to your participation. If you choose to complete this survey, you will be entered in a drawing for two iPads and eight \$25 gift certificates to Amazon.com. Your participation and answers to this study are confidential. Answers reported in the results of the study or future publications will not be linked to you or any other individual. If you have any questions, please feel free to contact Dr. Karen Inkelas at 434-243-1943 or email me at kki5x@virginia.edu. This study has been approved by the Institutional Review Board at the University of Virginia. Thank you for helping me in this important study. Please start with the survey now by clicking on the Continue button below.

A. If you wish to participate in this survey, for verification purposes, please provide your valid email id (e.g., "kki5x"). Providing your email address also confirms your eligibility to win one of two iPads or one of eight \$25 gift cards as a result of your participation.

1. I do NOT wish to participate in this survey at this time.
  2. I wish to participate in this survey and I can validate my UVA email address (e.g., kki5x, NO alias please)
- 

## **Background Information**

Before we begin, we would like to ask you a few questions about your background.

B. In which of the following categories is your primary major of study (select one)?

1. Undecided/Undeclared
2. Agriculture
3. Architecture and Urban Planning
4. Area, Ethnic, Cultural, And Gender Studies
5. Biological Sciences (Biology, Botany, Zoology, etc.)
6. Business (Commerce, Accounting, Finance)
7. Communications and Journalism
8. Computer or Information Sciences
9. Education
10. Engineering
11. English Language And Literature
12. Environmental Sciences
13. Family and Consumer Sciences or Human Services
14. Foreign Languages and Linguistics
15. Government and Public/Foreign Affairs
16. Health, Pre-Health, and Wellness
17. History
18. Interdisciplinary Studies

- 19. Law, Criminal Justice, or Safety Studies
- 20. Mathematics and Statistics
- 21. Personal, Hospitality, and Culinary Services
- 22. Philosophy, Theology, and Religion
- 23. Physical Sciences (Chemistry, Physics, etc.)
- 24. Social Science (Psychology, Sociology, Anthropology, Economics)
- 25. Visual and Performing Arts
- 26. I don't know

C. What career do you hope to eventually have after you've completed your education (select one)?

- 1. Artistic, creative professions
- 2. Business, finance-related professions
- 3. Education
- 4. Engineering, computer programming
- 5. Government, public service
- 6. Law
- 7. Medicine, health-care related professions
- 8. Psychology, helping professions
- 9. Researcher, scientist
- 10. I don't know
- 11. Other

D. Thinking back to BEFORE YOU STARTED COLLEGE, how prepared did you feel for the following (1=very unprepared; 3=moderately prepared; 5=very prepared):

	1	2	3	4	5
Math courses?					
Science courses?					
English courses?					
Social sciences courses (e.g., sociology, political science)?					
Writing courses?					
Courses that involve research?					

E. What is the highest level of education you expect to complete (select one)?

- 1. Attended college but not complete degree
- 2. Complete a bachelor's degree (B.A., B.S., etc.)
- 3. Complete a master's degree (M.A., M.S., etc.)
- 4. Complete a professional or doctoral degree (Ph.D., J.D., M.D., etc.)
- 5. I don't know



Structuring a reasoned argument in response to the research question on the basis of the material gathered												
Analyzing and synthesizing current knowledge regarding the research topic												
Making and monitoring the research plan (design & time schedule)												
Gathering and selecting information/data												
Assessing the value and utility of data												
Analyzing the data												
Drawing conclusions												
Creating a reference list												
Citing other literature using a standard style (e.g., MLA, APA, Chicago)												

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**Research Experiences: Description and Participation**

Definition of research: Research is a process of steps used to collect and analyze information to increase our understanding of a topic or issue. (Creswell, 2012, p. 2)

J. Based on the description above, have you completed a research project while at UVA (e.g., for class, internship/job, capstone, thesis, independent research, faculty research, and/or other research project)?

