

Finance in a High School Mathematics Course

Finance for High School Grads

EDCI 569

E-Learning Project Final Report

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[Link to Primary Digital Module](#)

[Link to Differentiated Digital Module \(PBS Learning Media\)](#)

Scope

The lesson focus is extending student knowledge of Exponential Functions to calculating investment values. An important prerequisite providing context for this focus is building a familiarity with budgeting. The student is exposed to the foundation of budgeting basics, to include the role of investing and saving, via presentation decks and an online game. In addition, there is a follow-up budget creation activity as part of a practice quiz during the focus session.

Preparation for the focus session is supported by Exponential Function reviews at various online sites whose differentiation ranges from strictly written to mixed media to full video lessons. Students may select the support site that best fits their learning style, or investigate all three. Students then proceed through various training/practice tasks including activities to print, complete, and submit artifacts to their instructor via Google Drive folder sharing. The summative assessment consists of creating and solving two investment scenarios, and completing an online test including constructive feedback for incorrect answers.

Target Learners

A key driver of my move from Telecom to Education was my interviews of students, teachers, administrators, and my business peers yielding the common theme (concurrently confirmed through my industry research) that students are leaving high

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school missing some key real-world application and problem-solving skillsets. My vision is to leverage my knowledge of future learner needs (employer expectations) to transform curriculum into a digital-lesson focused tool. Instructors would then deploy the designed instruction to provide students with experiences simulating what they will encounter in their digital culture.

My audience for 'Finance for High School Grads' is 11th and 12th grade high school students. These learners need to be awakened to their impending release into an environment expecting them to have a comprehensive set of problem-solving and coping skills that they may not yet possess. The lesson is constructed with the flexibility to support use by an in-class instructor, an on-line course instructor, or by any student with the curiosity and initiative to pursue this information on their own.

All high school graduates require the ability to contribute to a financial discussion involving investments and budgeting estimation. High school juniors and seniors are a viable target audience as their 'next step' thinking is already engaged and panic is often present.

These students will have had some exposure to Exponential Functions in both middle school and Algebra math courses. In order to build on that prior knowledge, I include scaffolding in the form of various websites with differentiated lessons on Exponential Functions. This allows the learner to take the time that they need to prepare for the extension of Exponential Functions, the primary objective of this lesson.

Instruction and Assessment Plan

A driving question, attuned by the instructor to their particular audience, will tie the learner's previous knowledge of Exponential Functions to the destination as well as pique their interest (pun intended) regarding the mysteries of personal budget construction. This question might be something as simple as, 'What are some financial options for purchasing that dream car when you are 25 years old?'

Following knowledge and skills digital training sessions utilizing a combination of existing websites and targeted presentations, students are guided to various, diverse practice sessions encouraging them to extend their base knowledge and explore new concepts. These sessions include multiple formative data-gathering applications (PBS LearningMedia/Google Drive artifact shares) providing the instructor with individual-level data to analyze. The instructor may then create or identify additional practice activities focused on addressing student-specific deficiencies.

The summative assessment involves a section where the learner demonstrates knowledge of investment basics through application (production and solving of realistic scenarios), and an online test providing constructive feedback for incorrect answers. Thus this is more a final formative assessment than a true summative. This constructive feedback is a form of the 'hint' that Horton suggests (Horton, 2006, p. 269).

A further extension, void of assessment, involves students exploring myriad financial investment guidance sites. The task in this extension is to delve into more advanced budgeting and investment strategies.

Learning Objectives

The following learning objectives are built using the Gagne strategy of creating learning objectives in the language, environmental perspective, and frame of reference of the learner as highlighted by Driscoll (Driscoll, 1994, p. 353).

The budget objective is to provide a context for understanding and applying investments skills, which is the overarching objective of the lesson. The early exposure to budgeting is important, but this action is serving in a supporting role in this lesson.

‘Finance for High School Grads’ learning objectives:

- Create Exponential Functions to represent any investment opportunity.
- Compare multiple investments containing varying rates, terms, and compounding methods, and evaluate the options relative to maximum growth.
- Research and construct a model of a real-life investment scenario and discern a reasonable solution. (Final assessment artifact submission.)
- Create a viable, balanced projected personal budget based on a mix of given criteria, investment options, and projected life interests.

