

NOVA INFORMATION AND CURRICULUM

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1. CLUB PURPOSES AND INTRODUCTION

This club is aimed as a pathway for talented and aspiring middle schoolers to build personal portfolios of research projects, entrepreneurship ventures, nonprofits, or startups. Founded on the belief that original work should be conducted at all age groups for community impact and personal growth, there are no prerequisites except for a strong proficiency in elementary level mathematics and an aptitude for problem solving, creativity, and discipline. The coaches have participated in programs and activities of their own, building significant portfolios with expertise that will be shared with students in this program. We have several international DECA qualifiers, science fair medalists, a thrice published researcher in mathematics and theoretical computer science, olympiad winners, entrepreneurship program medalists, FPS internationals qualifiers, and much, much more. In other words, **we have talent** that we want to instill in *your children*. More questions on qualifications can be directed towards Siddhu at s-pendyalas@bsd405.org.

This club has already been run in Tyee middle school for an academic year, so we've personally seen students grow, lead, and develop their own personal projects. These projects are incredibly diverse, ranging from computer games for learning academic subjects to a 3-d printing business out of a garage. Some of our students have been deeply invested in the research process, producing individual research after being connected with professors and local university mentors through our coaches' extensive contacts and networks. This should hopefully give you a taste of what we do in this program: all students who engage, participate in activities and lectures, and actively are encouraged by their parents at home to continue development should have *at least one complete, end-to-end project to display on their personal portfolios by the end of the year*, whether that be for future college applications, summer internship programs, or just fun!

2. SUBJECTS OF THE CLUB

To aid in developing these projects, students will be exposed to a wide variety of skills that they develop over the course of the year. Some of these skills are soft-skills, focusing on teamwork and leadership, while others are more technical. Here is a **non-exhaustive list** of subjects of interest that this club will be developing:

- **Mathematics**

- *Probability and Statistics: Descriptive and Analytic*
- *Algebra I, II, and brief Precalculus*

Date: September 2026 - June 2027.

- *Regressions, Modelling, and Applied Studies*
- **Software and Computers**
 - *Basic Python & Javascript/HTML/CSS Proficiency*
 - *Digital Applications/Spreadsheets*
 - *Web Development, Digital Marketing*
 - *Online Surveys, Data Collection/Processing*
 - *Data Analysis and Feedback Loops*
 - *Artificial Intelligence/Machine Learning*
 - *Natural Language Processing & Chatbots*
- **Entrepreneurship & Business**
 - *Market Analysis, Literature Reviews, Research Skills*
 - *Cold Emailing, Mentorship, Internships*
 - *Grant Applications, Funding Cycles, Sponsorships*
 - *Patents, Copyright, Nonprofits (501C3) Status*
 - *Marketing, Presentation, Elevator Pitches,*

Entrepreneurship and Business skills will help your student start, maintain, and grow their businesses, startups, research projects, and ventures, while software skills will help them develop products, market online, and use artificial intelligence algorithms seamlessly in whatever they happen to be working with. Mathematics skills ranging from basic Algebra I to intermediate Precalculus will be introduced occasionally in full depth and explained computationally such that students will understand other complicated topics (particularly in the software and data analysis parts of the program).

Overall, this program aims to create digitally literate students who are equipped with the necessary mathematical, software, data, and market skills to continue to generate important works of their own in any field they choose to study in depth.

3. MONTHLY CURRICULUM

The curriculum is structured so that students do not learn mathematics, computer science, and business as isolated subjects. Each month introduces technical skills that immediately support the development of the student's own project. Mathematics is taught especially as a practical language for analyzing data, evaluating decisions, measuring outcomes, and constructing models.

October: Project Foundations.

- **Mathematics:** Variables, linear equations, functions, ratios, percentages, averages, units, and basic graph interpretation.
 - *Application:* Students translate their project ideas into measurable quantities, estimate costs and outcomes, compare alternatives quantitatively, and learn how graphs and equations can represent the systems they are trying to build.
- **Computer Science:** Python fundamentals, variables, data types, conditionals, loops, functions, lists, basic debugging, and spreadsheet fundamentals.
- **Business:** Identifying real problems, brainstorming solutions, basic market research, competitor analysis, literature searching, feasibility, and defining a target audience.

By the end of October, each student should have a clearly defined problem, a target audience, preliminary research, and a written proposal for a personal project.

November: Data and Validation.

- **Mathematics:** Mean, median, quartiles, variance, standard deviation, distributions, sampling, basic probability, and interpretation of quantitative evidence.
 - *Application:* Students analyze surveys, experiments, user behavior, or market data from their own projects and learn to distinguish meaningful numerical evidence from isolated anecdotes.
- **Computer Science:** Python data structures, CSV files, spreadsheet formulas, online surveys, data cleaning, filtering, sorting, and introductory data visualization.
- **Business:** Customer discovery, interviews, survey design, market segmentation, validating assumptions, identifying user pain points, and refining a value proposition.

Students should finish November with real evidence about the problem they are addressing and use that evidence to revise their original project idea.

