

The Effect of Intrinsic and Extrinsic Motivation on Student Success in a Magnet Program

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Students may be motivated to join a magnet, or a specialized academic program, in secondary school for various reasons. Whether students are intrinsically or extrinsically motivated to join their magnet can be essential for understanding and predicting their success in the program. The purpose of this study was to examine how the type of motivation of magnet students was associated with their perceived learning, academic achievement, and satisfaction. It was hypothesized that students who were intrinsically motivated would have greater perceived learning, academic achievement, and satisfaction than students who were extrinsically motivated due to the potentially harmful effects of extrinsic motivation observed in various studies. Students in the Discovery and Explorations magnet programs at Spring Valley High School were asked to complete a survey to test this hypothesis, and three chi-square tests of independence were conducted to analyze the significance of the data. Results showed that the type of motivation was independent of perceived learning, $\chi^2(1, N = 90) = 1.56, p = .211$, and academic achievement, $\chi^2(1, N = 82) = 0.09, p = .767$. However, type of motivation was significantly correlated with satisfaction, $\chi^2(1, N = 83) = 4.63, p = .031$. These findings suggest that students who are intrinsically motivated to join their magnet programs are more likely to be highly satisfied with their academic experience than extrinsically motivated students are.

Introduction

A magnet is a school, or a program within a school, that focuses on a specific subject area and offers specialized classes that may differ from regular classes in their rigor or in the topics they prioritize. The name “magnet” originates from the fact that such programs bring students together who share specific interests or talents, allowing them to further explore the subjects they enjoy.¹ Though magnets may attract a wide range of smart, talented students, they typically only accept a select number of applicants so that students can receive a higher quality education and teachers can spend more time on each student.¹ Each student must stay motivated in order to meet the standards of academic excellence set by their magnet program.

Motivation refers to both the reason someone takes action or makes a decision and the purposeful continuation of certain behavior. The importance of the latter in an academic context is undisputed; according to research presented at the International Conference on Education and Educational Psychology, motivation equips students with “the inner strength to learn... to improve academic performance and to adapt to the demands of the school.”² The former definition can be further categorized into intrinsic and extrinsic motivation. Intrinsic motivation (IM), which is the type of motivation referenced by Ferreira and others,² stems from personal ambition rather than from external opinions or possible consequences. Intrinsically motivated people derive inherent enjoyment from the tasks they perform instead of relying on outcomes associated with the tasks.³ Extrinsic motivation (EM) is caused by the fear of an external punishment or the desire for an external reward. Examples of extrinsic motivators include money, competition, and grades. EM may be unreliable because it is dependent on the prospect of a punishment or reward and may disappear if the circumstances change. In fact, EM can actually be detrimental—in her master’s thesis, Baranek⁴ noted that EM has been found to distract from students’ learning, which should be the primary focus of school.

The presence and type of motivation that compel students to join a magnet program and persist as they continue on their academic journey may influence how successful they are in the program. Academic performance, perceived learning, and personal satisfaction are all factors that contribute to students’ success. Academic performance often refers to grades or Grade Point Average (GPA) and can be self-reported by students, while perceived learning and satisfaction are typically quantified using Likert scales, or numerical rating scales used to measure participants’ opinions on various statements. Success is largely subjective and is defined differently for each student; therefore, it is open to various methods of interpretation, and different forms of success may conflict with each other. However, academic achievement, perceived learning, and satisfaction are still notable indicators of whether a student’s school or magnet program is a good fit for him or her.

Several studies support the general importance of motivation on achievement; for example, Amrai et al.⁵ found that the academic achievement and academic motivation of Tehran University students are significantly and positively correlated. The researchers also noted that there are various aspects of motivation, such as competition and praise, that interact to influence students’ achievement. Other studies explore the relationship between the two types of motivation and compare and contrast their effectiveness. Baranek’s⁴ research suggests that extrinsic rewards, such as grades, detract from students’ preexisting intrinsic motivation and consequently impair the learning process. In contrast, Eom³ concluded that while IM is significantly positively associated with learning outcomes, EM is unrelated to learning outcomes. While the latter study does not determine any negative effects of EM, both still propose that IM is favorable while EM is not. On the other hand, an analysis by Fischer, Malycha, and Schafmann⁶ reveals synergy between extrinsic motivators and IM that leads to an increase in creativity and innovation. The researchers offer the explanation that even though IM is powerful, it may dwindle over time if it exists on its own because not all employees find their work inherently interesting. This idea can be applied to students in Discovery and Explorations—even if individuals are already highly motivated from the inside, they may require reinforcement from extrinsic rewards to propel them past challenging times. A possible implication of this pre-existing literature is that EM has a more harmful effect on students who lack IM.

