

Table of contents:

[Summary](#)

[Learning improvements - grade 9](#)

[Learning improvements - grade 10](#)

[Learning improvements - grade 11 & 12](#)

[Learning improvements - after school computer club](#)

[The flow of skills, knowledge, and capacity](#)

[Current course overview](#)

[Planned sabbatical course work](#)

[Value for us](#)

## **Summary**

I am requesting sabbatical leave to substantially improve our course offerings for software engineering and computer science.

## Learning improvements - grade 9

Introduction to Programming (designing solutions through programming - grade 9 MYP)	
Sabbatical Learning Goal	Student Benefit
Design and construct curriculum in node.js, javascript, mongo DB, Linux	This will enable students to solve problems in a contemporary, modern technical ecosystem. <i>A technical ecosystem encompasses the programming language, documentation, support, and linked services such as databases, operating systems and the way the program is executed.</i>
	Students have a real choice in environments and capitalizing on previous programming experience (some students enter 9th grade with some javascript experience)
	Students can choose this language or our current PHP, apache, mysql technical ecosystem, giving students a choice in how they solve problems.
	Students in grade 9, 10, 11, and 12 are advantaged by this learning. Also, the students in our computer club can use this learning.
Design and construct curriculum to substantially improve student usage of git (a version control system) and the IDE visual studio code.	Students using Git will be able to collaboratively build projects, and build a portfolio of their work. Git offers unprecedented visibility into student coding. Git is the de facto industry tool for collaborative coding.
	Visual studio code is an IDE which affords students a modern design environment and makes “getting to the solution” much easier. At higher levels of skill, students can manage very large and complex code easily. Like Git, visual studio code is an industry-level tool for professional software engineers.
	Git and visual studio code work very well together (both Microsoft owned), students benefit by using exceptionally powerful products that are very well integrated.
	Students in grade 9 through 12 richly benefit from expertise using these two systems

## Learning improvements - grade 10

Advanced programming (solving complex problems through programming - grade 10 MYP)	
Sabbatical Learning Goal	Student Benefit
Design and construct curriculum for OOP Python	Students will learn how to apply Object Oriented Programming (OOP), a very popular paradigm of programming. Students will be tested by the IB in Python OOP. Once a student understands OOP in one language, it is easy to transfer that understanding and skill to a different programming ecosystem.
	Students will learn Python, a very popular programming language, especially in the data science / machine learning / artificial intelligence world.
	Students in grade 10, 11, and 12 are advantaged by this learning. The IB exam is in OOP Python, so this learning is especially helpful for students planning to take IB computer science
Design and construct curriculum for advanced Python	Students will learn and apply advanced python concepts, enabling them to express complex solutions and have a fluency in Python. This is analogous to learning a foreign language very, very well. The better a student speaks, reads, and writes in a foreign language the better they can communicate
	Students in grade 10, 11, and 12 are advantaged by this learning. The IB exam is in OOP Python, so this learning is especially helpful for students planning to take IB computer science
Design and construct curriculum using Jupyter notebook	Interactive notebooks which allow students to execute code within a structured block of text. <a href="#">Please see here for an explainer video</a> ( <a href="#">another video here</a> ). These notebooks make learning programming easier and allow students to put their solutions into context. Imagine an essay where there is a place to run a computer program.
	Students in grade 10, 11, and 12 are advantaged by this learning. The IB exam is in OOP Python, so this learning is

	especially helpful for students planning to take IB computer science
Design and construct curriculum for artificial intelligence / machine learning / advanced topics	Machine Learning and Artificial intelligence skills and knowledge open doors to problems we can't even get close to right now. Students will work with huge datasets to understand and solve really interesting computationally complex problems. More than any other learning, this is one that sets our students apart by being conversant with very powerful tools.
	Equipped with knowledge and understanding of ML and AI, our students will design and construct very high level internal assessment projects.
	Students in grade 10, 11, and 12 are advantaged by this learning. Not to mention the internal assessment they will be able to make - it will be very impressive.

