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Technology in the Early Childhood Classroom: an Instructional Class for Pre-service Teachers

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Final Design Project Report
Masters
Instructional Psychology & Technology, Brigham Young University

Purpose

The purpose of this project was to create a new Instructional Psychology and Technology (IP&T) course for Early Childhood Education (ECE) majors at Brigham Young University. Currently, ECE students take three 1-credit IP&T classes that focus on the following disciplines: integrating technology into the classroom, using coding and computational thinking in the classroom, and teaching in online and blended learning environments. These classes are geared towards K-12 education majors and are taught to a broader group of preservice teachers. ECE majors have a very defined set of grades and ages that they can teach, all of which have unique and specific needs that other grades and ages do not have. In addition, the ECE program recently reduced the total course load for their students by 12 credit hours. Because of these specific ages and unique needs and uses of technology, Kathie MacKay, the ECE program chair, has asked the IP&T department to create a new 2-credit course that focuses on the needs and uses of technology in the early childhood classroom and combines aspects of the currently required IP&T courses to make the information more meaningful and useful to ECE students.

The approved learning outcomes for the new course are as follows:

1. Integrate technology into early childhood classrooms in developmentally appropriate ways
2. Teach computational thinking concepts in the early childhood classroom, including coding short programs.
3. Know how and when to use personalized learning software as well as how to analyze the data from those tools for further learning.

Project Needs and Constraints

Learner Personas

The Learners

This course is designed for Early Childhood Education majors. Students who will be in this class are generally juniors and seniors who will be starting their first practicum semester (meaning their first in-classroom experience) when they take this course. They will be doing their practicum experiences in the BYU preschool and kindergarten. Most students in this program are female.

To learn more about the learners, I sent out a survey to ECE majors. Twenty-nine students responded, ranging from students who were just starting the program to students who will soon be graduating. The information, below, about the learners came from this survey as well as my observations as an instructor to ECE majors in IP&T 372 since the fall semester of 2019.

Early Childhood Education majors are unique because they chose to have a specific focus in the early grades-- PreK up through 3rd grade. Many students enjoy working with younger learners and want to focus on setting young students up for future success. One ECE student said, in a survey response asking about why she chose ECE, “I wanted to narrow down the age group that I will be working with in my career, and I have an interest in helping young students create a solid foundation for future academic success.” Another responder said, “I... wanted more specific training in how to teach the young grades.” 27.6% of students also mentioned the unique intersection of teaching and human/child development as a reason they chose to go into ECE as opposed to general Elementary Education.

ECE students generally fall into one of three categories when it comes to their motivation and excitement towards learning about technology and how to use it in the classroom: the excited adopter, the reluctant technologist, and checklist learners. These categories are based on the survey and my own observations and interactions with ECE students.

The first category is that of the excited adopter. These learners are extremely motivated and excited to learn new content and are interested and invested in learning more about technology integration and how to use coding in their classrooms. They are often early adopters of using technology in the classroom and are willing to experiment with technology, even when they are less confident.

The second category is the complete opposite. These are the reluctant technologists-- students who do not see the purpose of learning about technology and coding when they are going to be teaching in an early childhood classroom. There is little investment or motivation in learning the

content. Some students in this group also believe that they are “bad” with technology; they have low self-efficacy in their abilities to use technology, which often prevents them from trying something if there is not a guarantee that it is going to work.

The third group is in the middle. They are the checklist learners. The learners in this group generally see this class as a checklist item, a class that they have to take to graduate. Students in this group will generally do the assignments and mostly understand them, but they are initially not excited about the content. Checklist learners can convert to excited adopters if they have successful and exciting experiences with technology in the classroom.

Identified Gaps

From the survey I sent out to ECE majors, 78% of students feel comfortable or extremely comfortable with personal technology use. But when asked about how comfortable students feel using technology in the classroom, there was a large shift downward where no respondents felt extremely comfortable using technology in the classroom. Most students (55%) felt somewhat neutral, neither comfortable nor uncomfortable about using technology in the classroom.

Many students do not know current developmentally appropriate practices (DAP) to use in early childhood classrooms when it comes to technology. Those who do have some knowledge of current DAP often say that the most appropriate way to use technology in the classroom is in simple ways. This is a misunderstood application and deeper knowledge is needed on actual best practices.

Students are also unaware of why coding in the classroom is important, especially at these young ages. There are lots of feelings of anxiety or uneasiness about how to teach coding in the classroom, how it would actually be helpful, and where to even start.

Finally, when asked about what specific questions students had using technology in the early childhood classroom, the most frequent questions were “What technology is available?” and “How do I start?” There were also various questions about specific technology tools as well as questions focusing on DAP.

Implications

Based on student responses, we wanted to increase their comfort level and confidence level in using technology in the classroom. This is one of the primary focuses that is emphasized throughout the course.

Another important area of focus in the first unit is current developmentally appropriate practices; students need to know what current experts recommend for technology use for young children. Based on those recommendations, they will need to understand how to use technology in appropriate, effective, and efficient ways in the early childhood classroom.

Coding is another emphasis in this course. Based on student responses, there is a lot of anxiety and a general lack of understanding as to why coding is important and why it should be taught in the early childhood classroom. By teaching students how to code simple programs and giving them tools to use coding in their future classrooms, students will come to understand the importance of coding and how to teach it to their students.

There seems to be a lack of knowledge about what technology is even available to use in the early childhood classroom. This means that throughout the course, exposure to as many pieces of technology and as many appropriate uses of technology as possible is a main consideration.

Finally, because we have different types of students who have different motivations/ excitement levels about learning about technology, we need to be able to provide opportunities that best meet the current needs of students. We offer opportunities for students who are highly motivated to go deeper and stretch themselves farther in the areas that they are interested in. We provide context and reasoning behind why this course is being taught and why it is important to reach the students who are in the middle/ lower levels of excitement/ motivation about the course. Additionally, we provide support for students who need extra help with assignments and understanding concepts in addition to taking a mastery-based approach and allowing students to have as many attempts as needed to show they have mastered the content.

Environmental Analysis

Stakeholders

Dr. Kathie MacKay is the main client for this project. She is the ECE program chair and asked that this class be created. She is a big proponent of technology use in the classroom and wants students to know and understand how to use technology in the early childhood classroom effectively, especially how it may look different than in other grades.

Dr. Peter Rich is the chair of the IP&T department and oversees the elementary sections of IP&T 372, which focus on coding and computational thinking in the elementary classroom. He will also oversee the teaching of this course, IP&T 370.

Meagan Nielsen is the designer for this course. She is an IP&T master's student who currently teaches IP&T 372 and has taught that class for over two years. She also has experience teaching IP&T 371 which is a technology integration course for education majors. Meagan also taught first grade for 3 years and has experience with younger elementary and preschool students.

Early Childhood Education major students are the secondary stakeholders in this project. They will be the learners and recipients of this course that is being created. They are invested in knowing how to use technology in the early childhood classroom so it can help them in future employment.

Environment

This class will be held in-person, face-to-face, once a week for two hours. It will be held on campus in the late afternoon or early evening to accommodate the students spending a portion of their day in the early childhood classroom. Canvas will be used at the online LMS and will contain homework assignments and readings, projects, class schedules, instructor info, and other course information. As part of some of their assignments, students will be applying what they are learning in class in the form of lesson plans that they will implement in BYU's preschool and Kindergarten classrooms.

The content that students need for the course will all be housed on Canvas and organized into modules that are clear and easy to understand. Each module has the same set up: the week of the semester and unit title, followed by a Before Class heading with any readings or assignments

that need to be done before coming to class; a Class heading that describes the content being taught in class that day as well as any digital content they may need for that day's activities; and an After Class heading with any assignments or other tasks that students need to do after class.

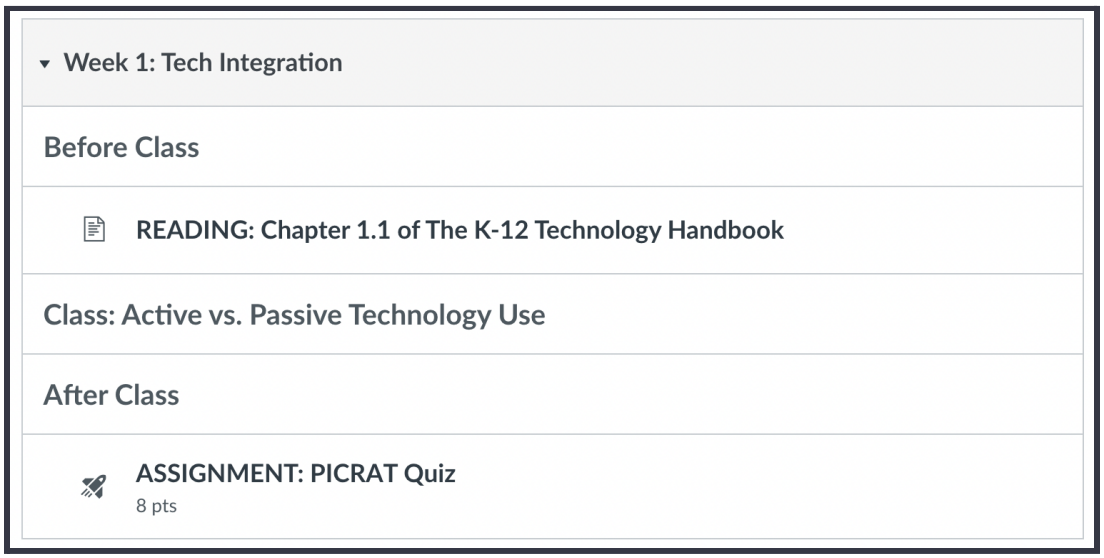


Figure 1

The content that the instructor will need is all housed and organized in Google Drive folders. Within the IP&T 370 Instructor Content folder, there are sub folders for each unit and lesson. Within these folders there is a pre-class checklist with tasks the instructor needs to do before teaching that week's session. There is also a lesson plan for the week as well as a slide deck. Some of the weeks also include additional materials, like digital task cards and recording sheets, for in-class center activities. In addition to the weekly content, there is also a folder with information on how to set up the course for the semester, including a checklist of to-do items and instructions on how to set up various aspects of the course, like setting up Canvas and setting up the weekly student feedback survey.

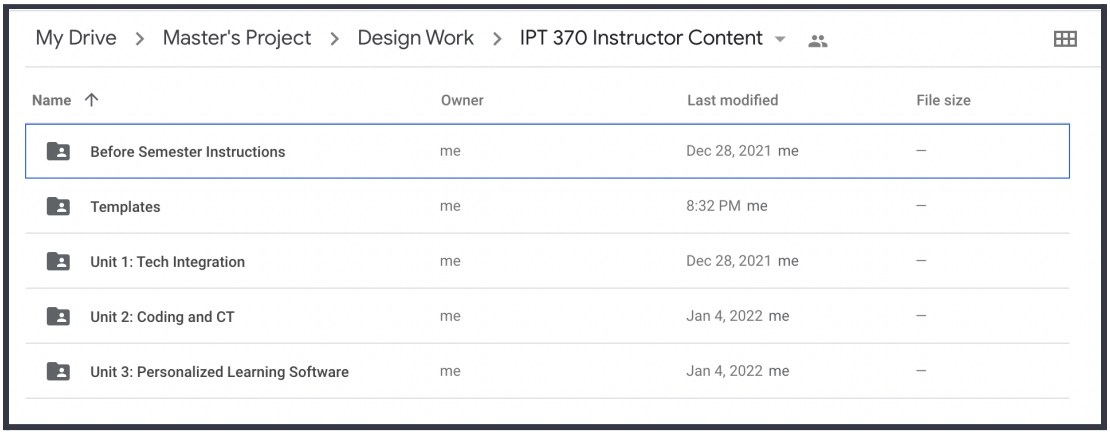


Figure 2

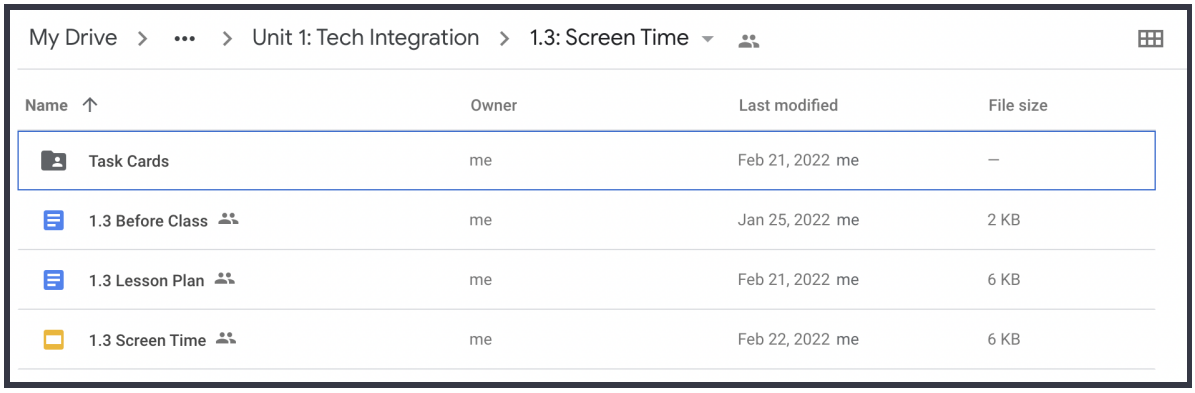


Figure 3

Constraints

There were three main constraints that I originally took into consideration when building this course. First, students will be in their first practicum semester within the ECE program. Second, there is a lot of content from three current 1-credit IP&T classes that needs to be incorporated into this single 2-credit class. Third, there is also a lot of content that is specific to ECE that will need to also be added and incorporated into the course.

All three of these constraints came into play as I was designing. When I was designing content for the students to interact with, both independently for homework and while they were in class, I kept in mind that they would be in their first practicum experience. I originally thought I needed to take into consideration that the students would be tired and not as interested in going to class after being in the classroom for most of the day. But what I actually focused more on with this constraint is making sure that what students are learning in this class can be directly applied and experimented with in their practicum experience. I wanted to give them ideas and experiences that they could turn around and use the next day in the classroom.

When I was going through the content that needed to go into this course, it was especially difficult to condense down the content for the first unit which is focusing on integrating technology. There was a lot of content from IP&T 371 that I wanted to include as well as specific ECE content that would make the class more meaningful and helpful to the students. It ended up not being too difficult to narrow down the content for the second unit, which focuses on coding and computational thinking. I was able to highlight the content that would be most appropriate for the early childhood classroom from IP&T 372, which I am very familiar with.

One constraint that I did not foresee in the beginning of my project was the lack of content for Unit Three, which focuses on personalized learning software. I had a difficult time determining what actually needed to be in this unit as well as finding good, real classroom examples that would actually be beneficial to the students.

Another constraint that I did not plan for was unreliable communication. I put forth effort to communicate with my client and tried to find a good balance of how often to communicate. I found that the best balance for this project was sending updates about once or twice a month communicating where the project currently was at and where feedback was needed. Most of my updates and requests for feedback went unanswered or had severely delayed responses, but I continued to move forward the best I could.

Implications

Because this class is being held in-person, I wanted to make sure that we utilized the opportunity of being together in a group, especially since working together in groups is so important in early childhood education. I designed five of the fourteen lessons to be center-rotation activities that really focus on students doing something hands-on and doing something together in a pair or a group. I also focused on discussions that included the whole class, small group, and pairs. Also, because of the length of time in each class period, I was able to design activity debriefing discussions and there was time for deeper learning experiences.

Students are taking this course during their first practicum, so I wanted to make sure that what we teach in this course goes along with what students are actually experiencing in the classroom setting. I talked with teachers at the BYU Preschool and Kindergarten to see what they use technology-wise in the classroom and what they wanted students to know more about. I also designed opportunities for students to explore and be introduced to many other types of technologies and developmentally appropriate ways to use technology in the classroom.

Content Analysis

Learning Content

Below is a visual representation of the learning content needed for successful technology integration in the early childhood classroom. There are four main areas: Developmentally Appropriate Practices; Evaluating Technology; Available Technology; and Content Knowledge.

