



Incorporating Indigenous Ways of Knowing in Computer Science:

A Case Study of a Work in Progress

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Introductions

- Introduction Sam: The Territory Acknowledgement
- Introduction Nathan: **Gan̄honyohk**
- The Audience
- The Project (a work in progress)



Territorial Acknowledgement

Our host for this event, the University of Waterloo, acknowledges that much of their work takes place on the traditional territory of the Neutral, Anishinaabeg and Haudenosaunee peoples. The main campus is situated on the Haldimand Tract, the land granted to the Six Nations that includes six miles on each side of the Grand River. The University commits to active work toward reconciliation which takes place across our campuses through research, learning, teaching, and community building, and is co-ordinated within the Office of Indigenous Relations.

Adapted from the [University of Waterloo Territorial Acknowledgement](#)



Ganq̄honyq̄hk / Thanksgiving Address

- Nathan introduction and story about Thanksgiving Address, ChatGPT and [Elder-in-Residence Woodworth](#)
 - The importance of Connection



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Outline



- The Context
- The Haudenosaunee Perspective
- The Course Design
- Feedback and Discussion

The SNP STEAM Academy



- Private secondary school within Six Nations Polytechnic
 - Federal funding for Indigenous students
 - Reciprocal funding agreements with local school boards for non-Indigenous students
 - Tuition-free
- A P-TECH school
 - A partnership between Six Nations Polytechnic, Mohawk College and IBM
 - Some college credits earned during high school
 - Students can continue to earn a two-year Software Engineering diploma (tuition free)
- Doors opened in 2016
 - We're about to graduate the second cohort

The SNP STEAM Academy



- Small student population
 - ~130 students
 - ~ 35 P-TECH students (Years 2-5)
- Indigenous students
 - About 70% of the school
 - Mostly from Six Nations of the Grand River
- Non-indigenous students
 - From Brantford and surrounding area



What is **P-TECH**™?

Pathways in **T**Echnology **E**arly **C**ollege **H**igh School

- ▶ First P-TECH school opened in 2011
 - ▶ City University New York, IBM, New York Department of Education
- ▶ Now there are hundreds of Early College programs all over the world
 - ▶ IBM has recently stepped away from the larger project
 - ▶ IBM Canada continues to be a partner for SNP STEAM Academy
- ▶ The Idea
 - ▶ Post-secondary education for at-risk populations
 - ▶ A secondary, post-secondary, and industry partnership
 - ▶ College and high school interleaved in a safe environment
 - ▶ Industry partner provides mentorship, internship, and job opportunities



P-TECH™



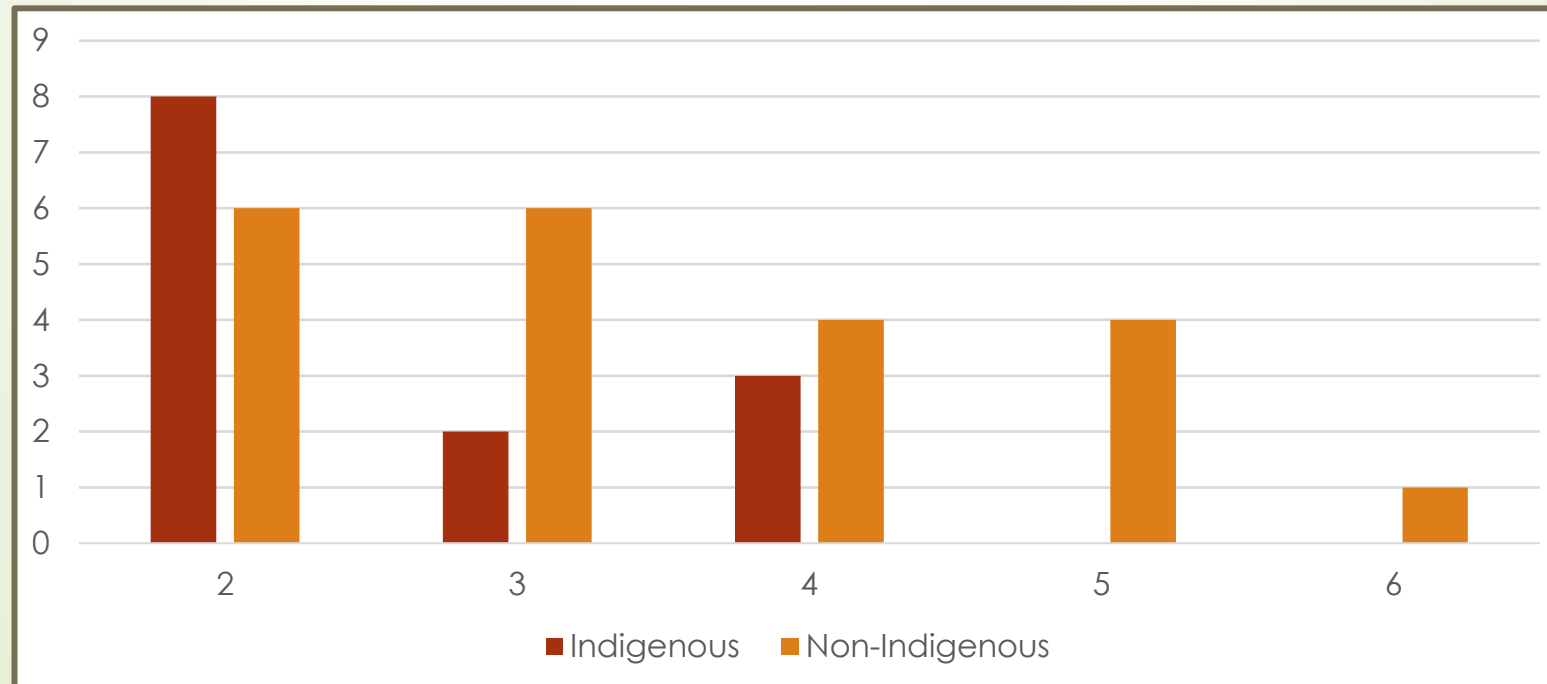
Grade 10	Grade 11	Grade 12
HTML & CSS (ICD2O)	Programming Fundamentals (ICS3U)	Programming in Java (ICS4U)
	Intro to Networking (TEJ3M)	Client-side Web Programming (DCP3O)
		Communications (???)