The purpose of this project was to investigate the relationship between intrinsic and extrinsic motivation in magnet students—namely, the primary reasons they joined their magnet programs—and how successful the students were in those programs. Though there have been numerous studies examining the influence of the two types of motivation on academic factors, they largely deal with more general student populations rather than specifically focusing on magnet students. Because students may face significant stress once they join a magnet and begin navigating their way through an environment that calls for excellence, it is all the more important that they have the motivation necessary to accomplish their goals and the self-awareness to recognize whether they do. A study that identifies correlational patterns involving their motivation and their success would benefit them by allowing them to reflect on whether they are on a path that is right for them. Additionally, this project would also benefit students who have yet to make the decision to join a magnet because of its implications on their potential performance.

It was hypothesized that students who were primarily intrinsically motivated would have greater perceived learning, be more successful in maintaining their grades, and feel more satisfied with their academic experience after joining their magnet than students who were extrinsically motivated due to the unreliability and potential disadvantages of EM. Participants were asked to self-report both the independent and dependent variables in a survey, and their responses were quantitatively measured using a Likert scale ranging from 1 to 5. Academic performance was measured by determining how participants' grades changed from middle school after entering their magnet programs in high school.

Methods

Using a computer and the platform Google Forms, a survey was created digitally and distributed via email to 9th-12th grade students in the Discovery and Explorations magnet programs at Spring Valley High School. Some questions in the survey were borrowed or inspired from published instruments.^{7,8} Prior to completing the survey, all potential participants, as well as their guardians if necessary, were requested to fill out a separate informed consent form online. Only the 114 people who submitted the informed consent form were provided with the link to the actual survey, which was completely anonymous.

Following a disclaimer about privacy, the first two sections of the survey contained questions that tested for intrinsic motivation and extrinsic motivation. The means of the participants' Likert scale responses in both sections were compared to classify participants as intrinsically motivated or extrinsically motivated. If the means had a difference of less than 0.33, participants were classified as equally motivated by both types of motivation. The next few sections of the survey contained questions that tested for the dependent variables: perceived learning, satisfaction, and academic achievement. To measure perceived learning and satisfaction, the sums of the participants' Likert scale responses were divided by the maximum possible scores in those sections, and the resulting percentages were used to classify participants into three groups: low (20%-46%), medium (47%-73%), and high (74%-100%). To measure academic achievement, the letter grades each participant earned in middle school and after joining Discovery and Explorations were converted to numbers with higher grades corresponding to smaller numbers, and the difference between the two values was calculated to determine whether their grades dropped, rose, or stayed the same. The subsequent section of the survey consisted of questions collecting demographic data such as grade, age, and race. A copy of the survey is included in **Appendix A**.

The survey was closed 4 weeks after participant recruitment began, and a total of 98 students responded. Raw data were collected and analyzed in a Google Sheet. Descriptive statistics were identified and chi-square tests of independence were run online in order to determine the significance of the data.⁹ A diagram summarizing the experimental setup is included in **Appendix B**.

Results

Table 1 in **Appendix C** contains the descriptive statistics for the values used to measure each variable in the study. Overall, participants had higher intrinsic motivation than extrinsic motivation. 54 participants were intrinsically motivated, 36 participants were extrinsically motivated, and 8 participants were equally motivated by both types of motivation. The average perceived learning percentage was 80%, the average satisfaction percentage was 72%, and the average score for academic achievement was -0.41. The motivation means could range anywhere from 1.00 to 5.00, and the perceived learning and satisfaction percentages could range anywhere from 20% to 100%. For all four cases, there was at least one participant who scored the highest possible value, but no participants scored any of the lowest possible values. For academic achievement scores, the highest possible and lowest possible values were -4 and 4, respectively. One participant had a score of -4, and the maximum academic achievement score any participant had was 2.

The figures in **Appendix D** represent the raw data collected by the survey, or the responses participants gave for each question. **Appendix A** contains all the questions that are referenced by the bar graphs. For most of the questions on IM, PL, and S, there were more participants who agreed or strongly agreed with the given statements than those who disagreed or strongly disagreed with them. The opposite is true for most of the questions on EM. All statements were worded so that greater Likert scale values, or greater agreement, indicated higher amounts of the variable being measured.