1. No
2. Yes

---

*If No to J: Skip to Thank You Page.  
If Yes to J: Continue*

**Research Experiences: Types of Research Experiences**

K. Under what circumstances did you complete a research project while at UVA (select all that apply)?

1. For a class assignment

2. For a cumulative project (e.g., capstone, honors thesis)
3. For a job or an internship (e.g., an assessment at your internship site)
4. For a professor's research project
5. For an independent research project (i.e., not part of a professor's study or a class)
6. Other research project not listed here

**Research Experiences: Research Activities**

*If 1 for K*

L. For your CLASS research project(s), please indicate the number of times you performed each of these activities:

	0	1	2	3+
Identifying the research problem				
Formulating a precise research question				
Gathering and interpreting material from sources appropriate to the research question				
Structuring a reasoned argument in response to the research question on the basis of the material gathered				
Analyzing and synthesizing current knowledge regarding the research topic				
Making and monitoring the research plan (design & time schedule)				
Gathering and selecting information/data				
Assessing the value and utility of data				
Analyzing the data				
Drawing conclusions				
Creating a reference list				
Citing other literature using a standard style (e.g., MLA, APA, Chicago)				

*If 2 for K:*

M. For your CUMULATIVE research project(s), please indicate the number of times you performed each of these activities:

	0	1	2	3+
Identifying the research problem				
Formulating a precise research question				
Gathering and interpreting material from sources appropriate to the research question				
Structuring a reasoned argument in response to				

the research question on the basis of the material gathered				
Analyzing and synthesizing current knowledge regarding the research topic				
Making and monitoring the research plan (design & time schedule)				
Gathering and selecting information/data				
Assessing the value and utility of data				
Analyzing the data				
Drawing conclusions				
Creating a reference list				
Citing other literature using a standard style (e.g., MLA, APA, Chicago)				

*If 3 for K:*

N. For your JOB/INTERNSHIP research project(s), please indicate the number of times you performed each of these activities:

	0	1	2	3+
Identifying the research problem				
Formulating a precise research question				
Gathering and interpreting material from sources appropriate to the research question				
Structuring a reasoned argument in response to the research question on the basis of the material gathered				
Analyzing and synthesizing current knowledge regarding the research topic				
Making and monitoring the research plan (design & time schedule)				
Gathering and selecting information/data				
Assessing the value and utility of data				
Analyzing the data				
Drawing conclusions				
Creating a reference list				
Citing other literature using a standard style (e.g., MLA, APA, Chicago)				

*If 4 for K:*

O. For your PROFESSORS research project(s), please indicate the number of times you performed each of these activities:

	0	1	2	3+
Identifying the research problem				
Formulating a precise research question				
Gathering and interpreting material from sources appropriate to the research question				
Structuring a reasoned argument in response to the research question on the basis of the material gathered				
Analyzing and synthesizing current knowledge regarding the research topic				
Making and monitoring the research plan (design & time schedule)				
Gathering and selecting information/data				
Assessing the value and utility of data				
Analyzing the data				
Drawing conclusions				
Creating a reference list				
Citing other literature using a standard style (e.g., MLA, APA, Chicago)				

*If 5 for K:*

P. For your INDEPENDENT research project(s), please indicate the number of times you performed each of these activities:

	0	1	2	3+
Identifying the research problem				
Formulating a precise research question				
Gathering and interpreting material from sources appropriate to the research question				
Structuring a reasoned argument in response to the research question on the basis of the material gathered				
Analyzing and synthesizing current knowledge regarding the research topic				
Making and monitoring the research plan (design & time schedule)				
Gathering and selecting information/data				
Assessing the value and utility of data				
Analyzing the data				
Drawing conclusions				
Creating a reference list				
Citing other literature using a standard style (e.g., MLA, APA, Chicago)				

If 6 for K:

Q. For your OTHER research project(s), please indicate the number of times you performed each of these activities:

	0	1	2	3+
Identifying the research problem				
Formulating a precise research question				
Gathering and interpreting material from sources appropriate to the research question				
Structuring a reasoned argument in response to the research question on the basis of the material gathered				
Analyzing and synthesizing current knowledge regarding the research topic				
Making and monitoring the research plan (design & time schedule)				
Gathering and selecting information/data				
Assessing the value and utility of data				
Analyzing the data				
Drawing conclusions				
Creating a reference list				
Citing other literature using a standard style (e.g., MLA, APA, Chicago)				

**Research Experiences: Confidence**

R. How would you describe your current level of confidence with the following research skills (0=No confidence at all; 3=Moderate confidence; 5=Complete confidence)?