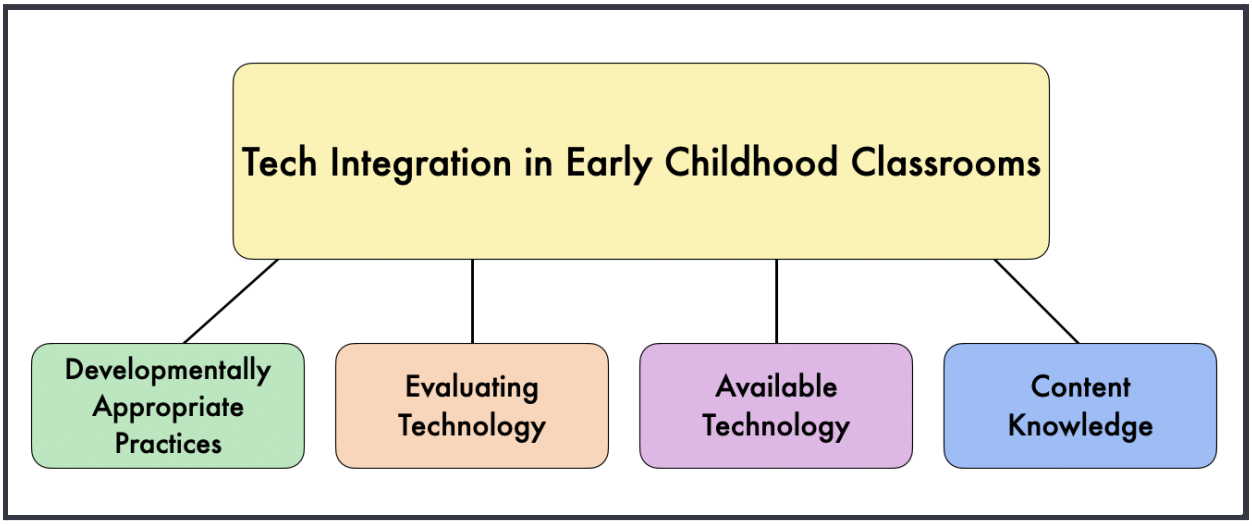


Figure 4

Content Analysis

Developmentally Appropriate Practices

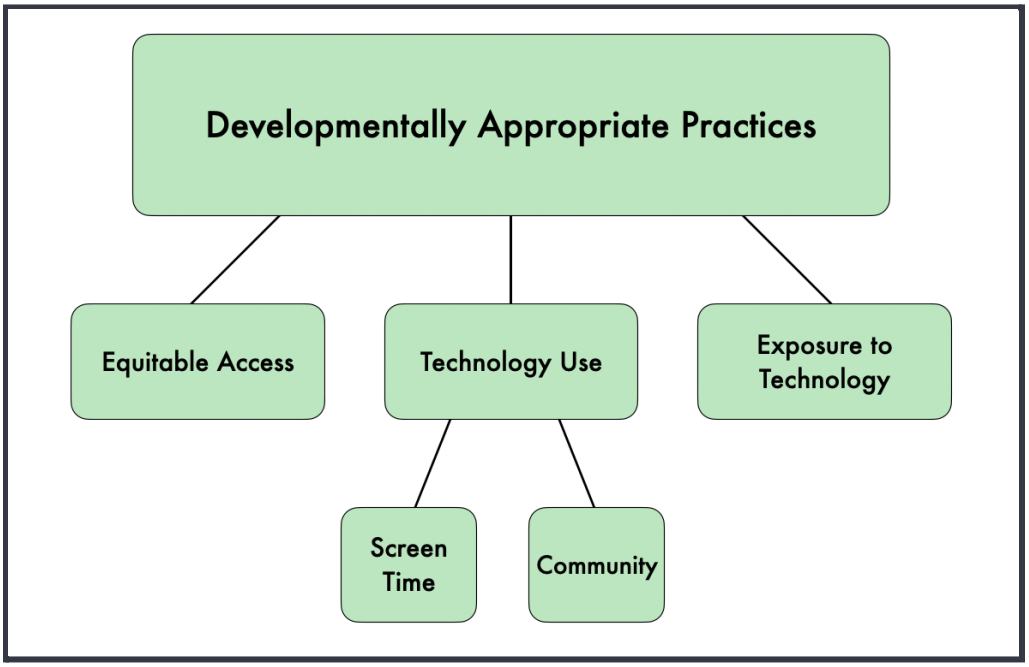


Figure 5

The early childhood classroom has unique circumstances that make technology use different in that setting than in other educational settings. There are developmentally appropriate practices (DAP) that are unique to this setting. Expert teachers know how to use technology in developmentally appropriate ways; this includes knowing current screen time recommendations from the American Academy of Pediatrics as well as providing opportunities for community technology use. In addition to knowing how to use technology in the early childhood classroom, expert teachers focus on providing opportunities to expose students to different technologies as well as providing equitable access to technology for all students. See Table 1 for more definitions.

Table 1

Label	Meaning
1: Developmentally Appropriate Practices	Using teaching methods and practices that enhance the optimal development of the learner. This includes utilizing student strengths and assets.
1.1: Equitable Access	Providing access to technology for all students. This includes providing opportunities and access to technology some students may not have at home and can only access at school.
1.2: Technology Use	Focusing on the specific ways technology is used by children in the early childhood

	classroom.
1.2.a: Screen Time	Regulating how much time children should have with screens as suggested by experts. This includes time both at home and at school. Screen time also covers the types of technology interactions children should be having. The most high-quality interactions for children include interactive educational experiences, communicating with others, and other interactions that involve other people alongside them.
1.2.b: Community	Providing technology experiences and interactions that involve working with others. This includes having an adult with the child during the technology interactions and having groups of children work together with technology.
1.3: Exposure to Technology	Giving children a wide variety of exposure to different types of technology. This can include exposure to smartboards, robots, tablets, computers, etc.

Evaluating Technology

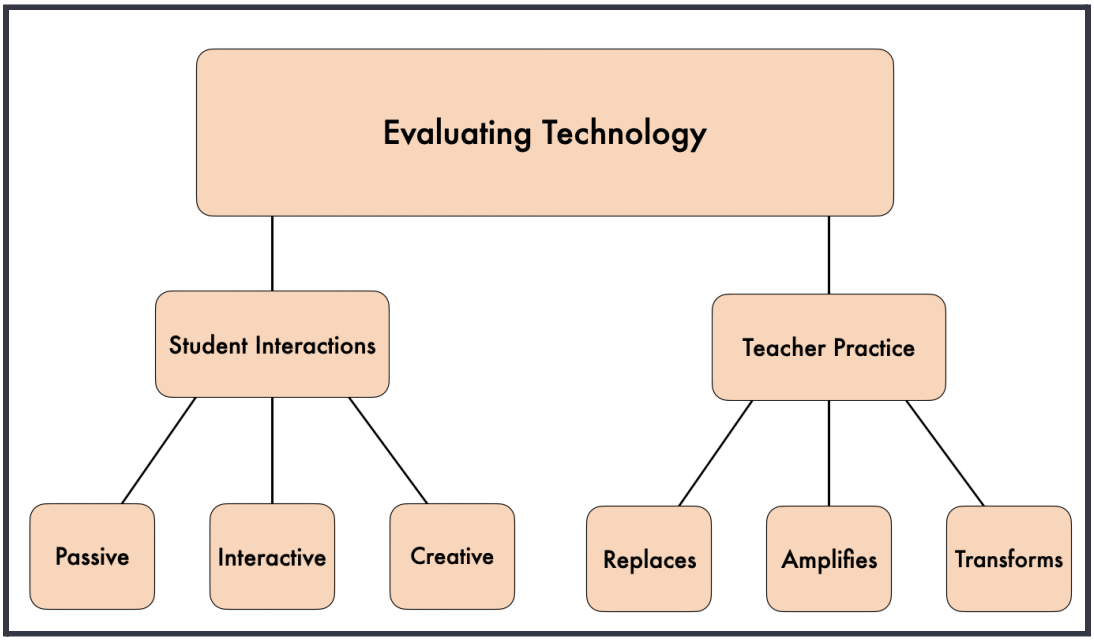


Figure 6

Expert teachers in the early childhood classroom know how to evaluate technology. They know how to evaluate student use as well as how technology informs teacher practice. They can use the PICRAT scale as a technology evaluation tool. The PICRAT scale helps educators evaluate technology in terms of how the students use the technology (Passive, Interactive, Creative) and how technology informs the educator's practice (Replaces, Amplifies, Transforms). See Table 2 for definitions.

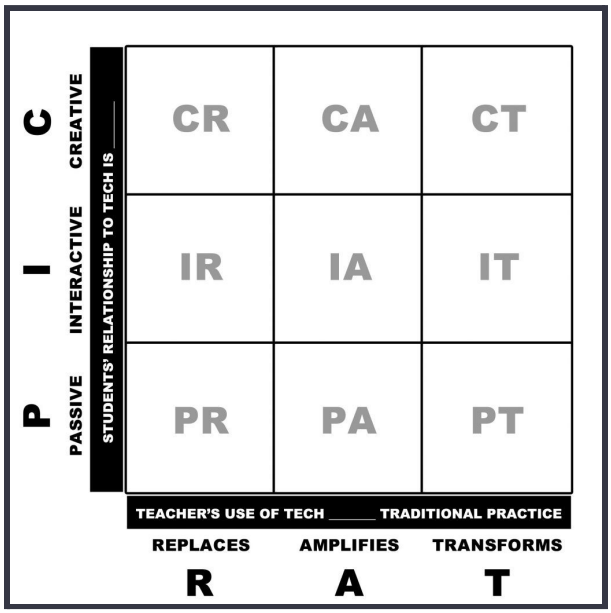


Figure 7 Source: https://edtechbooks.org/k12handbook/technology_integration

Table 2

Label	Meaning
1: Evaluating Technology	Teachers assessing, rating, or judging technology or technology interactions that will be used in the classroom either by students or by the teacher.
1.1: Student Interactions	Students using or interacting with technology in the classroom.
1.1.a: Passive	Students passively engaging with technology, such as watching a YouTube video or reading an online news article.
1.1.b: Interactive	Students interacting with technology, such as playing a math review game on the computer or using a teacher-created Scratch program to review and practice grammar.
1.1.c: Creative	Students creating with technology, such as

	coding a program using ScratchJr or shooting and editing a video explaining the water cycle.
1.2: Teacher Practice	Technology informing the teacher's classroom practice.
1.2.a: Replaces	Using technology simply replaces a practice that teachers were already using. For example, a teacher now writes their notes for students on Google slides and displays them instead of writing them on the whiteboard.
1.2.b: Amplifies	Using technology amplifies or enhances teaching practices. For example, having students keep their writing journal in a Google Doc that is shared with the teacher, making it easier and quicker for the teacher to write comments and feedback for students.
1.2.c: Transforms	Using technology transforms teaching practices, usually this makes a learning experience possible by using technology. For example, watching a livestream of animals in their natural habitats to make observations.

Available Technology

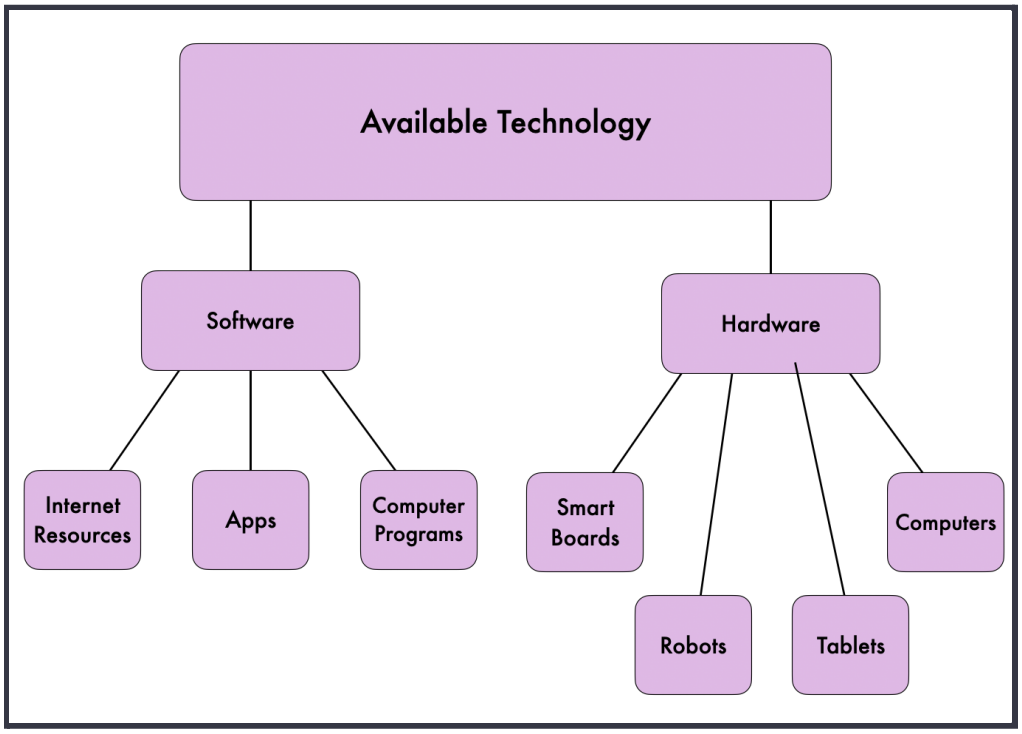


Figure 8

Expert teachers are aware of what technology is available and what is appropriate for use in their classrooms. This includes knowing what hardware, software, and other types of technology are available to them through their schools, districts, grants, etc.. In addition to knowing what technology is available, expert teachers also know how to use the technology and/or know where to find resources to learn about the technology. See Table 3 for definitions.

Table 3

Label	Meaning
1: Available Technology	What technology is available to teachers and students in general as well as what is available within the districts, schools, and classrooms.
1.1: Software	The programs that are available for teachers and students that are on or can be accessed by hardware.
1.1.a: Internet Resources	Any resources, media, etc. that is found on the internet that is appropriate for students.
1.1.b: Apps	Applications used on tablets for students to use.
1.1.c: Computer Programs	Programs available on computers for student use.
1.2: Hardware	The physical pieces of technology available to teachers and students. This can include computers, tablets, smartboards, and robots.

Content Knowledge

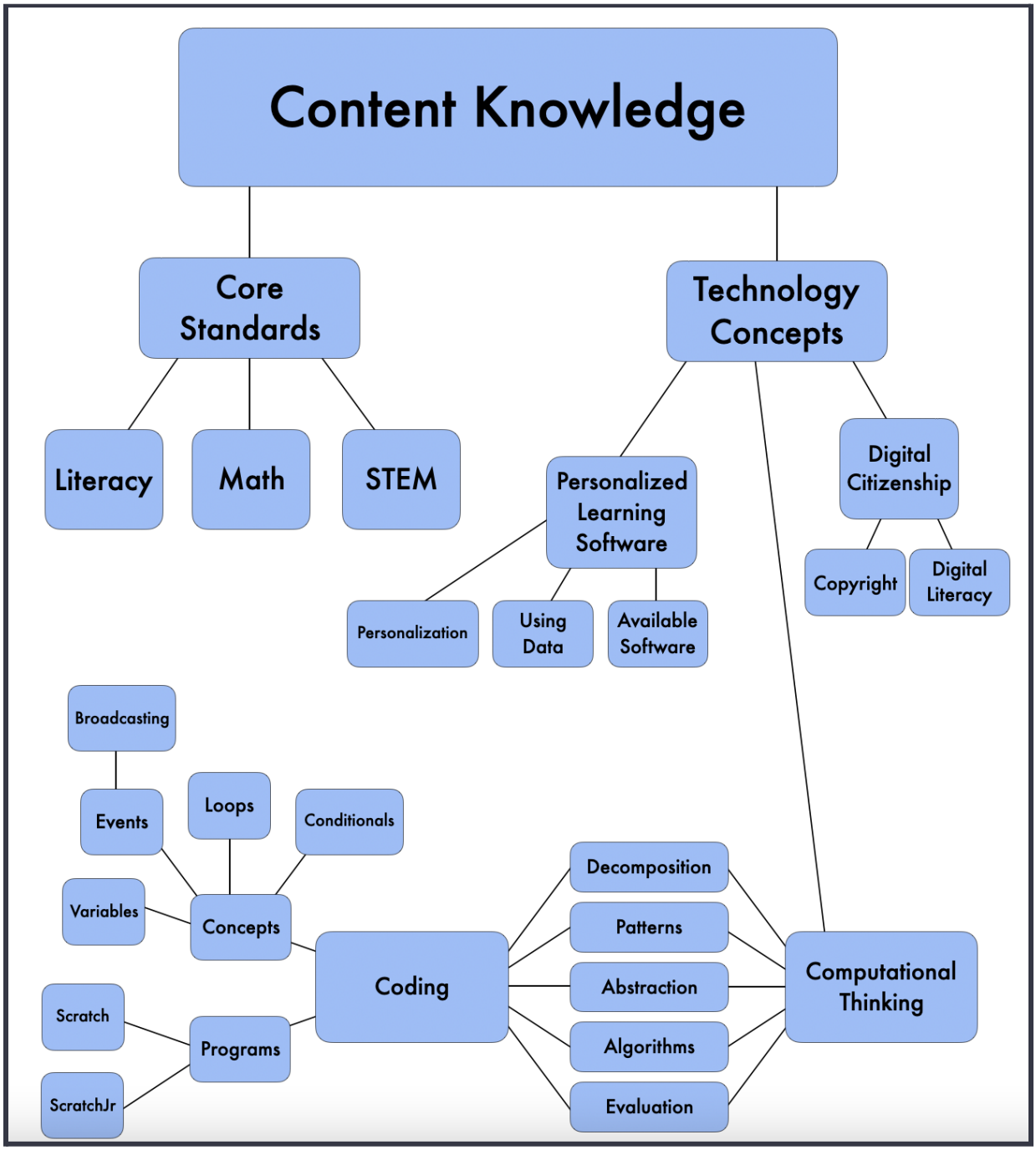


Figure 9

There are overarching types of content knowledge that expert teachers know. The first is knowledge about core standards. Core standards include knowledge about subjects such as literacy, math, and science. The second type of content knowledge teachers know is technology concepts.

There are many technology concepts that expert teachers understand. For the scope of this course, I decided to focus on four main areas based on the university approved learning outcomes for the course. First is digital citizenship, second is personalized learning software, third is computational thinking, and fourth is coding.

Digital Citizenship focuses on how to be a good citizen with digital tools and interactions. Within this area, teachers know about copyright laws (what is and is not appropriate to use in the classroom). Teachers also know about digital literacy which is how to correctly use and interact with technology. Teachers also need to know how to teach digital literacy to their students.

Personalized learning software helps students have a personalized learning experience using digital software. Expert teachers use the data gathered from these programs to inform their teaching and help their students. Teachers also know about other forms of personalization that can be used in the classroom which includes customizing learning experiences to the student and giving the student some control and say in their learning experiences.