Chi-square tests of independence were performed to determine whether type of motivation is related to perceived learning, academic achievement, and satisfaction. Tables 2, 3, and 4 are contingency tables that depict the data, and Table 5 is a summary of the results of the hypothesis tests (see **Appendix C**). All tests had a significance level of $\alpha=0.05$. There were only 7 participants with low satisfaction, so they had to be excluded from the chi-square tests along with the 8 participants who fell into the "Both" category for motivation because the minimum expected value of 5 was not met (Tables 2 and 4). The 8 participants whose grades rose after joining the magnet program (Figure 5, **Appendix D**) were excluded from the chi-square tests as well for the same reason (Table 3). There was no significant relationship between type of motivation and perceived learning, $\chi^2(1, N = 90) = 1.56, p = .211$. There was also no significant relationship between type of motivation and academic achievement, $\chi^2(1, N = 82) = 0.09, p = .767$. However, the relationship between type of motivation and satisfaction was significant, $\chi^2(1, N = 83) = 4.63, p = .031$.

Discussion

The purpose of this study was to determine whether a student's type of motivation for joining their magnet program is associated with their perceived learning, academic achievement, and satisfaction in the magnet program. It was hypothesized that Discovery and Explorations students who are intrinsically motivated will have higher perceived learning, academic achievement, and satisfaction. The hypothesis was not supported for the first two variables; however, it was determined that type of motivation has a significant relationship with satisfaction. Intrinsically motivated students were more likely to have high satisfaction in their magnet program than extrinsically motivated students were.

The information in Table 1 (**Appendix C**) shows that participants had at least a small degree of each type of motivation because no participants had the lowest possible mean of 1.00, where they would have strongly disagreed with all statements. However, there were multiple participants with a mean of 5.00 for either IM or EM, suggesting they were very strongly motivated. Questions IM7 and EM9 were excluded from the mean calculation because it was concluded that they were not truly representative of the variables they measured. In Figures 1 and 2, it can be seen that an unusually large number of participants had strong opinions on those questions; this is most likely due to the wording. In Figures 3 and 4, however, the responses to all of the survey questions were similarly distributed (see **Appendix D**).

All participants also had more than minimal perceived learning and satisfaction. In fact, there were no participants who had low PL, or a PL percentage between 20% and 46%. The 7 participants who had low satisfaction were all extrinsically motivated. Based on the range for academic

achievement scores (Table 1, **Appendix C**), the greatest improvement in a student's grades after joining the program was around 2 letter grades while the greatest decline was around 4 letter grades from earning Straight As in middle school to one or more Fs in high school.

The chi-square tests indicate that students' type of motivation is not significantly correlated with their perceived learning and academic achievement (Table 5, **Appendix C**). There was a non-significant trend in the predicted direction indicating that intrinsically motivated students have higher perceived learning ($p = .211$). In the case of academic achievement, however, the difference between the IM and EM group was much less pronounced ($p = .767$). The null hypothesis was only rejected in the case of satisfaction ($p = .031$). This suggests that students who joined magnet programs of their own will are likely to gain more from their experience than students who joined for other reasons, such as school zones or parental pressure.

The failure to reject the null hypothesis for perceived learning and academic achievement conflicts with other studies that found that the type of motivation does have a significant influence on those variables. Eom's³ study, which collected survey responses from 372 college students, suggests that IM is positively correlated with perceived learning outcomes while EM is not linked to PL. On the other hand, Hytti et al.,¹⁰ who used data from 117 entrepreneurship students who completed pre-program and post-program learning surveys, found that EM has a positive effect on PL while IM has a negative effect on it. As for academic achievement, Liu et al.'s¹¹ study on 13,799 Chinese students found that IM was positively correlated with AA while EM was negatively correlated with it. However, the results of this study do not support that there is a significant difference between the types of motivation in terms of PL or AA.

The result that IM is significantly positively associated with satisfaction compared to EM supports other researchers' findings. Küsting and Lipowsky¹² reported that student teachers' IM for selecting a teacher education program was a significant positive predictor of their satisfaction with their studies, while EM was not a predictor. Similarly, Goetz et al.¹³ concluded that though extrinsic factors were important as well, intrinsically motivating factors were the most positively associated with the job satisfaction of German dentists. Finally, a study by Wach et al.¹⁴ found that students who were intrinsically motivated to choose their major, i.e. selected their major because they were interested in the subject matter, were more satisfied with the program's academic content than those who were not intrinsically motivated. Externally motivated students, such as those who chose their major because they believed it was easy, also had higher satisfaction, but this increased satisfaction concerned the requirements of the program rather than the curriculum. Overall, these studies suggest that IM is the most crucial type of motivation that influences satisfaction in both academic and occupational fields.