Process Overview

Having just quickly completed an activity in my high school PreCalculus classroom addressing high school finances, my direction was clear. I needed this lesson digitized in a self-paced format to ensure that students had ample time to cover the material.

The initial two weeks of EDCI 569 were focused on getting the activity details and lesson flow well-defined. Next up was story boarding where I tested several venues

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for supporting various lesson activities. At this time I also began consciously viewing the lesson from the perspective of my audience and thereby found myself pursuing more engaging elements to keep the attention of that audience. This search brought the budget game and the imbedded online multiple choice test to the lesson flow.

A major design change occurred once story boarding was completed and I started digital production. I realized that many of my reference sites, my personal study sites, retail product sites, Facebook, Twitter, and even our recently migrated high school website had a single page scroll emphasis. Consequently, I moved production from click to single page scroll and then, in the name of differentiation, provided the same material in a more traditional format at PBS LearningMedia.

Three Successes

A major success for me was to be able to add this product to the activities on my personal website. Neglect resultant of school year time constraints had left this site in disrepair and I was able to couple adding a digital lesson with the 1st phase of a site revamp.

Being led to Quiz Editor by a peer was a nice add as well. Effective assessments in the digital world are a major challenge and I believe a key to ensuring that learning is occurring is the ability to provide constructive feedback within the tool, real time. Quiz Editor provides an element of this.

The third piece of good news is that I was able to incorporate my role as a PBS LearningMedia Digital Innovator by building a differentiated version using the PBS LearningMedia Lesson Builder. This will be a central element of my professional

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development presentations later this summer at my school and, hopefully, at TCEA in February.

Three Challenges

My initial challenge was finalizing a process flow where I was comfortable that the focus topic was adequately addressed, effectively built on prior knowledge (Exponential Functions), and was not too long. Consequently, I left many nice practices on the cutting room floor. I hope to incorporate those into further extensions of this lesson in the future.

I also struggled regarding a format for my lesson. I tried some common designs but kept being pulled to the cultural environment feeling of the single page scroll. My vision regarding lessons for the digital natives is that they need to feel like they fit into the millennial culture, thus the single page scroll has the feel of a social media site and is very similar to the base structure of the Google Classroom.

The final challenge, which is ongoing, is how to get all of a math-related practice online. We are still seeing much of math learned by working through a problem and much can be discerned as well by the instructor when reviewing the process used or path taken by a student. Though I was afforded the opportunity to bring a tool into my Principles of Engineering classroom like [Mechanix](#), from the [TAMU SRL](#), which depicts the great strides being made in human-computer interaction, widespread availability of programs with constructive feedback tailored to student actions is still buried in university and business incubators.

Impactful Course Resources/Activities

This course provided weekly revelations regarding new products to try, new directions to travel, and beneficial enhancements. Following my move to secondary education, I tend to get myopic regarding the focus of moving learning online. Purdue LDT peer interface helps me recall that this market is much larger than my vision. Business, industry, and higher education moves to online are progressing while secondary is still somewhat mired in overcoming historical processes. Though I see my role as championing the secondary move to online, I need to remember that there are bigger markets out there making great progress that I need to tap into for ideas and direction.

Role of Peers and Feedback

Avoiding production in a vacuum is key in this environment as perspectives and trends change daily and we need to engage peers to provide feedback as well as fodder for idea growth. The varied backgrounds and visions of the Purdue LDT students ensures that vetting a product with your cohort will yield a wide array of views to consider.

Especially when working solely on a project, it is important to pursue peer feedback as there are no team members to jointly drive the project.

Take-away Nuggets

A key lesson to recall is that even if you believe that you know your target audience, ensure that pre-launch testing occurs with real-life representatives to ensure the

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most effective launch. Though I spend significant time with my target audience, I still must overcome using my perspective of ‘how it is’ by remembering to ask ‘how it is’.

The introduction of Gantt charts to manage progress was nice to see. I had not worked with these time management tools much since leaving Telecom, but I now see that the Scope-and-Sequence and Year-at-a-Glance documents that we build to guide instruction in a course are really a specialized form of Gantt chart.

