

Linear Functions – Made Easy

Prospectus for the Capstone project
to be submitted to National University
in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE IN EDUCATIONAL AND INSTRUCTIONAL TECHNOLOGY

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Introduction

This project will be part of an online course for first-year high school students. The project's name is Linear Functions – Made Easy, and it will be available through Google Sites, which will include synchronous and asynchronous work. This course is part of an algebra 1 class that introduces linear functions as a mathematical model to observe how response variables increase or decrease by changing the explanatory variables. It is essential to understand when a relation of a set of points is a function to write the function rule to model a linear relationship between two variables. A linear equation can help make predictions or calculate the rate of change (Hoekenga et al., 2013). Students will learn how to graph and write linear functions in three different forms. The first form is the standard form, $Ax + By = C$, the second one is slope-intercept form, $y = mx + b$, and the third form is the point-slope form, $y - y_1 = m(x - x_1)$. Students will find the x-intercept, y-intercept, and the rate of change or slope of a linear function to graph the functions.

Educational Requirement

This course will meet the following California Common Core State Standards for Mathematics from the Algebra 1 Curriculum Frameworks:

F.IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x .

The graph of f is the graph of the equation $y = f(x)$.

F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

F.IF.7a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph linear and quadratic functions and show intercepts, maxima, and minima.

S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

F.LE.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

(Algebra I Chapter of the Mathematics Framework for California Public Schools, 2013)

Preliminary Extant Data Analysis

Other websites exist that cover linear functions. These websites offer a written explanation of each form of a linear function, accompanied by videos, practice work, and assessments. Some of the resources that are available include:

- Khan Academy – is a website that provides free lessons with videos and articles to read for each lesson. It allows the learner to practice with multiple choice questions and free responses, and the learner can check their progress in each lesson. Although, some explanations on the videos can be confusing for a high school student.
- Mathematics LibreTexts – this website offers articles explaining functions and examples on how to graph and write linear equations. It goes beyond linear functions

to other types of functions, which can confuse the learner if they have not mastered linear functions.

- MATHhelp.com – in this website, the learner can find multiple videos for each lesson. In each lesson, the learner can answer questions to practice what they are learning. The website also provides a worksheet that can be printed to practice instead of answering questions online.
- MathTV – This website has free examples for linear functions, and it has three or four videos from different teachers explaining the same problem using their methods. The student can choose which teacher they prefer to watch.

In the learning process, a teacher needs to establish a learning environment where the students' needs are met and motivate each student to learn (Acharya, 2017). Although other websites are available to learn linear functions, most of them miss the motivation factor by offering a fun environment to learn mathematics. This project will offer learning objects with simple but very motivational units for students to learn linear functions. Students will:

- Watch fun and educational videos that will cover all linear function forms.
- Collaborate in specific assignments to analyze how slope works in real-world applications.
- Create Google Slides presentation to distinguish all linear function forms.
- Create a story for a given linear graph
- Utilize a graphing calculator app to analyze how the linear functions transform.

- Learn new songs about the y-intercept form and the slope formula.

Goal

A math teacher needs to teach the curriculum with a high standard that focuses on students' knowledge, performance, and experiences (Taylor, 2018). This project facilitates students to learn linear functions and their three forms and will help them increase their performance in linear graphing functions. The objectives for the project are:

Unit 1

- Students will determine if a relation is a function by utilizing a table of values, graph, or mapping with 90% accuracy.
- Students will compute output function values given an input value to formulate a table of values with 100% accuracy.

Unit 2

- Students will identify the x-intercept and y-intercept of a linear function in standard form to sketch the function on a coordinate plane with 90% accuracy.

Unit 3

- Students will formulate linear equations in slope-intercept form and graph the function utilizing the slope and y-intercept with 90% accuracy.
- Students will interpret the slope by identifying the rise and run in a coordinate plane with 90% accuracy.

Unit 4

- Students will calculate the slope of a line by evaluating the slope formula using two points from a line with 90% accuracy.
- Students will generate linear functions in point-slope form with 90% accuracy.

Audience

The intended audience is ninth-grade students, ages fourteen and fifteen. They will have exposure to evaluating algebraic expressions and solving linear equations before graphing functions. These skills will help the students evaluate functions and identify different variables in each linear function form. The targeted audience will apply their knowledge of linear functions they learned in this project to the following higher-level function in their next mathematics class. As students move on to higher math classes, they will learn how to solve and graph various equations and functions.

Schedule

| Milestone | Target Completion Date | Status/Comments |
|------------------------------|------------------------|-----------------|
| Planning Document Report | June 06, 2021 | |
| Completed Literature Review | June 20, 2021 | |
| Working Prototype of Project | July 04, 2021 | |

| Milestone | Target Completion Date | Status/Comments |
|---|------------------------------|-----------------|
| Aesthetic, Usability, and Content Testing | July 11, 2021 | |
| Final Draft and Written Review of Report | July 18, 2021 | |
| Completed Project and Report | July 25, 2021 | |

Research, Theoretical Base, APA Format, and Overall Graduate-level Scholarship

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