	0	1	2	3	4	5
Identifying the research problem						
Formulating a precise research question						
Gathering and interpreting material from sources appropriate to the research question						
Structuring a reasoned argument in response to the research question on the basis of the material gathered						
Analyzing and synthesizing current knowledge regarding the research topic						
Making and monitoring the research plan (design & time schedule)						



Gathering and selecting information/data						
Assessing the value and utility of data						
Analyzing the data						
Drawing conclusions						
Creating a reference list						
Citing other literature using a standard style (e.g., MLA, APA, Chicago)						

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**Research Experiences: Details for One Research Project**

For the remainder of the survey, please think about the research project you completed that you feel the most proud of and answer the following questions:

S. Please describe your research study and your research study and the steps involved in completing your study (note: only for the research study you are most proud of).

T. Under what circumstances did you complete the research project that you described above?

1. For a class assignment
2. For a cumulative project (e.g., capstone, honors thesis)
3. For a job or an internship (e.g., an assessment at your internship site)
4. For a professor's research project
5. For an independent research project
6. Other research project

---

**Research Experiences: Written Report**

Reminder: think about the research project you completed that you feel the most proud of and answer the following questions:

U. Did you produce a written report as a result of your research project (select one)?

1. No
2. Yes

---

*IF Yes to U*

**Research Experiences: Writing Process**

Reminder: think about the research project you completed that you feel the most proud of and answer the following questions:

V. For your written report, did you?

	No	Yes
Create an outline prior to writing the report?		
Check and proofread the final version carefully?		

W. What was the approximate length of your written report, double-spaced, 1-inch margins (select one)?

1. Less than 5 pages
2. 5-10 pages
3. 11-15 pages
4. 16-20 pages
5. More than 20 pages

X. Approximately how many drafts did you create for peer/instructor/mentor feedback (select one)?

1. 1 draft (e.g., the draft you turned in was your only submission)
2. 2 drafts (got feedback on 1st draft and submitted revised version)
3. 3 or more drafts

---

### **Research Experiences: Mentorship**

Reminder: think about the research project you completed that you feel the most proud of and answer the following questions:

Y. Did you communicate with a mentor/instructor regarding your research project?

1. No
2. Yes

---

*If Yes to Y*

### **Research Experiences: Mentorship**

Reminder: think about the research project you completed that you feel the most proud of and answer the following questions:

Z. What mechanisms did you utilize to communicate with your mentor/instructor regarding your research project (select one primary and one secondary)?

	Regularly scheduled meetings	Occasional meetings when you request them	E-mail communication	Phone conversations
Primary mechanism				
Secondary mechanism				

AA. To what extent did your instructor/mentor:

	Not at all	A little	Some	A lot
Encourage and support you throughout the research and writing project?				
Help you formulate a well-focused research question?				
Ensure that your research question satisfies legal and ethical standards?				
Read and provide comments on the first draft of your report?				
Make suggestions on helpful resources used for completing your research project (e.g., library, database, scholar, labs, books, techniques, writing resources)?				

### Research Experiences: Additional Questions

Reminder: think about the research project you completed that you feel the most proud of and answer the following questions:

AB. How often did you do the following for your research project?

	0	1-2	3-4	5+
Use the library				
Consult librarians for advice				
Use online database resources available through the library				

AC. Do you agree/disagree with the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My research experience interested me.					
My research experience increased my desire to do further research.					
I will complete another research project as an undergraduate at the University of Virginia.					
I am proud of the work I produced for my research project.					
I would encourage other University of Virginia students to pursue research projects as part of their educational experience.					
Having good research skills is important for my future career or profession.					
I anticipate using research skills in my profession.					
I am satisfied with my research experience.					
I am satisfied with my mentor/instructor.					

AD. Are you willing to participate in a focus group or interview to discuss your research experiences at the University of Virginia (select one)?

1. No
2. Yes

---

*If Yes to AD:*

Thank you for agreeing to participate in a focus group or interview. Please provide your contact information here:

First Name:

Last Name:

UVA Email Address:

## Appendix B

### Student Interview/Focus Group Questions

## Student Interview/Focus Group Questions

To begin, I'd like to ask a few questions about you and your experiences with the IB program.