College Semester 1	College Semester 2	College Semester 3
Math for Computer Studies	Discrete Math and Statistics	Work Placement
Software Quality and Testing	Computer Training and Tech Writing	Field Placement Seminar
Server-side Web Programming	Capstone Project	
.NET Programming	General Elective	
Database Theory	General Elective	

The Project

➤ A Problem

➤ Attrition of students, especially Indigenous students





The Project



- A Problem
 - Attrition of students, especially Indigenous students
- Possible Causes
 - Situation outside of school
 - Intergenerational trauma
 - Lack of tech role models
 - Lack of familiarity with tech
 - Curriculum, delivery, and instructional design



The Project



- A Problem
 - Attrition of students, especially Indigenous students
- Possible Causes
 - Situation outside of school
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 - Lack of tech role models
 - Lack of familiarity with tech
 - **Curriculum, delivery, and instructional design** ← Focus of current project
- The Project
 - Re-design of the HTML & CSS course to align with core concepts
 - Support material for college instructors



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Haudenosaunee Perspective – Caution!

- Indigenous perspectives, world views, and ways of knowing do have some common grounds but are unique to each culture.
- Different members of the same culture might have different takes based on their experiences and teachings
- Importance of **Hędwa:yq?** / Connection
 - Ga'nigqhiyo: - The Good Mind
 - Sg'anigqha:t – The One Mind
 - Ne:'hq:ni? - The Reason Why




Hędwa:yq? - Connection

- ▶ Hędwa:yq? can literally mean “We all will arrive together” or “We all will give you all”.
 - ▶ As you walk your own path, it was formed by the paths you walked side by side with others and was influenced by others.
 - ▶ These shared paths and experiences represent a Connection.
 - ▶ You bring those Connections when you teach or learn.
 - ▶ Learning is the process of students forming Connections to the concepts.
 - ▶ Teaching is the process of encouraging the Connections to the concepts.



Ga'nigq̃híyo: - The Good Mind

- The Good Mind is a state of being where one can form good Connections with others.
- Heavily based on gratitude and living up to responsibilities.
 - Tell students that you are grateful they are there.
 - Tell students about things you are grateful for in your own life.
 - Encourage them to feel grateful for things in their lives.
- Celebrate progress / respect efforts.
- Frequent check-ins.
- Relationship building / reciprocal learning.



Sg'anigqha:t – The One Mind

- Coming to One Mind / Consensus building
 - Everyone will try to give their honest attention to be present.
 - Everyone will contribute the benefits of their personal connections and perspectives.
 - Everyone will attempt to see and respect each other's connections and perspectives.
- Establishing the One Mind is impossible without trust and relationship building.
- The One Mind also makes clear that the process is non-hierarchical but equitable, which lays the foundation for empathy and reciprocal learning.
- Encourage students to work on consensus building by providing opportunities for social learning and group work.