Computational Thinking encompasses five skills: decompositional thinking, pattern finding, creating abstractions, generating algorithms, and evaluating programs. Expert teachers know and understand these concepts and use them throughout their teaching in multiple areas of instruction. In addition to using them throughout instruction, expert teachers use these concepts to help teach students to code and to understand how coding works. See Table 4 for more specific definitions of computational thinking and the skills associated with it.

Coding is another type of content knowledge that today's expert teachers have. Within the realm of coding, teachers know about events including broadcasting, variables, conditionals, and loops in addition to basic coding functions like movement and sound. See Table 4 for definitions of these coding elements.

Table 4

Label	Meaning
1: Computational Thinking	A problem-solving process most often used within the context of coding.
1.1: Decomposition	Breaking down a problem or task into smaller pieces.
1.2: Patterns	Finding steps that repeat or occur multiple times.
1.3: Abstraction	Focusing in on the problem; making it more specific.
1.4: Algorithms	Providing step-by-step instructions to solve the problem.
1.5: Evaluation	Checking the solution, making sure it works, and making any necessary adjustments.

2: Coding	Creating computer programs that accomplish a specific task.
2.1: Concepts	Specific ways of thinking while coding and helpful tools to use to accomplish tasks.
2.1.a: Variables	A value that can change based on incoming information.
2.1.b: Events	Ways to start your code and get your program running. Events include clicking, pressing keys, hovering, etc. as well as broadcasting, which is sending messages within your code from one piece of code to another.
2.1.c: Loops	A way to repeat commands.
2.1.d: Conditionals	Often called an “if/then” statement; this code checks to see if conditions are met or not. If conditions are met, something will happen and if conditions are not met, something different will happen.

Implications

Expert teachers know what technology is available and how to use it in developmentally appropriate ways. They also know how to learn how to use new technology. Because teachers need to be aware of this, throughout the course I have designed regular interactions with new technology or new ways to use familiar technology. I wanted to give students an opportunity to see a wide variety of technologies that are available and that they could easily use in their classroom.

Since expert teachers need to stay current on available technology, it is important for them to be able to evaluate technology and to see how effective it is for them to use in the classroom and to see how effective it is for their students to use. Because this is a skill that needs to be practiced, I have designed the first lesson of the course to go over PICRAT, the technology evaluation framework students will use in the class. I have designed lessons so that PICRAT comes up frequently and will be a useful tool students will be familiar with so they can evaluate technology on their own in their future classrooms.

A large part of early childhood education is focusing on developmentally appropriate practices (DAP). Students will be learning about DAP in other subject and content areas within some of their other program classes: therefore, it is important for this course to teach DAP in regard to technology.

Students are getting content knowledge in core subjects (math, literacy, etc.) in their other program classes, so we do not need to focus on teaching students that information. What they are not getting in other classes is technology content knowledge. Based on state standards and

state teacher proficiencies, the technology content knowledge we will be teaching focuses on digital citizenship and literacy, personalized learning software, computational thinking, and coding.

Product Design

Design Details

I created the course IP&T 370: Technology Use in the Early Childhood Classroom. This is a 2-credit course that focuses on the unique needs of using technology in the early childhood classroom. It combines the important elements from previous IP&T courses that are specific and relevant to ECE majors. This fulfills the needs of my client, Kathie MacKay, by providing a course that is more specific to ECE majors and takes up less credit time than the previously required IP&T courses. This is relevant because the ECE department recently went through a program evaluation where they had to cut down on their required credit hours.

This course will be held in-person once a week. All student materials for homework, assignments, and readings, as well as in-class content, is housed on Canvas. All instructor content (lesson plans, slide decks, and pre-class checklists) are housed and organized on Google Drive.

Instructional Strategies
Rather than follow a specific ID model, the design of this course is rooted in four interrelated instructional theories and their accompanying strategies (see Figure 10). Each of these is briefly explained in the following section.

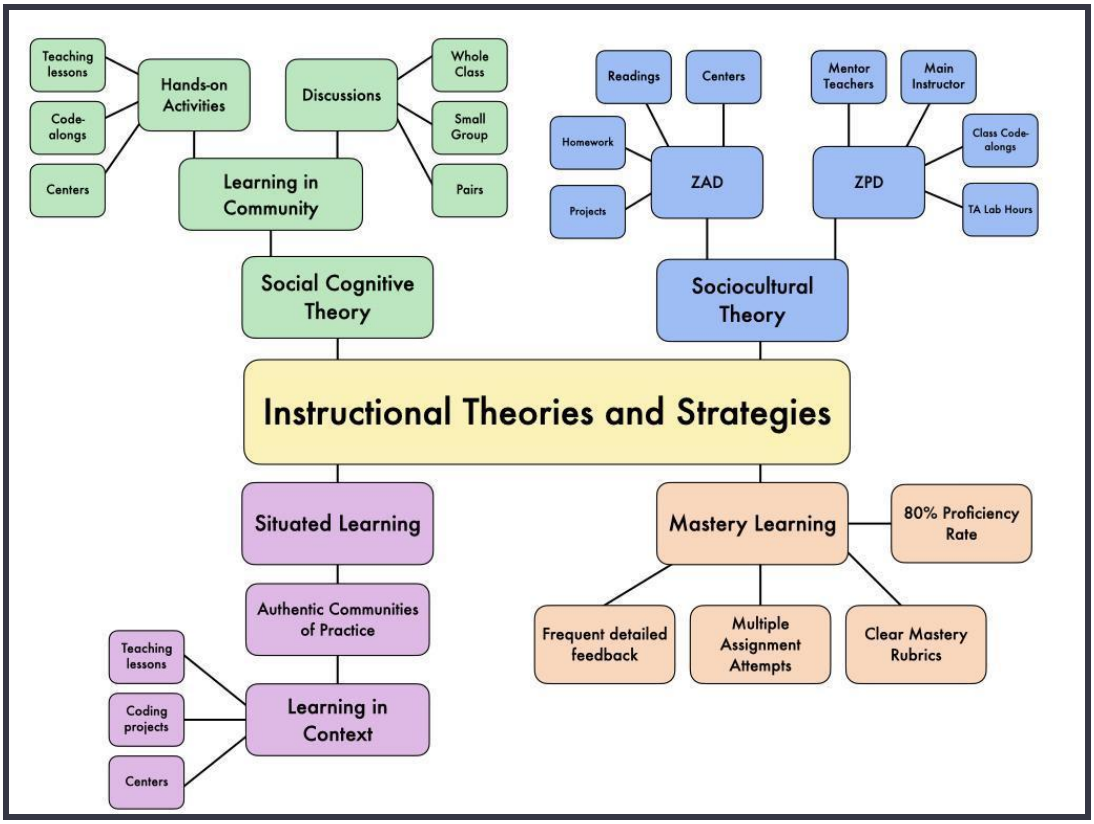


Figure 10

One of the main instructional strategies that is utilized in this class is 'Learning in Community.' I drew upon social cognitive theory, which "focuses on what and how people learn from one another, encompassing such concepts as observational learning, imitation, and modeling" (Ormrod, 2008 p. 118). In consulting with Kathie MacKay, this is a main learning theory she wanted to be incorporated into this class. She wants students to experience learning this way so that they can use the same strategy in their classrooms, since learning in community is one of the best ways for young children to use and interact with technology. To utilize this idea of learning in community, I have designed this course to include a lot of discussions in various group sizes (whole class, small group, and pairs) so that students can learn from others within different groups. I have also designed a lot of hands-on activities that students will do in groups of various sizes. Some of these activities include centers, teaching lesson plans, and code-along projects.

I also drew on Vygotsky's (1978) sociocultural theory, specifically the aspects of Zone of Proximal Development (ZPD) and Zone of Actual Development (ZAD). The instructor will take on the role of "more knowledgeable other" and can help students reach their ZPD. Since a lot of this content will be very new to students, they will need a guide to help them with their learning. In addition to the main instructor, some other "more knowledgeable others" include the students' mentor teachers in the BYU Preschool and Kindergarten and the TAs during the weekly TA lab hours. Students will be in the ZAD during center activities that we will do during class as well as when they are outside of class doing their readings, homework assignments, and projects.

In addition to learning in community, learning in context is also important in this course. Using Lave and Wenger's (2003) situated learning, this course focuses on actually *doing* the work and

having authentic experiences to learn and will include authentic communities of practice. Students will have real life opportunities to practice and attempt to demonstrate learning and understanding. They will implement their lesson plans in small groups and whole class settings to be carried out in the BYU preschool and Kindergarten during their practicum experiences. They will also be learning in context when they are doing center activities (centers are providing examples of what teachers could use in their own classroom) as well as when they are creating coding projects that they could use in their future classrooms.

Finally, this course takes a mastery learning approach. Bloom (1984) researched ways for students to achieve higher understanding. With the help of graduate students, they found that tutoring yielded the highest gains in student learning. However, because tutoring is very time intensive and costly, they focused on Mastery Learning, which yielded high gains in student learning and it was able to be implemented in a whole group classroom situation without any extra cost-- just extra time was needed. Students would take formative assessments, then receive feedback on their assessments. Students could then learn from the holes in their understanding and would then be re-assessed. Similarly, in this course, students will receive specific feedback on their assignments and have the opportunity to re-do their projects based on the feedback that is given in order to demonstrate that they have achieved a higher level of understanding. There are rubrics that clearly define what is expected at leach level. Students must attain an 80% proficiency rate in order to achieve mastery-level learning and earn credit for the assignment.

Achieving Learning Goals

This course has three main learning goals:

1. Students will be able to integrate technology into early childhood classrooms in developmentally appropriate ways.
2. Students will be able to teach computational thinking concepts in the early childhood classroom, including coding short programs.
3. Students will know how and when to use personalized learning software, as well as how to analyze the data from those tools for further learning.

To achieve the first learning goal of integrating technology in developmentally appropriate ways, I designed the first unit to focus on technology integration and DAP. The first unit has lessons about active vs. passive technology use, how to evaluate technology, DAP, screen time, and focuses multiple lessons on how to integrate technology with core subjects that are already being taught such as literacy, math, and science. In addition to reflection papers on integrating technology and finding subject specific integration resources, students will prepare a small group center lesson plan that integrates technology. Students will actually teach the lesson in the BYU preschool during the semester and write a reflection about their experience.

To achieve the second learning goal of being able to teach computational thinking concepts and code short programs, I designed a unit that includes lessons on two different coding programs (ScratchJr and Scratch), working with robots, ways to teach unplugged coding (teaching coding and computational thinking concepts without the use of technology or screens), and giving students some basic coding pedagogy. To demonstrate their understanding, students will find and create activities to teach coding and they will create coding programs to use in the classroom.

To achieve the third learning goal of using personalized learning software and the data they produce, I have designed lessons that focus on personalization and what that can look like in the classroom, especially when we utilize personalized learning software. I have also designed lessons that focus on looking at the data that is produced from personalized learning software and focusing on how teachers can use that data to inform their teaching and help their students.

In addition to the learning goals of the course, I wanted to create a course that (1) exposed students to lots of different types of technology and how to use that technology and (2) demonstrated ways students could use activities and ideas we have in class in their own classrooms. As I kept these two goals in mind while I was designing, I was able to incorporate different types of technology into almost every lesson and I was able to include five of fourteen lessons full of center ideas that students could take right from class and use in their classroom experiences. In addition to including centers within the lessons, all lessons were designed with the idea that students will be working together to have a discussion, accomplish a task, or do a project or activity together to demonstrate working in community, which is a developmentally appropriate way for early childhood students to learn and use technology.

Considering Constraints

One of the main constraints I had to focus on while designing this course was the fact that students were going to be in their first practicum semester. That means that this is the first actual classroom teaching experience for most of the ECE students. Because of this, I knew as I was designing that students might not have a good grasp on what is actually possible or doable in a classroom setting. That is why in my design, I focused a lot on activities and tools students could take from our class and use directly in their own classroom experience. I also focused on sharing many different types of technologies and ways to use technology so students could see a broad view of what is possible to use in the classroom. Because this is their first semester in a practicum, I also wanted to design lessons and activities that would help students have a solid foundation in technology integration so they can continue to integrate technology in their future teaching experiences.

Another constraint was the amount of content that I had to go through to develop this course. I took content from three 1-credit IP&T classes and evaluated what would be most useful and applicable in the early childhood classroom. Because I have experience teaching in early childhood classroom settings, I gathered and organized the content that I thought would be most helpful for these future early childhood educators. After I gathered and organized the content, I met with Kathie MacKay to discuss the content that I thought was important. She and I had a discussion about why I chose the information that I did, and I received guidance and feedback from her about what she thought would be most appropriate for the early childhood classroom.

In addition to meeting with Kathie to discuss the content that I had gone through from the previous IP&T courses, we also discussed some ECE specific content that she wanted to be included in the course. This included information about DAP, screen time, and familiarizing students with the position statements on technology from the National Association for the Education of Young Children (NAEYC). The NAEYC is the professional organization for early childhood educators that do a lot of work in teaching and sharing research and best practices for the early childhood children. This provided more information that I knew would be helpful and useful to students. But it also required me to design ways to include this content in meaningful and helpful ways.

While most of my constraints focused on having a lot of content and whittling it down to a manageable amount that would be helpful and beneficial to students, there was one unit of content that I had a hard time finding content for: Personalized Learning Software. One of the requirements for early childhood educators is that they need to know how to use personalized learning software and the data it produces. But there is not a lot of information about personalized learning software that is specific to early childhood. But I was able to use Chapters 3-4 of *K-12 Blended Teaching: A guide to personalized learning and online integration* (Graham et al., 2019). These chapters focused on data and personalization, which were the key pieces that I wanted to have students learn about. I based my lessons for this unit on personalized learning software on these chapters.

Precedent Products

The precedent products that I consulted for my design were the IP&T courses designed for education majors: IP&T 371 Integrating K–12 Educational Technology 1; IP&T 372 Integrating K–12 Educational Technology 2 (Coding and Computational Thinking); and IP&T 373 Teaching in K–12 Online and Blended Learning Contexts. I consulted these courses because these are the three technology courses that ECE students are required to take. I looked at these courses for content as well as for design inspiration.

Because I currently teach sections of IP&T 372 and have helped with the iterative design of the course from the first semester it was taught (Fall 2019), I relied heavily on my design experience from that course to develop IP&T 370 Technology Use in the Early Childhood Classroom. By going through the design process and the evolution of IP&T 372, I knew some of the best ways to teach some of the content that I included in IP&T 370. I also know from student feedback from IP&T 372 what students do and do not like about that course. I was able to apply some of the overarching concepts, ideas, and practices from IP&T 372 into IP&T 370, like mastery-based learning, zero-based grading, and a lot of instructor and TA support through detailed feedback and TA lab hours.

Design in Action

Here is a link to the Canvas course that I created for IP&T 370. Within the course, the student modules are laid out with clear headings indicating what needs to be done before class, what the topic will be for class that week, as well as any digital materials or resources needed for that class session, and what assignments students have after class. There are readings, assignments, rubrics, and task cards within the modules.

Here is a link to the instructor folder on Google Drive. It contains the before semester instructions for the instructor as well as the content for each unit. Within each unit, there are folders for each lesson titled with the unit, the week, and the topic of the class session. Within each of those folders there is a before-class checklist, a lesson plan, slide decks, and other possible resources needed for that class session, like task cards.

To see more images of the product that I designed, see the Product section below.

Product

The product I designed is in two parts. The first part is the Canvas course that I designed for students. This houses all of their readings, assignments, rubrics, course information, etc.. It is divided up into modules with clear headings for what is to be done before class, what is going on in class, and what needs to be done after class.

Figure 11 is an example of a module students would see on Canvas. It shows the reading they need to do before coming to class, the class topic and the resources needed for that class session, and the assignment students need to do after class. I designed the modules this way so it was clear to students what needed to be done and when it needed to be completed. I also wanted to make it easy for students to access digital resources that may be needed in class, so I added links to those resources under the class topic heading.