E-Learning by Design (Horton, 2006) has proven itself a wonderful resource of direction and guidance in the construction of an online course with significant highlighting of typical pitfalls. It is a comfortable mix of text and visuals that takes its own advice in regard to maximizing, but not overusing, whitespace while interspersing visuals to keep the ‘story’ moving forward.

Ongoing Application

My vision for moving to Education was to create quality and engaging online experiences for secondary school courses. EDCI 569 is solidly in-line with supporting this vision and the expanded world I have encountered during these eight weeks is immense.

I will continue to use the skills honed here to convert a lesson at a time in both my PreCalculus and Principles of Engineering courses going forward on a regular basis. Any time a rewrite of a particular lesson is pondered, I will take the action to make it digital using the skills acquired these past eight weeks.

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Overlaying a strong Gagne base with equal parts of Prensky and Horton with a dash of irreverence for the establishment from Tony Wagner is the ideal recipe for extending pursuit of my vision to outlast my life here on this planet.

Formative Evaluation

I received extensive feedback from peers and my family (including targeted 21-year-old and 18-year-old daughters) throughout the process that drove many enhancements. Though my role as a high school educator provided me with data on lesson templates that are effective, the element-level critiques were quite impactful ranging from font size to navigation support to step separation. A great aspect of the digital world is that the product is always, often quickly, evolving and many issues are quick fixes. Consequently, the font/navigation/separation suggestions have already been incorporated.

Aside from some navigation concerns, the consensus on the overall design was described as conducive, comfortable, and contemporary. Both the Weebly and PBS Learning modules had discernable flows that the lesson structure used well to guide learners through the activities.

The provision of answer keys to support self-assessment were appreciated and supported the self-pacing aspect as opposed to needing to wait for instructor 'grading' on several steps. Suggested enhancements are more detailed or multi-media answer keys. The multi-media element is an option that I am looking at for the future. Significant thought and planning needs to go into determining how to structure these video teachings.

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The embedded test was popular which encourages me to ensure effective application of Quiz Editor in the future. This is a fairly simple tool to build and deploy and contains significant flexibility. I will provide feedback to the Quiz Editor staff that they incorporate a 'sign-in' element in the future to allow for more detailed gathering of data regarding student-specific performance. Gathering more student metrics would make Quiz Editor much more useful to the instructor.

There was mention by the reviewers that the lesson may be a little long. These were issued relative to the single page scroll and not the PBS LearningMedia lesson, so I believe that the length concern is more related to environment than content. I do believe that my eight steps have this single page scroll near the limit. I offer that 10 steps is too many and, depending on the complexity of the steps, six steps should be the limit for introducing new, challenging topics, such as math. As I am building on prior knowledge and simply showing application of a previously learned concept, eight steps is reasonable for the single page scroll.

Several reviewers mentioned that the slideshows were somewhat confusing and dry, so future enhancements would involve providing commentary and sketch-up on the slide show. And I mentioned previously, learners would benefit from multimedia answer keys on a few of the more complex practices and quizzes.

From a technology use perspective, this is a very easy and non-intimidating study to pursue and complete. All reviewers appreciated the game and I plan to incorporate more of that 'disguised' learning in my digital lessons going forward.

I performed my proof-of-concept study by building the initial lesson with no visuals and then followed successful testing with adding visuals for many of the link

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references. I was surprised at how much this changed the feel and flow of the lesson. I now fully understand the importance of building digital lessons with deliberate use of visual markers. This matched closely with the feedback I received from my reviewers. Though my previous proposals involved a colored background with nicely contrasting text, I continue to find that the white background creates a simpler and more comfortable canvas for my work.

Appendix A

Merrill’s Five Star Instructional Design Rating

Type of Instruction:

| Stage | Criteria | Explanation |
|--|--|--|
| PROBLEM Is the courseware presented in the context of real world problems? | Does the courseware show learners the task they will be able to do or the problem they will be able to solve as a result of completing a module or course? | Financial acuity is key for each human and this lesson establishes a solid base and provides quality resources for further and future study. |
| | Are students engaged at the problem or task level not just the operation or action levels? | The objectives of this lesson are clearly tied to life application while the training and practice activities reflect progressing rigor. |
| | Does the courseware involve a progression of problems rather than a single problem? | |
| RATING FOR PROBLEM STAGE: A Full Star | | |
| ACTIVATION Does the courseware attempt to activate relevant prior knowledge or experience? | Does the courseware direct learners to recall, relate, describe, or apply knowledge from relevant or past experience that can be used as a foundation for new knowledge? | The whole premise of this lesson is extending prior knowledge of Exponential Functions. This is the primary purpose of targeting this particular |