This study had multiple limitations and sources of error. One source of error was that multiple categories had to be excluded from the chi-square tests due to a lack of participants in those groups. Had they been included, they may have affected the conclusions in significant ways. Additionally, it had to be assumed that all the survey questions were truly representative of the variables they measured. Using validated survey instruments may have led to greater accuracy. Demographics may also have skewed the results. Over half (54%) of the survey respondents were freshmen, and participants' grade levels, as well as any other demographic variables, may have been a confounding variable. A summary of participants' demographics is included in **Appendix E**.

Future work on this subject could expand to include students in other magnet programs. Because Discovery and Explorations are not representative of all magnets, the results of this study should be generalized to different magnet programs with caution. Having a larger sample size is also recommended in order to improve the validity of any statistical tests that may be conducted. Other tests such as linear regression could be used in favor of chi-square tests in order to account for the exact measurements of the variables, such as the degree to which participants are motivated, rather than categorizing the participants.

Acknowledgements

The author would like to thank Dr. Michelle Wyatt, who provided quality guidance throughout the research process, Ms. Heather Alexander, Ms. Lindsey Rega, and Mrs. Michelle Spigner, who took the time to discuss her project and give feedback, and her parents, who gave their support and encouragement. The author would also like to thank Mrs. Erin Reeves, Ms. Karen Hatter, Mrs. Christina Smith, Ms. Kimberley Bouchee, and Mrs. Melissa Dissinger for their assistance in recruiting survey participants. Lastly, the author would like to thank all the students who participated in her research, especially those who completed their consent forms correctly the first time.

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Appendix

Appendix A. Catalog of survey questions

Intrinsic Motivation (linear scale of 1: strongly disagree to 5: strongly agree)-

- IM1. I joined my magnet program because I wanted to, not because people around me suggested I should.
- IM2. I would have chosen to join my magnet program regardless of my family and friends' opinions.
- IM3. The goal/focus of my magnet program interests me.
- IM4. I look forward to learning from the experiences my magnet classes provide, not just to get good grades in them.
- IM5. I was primarily in charge of the decision to join my magnet program.
- IM6. I am willing to take on the workload from my magnet program because it was my decision to join it.
- IM7. Whether or not I succeed in my magnet program depends, above all, on me. [X]

Extrinsic Motivation (linear scale of 1: strongly disagree to 5: strongly agree)-

- EM1. The primary reason I considered joining a magnet is that I was not zoned for Spring Valley.
- EM2. My parents heavily influenced me to join my magnet program.
- EM3. A major reason I joined my magnet program is that many of my friends were doing it.
- EM4. I only began considering joining my magnet program because the people around me encouraged me to do so.
- EM5. I joined my magnet program so that I would not disappoint the people around me.
- EM6. I joined my magnet program due to the prospect of something pleasant, such as praise from my parents or being able to spend more time with friends.
- EM7. Even when I am unmotivated, I continue working in order to earn good grades.
- EM8. If there were no consequences that came with my decision, I most likely would not have chosen to join my magnet program.
- EM9. I never wanted to be in my magnet program. [X]

Perceived Learning (linear scale of 1: strongly disagree to 5: strongly agree)-

- PL1. I am learning a lot through my magnet program.
- PL2. I am learning a lot from working with my classmates in the magnet program.
- PL3. Due to my magnet program, I am learning a lot about my own academic strengths and weaknesses.
- PL4. My magnet program has helped me grow as a student.
- PL5. I believe that the pace and scope of the classes I have taken that are specialized for my magnet program (ex. Biology 1 Hon Mag) are more suitable for me than non-magnet classes on the same subject matter would have been.

Academic Achievement (multiple choice)-

- AA1. In middle school I earned...
 - Straight A's
 - A's and B's
 - Some C's
 - Some D's
 - One or more F's
- AA2. Since joining my magnet program in high school, I have been earning... (in ALL CLASSES)
 - Straight A's
 - A's and B's
 - Some C's
 - Some D's
 - One or more F's

Satisfaction (linear scale of 1: strongly disagree to 5: strongly agree)-

- S1. The classes I take through my magnet program have benefitted me more than my non-magnet classes have.
- S2. If I had a second chance to decide, I would willingly choose to be in my magnet program.
- S3. Since joining my magnet program, I gained more interest in subject matters the program focuses on, such as STEM.
- S4. I feel that this magnet program is right for me. / I feel that I belong in my magnet program.
- S5. I would recommend this magnet program to another student.
- S6. I am very satisfied with my magnet program.
- S7. I am very satisfied with what I have achieved while in my magnet program.
- S8. Please rate the effect that you feel your magnet program has had on you. (*slightly different scale*- 1: very negative to 5: very positive)