Ne:ʔhɔ:niʔ - The Reason Why

- Context is important for everything we learn, as it anchors the concepts in our minds.
- Students should be able to see themselves (or their future selves) in what they are learning.
- Examples should be given wherever possible that are relatable as possible for the students to establish proper context.
- Student choice allows learners to attempt to form the proper context.
- Give your own personal examples of context.
- Challenge them to make their own examples of context in groups and share them.
- Journalling/Reflections allows learners an opportunity to reflect on the new concepts and place them in proper context.



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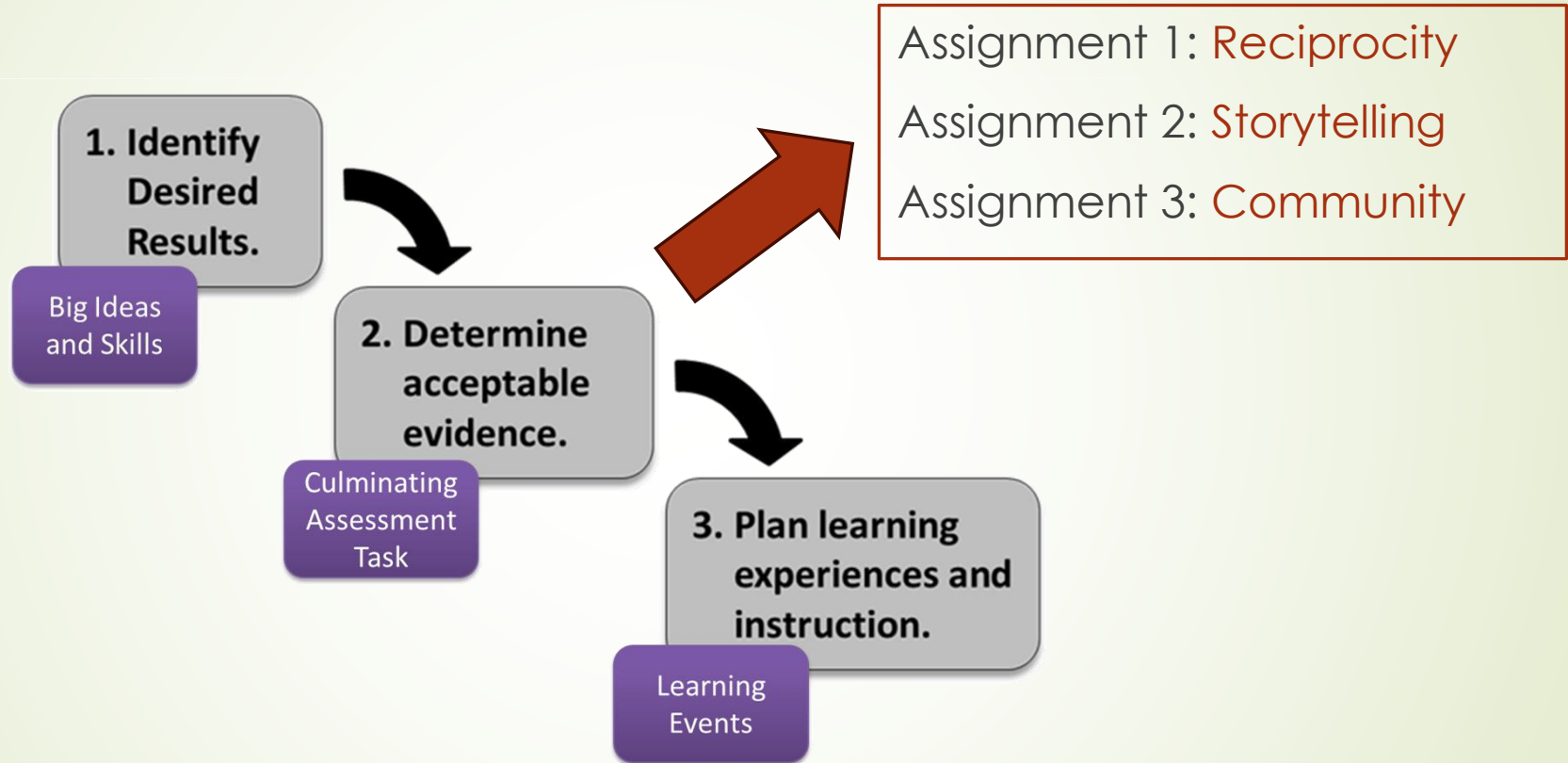


An Instructional Design Task

Working with **Bernadette Summers** at the College

- The **curriculum** was already set
 - **Basic HTML, CSS, and design** ← most of the course is here
 - Forms and Tables
 - Accessibility
- We focused on **instructional design**
 - Overall structure, guiding values, and approach
 - Assignments
 - Teaching materials
 - Teacher supports

Backwards Design



Assignment 1: Reciprocity

- Culminating for Unit 1
 - Basic HTML and CSS
 - Build a personal portfolio

- Built with **Reciprocity** in mind

“[your teachers] would like you to think of [this] as an exchange of knowledge.”