December: Modeling and First Prototypes.

- **Mathematics:** Systems of equations, slope, rates of change, linear models, correlation, regression, residuals, and interpreting model limitations.
 - *Application:* Students use mathematical models to identify relationships in project data, estimate future outcomes, compare variables, and decide whether an observed trend is useful enough to influence their design.
- **Computer Science:** HTML, CSS, introductory JavaScript, Python libraries, plotting, basic user interfaces, and building a first functional software or data prototype.
- **Business:** Minimum viable products, feature prioritization, value propositions, pricing fundamentals, prototype testing, and structured collection of user feedback.

By winter break, students should have produced a first prototype, preliminary research model, or equivalent proof-of-concept.

January: Experiments and Iteration.

- **Mathematics:** Probability models, expected value, conditional probability, experimental design, measurement error, confounding variables, and comparison of experimental groups.
 - *Application:* Students learn how to test whether a feature, strategy, intervention, or design actually works instead of interpreting every change in results as evidence of improvement.
- **Computer Science:** Algorithms, modular programming, file processing, APIs, automation, debugging strategies, basic version control, and iterative software development.
- **Business:** A/B testing, feedback loops, success metrics, professional communication, cold emailing, mentor outreach, and using feedback to guide product decisions.

Students conduct a structured experiment, user test, or technical evaluation and make a substantial revision to their project based on measurable results.

February: Data Science and Artificial Intelligence.

- **Mathematics:** Nonlinear functions, exponentials, logarithms, multivariable relationships, regression comparison, classification intuition, and introductory statistical inference.

- *Application:* Students learn the mathematics behind prediction and data-driven systems so that machine learning is understood as modeling patterns in data rather than as a black-box tool.
- **Computer Science:** Python data analysis, introductory machine learning, features and labels, training and testing data, classification, regression, natural language processing, and chatbot systems.
- **Business:** Product differentiation, responsible AI use, technology strategy, intellectual property, patents, copyright, and analysis of competing technologies.

Students may incorporate machine learning, natural language processing, automation, or advanced data analysis where it contributes meaningfully to their project.

March: Growth, Optimization, and Deployment.

- **Mathematics:** Sequences, exponential growth, compound growth, forecasting, optimization intuition, constraints, rates, and uncertainty in prediction.
 - *Application:* Students model how users, revenue, costs, production, engagement, or other project quantities change over time and use quantitative reasoning to decide where limited resources should be allocated.
- **Computer Science:** Web deployment, databases, APIs, persistent data, application architecture, analytics, user accounts, and refinement of front-end interfaces.
- **Business:** Marketing strategy, customer acquisition, digital marketing, mentorship outreach, university contacts, grants, sponsorships, funding, and basic scaling strategy.

Students begin moving their projects beyond a classroom prototype by obtaining real users, mentors, external data, funding opportunities, or other forms of outside validation.

April: Research and Technical Depth.

- **Mathematics:** Confidence intervals, hypothesis testing, statistical significance, model evaluation, bias, error analysis, uncertainty, and selecting appropriate quantitative methods.
 - *Application:* Students learn to justify claims made by their project, evaluate whether observed results are convincing, quantify uncertainty, and avoid overstating what their data actually demonstrates.
- **Computer Science:** Testing, code organization, documentation, data pipelines, performance analysis, technical troubleshooting, reproducibility, and more substantial independent development.
- **Business:** Formal research methods, literature reviews, citations, nonprofit structures, 501(c)(3) fundamentals, impact measurement, sustainability, and long-term organizational planning.

Students develop the technical core of the final project and begin formally documenting their methodology, results, limitations, and impact.

May: Analysis and Final Product.

- **Mathematics:** Selecting statistical methods, checking assumptions, validating calculations, comparing models, producing effective graphs, and communicating uncertainty.
 - *Application:* Students use the mathematical tools developed throughout the year to produce a defensible final analysis and present numerical results in a form that other people can understand and verify.

- **Computer Science:** Final debugging, testing, deployment, GitHub and repository organization, technical documentation, visualization, accessibility, and refinement of the finished product.
- **Business:** Elevator pitches, presentation design, demonstrations, storytelling with data, resumes, portfolio construction, audience-specific communication, and final marketing materials.

Students complete a polished version of their project and prepare both a technical explanation and a concise public presentation.

June: Presentation, Publication, and Continuation.

- **Mathematics:** Synthesis of modeling, statistics, probability, and quantitative reasoning used throughout the project.
 - *Application:* Students should be able to explain independently why their calculations are valid, what their results do and do not imply, and how mathematics influenced the final decisions made in their project.
- **Computer Science:** Final deployment, repository cleanup, reproducibility, documentation, maintenance planning, technical handoff, and preservation of completed software or data products.
- **Business:** Final pitches, project showcases, competition and summer-program applications, mentor follow-ups, publication or outreach opportunities, and planning for continued development after NOVA.

By the end of June, every consistently participating student should possess a complete end-to-end project together with the supporting code, research, data, documentation, presentation materials, or business materials necessary to display it as a substantive personal portfolio piece.