Demographic Information (multiple choice)-

- Age (*short answer*)
- Grade
 - 9th
 - 10th
 - 11th

- 12th
- Magnet
 - Discovery
 - Explorations
- Gender
 - Male
 - Female
 - Prefer not to say
 - Other: _____
- Race
 - Caucasian
 - African American
 - Asian American or Pacific Islander
 - Hispanic/Latino
 - Native American
 - Other: _____
- Average annual family income
 - \$0 ~ \$24k
 - \$25k ~ \$49k
 - \$50k ~ \$74k
 - \$75k ~ \$99k
 - \$100k ~ \$149k
 - \$150k or more
 - Unsure/ Prefer not to say

Questions that were excluded from statistical analysis are marked with a bold [X].

Appendix B. *Experimental design diagram*

Title The Effect of Intrinsic and Extrinsic Motivation on Student Success in a Magnet Program			
Hypothesis Students who are primarily intrinsically motivated will have greater perceived learning, experience a more positive effect on their grades, and feel more satisfied with their academic experience after joining their magnet than students who are extrinsically motivated due to the detrimental effects of extrinsic motivation.			
Independent Variable Type of motivation (intrinsic, extrinsic, or both)			
Levels of Independent Variable	Intrinsically Motivated	Extrinsically Motivated	Both
Number of Participants Total: 98	54	36	8
Dependent Variable Academic achievement/grades, perceived learning, satisfaction			
Constants Age range of students School and region of students Survey platform Date of survey distribution Questions asked			

Appendix C. Statistics tables

Table 1. Descriptive statistics summary

	<i>M</i>	Range	<i>SD</i>
Intrinsic motivation (IM) means	3.56	1.50 - 5.00	0.86
Extrinsic motivation (EM) means	3.11	1.67 - 5.00	0.79
Perceived learning (PL) percentages	0.80	0.48 - 1.00	0.14
Academic achievement (AA) scores	- 0.41	- 4 - +2	0.89
Satisfaction (S) percentages	0.72	0.25 - 1.00	0.17

IM and EM means refer to the means of participants' Likert scale selections for the survey questions on IM and EM. PL and S percentages refer to the sums of participants' Likert scale selections for the questions on PL and S divided by the total possible sum, or the number of PL or S questions participants answered multiplied by 5. To analyze AA, the five multiple choice options for participants' grades in middle school and high school (see **Appendix A**) were assigned a score from 1 to 5, with 1 corresponding to "Straight As," the highest grade, and 5 corresponding to "One or more Fs." The AA score was calculated by subtracting the score for high school grades from the score for middle school grades. The Likert scales used in the survey questions all ranged from 1 to 5.

Table 2. Chi-square test of independence for type of motivation and perceived learning

	Medium perceived learning	High perceived learning	Row totals
Intrinsically motivated	Observed: 17 Expected: 19.80 $\chi^2= 0.40$	O: 37 E: 34.20 $\chi^2= 0.23$	54
Extrinsically motivated	O: 16 E: 13.20 $\chi^2= 0.59$	O: 20 E: 22.80 $\chi^2= 0.34$	36
Column totals	33	57	TOTAL: 90

Table 3. Chi-square test of independence for type of motivation and academic achievement

	Grades dropped	Grades stayed the same	Row totals
Intrinsically motivated	Observed: 21 Expected: 21.66 $\chi^2= 0.02$	O: 27 E: 26.34 $\chi^2= 0.02$	48
Extrinsically motivated	O: 16 E: 15.34 $\chi^2= 0.03$	O: 18 E: 18.66 $\chi^2= 0.02$	34
Column totals	37	45	TOTAL: 82

Table 4. Chi-square test of independence for type of motivation and satisfaction

	Medium satisfaction	High satisfaction	Row totals
Intrinsically motivated	Observed: 22 Expected: 26.67 $\chi^2= 0.82$	O: 32 E: 27.33 $\chi^2= 0.80$	54
Extrinsically motivated	O: 19 E: 14.33 $\chi^2= 1.53$	O: 10 E: 14.67 $\chi^2= 1.49$	29
Column totals	41	42	TOTAL: 83

Tables 2, 3, and 4 are contingency tables that display the number of participants in each group as well as the expected values and the chi-square statistics for each cell. A separate chi-square test of independence was run for the information in each table.