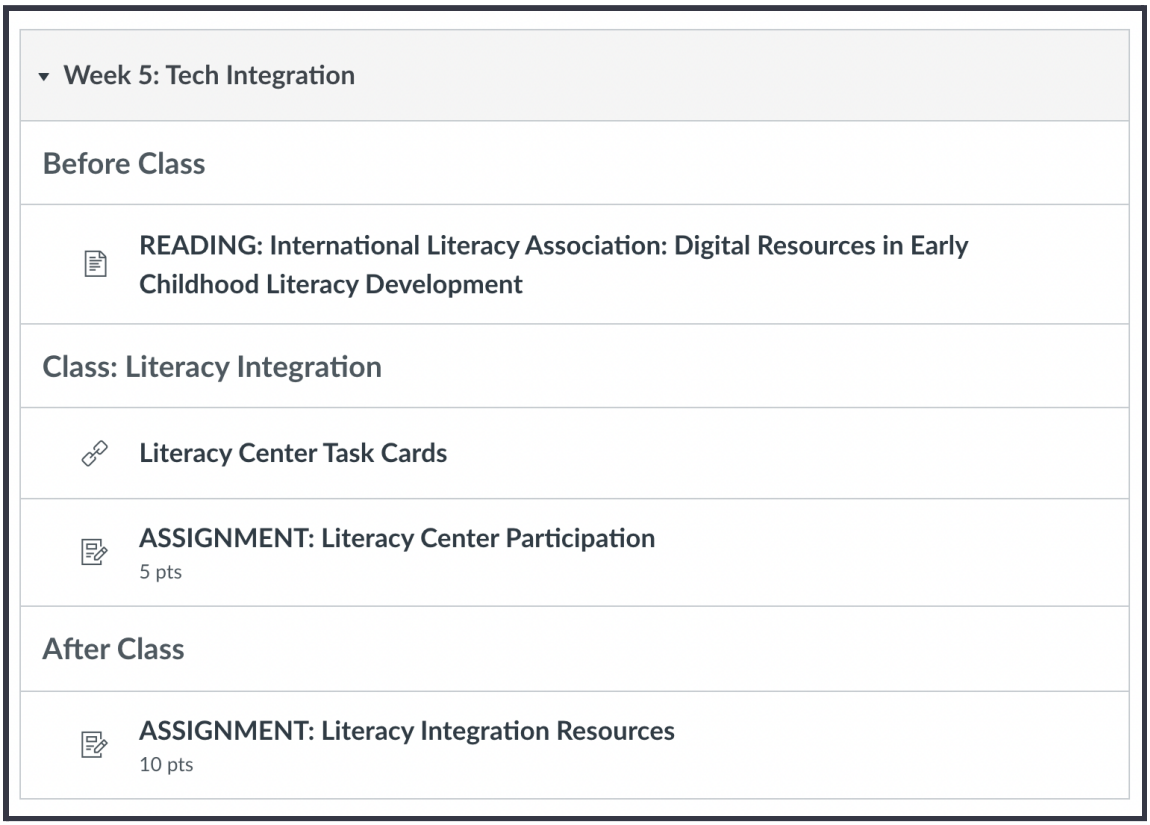


Figure 11

Figure 12 shows an example of an assignment followed by an example of the accompanying rubric in figure 13. I made sure to align assignments and assessments with the course learning objectives. This ensures that what is being assessed aligns with what students are learning in the course. In the example below, the assignment goes along with the second learning objective: teach computational thinking concepts in the early childhood classroom, including coding short programs. The assignments in this class are designed to help students in their future classrooms. Some of the assignments are actual products that they could use in their classrooms and other assignments help students think through their own ideas and thoughts about using technology in the classroom. These assignments tie into the idea of learning in context-- I wanted students to be able to use what we are doing in class in an actual classroom.

In addition to designing assignments that students could use in the classroom, I wanted to make sure that students are actually understanding the concepts we are teaching in class. To show that students understand, I have taken a mastery-based approach to the class. To do this, I have designated an 80% mastery threshold that students need to achieve in order to receive a grade for an assignment. If students score below that threshold, they will be asked to make changes to their assignment based on the detailed feedback that is left for them. They can then resubmit the assignment for it to be re-graded. There is no penalty for resubmissions because I want students to actually show that they know and understand what is being taught. Students can resubmit as many times as they need in order to show their understanding.

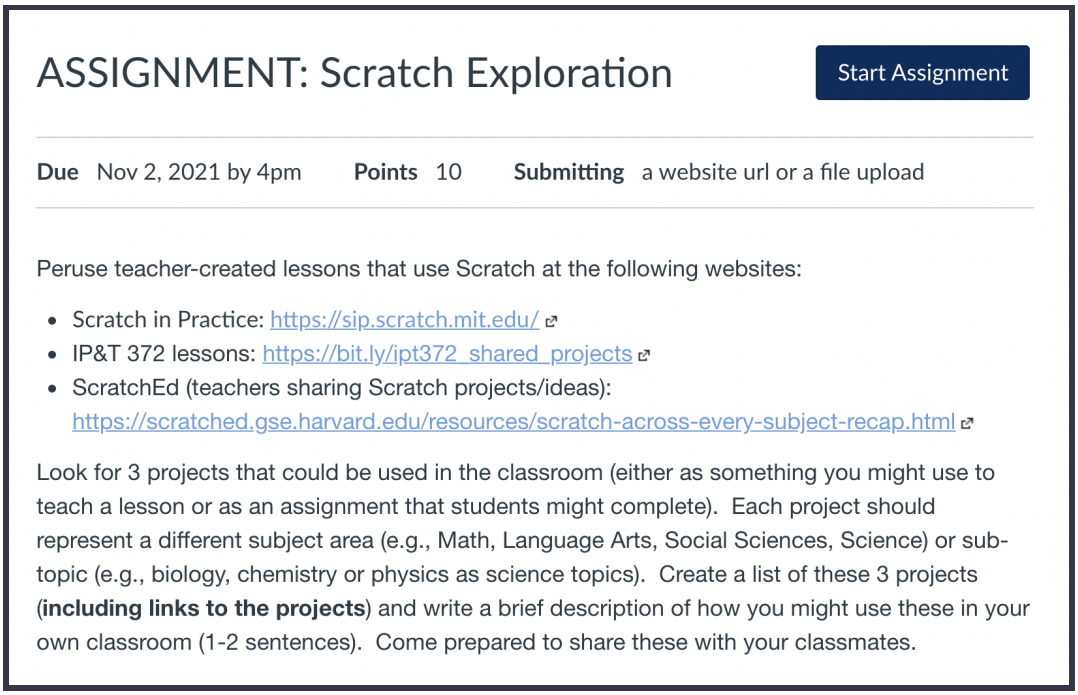


Figure 12

Scratch Exploration (1)

Criteria	Ratings				Pts
Completeness	**6 pts** **Distnguished** • 3 Scratch projects included	**4 pts** **Proficient** 2 Scratch projects Included	**2 pts** **Basic** 1 Scratch project included	**0 pts** **Lacking** No projects identified	6 pts
Quality	**3 pts** **Distinguished** • All projects include a 1-2 sentence description of how you'd use them in your own class • Projects represent varied subjects	**2 pts** **Proficient** • All projects include a 1-2 sentence description of how you'd use them in your own class • Two projects represent the same subject.	**1 pts** **Basic** •Projects include a brief sentence about how you'd use them in your class. • One subject area represented	**0 pts** **No Marks**	3 pts
Feedback Survey	**1 pts** **Full Marks** You completed the weekly feedback survey			**0 pts** **No Marks**	1 pts
					Total Points: 10

Figure 13

The second part of my design is the instructor content. This is housed on Google Drive, and it includes all of the information the instructor will need to teach the course. There are before-semester instructions as well as folders for each unit. Within each unit, there are folders for each lesson that include a before-class checklist, a lesson plan, and a slide deck. There are also other materials, like task cards, in the lessons that require additional resources.

When designing the lessons, I really focused on providing opportunities to learn from other students as well as the instructor. I created lessons that were discussion-based and varied what types of discussions to have (whole class, small group, or pairs) with the intention that students would get to talk to and hear from a variety of people over the course of a semester. This ties back into the idea of learning in community and sociocultural theory. In addition to having discussion-based lessons, five of the fourteen lessons also include center activities. Centers are an instructional strategy used frequently in early childhood education. Centers provide great opportunities for students to work together to accomplish a task and can provide support to students as they are learning. Again, this ties into the idea of learning in community. I created centers that would help students experience different aspects of technology that they could use in their classrooms and give them some ideas about how to implement centers in their own classrooms. I created task cards so students could independently complete the tasks at each center without the need for the instructor to explain every single thing.

I was able to lessen the cognitive load for the instructor by creating a flow for each week that would be the same. The instructor will start out by looking at the checklist for the week. This checklist includes items like checking that Canvas is up to date, reviewing the student readings for the week, reviewing the lesson plan for the week, looking at and updating the slides for the week, and looking through student questions from the previous week's assignment. I have set up the checklists, lesson plans, and slides with the same template so they have a consistent feel and look to also lessen the cognitive load of the instructor. In addition to the weekly set-up of the lesson materials, I also created clear instructions and checklists for the instructor to set up the course before a new semester starts.

Figure 14 shows the documents included in the instructor's before semester instructions.

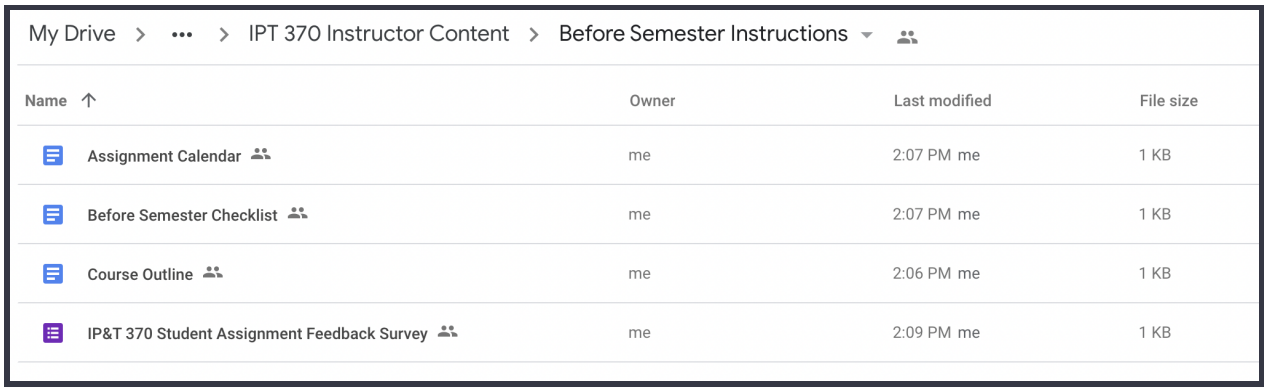


Figure 14

Figure 15 shows all of the lessons included in Unit 1: Tech Integration

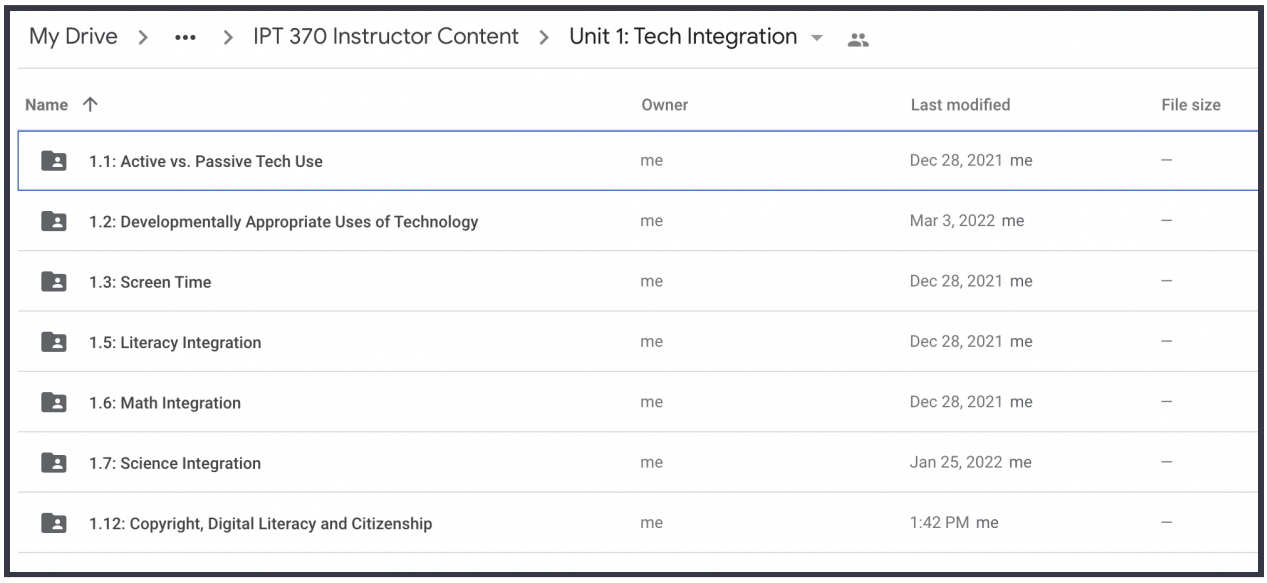


Figure 15

Figure 16 shows all of the contents for lesson 1.6: Math Integration.

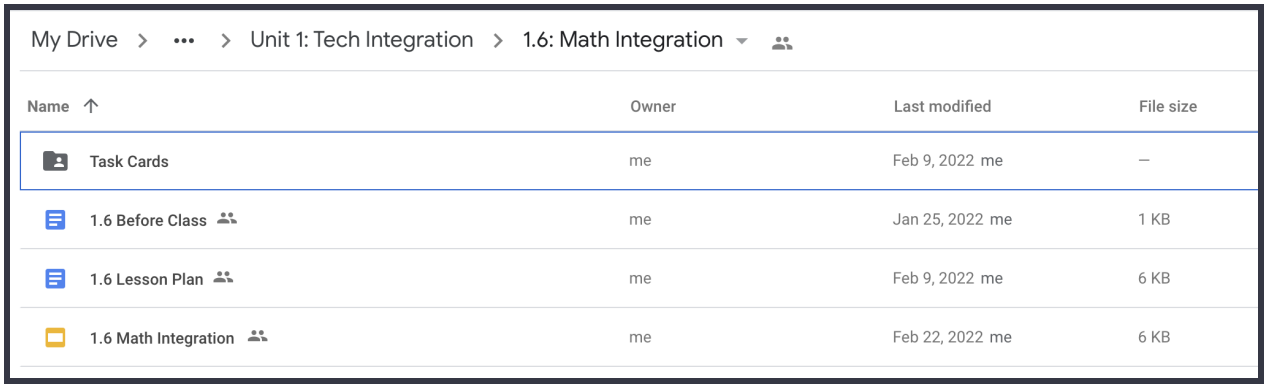
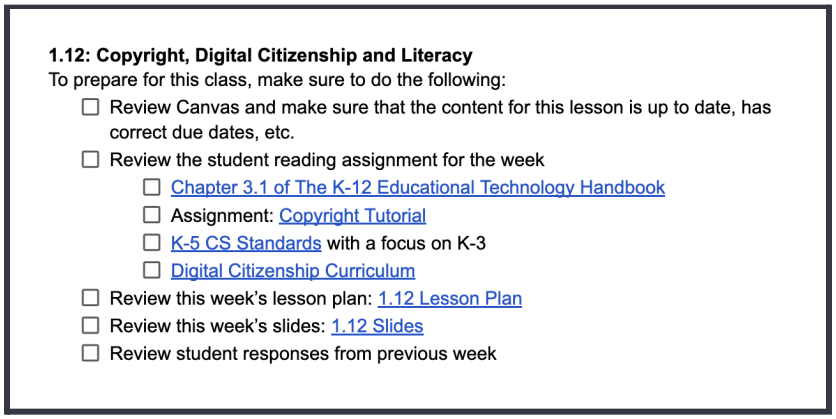


Figure 16

Figure 17 shows an example of a before class checklist. Figure 18 shows an example of the lesson plan followed by an example of a slide deck in figure 19.



1.12: Copyright, Digital Citizenship and Literacy

To prepare for this class, make sure to do the following:

- ☐ Review Canvas and make sure that the content for this lesson is up to date, has correct due dates, etc.
- ☐ Review the student reading assignment for the week
  - ☐ Chapter 3.1 of The K-12 Educational Technology Handbook
  - ☐ Assignment: Copyright Tutorial
  - ☐ K-5 CS Standards with a focus on K-3
  - ☐ Digital Citizenship Curriculum
- ☐ Review this week's lesson plan: 1.12 Lesson Plan
- ☐ Review this week's slides: 1.12 Slides
- ☐ Review student responses from previous week

Figure 17

Lesson: 1.12 Copyright, Digital Literacy and Citizenship

Objectives:

- Students will explain and use basic copyright.
- Students will identify important aspects of digital literacy and citizenship for early childhood classrooms.