1. Tell me a little bit about yourselves.
  - a. What year are you here at UVA?
  - b. Where did you go to high school?
  - c. What's your major, or what do you think you want to major in?
2. In high school, how did you decide to enroll in the IB program?
3. Tell me a little bit about your Extended Essay project.
  - a. What was the nature of your project?
  - b. How did you decide on a topic?
  - c. What was your research process (e.g., what steps did you take to complete the project)?
  - d. How did you feel about your final product?
  - e. What parts of the project are you most proud of?
4. Thinking back, what did you know about conducting research prior to the Extended Essay requirement?
  - a. In what ways, if any, did your understanding of research change from the time you started your Extended Essay project to the time you finished it?
  - b. What was most challenging about your Extended Essay project?
  - c. What did you like best about your Extended Essay project experience?
  - d. What skills, if any, did you acquire from the IB Extended Essay project?
5. On the survey, you briefly described a research project that you were most proud of. Tell me a little bit more about that project, and why you picked it to describe on the survey.
  - a. In what context did you conduct this particular project?
  - b. How did you get involved in the project?
  - c. Did you work with anyone else on the project?
  - d. Did anyone advise you on the project?
  - e. In what ways, if any, did your experience with the IB Extended Essay help prepare you to undertake the project you described?
6. Beyond the projects you described, how, if at all, has your experience with the IB Extended Essay shaped the way you think about research as a college student?
  - a. Have you sought out courses, internships, or jobs that involve conducting research?
    - i. If yes, what was it about conducting research that appealed to you?
    - ii. If no, tell me about your reasons for not seeking out research experiences.

7. How confident do you feel about your ability to conduct research?
  - a. Are there any aspects (e.g., steps like developing a research plan or collecting data) of the research process that you wish you had had more exposure to, coming into college?
  
8. Do you enjoy conducting research?
  - a. If yes, tell me what it is that you like about research, and why you like these aspects of research.
  - b. If no, tell me what you don't like about conducting research, and why.
  - c. Has there been a change in the way you feel about research over time?
  
9. Thinking about your time here at UVA, what supports or barriers have you encountered in college with regard to conducting research? [Are there any people or organizations that they've found particularly supportive of their research endeavors, or things that have made conducting research more challenging (e.g., they don't have enough time, they don't know how to go about getting involved in research)?]
  
10. Is there anyone at UVA (e.g., faculty members, advisors, peers, mentors), or a particular experience you've had here, that has made you think about getting more involved in conducting research?
  - a. Is there anyone at UVA, or a particular experience you've had here, that has changed the way you think about research?
    - i. We were hoping to interview a few faculty members or administrators here at UVA, to talk about their perceptions of student research – is there anyone you'd suggest we talk with?
  
11. [For students who have worked with professors on research projects]: As a result of working on these projects, are there parts of the research process that you feel more or less confident about or more or less experienced with?
  
12. Looking ahead, in what ways, if any, do you think you might use your research skills?
  - a. As a student?
    - i. If yes, do you think you might conduct additional research studies while you're here at UVA?
  - b. In the professional world?
  - c. In other areas of your life?
  
13. One last thing: would any of you be willing to share copies of your research projects with us?
  
14. Those are all the questions we have. Is there anything you'd like to add?
  
15. Do you have any questions for us, or about the study?

## Appendix C

University of Virginia Institutional Review Board  
Approval for the Study





# UNIVERSITY of VIRGINIA

OFFICE OF THE VICE PRESIDENT FOR RESEARCH  
INSTITUTIONAL REVIEW BOARD FOR THE SOCIAL AND BEHAVIORAL SCIENCES

In reply, please refer to: Project # 2011-0419-00

December 21, 2011

Karen Inkelas  
Center for Advanced Study of Teaching and Learning (CASTL)  
PO Box 400265

Dear Karen Inkelas:

Thank you for submitting your project entitled: "Exploring the Benefits of High School and College Research Experiences" for review by the Institutional Review Board for the Social & Behavioral Sciences. The Board reviewed your Protocol on December 21, 2011.

The first action that the Board takes with a new project is to decide whether the project is exempt from a more detailed review by the Board because the project may fall into one of the categories of research described as "exempt" in the Code of Federal Regulations. Since the Board, and not individual researchers, is authorized to classify a project as exempt, we requested that you submit the materials describing your project so that we could make this initial decision.

As a result of this request, we have reviewed your project and classified it as exempt from further review by the Board for a period of four years. This means that you may conduct the study as planned and you are not required to submit requests for continuation until the end of the fourth year. Please use the enclosed stamped Consent Form as the master for copying and obtaining consent as needed.

This project # 2011-0419-00 has been exempted for the period December 21, 2011 to December 20, 2015. If the study continues beyond the approval period, you will need to submit a continuation request to the Board. If you make changes in the study, you will need to notify the Board of the changes.

Sincerely,

Tonya R. Moon, Ph.D.  
Chair, Institutional Review Board for the Social and Behavioral Sciences