Table 5. Summary of chi-square tests of independence

	α	N	χ^2	df ($r-1$)($c-1$)	p
Type of motivation and PL	.05	90	1.56	1	.211
Type of motivation and AA	.05	82	0.09	1	.767
Type of motivation and S	.05	83	4.63	1	.031

This table shows the alpha level (α), sample size (N), chi-square statistic (χ^2), degrees of freedom (df), and p value (p) used in all three chi-square tests to determine statistical significance.

Appendix D. Raw data

Figure 1. Responses to survey questions on intrinsic motivation

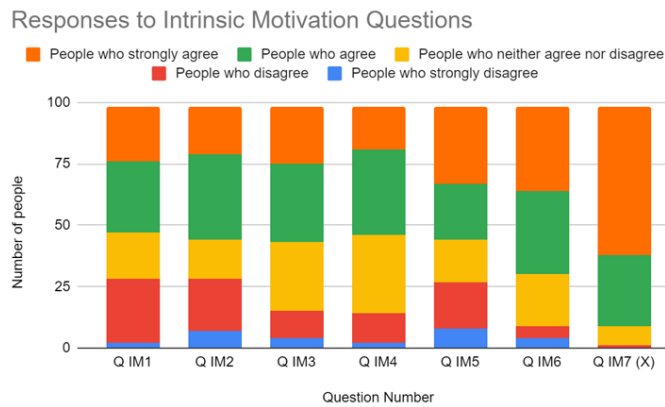
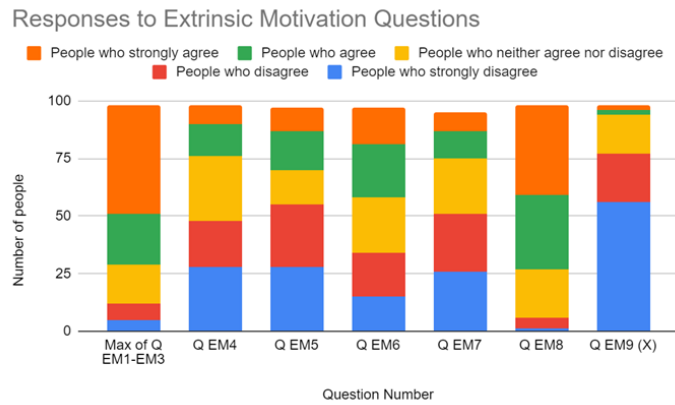


Figure 2. Responses to survey questions on extrinsic motivation



Figures 1 and 2 are a visual representation of participants’ survey responses in the IM and EM sections. All questions used a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Questions that were excluded from statistical analysis are marked with an X. Note that only the most affirmative response out of those that each participant gave to the first 3 EM questions was considered in data analysis due to the fact that participants could be strongly extrinsically motivated by any three of the factors, even if any of the others do not apply to them.

Figure 3. Responses to survey questions on perceived learning

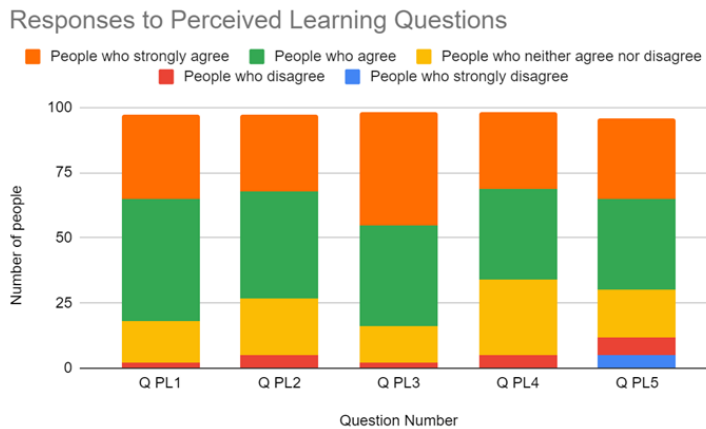
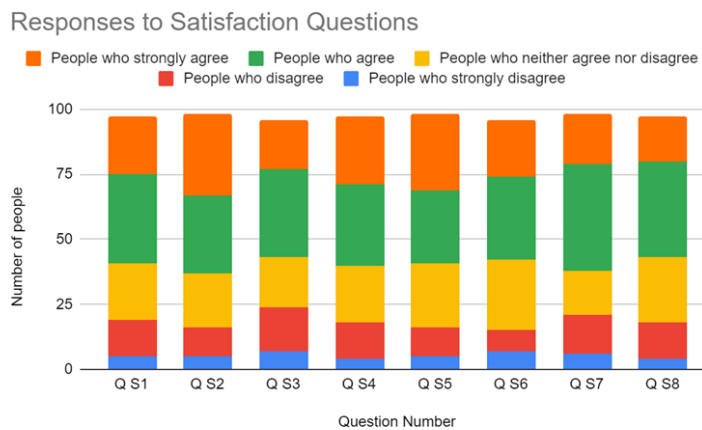