Materials Needed:

- None

Lesson Plan:

Time	Content
10 min.	Class Intro ● Prayer ● Announcements ● Questions from student survey ● Additional questions
30 min.	Copyright ● What is Copyright? ● Fair Use Guiding Principles ● Appropriate uses ● Public Domain and Open Resources ● Answer any questions
20 min.	Copyright Activity ● In small groups, create a short lesson using resources from BYU Copyright
25 min.	Digital Literacy and Digital Citizenship ● Definitions of digital literacy and digital citizenship ● Background on Utah K-5 CS standards ● Dive into standards ○ Look at what Digital literacy and citizenship look like in each grade ○ Come up with ideas about how to teach and incorporate those standards into the classroom
15 min.	Wrap-up ● Go over lingering questions from today ● Discuss assignments for next week ○ Begin working on lesson plan

Figure 18

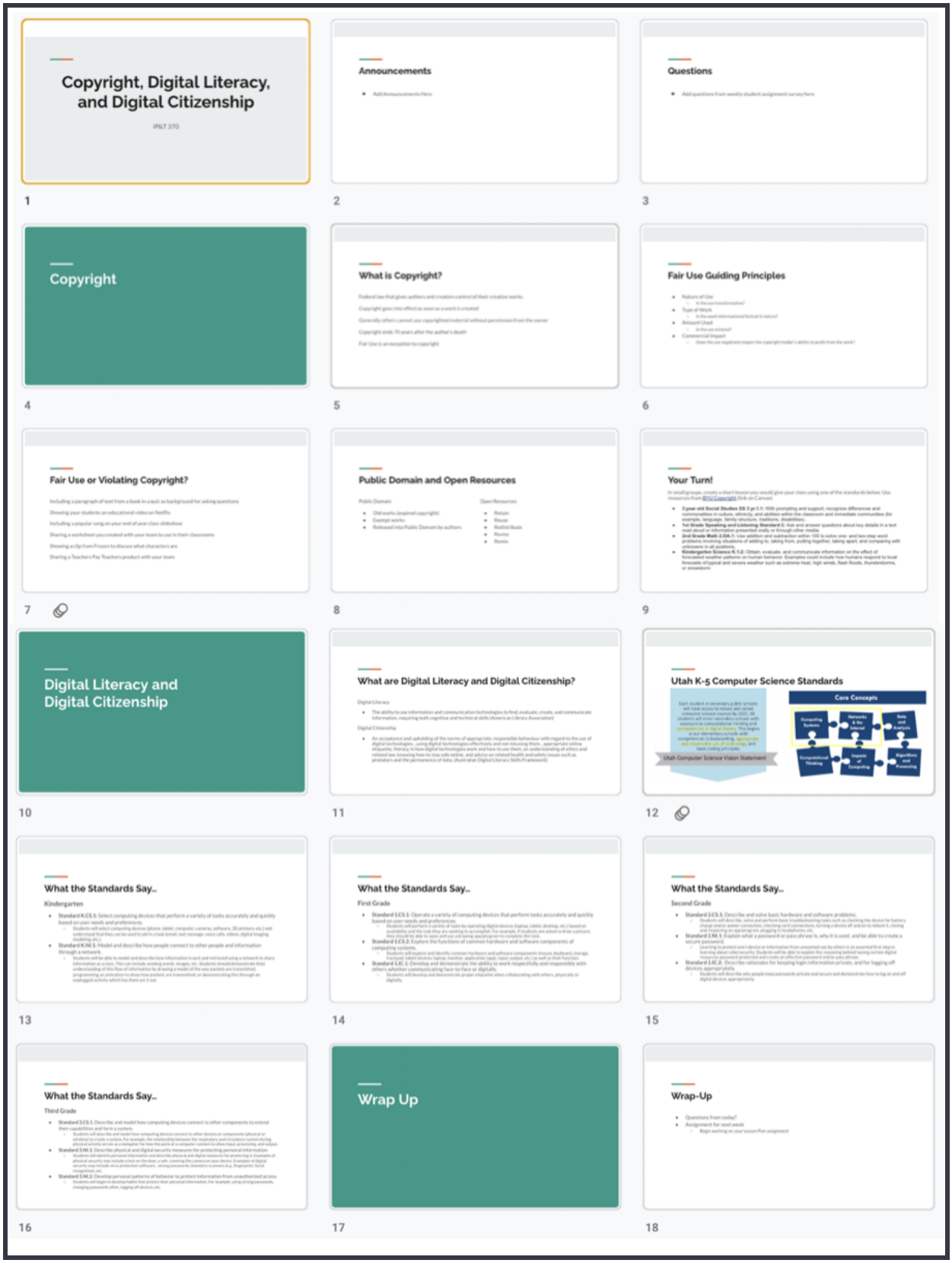

Copyright, Digital Literacy, and Digital Citizenship
IP&T 370
1
Announcements
Add Announcements Here
2
Questions
Add questions from weekly student assignment survey here
3
Copyright
4
What is Copyright?
Federal law that gives authors and creators control of their creative works
Copyright goes into effect as soon as a work is created
Generally others cannot use copyrighted material without permission from the owner
Copyright ends 70 years after the author's death
Fair Use is an exception to copyright
5
Fair Use Guiding Principles
Nature of Use
Is the use transformative?
Type of Work
Is the work informational factual in nature?
Amount Used
Is the use minimal?
Commercial Impact
Does the use negatively impact the copyright holder's ability to profit from the work?
6
Fair Use or Violating Copyright?
Including a paragraph of text from a book in a quiz as background for asking questions
Showing your students an educational video on Netflix
Including a popular song on your end of year class slideshow
Sharing a worksheet you created with your team to use in their classrooms
Showing a clip from Frozen to discuss what characters are
Sharing a Teachers Pay Teachers product with your team
7
Public Domain and Open Resources
Public Domain
Old works (expired copyright)
Exempt works
Released into Public Domain by authors
Open Resources
Retain
Reuse
Redistribute
Revise
Remix
8
Your Turn!
In small groups, create a short lesson you would give your class using one of the standards below. Use resources from BYU Copyright (link on Canvas)
3 year old Social Studies SS 3 pt 1.1: With prompting and support, recognize differences and commonalities in culture, ethnicity, and abilities within the classroom and immediate communities (for example, language, family structure, traditions, disabilities).
1st Grade Speaking and Listening Standard 2: Ask and answer questions about key details in a text read aloud or information presented orally or through other media.
2nd Grade Math 2.OA.1: Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all positions.
Kindergarten Science K.1.2: Obtain, evaluate, and communicate information on the effect of forecasted weather patterns on human behavior. Examples could include how humans respond to local forecasts of typical and severe weather such as extreme heat, high winds, flash floods, thunderstorms, or snowstorm
9
Digital Literacy and Digital Citizenship
10
What are Digital Literacy and Digital Citizenship?
Digital Literacy
The ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills (American Library Association)
Digital Citizenship
An acceptance and upholding of the norms of appropriate, responsible behaviour with regard to the use of digital technologies…using digital technologies effectively and not misusing them…appropriate online etiquette, literacy in how digital technologies work and how to use them, an understanding of ethics and related law, knowing how to stay safe online, and advice on related health and safety issues such as predators and the permanence of data. (Australian Digital Literacy Skills Framework)
11
Utah K-5 Computer Science Standards
Each student in secondary public schools will have access to robust and varied computer science courses by 2027. All students will enter secondary schools with exposure to computational thinking and competencies in digital literacy. This begins in our elementary schools with competencies in keyboarding, algorithm and responsible use of technology, and basic coding principles.
Utah Computer Science Vision Statement
Core Concepts
Computing Systems
Networks & the Internet
Data and Analysis
Algorithms and Programming
Impacts of Computing
Computational Thinking
12
What the Standards Say..
Kindergarten
Standard K.CS.1: Select computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
Students will select computing devices (phone, tablet, computer, cameras, software, 3D printers, etc.) and understand that they can be used to aid in a task (email, text message, voice calls, videos, digital imaging, modeling, etc.).
Standard K.NI.1: Model and describe how people connect to other people and information through a network.
Students will be able to model and describe how information is sent and retrieved using a network to share information as a class. This can include: sending words, images, etc. Students should demonstrate their understanding of this flow of information by drawing a model of the way packets are transmitted, programming an animation to show how packets are transmitted, or demonstrating this through an unplugged activity which has them act it out.
13
What the Standards Say..
First Grade
Standard 1.CS.1: Operate a variety of computing devices that perform tasks accurately and quickly based on user needs and preferences.
Students will perform a variety of tasks by operating digital devices (laptop, tablet, desktop, etc.) based on availability, and the task they are seeking to accomplish. For example, if students are asked to draw a picture, they should be able to open and use a drawing appropriate to complete this task.
Standard 1.CS.2: Explore the functions of common hardware and software components of computing systems.
Students will explore and identify common hardware and software components (mouse, keyboard, storage, trackpad, tablet devices, laptop, monitor, application (app), input, output, etc.) as well as their function.
Standard 1.IC.1: Develop and demonstrate the ability to work respectfully and responsibly with others whether communicating face-to-face or digitally.
Students will develop and demonstrate proper etiquette when collaborating with others, physically or digitally.
14
What the Standards Say..
Second Grade
Standard 2.CS.1: Describe and solve basic hardware and software problems.
Students will describe, solve and perform basic troubleshooting tasks such as checking the device for battery charge and/or power connection, checking cord connections, turning a device off and on to reboot it, closing and restarting an app/program, plugging in headphones, etc.
Standard 2.NI.1: Explain what a password or pass phrase is, why it is used, and be able to create a secure password.
Learning to protect one's device or information from unwanted use by others is an essential first step in learning about cybersecurity. Students will be able to explain the reasoning behind having certain digital resources password protected and create an effective password and/or pass phrase.
Standard 2.IC.2: Describe rationales for keeping login information private, and for logging off devices appropriately.
Students will describe why people keep passwords private and secure and demonstrate how to log on and off digital devices appropriately.
15
What the Standards Say..
Third Grade
Standard 3.CS.1: Describe and model how computing devices connect to other components to extend their capabilities and form a system.
Students will describe and model how computing devices connect to other devices or components (physical or wireless) to create a system. For example, the relationship between the respirators and circulatory system during physical activity serves as a metaphor for how the parts of a computer connect to allow input, processing, and output.
Standard 3.NI.1: Describe physical and digital security measures for protecting personal information.
Students will identify personal information and describe physical and digital measures for protecting it. Examples of physical security may include a lock on the door, a safe, covering the camera on your device. Examples of digital security may include virus protection software, strong passwords, biometric screens (e.g., fingerprint, facial recognition), etc.
Standard 3.NI.2: Develop personal patterns of behavior to protect information from unauthorized access.
Students will begin to develop habits that protect their personal information. For example, using strong passwords, changing passwords often, logging off devices, etc.
16
Wrap Up
17
Wrap-Up
Questions from today?
Assignment for next week
Begin working on your Lesson Plan assignment
18

Figure 19

Video Walkthrough

This is a video walk through of my project. It includes highlights from the student content on Canvas as well as highlights from the teacher content on Google Drive.

Design Process and Evolution

Major Design Phases

There were six major phases in my design. The first phase was writing up the course proposal and getting it approved. The second phase was completing the front-end analysis for the course. The third phase involved gathering content for the course and familiarizing myself with that knowledge. After the content was gathered and evaluated, the fourth phase involved putting together the student content and developing the Canvas course. Once the student content was put together, I began the fifth phase which was creating the teacher content including lesson plans, slides, and checklists. The final phase was reviewing what had been designed with my client, making final revisions, and finalizing the course.

Course Proposal and Approval

The first phase in my design was establishing course learning outcomes and putting together an outline for the course. This was done in August and September 2021 and was put together in a proposal to the university to get approval for IP&T 370 to actually become a course. I worked closely with Kathie MacKay and Peter Rich to put together a cohesive and comprehensive outline and proposal. I met with both of them to discuss the session topics as well as possible reading and assignment ideas. I divided the course up into three main units: Unit 1- Technology Integration; Unit 2- Computational Thinking and Coding; and Unit 3- Personalized Learning Software. These units aligned with the three main learning outcomes for the course. The full proposal can be found here and a portion of the proposal can be seen below in Figure 20 and Figure 21.

Course: Technology Use in Early Childhood Classrooms
IP&T 370
Offered: Fall, Winter
(2 hrs, 1 time a week)

Course Description
Students will develop knowledge, skills, and dispositions necessary to effectively integrate technology into real-world early childhood classrooms in developmentally appropriate ways.

Course Learning Outcomes/Course Objectives

Course Learning Outcomes	Course Key Assessments
Students will be able to integrate technology into early childhood classrooms in developmentally appropriate ways.	• Teach a student-developed lesson plan that integrates technology
Students will be able to teach computational thinking concepts in the early childhood classroom, including coding short programs.	• Code a ScratchJr program • Generate 5 ways to integrate CT concepts into other subjects
Students will know how and when to use computer assisted learning tools as well as how to analyze the data from those tools for further learning.	• Share next steps to take with example student data from computer-aided learning tools.

Required Texts/Readings

- NAEYC Position Statement on Technology
- American Academy of Pediatrics: Where We Stand: Screen Time
- Beyond Screen Time: Better Questions for Children and Technology in 2020
- K-5 CS Standards
- Kimmons, R., & Ottenbreit-Leftwich, A. (2016). The K-12 educational technology handbook.

Figure 20

Date	Course Topic(s)	Readings/Assignments
Session 1	Integration: Active vs. Passive Technology Use	**Reading:** Chapter 1 The K-12 Technology Handbook **Assignment:** List 5 technology integrations you see in the classroom and evaluate them using the PICRAT scale
Session 2	Developmentally Appropriate Uses of Technology: What We Know	**Reading**: NAEYC Position Statement on Technology
Session 3	Screen Time: What is the Debate?	**Readings**: • American Academy of Pediatrics: Where We Stand: Screen Time • Beyond Screen Time: Better Questions for Children and Technology in 2020 **Assignment:** Based on the previous two sessions, write a reflection about where you stand on screen time. Include references to the readings from the last two sessions.
Session 4	Digital Literacy and Citizenship	**Readings:** Copyright and Open Licensing The K-12 Technology Handbook
Session 5	Integration: Literacy Technologies	**Assignment:** Choose 3 PreK-3 literacy standards from UEN and write down an idea to integrate technology for each standard
Session 6	Integration: Math Technologies	**Assignment:** Choose 3 PreK-3 math standards from UEN and write down an idea to integrate technology for each standard
Session 7	Coding/CT: Learning CT through Unplugged Activities	**Reading:** K-5 CS Standards **Assignment:** Go through K-5 CS Standards and choose one standard from grades K-3. Write down an unplugged activity to go along with the standard.
Session 8	Coding/CT: Sequence and Patterns; Robots	**Assignment:** Tech Integrated Center Lesson Plan-create a lesson plan that integrates technology and teach it in your practicum class.

Figure 21

Front-End Analysis

While I was waiting for the course to be approved, I began working on my front-end analysis. I focused on getting to know my learners and creating my learner personas. I sent out a survey (Figure 22) to current ECE majors asking them questions about their comfort levels with technology, what types of technology they knew about, and asking if they had any questions or things they wish they knew about integrating technology into the classroom. I used the data to help create my learner personas and to help in my design. For example, I found that multiple students said that they did not even know where to start when it comes to integrating technology. Because of this response, I knew when I was designing the course that I wanted to make technology accessible and I wanted to give the students examples of ways to use technology in their classroom. I also analyzed the learning environment and identified key constraints for this project.

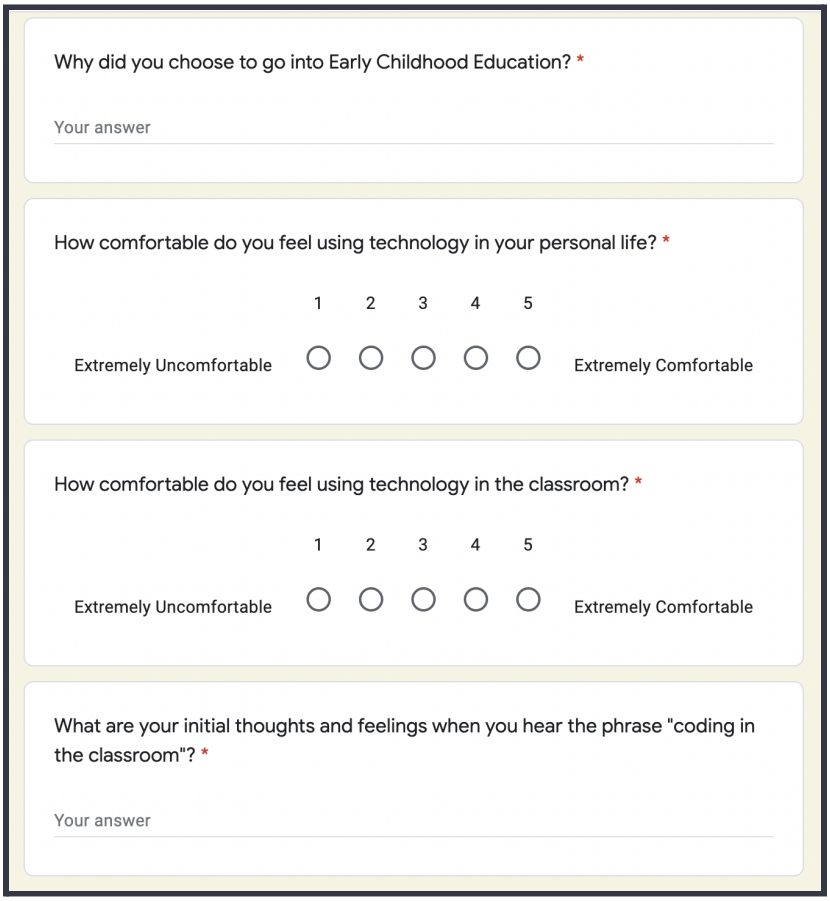


Figure 22

Content Gathering

Once the class proposal was approved, I began gathering the content needed for each class session. Because I had an approved outline, I knew what topic would be covered in each session. I also had a list of great resources from Kathie MacKay that she wanted to be included in the course as well as content from the current three 1-credit IP&T education courses. I read through the resources Kathie wanted included, as well as some of the resources from the other IP&T classes, and made notes on which resources would be helpful for students or would make good reading assignments. This helped to establish my background knowledge in a deeper way than

simply knowing what the topics of each class session were. It was also during this phase that I set up my project management sheet to track my progress throughout the project and my design journal to help me remember things that were discussed in meetings, reminders of tasks to complete or add to my project management sheet, and to record questions that I had for Peter or Kathie the next time I met with them.

Student Content

Once I had gathered the content I needed, I focused on creating the student content first. I gathered readings from the resources I had from the previous phase and started figuring out which sessions they would fit in best. I also started to design student assignments and assessments throughout each unit. I created a course scope and sequence so I could see a semester view of the student content I was designing. I included the unit, session, topic, readings, assignments, unit assessments, and any notes specific to that lesson. The whole scope and sequence can be seen here and an example is shown in Figure 23.