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| Stage | Criteria | Explanation |
|---|---|--|
| | Does the courseware provide relevant experience that can be used as a foundation for the new knowledge? | audience at this particular time. Their upcoming release into the world beyond high school is another element that supports potential for effective engagement of this very relevant information. |
| | If learners already know some of the content are they given an opportunity to demonstrate their previously acquired knowledge or skill. | |
| RATING FOR ACTIVATION STAGE: A Full Star | | |
| DEMONSTRATION Are the demonstrations (examples) consistent with the content being taught? | Are the demonstrations (examples) consistent with the content being taught? <ul style="list-style-type: none"> • Examples and non-examples for concepts? • Demonstrations for procedures? • Visualizations for processes? • Modeling for behavior? | The practice, training, and assessments are filled with life applications. The budgeting game is an alternate venue of real-life simulation. The Exponential Function scaffolding is provided using diverse offerings to allow for student choice. Students learn at different speeds so this course is provided as self-paced to allow the student to control when learning occurs as the materials are available 24/7. |
| | Are at least some of the following learner guidance techniques employed? <ul style="list-style-type: none"> • Learners are directed to relevant information? • Multiple representations are used for the demonstrations? • Multiple demonstrations are explicitly compared? | |
| | Is media relevant to the content and used to enhance learning? | |
| RATING FOR DEMONSTRATION STAGE: A Full Star | | |

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| Stage | Criteria | Explanation |
|---|--|---|
| <p>APPLICATION Are the application (practice) and the posttest consistent with the stated or implied objectives?</p> | <p>Are the application (practice) and the posttest consistent with the stated or implied objectives?</p> <ul style="list-style-type: none"> • Information-about practice requires learners to recall or recognize information. • Parts-of practice requires the learners to locate, name, and/or describe each part. • Kinds-of practice requires learners to identify new examples of each kind. • How-to practice requires learners to do the procedure. • What-happens practice requires learners to predict a consequence of a process given conditions, or to find faulted conditions given an unexpected consequence. | <p>The summative artifact requires creation of a situation and determining the solution. This is right out of the Gagne playbook (eliciting performance) (Driscoll, 1994). The online test provides the pathway to the correct solution and is available immediately as constructive feedback following submission of student selections. The Exponential Function scaffolding is introduced at the beginning so that the students may reference that support throughout the study.</p> |
| | <p>Does the courseware require learners to use new knowledge or skill to solve a varied sequence of problems and do learners receive corrective feedback on their performance?</p> | |
| | <p>In most application or practice activities, are learners able to access context sensitive help or guidance when having difficulty with the instructional materials? Is this coaching gradually diminished as the instruction progresses?</p> | |
| <p>RATING FOR APPLICATION STAGE: A Full Star</p> | | |
| <p>INTEGRATION Does the courseware provide techniques that encourage learners to integrate (transfer) the new knowledge or skill into their everyday life?</p> | <p>Does the courseware provide an opportunity for learners to publicly demonstrate their new knowledge or skill?</p> | <p>The purpose of this extension is the need of this information by the target audience in support of the many regular</p> |

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| Stage | Criteria | Explanation |
|--|--|--|
| | Does the courseware provide an opportunity for learners to reflect-on, discuss, and defend their new knowledge or skill? | financial evaluations and decisions in their life ahead. |
| | Does the courseware provide an opportunity for learners to create, invent, or explore new and personal ways to use their new knowledge or skill? | Websites are provided as the last offering for further exploration of the topic and the students are encouraged to pursue this. It is quite likely that the future will see further development of this extension to include a lesson exploring the 'deeper dive'. |
| RATING FOR INTEGRATION STAGE: A Full Star | | |

Bibliography

Driscoll, M. P. (1994). *Psychology of learning for instruction*. Boston: Allyn and Bacon.

Horton, W. K. (2006). *E-learning by design*. San Francisco: Pfeiffer.