Figure 4. Responses to survey questions on satisfaction



Figures 3 and 4 are a visual representation of participants’ survey responses in the PL and S sections. All questions used a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) except for question S8, which had a scale of 1 (very negative) to 5 (very positive).

Figure 5. Responses to survey questions on academic achievement

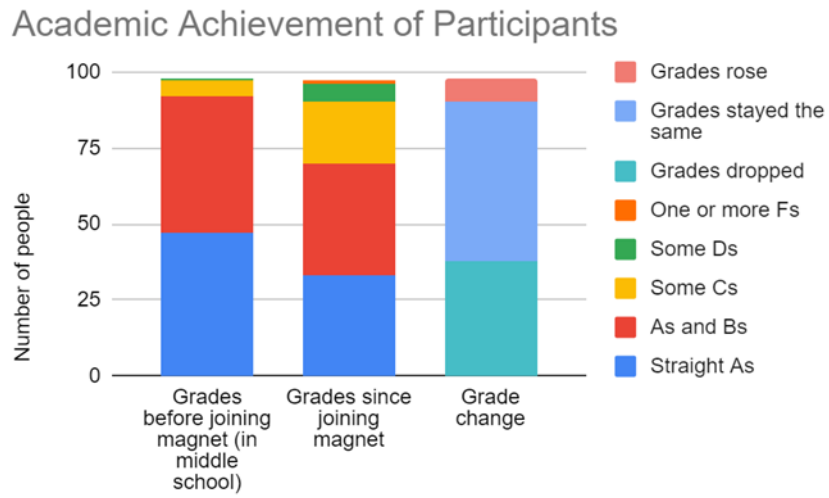
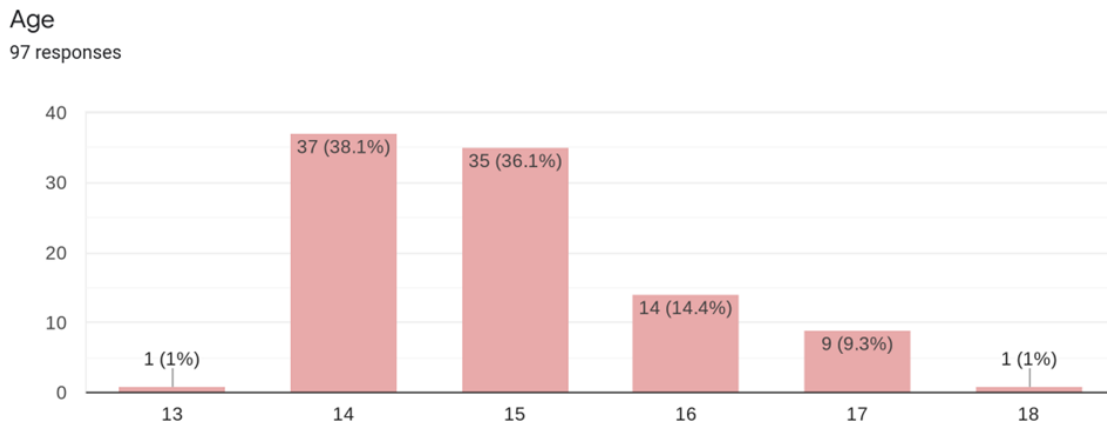
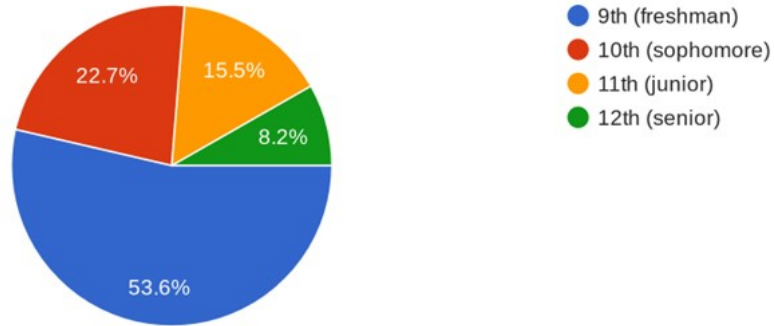


Figure 5 is a visual representation of participants' survey responses to question AA1 (first bar) and question AA2 (second bar) as well as how their grades changed from middle school to high school.