Session	Unit	Topic	Readings	Assignments	Unit Assessment	Notes
1	1: Tech Integration	Active vs. Passive Technology Use	Chapter 1 The K-12 Technology Handbook	PICRAT Quiz Set up portfolio?		PICRAT
2	1: Tech Integration	Deveopmentally Appropriate Uses of Technology	NAEYC Position Statement on Technology	-Initial thoughts on Tech Int in EC Classroom -Read position statement -Have your thoughts changed? -Class Discussion -Any new insights?		
3	1: Tech Integration	Screen Time: What is the Debate?	AAP: Media and Young Minds AAP: Media Use in School-Aged Children and Adolescents Healthy Digital Media Use Habits for Babies, Toddlers & Preschoolers Beyond Screen Time: Better Questions for Children and Technology in 2020	Personal position statement on technology in the classroom -Discuss how you would follow AAP guidelines -Discuss ideas about what technologies you would use in class, why and how you would use them		Maybe move some of the AAP readings to session 2
4	1: Tech Integration	Digital LIteracy and Citizenship	K-5 CS Standards Common Sense Education: Digital Citizenship Curriculum	Find a resource you could use to teach an aspect of digitial literacy or citizenship		Pull out which standards involve DL; read those ones Look at curriculum for K-3
5	1: Tech Integration	Integration: Literacy	International Literacy Association: Digital Resources in Early Childhood LIteracy Development	Find 5 high quality resources (we did not go over in class) you could use to teach literacy in your classroom		Centers; time for lesson plan feedback
6	1: Tech Integration	Integration: Math		Find 5 high quality resources (we did not go over in class) you could use to teach math in your classroom	Center lesson plan using DA tech integration	Centers; time for lesson plan feedback

Figure 23

After creating my schedule, complete with readings and assignments, I started to create the Canvas outline that students would use. I chose Canvas as the LMS for this course because that is what the current IP&T technology education courses use, it was the LMS that I was most familiar with, and it is the LMS that the future instructors will most likely be most familiar with.

Something that I noticed from teaching IP&T 372 and from taking courses myself as a student is that every class is so different when it comes to the design and layout of the LMS. Each class has its own way of including content for each class session and each class is different with when assignments or readings are assigned and due. I wanted it to be extremely clear to the students which things needed to be done *before class*, what we were doing *in class*, and what was

expected to be done *after class*. So, when I was designing the layout of Canvas, I made sure that each week's module started out with which week in the semester we are in, the title of the unit, and clear headers that shared what was to be done before class, in class, and after class. We even implemented this design to the current IP&T 372 class Canvas course and it has really helped students know what to do before class, what we are doing in class, and what we are doing after class. I also made it clear if the content was an assignment, a reading, a quiz, etc. by making those words in all caps and by making them the first word in the title. An example of a module is below in Figure 24.

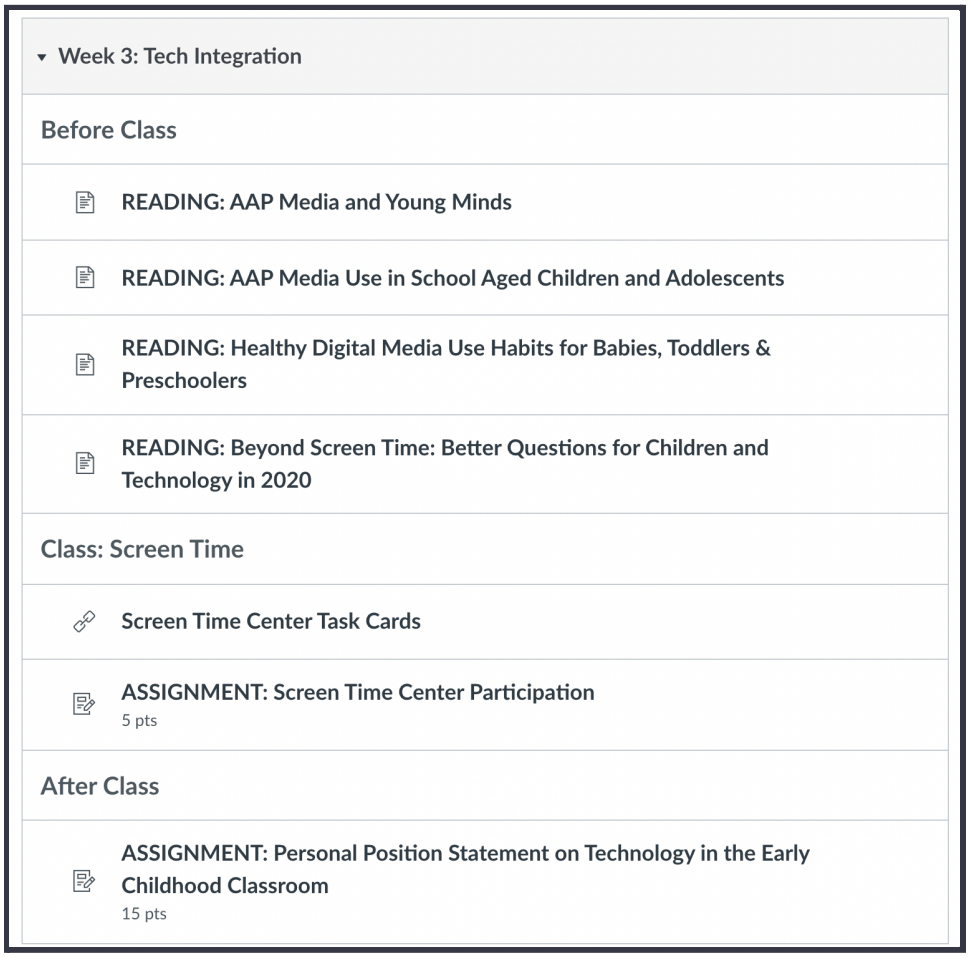


Figure 24

After I had everything in Canvas, I started fully developing assignment descriptions and rubrics. I created assignments for each session and I created unit assessments and a final assessment as well. See Figure 25 and Figure 26 for examples of an assignment description and the rubric.

ASSIGNMENT: ScratchJr Project

Start Assignment

Due No Due Date **Points** 30 **Submitting** a website url, a media recording, or a file upload

For this project, you will create an interactive version of a children's book of your choice. You will be limited to 4 scenes and 4 sprites per scene. After you have created your project you will need to share your project. To do so, you will need to complete a screen recording of you walking through your project. During this recording, **show each sprite along with its code** and explain what the code means. After walking through all the sprites and scenes, show how the whole project works together. Also, if you would like to earn full points, you will need to include a separate document that shows your Decomposition thinking and comments.

Decomposition Examples:

- "I want my hat back" by Jon Klassen
- "Prince and Princess Defeat the Dragon"
- "The Giving Tree"

Screen Recording Info

The desktop version of Scratch Jr. doesn't have a way to share your project files. So, to turn in your project, you can make a short screen recording (talk through what you did in the project). Here are instructions for making a screen recording:

iOS: https://support.apple.com/en-us/HT207935 (make sure to long-press the record button and turn on the mic before recording!)

Mac OS: https://support.apple.com/en-us/HT208721

Windows: https://www.laptopmag.com/articles/how-to-video-screen-capture-windows-10

Upload the screen recording as your project file.

Figure 25

Criteria	Ratings				Pts
Completeness	**5 pts** **Distinguished** • All 4 scenes used • 3-4 sprites on each scene. • All sprites have actions. • Sprites' actions contribute to the story in a meaningful way.	**4 pts** **Proficient** • 3 scenes used • 1-2 sprites on each scene • sprites all have meaningful actions that contribute to the story	**3 pts** **Basic Understanding** • 1-2 Scenes • Story is cohesive, but minimal or incomplete • Essential sprites have actions, but there are sprites without actions or that don't contribute meaningfully to the story. • ~2 sprites per scene.	**0 pts** **Lacking Understanding** Sprites and scenes are insufficient to meet the needs of the story or confuse that purpose.	5 pts
Code	**20 pts** **Distinguished Understanding** Each sprite is coded with multiple actions and uses a variety of coding blocks (different blocks are used throughout the project). Code is debugged	**18 pts** **Higher Understanding** Each sprite is coded with multiple actions Code is debugged	**16 pts** **Basic Understanding** Code works as expected to accomplish the goal of the program. All sprites work as expected.	**14 pts** **Approaching Understandiung** • Code mostly works, but there may be a bug or two • Code fragments present (i.e., code that does not contribute to the intended goal)	**0 pts** **Lacking Understanding** • Code does not work. • Code is missing or full of bugs.	20 pts
Coding Habits	**5 pts** **Distinguished** Project works smoothly and it is clear what to do • There is no orphaned code (i.e., code not attached to an event) • Comments/Decomposition were created (this must be done outside of ScratchJr)	**4 pts** **Proficient** Project works but is lacking one or more other good habits.	**3 pts** **Basic** Project functions. • Comments/Decomposition is missing, and • There is orphaned code	**0 pts** **Lacking** Code does not work properly	5 pts

Figure 26

I originally planned on creating the student content in chronological order (Unit 1, Unit 2, Unit 3). But as I got started, I ended up creating student content for Unit 1 and Unit 2 and then took a break to work on the teacher content while I continued research for Unit 3. And then I ended up coming back to Unit 3 at the end of my project after I worked through the rest of the content (both student and teacher) for Units 1 and 2. I did this because Unit 3 had less guidance and expectation from my client. Therefore, it was not as clear what she wanted to be included in that unit and I had to do more research and developing background knowledge to even know what should be included in that unit. Units 1 and 2 had very clear content and clear expectations for what needed to be in those units. I found it easier to work on those two units and feel like I was making significant progress in my design. It was also nice to have Units 1 and 2 wrapped up and finalized so then I could focus all of my efforts into developing Unit 3.

Teacher Content

The next phase of my design focused on the teacher content for the course. I designed a lesson plan, a slide deck, and a pre-session checklist for the instructor for each session. I knew that each session would need time at the beginning and end of class for management needs, such as

announcements and questions. From there, I knew that I wanted to include a lot of discussions and hands-on activities to model how to learn in communities for the students based on the sociocultural theory of learning together with others. See Figure 27 for an example of a lesson plan.

Lesson: 3.14 Using Data

Objectives:

- Students will understand how to analyze and use data in the classroom.

Materials Needed:

- None

Lesson Plan:

Time	Content
10 min.	Class Intro ● Prayer ● Announcements ● Questions from student survey ● Additional questions
15 min.	Mastery-based Classroom ● What is it? ○ "Students demonstrate mastery of a skill or topic before moving on to a more advanced one. Meanwhile, you maintain a fixed expectation of how students will perform and allow the time required to achieve that level to vary" ● How do we do it? ○ Aligned Assessments (broken down into SLOs) ○ Time ○ Opportunities to try again
20 min.	Looking at Data ● Go over examples of data spreads from textbook ● Discuss what we are seeing
10 min.	AAA Method ● Ask (what am I asking the data?) ● Analyze (look for patterns to answer your question) ● Act (acting on what you have found)
20 min.	Looking at the Data with AAA ● Look at examples of data and go through the AAA method
15 min.	Using Data to Set Goals ● Look at data and determine appropriate goals for students ● Have students create SMART goals in groups ● Have each group share one SMART goal they came up with and explain what data they used to support the goal.
10 min.	Wrap-up ● Go over lingering questions from today ● Discuss assignments for next week

Figure 27

Five of the sessions are center-based. Centers are short learning activities that are happening at the same time in the classroom and are often done independently. Groups of students go to each center and follow the task card instructions for that activity. After a certain amount of time, groups rotate to another center activity with the goal of students visiting each center by the end of the time period. For those center-based sessions, I designed lessons to give time to review the content that was read before class and explain the centers, ample time to experience 4-5 centers, and time after the centers to have a debrief. Having that debrief time and time to go more deeply into centers is something that I knew I wanted because we do not have the time in IP&T 372 to do that when we do centers. Having the time to actually get into a center activity and time to debrief the activities afterwards will provide students with a deeper understanding of what they were learning.

While designing center lesson plans, I developed task cards for the students to use at each center. I designed task cards so students could independently do the centers, giving the instructor opportunities to visit with students and check understanding, help groups of students who need assistance, and to ensure student participation. Centers are a great opportunity for students to learn from each other instead of just from the instructor. This is another aspect of sociocultural theory focusing on learning from peers within a learning community. To make it easier for students to access, I added the task cards for a session to a Google Drive folder and then linked that folder to the class session in Canvas. In addition to task cards, I also created a recording sheet for students to record what they did at the center, ideas for how to use that center in their classroom, and any notes that they want to write down. See Figure 28 for an example of a center lesson plan.

Lesson: 1.3 Screen Time

Objectives:

- Students will identify current screen time suggestions by professionals.
- Students will develop ways to balance screen time in their classrooms based on time suggestions by professionals.

Materials Needed:

- iPads (could have students use phones if iPad isn't available)
- Smart Board (if available for GoNoodle activity)
- Creation Station items (blocks, paper, crayons/markers, etc.)

Lesson Plan:

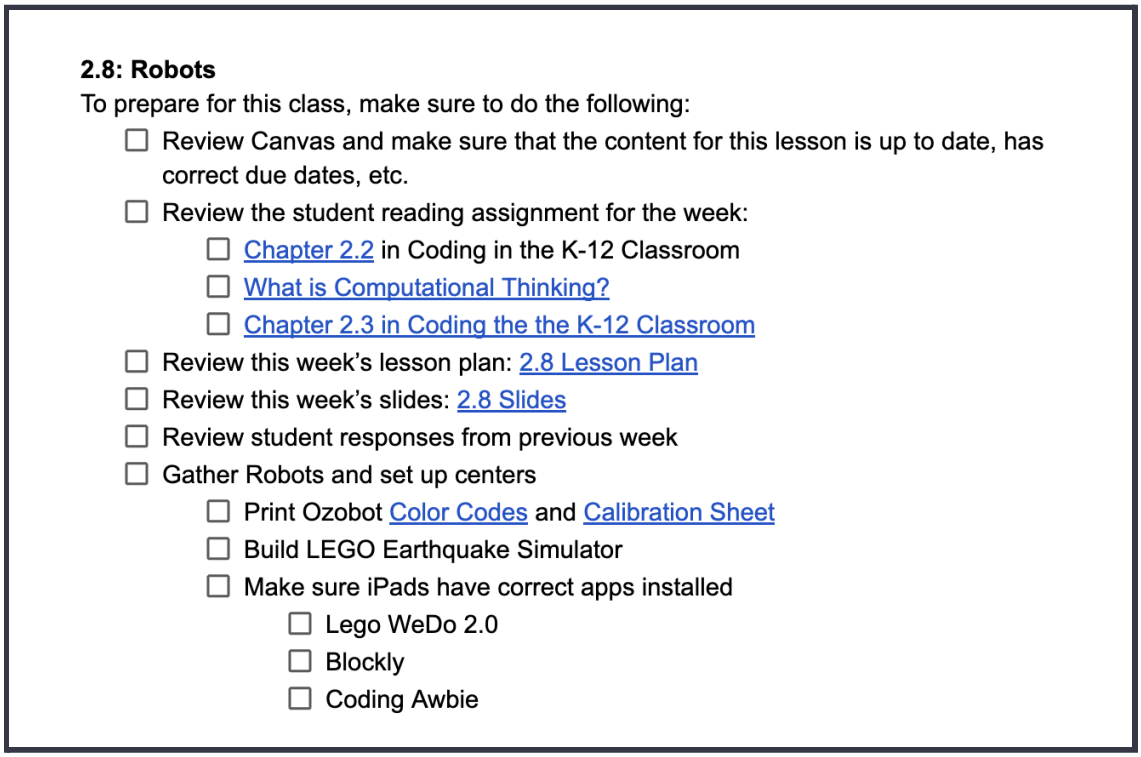
Time	Content
10 min.	Class Intro • Prayer • Announcements • Questions from student survey • Additional questions
5 min.	Screen Time Suggestions • Review screen time suggestions by AAP
15 min.	What Qualifies as Screen Time? • Discuss what qualifies as screen time • Are there exceptions?

60 min.	High Quality Technology Interactions
	• Set up 4 centers with high quality technology interactions for students to experience
	  ◦ Go Noodle
	  ◦ Color or Letter Scavenger Hunt
	  ◦ Creation Station
	  ◦ Digital Field Trip
	• 13 minutes per center, 1-2 minutes of rotation time

10 min.	Wrap-up
	• Quick debrief on centers
	  ◦ What did you learn about high quality tech interactions?
	  ◦ How could you use these ideas in your classroom?
	• Go over lingering questions from today
	• Discuss assignments for next week

Figure 28

After I developed the lesson plan for a session, I would create the before-session checklist. This is a brief checklist of things the instructor needs to do before that session's class period. It includes things like reviewing the readings, checking assignment due dates, looking at the lesson plan and slides, preparing any materials that might be needed in class, and looking at the student responses from that week's assignment survey to pull questions from to discuss in class. Below in Figure 29 is an example of a pre-session checklist.



2.8: Robots

To prepare for this class, make sure to do the following:

- ☐ Review Canvas and make sure that the content for this lesson is up to date, has correct due dates, etc.
- ☐ Review the student reading assignment for the week:
  - ☐ Chapter 2.2 in Coding in the K-12 Classroom
  - ☐ What is Computational Thinking?
  - ☐ Chapter 2.3 in Coding the the K-12 Classroom
- ☐ Review this week's lesson plan: 2.8 Lesson Plan
- ☐ Review this week's slides: 2.8 Slides
- ☐ Review student responses from previous week
- ☐ Gather Robots and set up centers
  - ☐ Print Ozobot Color Codes and Calibration Sheet
  - ☐ Build LEGO Earthquake Simulator
  - ☐ Make sure iPads have correct apps installed
    - ☐ Lego WeDo 2.0
    - ☐ Blockly
    - ☐ Coding Awbie

Figure 29

After I had planned all of the lessons, I went back through each session and created a slide deck for that lesson. To be more efficient, I created a slide deck template that made it easy to create uniform presentations and included information that was needed each session, like a slide for announcements, a slide for weekly questions gathered from the survey, and a slide to review the weekly assignments. My template is linked here.

After all of the teacher content for all of the sessions was completed, I created some instructions for the instructor about how to prepare the course for the semester. These instructions include how to set up Canvas, how to create and add the weekly assignment survey, an assignment schedule so the instructor knows when to assign due dates on assignments, etc.. You can view the instructor before semester instructions here.