“The assignment has two goals:

1. To find out what you have learned so far about making web pages.
2. To allow you to share important information about yourself with teachers, classmates, and others.”




Image from <https://opentextbc.ca/indigenizationfrontlineworkers/chapter/indigenous-ways-of-knowing-and-being/>



Assignment 1: Choices

- Choice is built into the assignment
 - “What you can choose to **accept**... what you can choose to **offer**...”
 - Fun vs. goal-focused
 - Formal, structured vs. creative or artistic
- The student as teacher

“...**consider adding some explanation** about what [details you share] mean to you and what you would like the reader to understand about them. For example, if you claim an Indigenous heritage, you might decide to mention that, but you might also want to say more to **help the reader understand** what it means to you to have an Indigenous heritage, what it says about who you are, how you view the world, and how you would like the reader to understand and relate to this aspect of who you are.”



Assignment 1: Reflection

- Students reflect
 - On how they've grown and would like to continue to grow
 - On what they **offered** and **accepted**
- Teachers reflect
 - What did you **learn** about the student and about your teaching?
 - What are you **thankful** for?



Assignment 1: Other Features

- ESL-style statement: “This is an important handout...”
 - Some Six Nations Students focus on reading and writing in Indigenous languages
- Explanation of the teacher’s role

“The content of the page is up to you, and it’s also up to you how much you make use of the basic elements of HTML and CSS. But please keep in mind that **your teachers’ job is to evaluate the web page** as evidence for how well you have achieved the course learning outcomes.

That means they will be looking for the following: ...”



Assignment 1: The Teacher's Guide


- The first unit is the most important!
 - Establishing **relationships** with the students
 - Establishing trust and mutual **respect**
 - Demonstrating the **relevance** of the material
- Scaffolding
 - Regular reflections (teacher and student)
 - Introduce culminating on day 1
 - Do the assignment along with them



Assignment 1: The Teacher's Guide

- Establishing trust and respect
 - Age of students
 - Mistrust of the educational system
 - Difficulties with written English

“Any **mistrust** you experience must be treated respectfully, as it **is supported by historical evidence and often by a student's own experiences**. The best approach is to show by example on a day-to-day basis that at least in *this* classroom, the students are going to be respected and supported and are going to learn useful things.”



Assignment 2: Storytelling

- Culminating for Unit 2
 - HTML and CSS for mobile phones
 - Tell an interactive (collaborative) story
- Built with the importance of Storytelling in mind

“Storytelling plays a vitally important role in communities around the world... New and emerging technologies give us the opportunity to experience stories in a new way.”



Assignment 2: Embracing Choice

➤ Possibilities

- Drawing from your background or culture vs. making something new
- A **teaching** opportunity vs. just for fun
- A game vs. just a story

“You could also choose to embed **Indigenous** content into your story. For example, you could tell a creation story or the story of a historically or culturally significant event or individual, you could use current issues around **Truth and Reconciliation** as a theme for your story, or you could use an important **cultural practice** that you want to share with others.”

Assignment 3: Community Involvement

- Culminating for Unit 3
 - Desktop design and responsive design
 - Promote something fun or important
- Built with **Choice**, **Reciprocity**, and **Community Context** in mind
 - “The thing that you are promoting could be:
 - a social or political cause that is important to you or your community,
 - an upcoming cultural or community event,
 - a club or activity you are involved in,
 - a product or service you are offering,
 - or anything else that you want to promote to the world!





Common to all Three Assignments

- Framed as an exchange of knowledge (**reciprocity**)
- **Choice** is everywhere
- Student and teacher **reflection**
- **ESL-informed** approach
- Assignments give **context** to students for the knowledge they are learning.
- Explanation of the **teacher's role**



A Possible Issue

- Choice paralysis
 - Some students may not function well in this situation
- Possible solution
 - Counselling and help from the teachers
 - This can be added to the Assignment 1 guide
 - Some “fallback” options that are well spelled-out
 - Can be added on a separate (optional) page, one per assignment



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