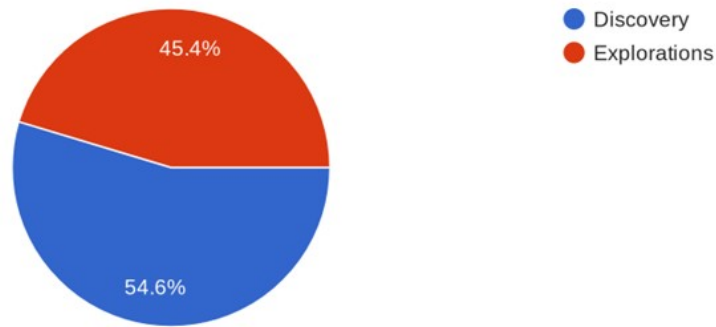
Appendix E. Demographic data of participants



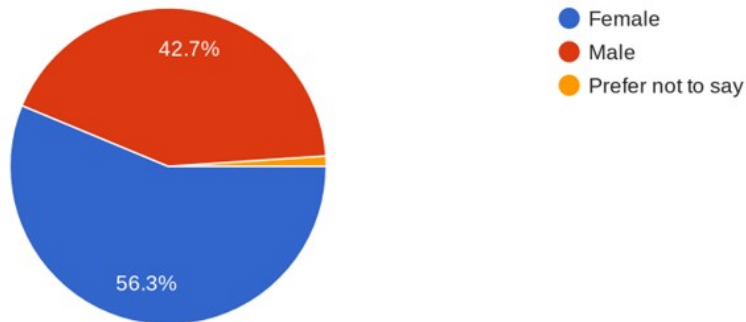
Grade
97 responses



Magnet
97 responses

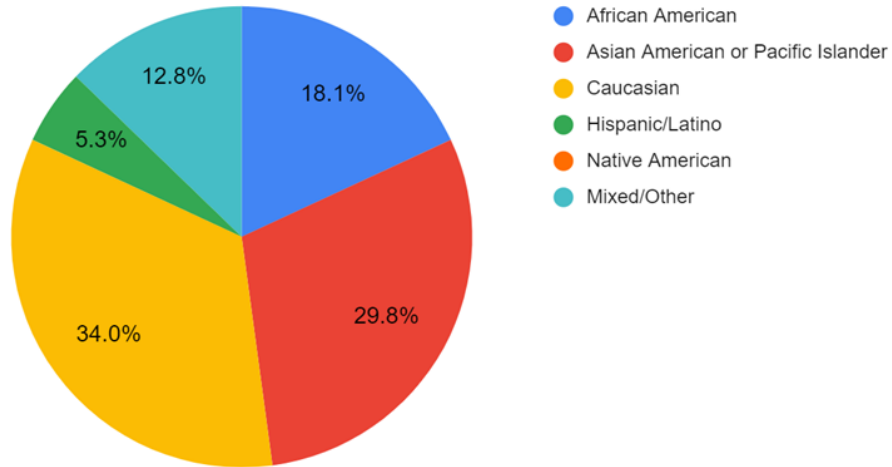


Gender
96 responses



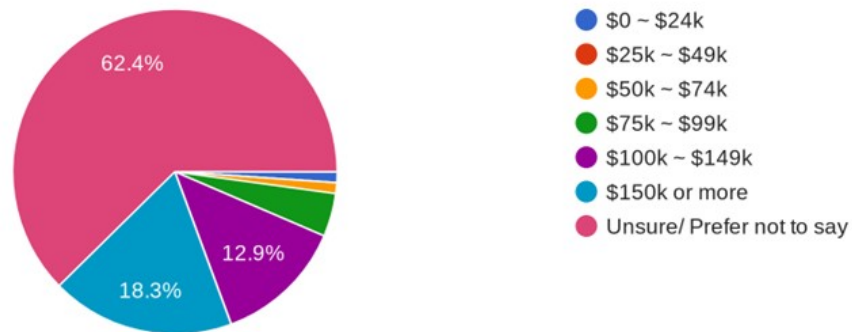
Race

94 responses



Average annual family income

93 responses



Appendix E is a summary of participants' responses to the demographic questions. All charts are auto-generated by Google Forms except for the chart on Race.