Review and Finalize

Throughout the design process, I met with Peter Rich weekly to review what had been completed in the previous week. We reviewed all of the student content as well as the teacher content. I also updated Kathie MacKay every 2-4 weeks with the progress of the project and asked for feedback.

Once everything had been created (all of the student content and all of the instructor content) I set up a meeting with Peter and Kathie to review the whole course and to ensure that we did not have any large holes in the design of the course. After taking into account some of the feedback Kathie gave, I finalized the course and prepared it to be handed off to the future instructor.

Iterations

Below are visual representations of the four iterations of this project followed by specific details about each iteration.

Iteration 1

Date	Course Topic(s)
Session 1	Integration: Active vs. Passive Technology Use
Session 2	Developmentally Appropriate Uses of Technology: What We Know
Session 3	Screen Time: What is the Debate?
Session 4	Digital Literacy and Citizenship
Session 5	Integration: Literacy Technologies
Session 6	Integration: Math Technologies
Session 7	Coding/CT: Learning CT through Unplugged Activities
Session 8	Coding/CT: Sequence and Patterns; Robots
Session 9	Coding/CT: Algorithms
Session 10	Coding/CT: Debugging
Session 11	Coding/CT: Using Scratch in the Classroom
Session 12	Coding/CT: Using Scratch in the Classroom
Session 13	Computer Assisted Learning: Programs
Session 14	Computer Assisted Learning: Analyzing Data

Iteration 2

Session	Unit	Topic
1	1: Tech Integration	Active vs. Passive Technology Use
2	1: Tech Integration	Deveopmentally Appropriate Uses of Technology
3	1: Tech Integration	Screen Time: What is the Debate?
4	1: Tech Integration	Digital LIteracy and Citizenship
5	1: Tech Integration	Integration: Literacy
6	1: Tech Integration	Integration: Math
7	2: Coding and CT	Unplugged Activities
8	2: Coding and CT	Sequence and Patterns; Robots
9	2: Coding and CT	Scratch Jr: Algorithims and Debugging
10	2: Coding and CT	Using ScratchJr in the Classroom
11	2: Coding and CT	Scratch: Conditional Logic and Variables
12	2: Coding and CT	Using Scratch in the Classroom
13	3: Personalized Learning Software	Programs
14	3: Personalized Learning Software	Data Analysis

Figure 30

Iteration 3

Unit/Session	Topic
Tech Integration 1.1	Active vs. Passive Technology Use
Tech Integration 1.2	Deveopmentally Appropriate Uses of Technology
Tech Integration 1.3	Screen Time: What is the Debate?
Tech Integration 1.4	Copyright, Digital LIteracy and Citizenship
Tech Integration 1.5	Integration: Literacy
Tech Integration 1.6	Integration: Math
Tech Integration 1.7	Integration: STEM
Coding and CT 2.8	Robots
Coding and CT 2.9	ScratchJr
Coding and CT 2.10	Scratch
Coding and CT 2.11	Unplugged Activities
Coding and CT 2.12	Using Coding in the Classroom
Personalized Learning Software 3.13	Personalization
Personalized Learning Software 3.14	Using Data

Iteration 4

Unit/Session	Topic
Tech Integration 1.1	Active vs. Passive Technology Use
Tech Integration 1.2	Deveopmentally Appropriate Uses of Technology
Tech Integration 1.3	Screen Time: What is the Debate?
Coding and CT 2.4	Robots
Tech Integration 1.5	Integration: Literacy
Tech Integration 1.6	Integration: Math
Tech Integration 1.7	Integration: STEM
Coding and CT 2.8	ScratchJr
Coding and CT 2.9	Scratch
Coding and CT 2.10	Unplugged Activities
Coding and CT 2.11	Using Coding in the Classroom
Tech Integration 1.12	Copyright, Digital LIteracy and Citizenship
Personalized Learning Software 3.13	Personalization
Personalized Learning Software 3.14	Using Data

Figure 31

There were four main iterations for this project. The first iteration was the original proposal that was submitted to the university. This iteration had three units that focused on Tech Integration, CT and Coding, and Computer Assisted Learning. This was a true “first draft” and was basically a record of the original ideas about the course before much background work was done.

The second iteration was developed once I started creating the student content. I had a better feel for what I was actually going to be designing and knew more information to refine the lesson titles and lesson topics, including switching the title of Unit 3 to “Personalized Learning Software” instead of “Computer Assisted Learning.”

The third iteration was created after discussion with Peter Rich about the flow of the class. This came as I was in the middle of designing student content. I was struggling to find a full lesson’s-worth of content for some of the originally planned lesson topics like using ScratchJr in the classroom. We also realized that we did not have the topic of Copyright anywhere in our original plans; we decided to add that to the lesson on Digital Literacy and Citizenship, since it seemed to fit nicely with those topics. We decided to combine the lesson about using ScratchJr in the classroom with the lesson about using Scratch in the classroom and created a new lesson called Using Coding in the Classroom. Because we combined two lessons, we took the extra

session we created and made a third week of content integration in Unit 1. We also moved the unplugged activity lesson to be after students have had coding experience. We made this decision based on our experience teaching IP&T 372 where students seem to have a better idea about how to use unplugged coding in the classroom after they have already had coding experience. We created a STEM Integration lesson to give students additional ideas on how to integrate technology, specifically with science and engineering. I also changed the topics of the Unit 3 lessons to focus more on broader concepts of personalized learning software like personalization and how to use data.

The fourth iteration came after the final content meeting I had with Kathie MacKay and Peter Rich. During that meeting, Kathie signed off on all of the content, but asked if we could restructure some of the lessons. Students will be in their first practicum experience in the BYU preschool and Kindergarten. Because there are so many students who will be in those practicum experiences, they need to know in advance when students will need to be teaching which kinds of lessons. In our class we are asking them to create a small group center lesson plan that integrates technology in some way. Because of the preschool and Kindergarten's timeline, Kathie asked if we could move the lesson on robots to earlier in the semester so students could experience the robots and possibly utilize them in their small group lessons. We decided to move the robot lesson to Week 4 and then continue with other types of technology integration followed by the unit on computational thinking and coding. We moved the copyright, digital literacy and citizenship lessons to be at the end of Unit 2 in Week 12 (see Figure 31). This ends up working out because students will be learning this content around the time they are preparing their final lesson plan for the course.

Design Decisions and Challenges

My client, Kathie MacKay, really wanted the instructional strategy of learning in community to be prevalent throughout the course. So, when it came to designing how students would interact with the course, with each other, and with the instructor, I wanted to make sure that I kept that idea of community and working/experiencing together at the forefront of my design. I made sure to design lessons and activities that involve students working together to have a discussion, accomplish a task, or learn something.

When I was deciding what to include in terms of content, I relied on my knowledge and experience teaching in early childhood classrooms and consulted with Kathie MacKay to determine what was most appropriate for ECE students.

While overall my project went really well, there were a few challenges and obstacles that came up. The first challenge was the lack of communication from my client, which was unexpected since this course was originally her idea. I began my project by sending weekly updates to my client and requests for feedback. Those emails often went unanswered or, if they were answered, it was not in a timely manner. So, I cut down on my updates and sent them once or twice a month. I included information at a broader, higher level and requested feedback on specific items if I needed her input. Sometimes I got the feedback and sometimes I did not. When I did get feedback, my client often wanted to talk about the feedback instead of leaving text-based feedback. So, I became flexible and was quick to get on a Zoom call and arrange my schedule to fit with hers so I could get that valuable feedback I needed. When I did not receive the feedback I hoped to get, I moved forward with my best efforts and discussed the items I wanted feedback on with Peter Rich.

Another challenge with my project happened while I was beginning to work on the initial stages of developing an outline for the course. When I met with Kathie MacKay about what should be included in the course, she pushed back on including lessons teaching students how to use Scratch. She thought that Scratch was a developmentally inappropriate tool for the early childhood classroom. I was able to explain that Scratch is a tool that is appropriate for third grade and up. Since students who are early childhood educators are licensed to teach PreK up through third grade, I felt it was important that they at least knew about Scratch and were aware of what it was and what it could do. I also felt it was appropriate because Scratch can be used as a tool for the teacher to create interactive lessons. If a teacher knows how to code in Scratch, she can make projects that meet the specific needs in her classroom and customize her students' learning experience. After I explained my rationale, Kathie better understood my position and supported my decision to include it in the class. At the final course review meeting, she was still not completely in on the idea to include Scratch but was willing to trust my judgment and willing to see what it will look like when this course is taught.

The final obstacle came towards the end of my design during the content meeting I had with Peter and Kathie. I was unaware of how tight the BYU preschool and Kindergarten schedules are and how far in advance they need to know when students will need to teach lessons in the classroom. When we found out about this in our meeting, I had to adjust when the technology-integrated center lesson plan would be assigned and had to be fairly flexible with when it could be turned in due to scheduling (because not every student will be able to complete the lesson in the same week). Also, Kathie shared at the meeting that she really wanted students to experience robots and possibly use them for their center lesson plans. Robots fit nicely into Unit 2: Computational Thinking and Coding, but Kathie's request made sense in terms of student learning and application, so I did decide to move that lesson up in the semester. While it makes the overall flow not quite as nice as my original plan, I don't think it will severely disrupt or confuse student learning and was something that I was willing to be flexible with.

Product Implementation

To be successfully implemented, this course needs to meet in-person, once a week for a 2-credit time block. Students will need to follow Canvas for what is expected to be done before, during, and after class. Instructors will need to follow the before class checklists, lesson plans, and slide decks to make each session successful. They will also need to review the pre-semester instructions to ensure that the course is set up properly for the semester.

I have designed this course to be very clear to both the students and the instructors. On the student side of things, I have designed Canvas to have clear headings to let students know when they need to do an assignment, what type of assignment they are doing, and when assignments and other homework are due. For the instructors I have made very clear checklists, lesson plans, and slide decks that should ensure that any instructor could be successful in implementing the course.

To see the student implementation, visit the Canvas page here. To view the instructor implementation, view the Instructor Content Folder here.

Assessment of Student Learning

There are three main summative assessments in this course. The first is a small group, tech-integrated lesson plan. Students are asked to teach a tech-integrated lesson plan that they have created and are asked to reflect on the teaching experience. This assesses the first (and overarching) learning outcome of the course: integrate technology into early childhood classrooms in developmentally appropriate ways. Figure 32 shows the rubric for this assessment.

Lesson Plan Rubric

Criteria	Ratings					Pts
Lesson Plan	**10 pts** **Mastery** Lesson plan includes 1) Utah core standard 2) Aligned learning goal 3) Clear instructions to successfully carry out the lesson/activity 4) Materials needed 5) Clear tech integration	**9 pts** **Proficiency** Includes 4 of Mastery Standards	**8 pts** **Basic Understanding** Includes 3 Mastery Standards	**5 pts** **Developing** Includes 2 Mastery Standards	**0 pts** **Lacking** Does not contain any Mastery Standards	10 pts
Teaching Lesson	**10 pts** **Mastery** Taught lesson in small group in practicum classroom.			**0 pts** **Lacking** Did not teach lesson		10 pts
Reflection	**10 pts** **Mastery** Includes reflection that thoughtfully reviews the teaching process. Includes what went well and what could be improved in the lesson overall. Also includes what went well and what could be improved specific to technology integration. Shows original thought and goes deeper in explanations and reasoning than simply stating what happened.	**8 pts** **Basic Understanding** Includes reflection that thoughtfully reviews the teaching process. Includes what went well and what could be improved in the lesson overall. Also includes what went well and what could be improved specific to technology integration.	**6 pts** **Developing** Includes reflection that reviews the teaching process. Mentions what went well and what could be improved in the lesson overall. May or may not include technology integration reflection.	**0 pts** **Lacking** Does not include reflection.		10 pts
Tech Integration	**15 pts** **Full Marks** Technology used falls into CT on the PICRAT scale.	**13.5 pts** **Proficiency** Technology used falls into CA or IT on the PICRAT scale.	**12 pts** **Basic Understanding** Technology used falls into IA on the PICRAT scale.	**9 pts** **Developing** Technology used falls into IR or PA on the PICRAT scale.	**5 pts** **Lacking** Technology used falls into PR on the PICRAT scale.	15 pts
						Total Points: 45

Figure 32

The second assessment is to create a Scratch coding program that could be used in the classroom. Students will need to use computational thinking concepts in order to code the project and they will demonstrate they know about those concepts by creating a program. This assesses the second learning outcome of the course: Teach computational thinking concepts in the early childhood classroom, including coding short programs. Figure 33 shows the rubric for this assessment.

Classroom Coding (1)

Criteria	Ratings					Pts
Completeness	**5 pts** **Mastery** • 8+ sprites • 3+ backgrounds. • All sprites and backgrounds are coded.	**4 pts** **Proficiency** • 5-7 sprites • 2 coded backgrounds.	**3 pts** **Basic Competence** • 4 sprites • 1 coded background	**2 pts** **Developing** • 1-2 sprites • 1 background • background isn't coded	**0 pts** **Lacking** • 1 or fewer sprites • 1 background. Sprites and background are not coded	5 pts
Coding Habits	**5 pts** **Mastery** • Code is well-commented throughout; • Sprites are named; • No dead/orphaned code; • Clear instructions are included to know how to use the project. • backgrounds are named	**4 pts** **Proficiency** • Code is commented throughout • 3 other mastery habits observed	**3 pts** **Basic Competence** • Code is commented • 2 other mastery habits observed	**2 pts** **Developing** • Code is not commented • other coding habits are not observed	**0 pts** **Lacking** no mastery habits observed	5 pts
Complexity	**30 pts** **Mastery** Project scores 15+ on DrScratch.org (30 pts)	**27 pts** **Proficiency** Score 12-14 points on DrScratch.org (27 pts)	**24 pts** **Basic Competence** Score 8-11 points on DrScratch.org (24 pts)	**20 pts** **Developing** Scores 5-7 points on DrScratch.org (1-20 pts)	**0 pts** **Lacking** Scores 0-4 points on DrScratch.org (0 pts)	30 pts
Functionality	**4 pts** **Mastery** Project is original AND works as intended • Project aligns with UEN standard • Sprites all contribute to the project meaningfully • Project can be reset (i.e., it will be replayable), and all elements return to their starting positions upon reset.	**3 pts** **Proficient** Project is original AND works as intended • 2 other mastery habits observed	**2 pts** **Basic Competence** Project is original AND works as intended • 1 other master habit observed	**1 pts** **Developing** Project works (but may have bugs)	**0 pts** **Lacking** Project Doesn't work (0 points)	4 pts
Feedback Survey	**1 pts** **Full Marks** You completed the weekly feedback survey				**0 pts** **No Marks**	1 pts
						Total Points: 45

Figure 33

The third assessment is the final for the course. Because this course focuses on integrating technology, the final assessment will be a whole class, technology-integrated lesson plan that students will create, teach, and reflect on. This assessment requires that students apply what they have been learning and experiencing all semester. Figure 34 shows the rubric for this assessment.

Lesson Plan Rubric (FINAL)

Criteria	Ratings					Pts
Lesson Plan	**10 pts** **Mastery** Lesson plan includes 1) Utah core standard 2) Aligned learning goal 3) Clear instructions to successfully carry out the lesson/activity 4) Materials needed 5) Clear tech integration	**9 pts** **Proficiency** Includes 4 of Mastery Standards	**8 pts** **Basic Understanding** Includes 3 Mastery Standards	**5 pts** **Developing** Includes 2 Mastery Standards	**0 pts** **Lacking** Does not contain any Mastery Standards	10 pts
Teaching Lesson	**10 pts** **Mastery** Taught whole group lesson in the practicum classroom.			**0 pts** **Lacking** Did not teach lesson		10 pts
Reflection	**10 pts** **Mastery** Includes reflection that thoughtfully reviews the teaching process. Includes what went well and what could be improved in the lesson overall. Also includes what went well and what could be improved specific to technology integration. Shows original thought and goes deeper in explanations and reasoning than simply stating what happened.	**8 pts** **Basic Understanding** Includes reflection that thoughtfully reviews the teaching process. Includes what went well and what could be improved in the lesson overall. Also includes what went well and what could be improved specific to technology integration.	**6 pts** **Developing** Includes reflection that reviews the teaching process. Mentions what went well and what could be improved in the lesson overall. May or may not include technology integration reflection.	**0 pts** **Lacking** Does not include reflection.		10 pts
Tech Integration	**15 pts** **Full Marks** Technology used falls into CT on the PICRAT scale.	**13.5 pts** **Proficiency** Technology used falls into CA or IT on the PICRAT scale.	**12 pts** **Basic Understanding** Technology used falls into IA on the PICRAT scale.	**9 pts** **Developing** Technology used falls into IR or PA on the PICRAT scale.	**5 pts** **Lacking** Technology used falls into PR on the PICRAT scale.	15 pts
						Total Points: 45

Figure 34

In addition to these summative assessments, there are smaller, more formative assessments that will be happening throughout the course in smaller assignments and in-class activities. For example, to formatively assess the third learning objective for the course: Know how and when to use computer-assisted learning tools as well as how to analyze the data from those tools for further learning, students will have in-class activities where they create personalized learning experiences for their students and activities that have students look at data, interpret what it says, and make decisions about how to act based on the data.

Evaluation

There are two main areas of evaluation for this project: first, evaluation of the design of my project; second, the ongoing evaluation of the course itself once it is implemented. These are explained in greater detail below.

Evidence

This course was not taught and evaluated as part of my project. Due to my graduation date and the course not being implemented until Winter semester of 2023, it was not possible to actually test out this course. Because I knew this going into my project, I knew I needed to evaluate the content and the overall course with Peter Rich and Kathie MacKay as I was designing. The main things I wanted to know were (1) is the content appropriate and useful for ECE students? and (2) is the instructor content clear and useful to future instructors?

