New Fairfield Public Schools

New Course Proposal

Directions:
Before completing this form, please discuss this proposal with the appropriate administrator(s) in your school. Complete this proposal form thoroughly, and attach any supporting documentation that would help the Board of Education's Curriculum Sub-Committee understand this proposal better. Be sure that you adhere to all deadlines, and be certain to acquire all required signatures. To ensure that a course can be properly planned for, if it is intended for a coming school year, please complete it by October 31. All other proposals can be forwarded at any time of the year.

Course Being Proposed: Explorations in Data Science 1 and 2

Proposal submitted by: Catherine Hall- NFHS Mathematics Department Chair

School: New Fairfield High School

1. Indicate the department/grade level in which this course/program will run.

   The mathematics department proposes to run a course titled Explorations in Data Science for students as an elective upon completion of their math graduation requirements.

2. Please indicate if the new course or instructional program is a semester long or year long, and indicate the applicable grade levels. Please indicate the course level if applicable.

   The course is a year long but divided into two semesters for students to have choice in their electives. It would be open to any students who had already met their math graduation requirements, typically students in grades 11-12. It would be a CP level course.

3. Please give the rationale for this proposal, and include its relationship to the past, current and future development of curricular offerings in New Fairfield.

   Current research shows that data science is a major component of many career paths that our students will be pursuing. We currently offer an Intro to Statistics class which dives heavily into data analysis and testing, but does not provide a broad overview of all aspects of data science, which this course would do. This course would allow students of all levels access to data analysis and statistics as well as an intro to computer programming in conjunction with data analysis.

4. Please indicate the target population for this proposal.

   Students in grades 11-12 who have already completed their graduation requirements for mathematics.

5. Please explain if this course or instructional program is an addition or a replacement for an existing course or program.

   This course is a new elective course and would not be replacing any particular course.

6. List any prerequisites for this course or instructional program.

   This course would be available to students who had already met their graduation requirements for mathematics, typically by taking an Algebra 2 course.

7. Please write a short description of the new course or instructional program that would be suitable for the high school *Program of Studies* or for a curriculum document.

   The Explorations in Data Science 1 course will introduce students to the main ideas in data science. Students will learn to be data explorers in project-based units, through which they will develop their understanding in several topics such as data analysis, sampling, correlation/causation, bias and uncertainty, probability, modeling with data, making and evaluating data-based arguments and the power of data in society.

8. Please list the long-term course or program goals that define the broad outcomes that this course or program seeks to help students achieve.

   Students should have an understanding of data analysis and how it relates to many topics in the real-world and many career paths.

9. Please indicate what topics, units, or material will be used to meet the long-term goals listed above. What assessment strategies will be used in this course or program? What are the unique components of this course or program content that make it a worthwhile addition for our students?

   This course curriculum is free and is available on youcubed

   The units include:

   Unit 1: Data Tells a Story

   In this unit students will be introduced to data science through a reflection of their own experiences using self-generated data, an exploration of a larger dataset of people's media use, and an analysis of business data. Through these activities students will learn about the data science process, begin using data to tell stories, and think about the ethics involved in working with data.

Unit 2: The Data of our Community

In Unit 2 students will explore different ways of modeling data, starting with the basic models of measures of center and spread, as well as considering sampling. Students will likely already be familiar with the calculations needed to find measures of center and spread for small data sets, but this unit takes a deeper dive into understanding the concepts, deeper meanings, limitations, and the impact of outliers in the context of data modeling. Students will explore distributions and the role of probability in understanding them. Additionally, students will collect their own data and compare it to a larger data set.

Unit 3: Water in Your Life

In this unit, students will learn about bivariate data through discussions and data explorations around the theme of water usage. Students will explore scatter plots as a visual way to represent the relationship between two variables, draw their own lines of best fit, and learn how data scientists determine and analyze lines of best fit .

Unit 4: Shuffling Songs

In this unit, students will again consider the modeling process and the role played by variation, reflecting on the data collected from simulations and the ways data can help answer probabilistic questions and leverage this power for decision-making. In the process of creating powerful simulations, students will learn the basics of programming, which will continue to be a powerful tool for data analysis.

END OF EXPLORATIONS IN DATA SCIENCE 1 (SEMESTER 1)

Unit 5: Skin Tones and Representation

In this unit, students explore the issues around skin tone representation in the media through a data-based exploration of skin tone representation in magazines. Students conduct both a categorical and a numerical analysis and compare the benefits and drawbacks of both. In their categorical analysis students create two-way tables based on their interpretation of the skin tones of the people pictured, and in the numerical analysis they use the RGB values of the images themselves. After both analyses, students chose an audience for whom the information would be relevant and write a data-supported piece to share their findings with that audience.

Unit 6: What's the Best Place for Me?

In this unit students will build a prioritization model to create a ranking. In this process, students will decide what they value, collect variables based on their values, gather and clean data, create functions to combine variables, normalize data, and create a weighting system for prioritizing their data. Students will do a sensitivity analysis on their weighting system. During this process, students will discuss how bias impacts mathematical models. They will use reasoning, justifications, and visualizations to explain their decisions.

Unit 7: Predicting My Preferences

In this unit, students will be introduced to the big ideas behind machine learning. They will build two different machine learning algorithms to make predictions on whether they will like a song. In this process they will learn about using vectors and matrices as data structures as well as applying conditional probability and exercising their basic programming abilities. Students will also consider how machine learning impacts their lives and others' lives and will share their newly gained understandings of machine learning with a member of their community.

Unit 8: Being a Data Scientist

This unit will bring together all that the students have been working on. Students will have an opportunity to work through the full cycle of data science: making their own decisions about the questions they are interested in exploring, finding data to answer that question, cleaning the data, creating and analyzing a model, communicating with the data visually and reflecting on their process. This will be an iterative process mirroring how data scientists work on a project. Students will gather their own data. They will make decisions about how to work with it and describe the choices they have made including what technology tools to use, cleaning moves, visualization selection, univariate or bivariate data choices, combining data, and other content relevant to their project of choice.

END OF EXPLORATIONS IN DATA SCIENCE 2 (SEMESTER 2)

10. Please enumerate the resources – both human and financial – that you anticipate will be needed to develop this course or program correctly. What impact would this proposal have on scheduling, staffing, and resources? Consider training, equipment and space needs.

The resource and curriculum are free from www.youcubed.org. The course uses several free online platforms as part of their lesson plan format, all provided by Google which the district already has access to for free. There is a Professional Development Course through Stanford that the teacher may participate in (it's online and self-paced) for a cost of $149.
The course would be staffed by current staff, it would replace a section of one of the upperclassmen electives currently offered.

11. If this course will require a textbook, what is the title and cost estimate of a likely text?

None - resource is free online - PD may be used by the teacher if desired, cost of $149.

12. What impact will this course/program proposal have upon other courses/programs currently being offered in the district?

This course does not impact any other courses that are currently being offered at this time, except that it may reduce the number of sections of other upperclassmen elective courses.

Signatures of those making this proposal:

Catherine Hall — 11/21/22
Teacher/Department Chair **Date**

[signature] — 11/21/22
Principal **Date**

Julie Lutz — 11/22/22
Assistant Superintendent **Date**