When the course is implemented, there are a few areas in which the instructor will gather data that will inform their current teaching and assist in the iterative design of the course in future semesters. First, data will be collected about student assignments through a Google survey. With each assignment, students will submit the feedback survey that includes the following questions:

- How many hours did you spend on homework for this course this week?
- How many assignments did you submit for the first time this week?
- How many assignments did you resubmit this week?
- What did you learn from the assignments this week?
- What do you still have questions about?
- How much did you enjoy the project? (Scale 1-10)
- How proud of your work are you on this assignment? (Scale 1-10)
- Was there anything you learned in class that you implemented in your practicum classroom this week? If yes, explain.

The other evaluation piece I will implement is a pre and post survey taken by students at the beginning and end of each semester. The survey will include questions about student belief and value in using technology in the classroom, how they feel about integrating technology in the classroom, how confident they feel about integrating technology, how they feel about knowing developmentally appropriate practices to use in the classroom, and other questions about their feelings, beliefs, and perceptions. The end of the semester survey will also include questions about the course overall such as what their favorite assignment was, overall things they liked about the course, and suggestions to improve the course.

Procedures

For my project I used formative design to help evaluate the course as I was designing it. I met with Peter Rich weekly to go over what had been created and we discussed what needed to be changed in order to make the design better. I also set Kathie MacKay updates on the course and asked for feedback as I was designing so I could implement changes during the design process instead of doing it all at the end of the design project.

For the ongoing evaluation of the course, the instructor will look at the feedback weekly and use the information to guide their next lesson. They can also use the data to make changes for future semesters. Getting a weekly check-in from students really will help the instructor see how the class is going. This is a model that we currently use in IP&T 372, and it has really helped gauge how long each project takes, how students feel about the project, what they are learning, and which projects overall they enjoy and do not enjoy. This data then helps us make changes to assignments, requirements, how long students have to work on the assignment, etc. for future semesters.

For the pre and post belief survey, the instructor will give time in class on the first and last day of class for students to take the survey. The data will be gathered at the end of the semester and can then be shared with students during finals week about how much they grew over the semester.

Outcomes

The ongoing evaluation of my design helped to make IP&T 370 a better course. It was nice to be able to pivot and make changes during the design process instead of creating and testing the whole thing, and then making changes. By evaluating the course each week, we were able to look at smaller details than if we were trying to evaluate the course all at once. I also included built-in evaluation tools throughout the course so data from those evaluation tools can be used in the future iterations of the course.

The outcomes from the assignment survey and the pre- and post-belief survey can help inform current instruction as well as the future design of the course. Changes to assignments can be made based on student feedback and time spent on assignments. However, these changes are based on outcome data and not simply on students' like or dislike for an assignment.

Budget and Timeline

Date	Estimated Milestones	Estimated Time	Estimated Cost	Actual Milestones	Actual Time	Actual Cost
November 2021	Prospectus defense Finalize unit outlines -Number of lessons -Lesson topics/content -Unit assessments Student content Unit 1 -Canvas Outline -Readings -Assignments/Rubrics	40 hours	$800	Defended prospectus Finalized unit outlines Began Student Content Unit 1	7 hours	$140.00
December 2021	Student content Unit 2 -Canvas Outline -Readings -Assignments/Rubrics Student content Unit 3 -Canvas Outline -Readings -Assignments/Rubrics	40 hours	$800	Completed Student Content Unit 1 Completed Student Content Unit 2	19.75 hours	$395.00
January 2022	Instructor content Unit 1 -Lesson Outlines -Lesson Slide Decks Instructor content Unit 2 -Lesson Outlines -Lesson Slide Decks	50 hours	$1,000	Worked on Teacher Content Unit 1 Worked on Teacher Content Unit 2	29.65 hours	$593.00
February 2022	Instructor content Unit 3 -Lesson Outlines -Lesson Slide Decks Begin writing final project	50 hours	$1,000	Finished Teacher Content Unit 1 Finished Teacher Content Unit 2 Worked on Student and Teacher Content Unit 3 Began final project write-up	25.15 hours	$503.00
March 2022	Finish final write-up Defend project	40 hours	$800	Finished Student and Teacher Content Unit 3 Final project write-up Defend project	30.88 hours	$617.60
	Estimated Totals:	**220 hours**	**$4,400**	**Actual Totals:**	**112.43 hours**	**$2,248.60**

Figure 35

When I created the budget and timeline, I generally tended to overestimate how long I would spend on the project each month because I really had no idea how long things would actually take. In November, I had some health challenges that made it difficult to work on the project, which is why the time for that month is so low. Time in December was significantly lower than expected also, as my health was recovering and as I slowed things down around the holidays. But in January, February, and March, even though my actual time was about 50% lower than I originally estimated, I was accurate in predicting that I would spend more time working on the project in those months than I had in previous months. Note that the hourly wage used to calculate the estimated and total costs was $20 per hour.

Annotated Bibliography

Listed below are sources that I used to help inform my design. There are sources that helped establish content knowledge in the areas of early childhood technology integration, computational thinking and coding, and personalized learning. Additionally, there are sources that I used to establish my instructional strategies and learning theories that I utilized while designing this course.

Content Knowledge

Early Childhood Technology Integration

Hill, D., Ameenuddin, N., Reid Chassiakos, Y. L., Cross, C., Hutchinson, J., Levine, A., ... & Swanson, W. S. (2016). Media and young minds. *Pediatrics, 138*(5).

The American Academy of Pediatrics (AAP) shares their recommendations for screen time and media use for babies, toddlers, and young children. They suggest no screen or media for infants and limited media time until the age of 2 with the caveat that parents or caregivers should be involved in the media with the child. From ages 2-5, the AAP shares that media should be high quality and educational and should be no more than 1 hour per day. They continue to share some health concerns related to screens and media use such as obesity, sleep, and child development.

Kimmons, R. (2018). Technology Integration: Effectively Integrating Technology in Educational Settings. In A. Ottenbreit-Leftwich & R. Kimmons, *The K-12 Educational Technology Handbook*. EdTech Books. Retrieved from https://edtechbooks.org/k12handbook/technology_integration

This chapter gives some basic background on some well-known learning theories and then goes into beliefs and values about technology. From there, this chapter gives different models for tech integration. The model we focus on in this course is the PICRAT model which focuses on the intersection of how students use technology (Passive, Interactive, Creative) and how teachers use technology in their teaching practices (Replaces, Amplifies, Transforms).

Kimmons, R. (2018). Copyright and Open Licensing. In A. Ottenbreit-Leftwich & R. Kimmons, *The K-12 Educational Technology Handbook.* EdTech Books. Retrieved from https://edtechbooks.org/k12handbook/copyright

This chapter focuses on copyright and open licensing. It describes what copyright is, what is and is not allowed within copyright, and fair use. It also discusses the public domain and open resources.

National Association for the Education of Young Children and Fred Rogers Center for Early Learning and Children's Media. (2012). Technology and interactive media as tools in early childhood programs serving children from birth through age 8. https://www.naeyc.org/sites/default/files/globally-shared/downloads/PDFs/resources/position-statements/ps_technology.pdf
This position statement shares how NAEYC and the Fred Rogers Center feel about technology. They state that technology is here to stay and it will always be evolving. They also share what they think should be taken into account when using technology in early childhood settings. They support high quality technology and technology interactions and believe that technology is a tool to be used with intention. They are aware that equity and access are issues with technology that need to be addressed. Educators have the responsibility to make decisions about technology based on developmentally appropriate practices for the students they are teaching.

Computational Thinking and Coding

Alexiou-Ray, J., Raulston, C., Fenton, D., & Johnston, S. (2018). Coding: Coding in the K-12 Classroom. In A. Ottenbreit-Leftwich & R. Kimmons, *The K-12 Educational Technology Handbook*. EdTech Books. Retrieved from https://edtechbooks.org/k12handbook/coding_in_k-12
This chapter shares why coding is important in the classroom. It discusses how coding is related to the ISTE (International Society for Technology in Education) Standards. It also includes multiple coding activities, examples, and resources.

Hunsaker, E. (2018). Computational Thinking. In A. Ottenbreit-Leftwich & R. Kimmons, *The K-12 Educational Technology Handbook*. EdTech Books. Retrieved from https://edtechbooks.org/k12handbook/computational_thinking
This chapter focuses on computational thinking which is a framework to solve problems and help with critical thinking. It discusses the integration of computational thinking into the everyday classroom with research based practices and provides examples of what the integration can look like in the classroom.

Personalized Learning

Graham, C. R., Borup, J., Short, C. R., & Archambault, L. (2019). Data practices. *K-12 blended teaching: A guide to personalized learning and online integration*. Provo, UT: EdTechBooks.org. Retrieved from https://edtechbooks.org/k12blended/data_practices
This chapter focuses on data and how to use it. It begins by discussing what a mastery classroom looks like and how to set up assessments for that type of learning environment. It then discusses how to use the data from those assessments to ensure student understanding. The chapter describes the AAA (Ask, Analyze, Act) Model of looking at data and provides examples of data sets to look at through the lens of the model. The end of the chapter discusses using the data to set learning goals with students and to improve assessments and learning materials.

Graham, C. R., Borup, J., Short, C. R., & Archambault, L. (2019). Personalizing instruction. *K-12 blended teaching: A guide to personalized learning and online integration*. Provo, UT: EdTechBooks.org. Retrieved from https://edtechbooks.org/k12blended/personalizing_instruction

This chapter defines personalization as “tailoring/customizing the learning experience to the individual student’s needs and interests” and “giving students some element of control over their own learning experience.” It goes on to share how educators can create personalized learning for their students in their classrooms. It also gives information on personalized learning software and shares some examples of common software used in schools.

Learning Theories and Instructional Strategies

The learning theories and instructional strategies that I used in my design focus on learning in community and learning in context. Learning in community was especially important for me to focus on in my design because learning together, with others, is a very important part of learning for early childhood students. Learning in context is important to the design of this course because I wanted to give students the opportunity to learn the content of technology integration in real life contexts and situations. Learning in context also includes the continuation of learning until the learner understands the content at a proficient level. This happens by letting the learner stay within the context and practice what they are learning until they are proficient.

Bloom, B. S. (1984). The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. Educational researcher, 13(6), 4-16.
This study focused on the effectiveness of mastery-learning. Bloom researched ways for students to achieve higher understanding. With the help of graduate students, they found that tutoring yielded the highest gains in student learning. But because tutoring is very time intensive and costly, they focused on Mastery Learning which yielded high gains in student learning and it was able to be implemented in a whole group classroom situation without any extra cost, just extra time was needed. Students would take formative assessments, then receive feedback on their assessments. Students could then learn from the holes in their understanding and would then be re-assessed.

Lave, J. & Wenger, E., (2003). Situated learning: legitimate peripheral participation. Cambridge University Press.
Lave and Wenger focus their research on learning in context. They say that learning happens in communities of practice where learners interact with others in a real-life context. As new learners come into the community of practice, they participate through observation and on the outer edge of the community. As learners learn more and begin to participate more, they move towards the center of the community and towards full participation.

Ormrod, J. E., (2008). Social cognitive theory. In M. Harlan, Human Learning (pp. 117-148). Pearson.
Social cognitive theory “focuses on what and how people learn from one another, encompassing such concepts as observational learning, imitation, and modeling.” (pg. 118) Learning from each other in a community is a way for knowledge and understanding to be shared with a group. Learners can observe what is taking place, try out what they are observing through imitation, and model learning and understanding.

Vygotsky, L. S., (1978). Mind in society: the development of higher psychological processes. Harvard University Press.
I focused mostly on the aspects of Zone of Proximal Development (ZPD) and Zone of Actual Development (ZAD) from Vygotsky’s sociocultural theory. The Zone of Proximal Development is what the learner can understand and do with the help of a more knowledgeable other. The Zone

of Actual Development is what they can do and understand on their own, without assistance. The goal of the more knowledgeable other is to help the learner move from their ZPD to their ZAD.

Conclusion

The design of this course relied heavily on these resources. I used the learning theories of social cognitive theory and sociocultural theory as the main driving theories for developing how the course would be run during class time. I also took into account mastery-based learning when it came to assignments and assessments. When designing I also wanted to leverage the authentic community of practice that students will be in during their practicum, so I chose activities, learning experiences, and assignments that could easily tie into what they are doing in a real classroom setting and environment.

When designing the student content for the course and the content for each lesson, I used the above resources to solidify my background in some of the areas that need to be taught. I also included all of the content specific sources listed above as readings for the students so they could also have a solid background in the content areas before deepening their learning experience through in-class discussions and activities.

Design Knowledge and Critique

By working on this project, I have gained new skills and knowledge about how to be an instructional designer. In previous projects I have worked on, I was always a part of a team and worked within a group to go through the design process together. But in this case, I was on my own to design and develop this course. I did have others I could look to for feedback, for resources, and to ask questions but most of the actual work was done individually. Consequently, there are five key takeaways that I learned that I believe may be helpful to other designers who find themselves in a similar situation.

Takeaway #1: Even If You Know Your Learners, Know Them Better

An important part of the design process is to know your learners. Even though I actually had quite a bit of experience with my learners before I started this project, I still took the time to think through what I knew about them and to make sure that I actually knew them. I sent out a learner survey which was very helpful in designing the course. These are learners that I'm already teaching, but the survey gave me more insight into how they might receive a course like this and what their particular comfort-level is with technology before taking the class.

Takeaway #2: Clear Learning Objectives Make Clear Guideposts

One of the first things I did after understanding my learners was to develop clear learning objectives to guide the course development. Between knowing my learners and knowing my learning objectives, I had two key points to look to when I was designing. All of my major design decisions tied back to a learning objective or to the learners and what they needed. I have worked on other projects where learning objectives were not as clear and not as guiding. The

product we ended up with at the end was often not completely aligned with the original learning objectives because the excitement of ideas and possibilities overshadowed the original objectives. In this project, the learning objectives were very clear which made it easier to create activities and learning experiences. I was able to develop a unit for each of the learning objectives which helped me to really focus on what the learners were supposed to get out of this course and made it less likely that I would come up with exciting ideas that were outside of the scope of the objective.

Takeaway #3: Taking Time to Organize and Document? Worth It!

After I had my initial design laid out for the course, I wanted to break down the tasks needed to make that design a reality. It was totally worth my time in the beginning to create a detailed list of tasks that needed to be accomplished and to think through a realistic timeline for getting those tasks completed. This idea of taking time at the beginning before you start working is something that is required of the students I teach in IP&T 372. Before they start a coding project, they have to write down a plan for what they are going to do and the students who really take this to heart tend to have much better projects because they are well thought out beforehand. Taking the time to plan out this project in the way that I did reminded me that this is something I ask my students to do because it actually is really helpful and makes for a better end product.

Even though I originally came up with a really detailed list of tasks to be completed, it still evolved and changed as I was designing. While I did not do a great job at going back to my original list and adding to it, I did find it helpful to utilize my design journal to capture additional tasks that came up and needed to get done. I also found it helpful to break down some of the tasks from my original plan into much smaller steps. I often would write them down on sticky notes as a way for me to help process the steps required to complete the task.

I also found my design journal to be a great tool in documenting everything. While the journal itself may not look very organized to an outside viewer, it worked for me. I would create a new entry for most work sessions and for each meeting I had. Under that heading I would add tasks that needed to be completed, changes that were made, suggestions, additional resources to look at, and questions I needed to ask others. Because my journal was digital, I found it easy to use the find feature to search the document for keywords if I needed to refer back to something. I also found it helpful to use the strikethrough feature to “cross off” tasks that had been completed or feedback that was taken into account. Having this design journal digitally also made it very easy to simply type the answers to questions that I had right next to the original question in my notes. Documenting the changes in my design journal was very helpful when I was looking back at the different iterations of the course.

Takeaway #4: Feedback, Feedback, Feedback (and More Feedback)

I found frequent feedback to be extremely helpful when designing this course. I was able to meet weekly with Peter Rich to discuss what I had designed and worked on the previous week. It was helpful to have someone to discuss my design decisions with and to give suggestions on how to make my designs even better. I also received some feedback from my client, which was extremely helpful because she has knowledge and experience with the Early Childhood Education program that I do not. She was able to make suggestions about timelines and

assignments that would help this course fit well with the other courses students will be taking at the same time.

Takeaway #5: Find Balance Between Iterative Design and Done Design

Design is always iterative. There are always going to be things to change and ways to make your design better. There is a balance that needs to be achieved between continuously improving the design and saying that the design is ready to be implemented. I found it helpful to include ongoing evaluation tools within my design because I know that the course I developed is not going to be the same course that is taught in the second, third, or even fourth semester the course is taught. Because I want the course to continue to get better even after I have finished the project, I built in a few different ongoing evaluation tools that the instructor can use to gather data to help inform the instruction and to help change and adjust pieces of the course to better fit the needs of the students. This helped me to balance the idea of being “done” with a design and the idea that there is always more to design and improve on.

Conclusion

Designing this project has been a wonderful experience for me. I learned a lot about design, especially about the importance of planning and documenting. I really enjoyed the ongoing feedback that I was able to have throughout the design process. I think this made my final product much higher quality than if I had less frequent feedback and had received feedback on larger sections of my design at a time. Designing a brand new course takes a lot of work, but I found it very helpful to know the learners well, have clear learning objectives, and then to focus on what the students need to learn as well as what the instructor needs to do to facilitate learning and growth in the classroom. I found it is also very important to include very clear instructions for both the learner and the instructor so the course can be implemented as it has been designed.