## Learning improvements - grade 11 & 12

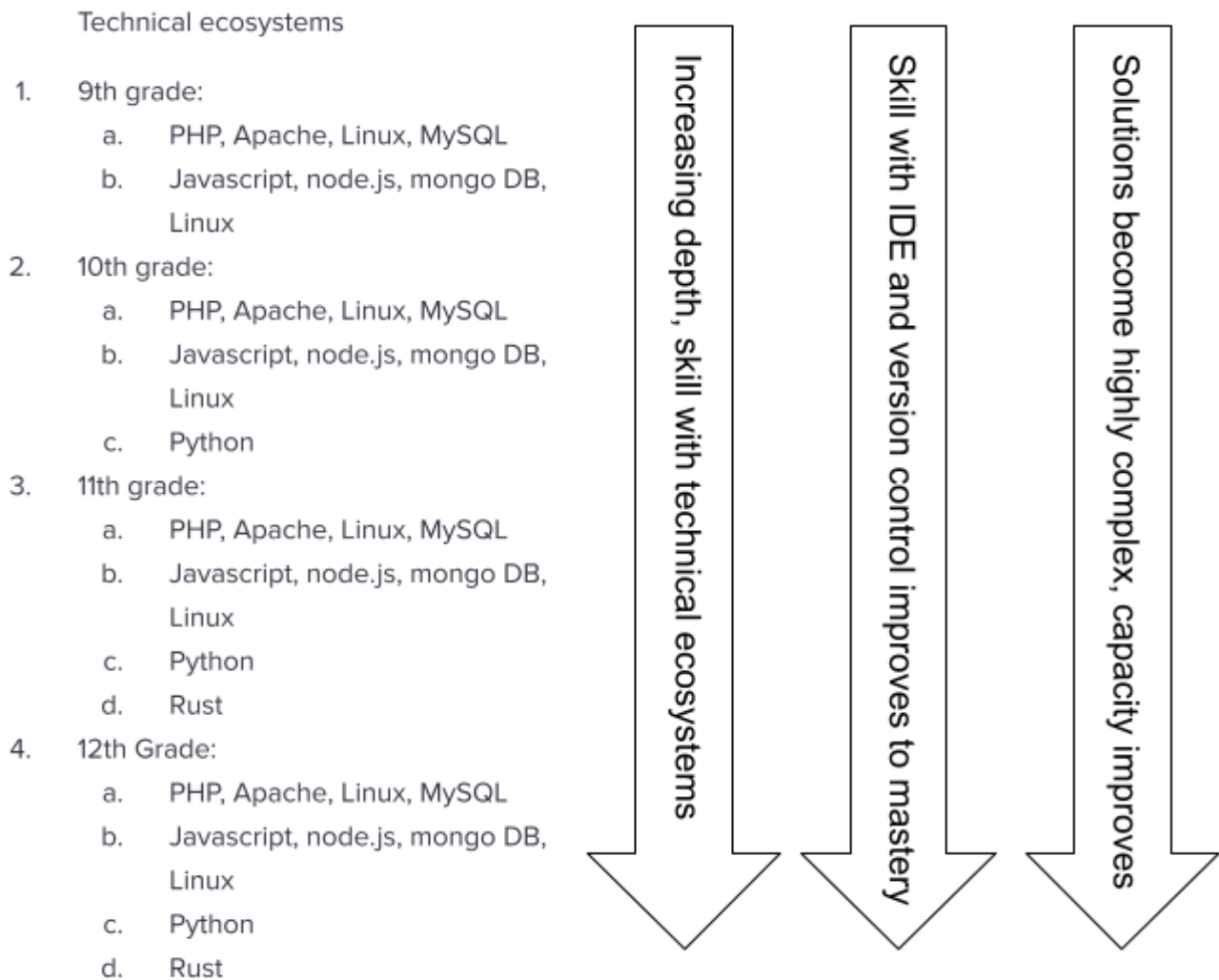
DP Computer Science (grade 11 and 12 DP)	
Sabbatical Learning Goal	Student Benefit
Rebuild every learning engagement and assessment in the two year IB computer science course (this is hundreds of learning engagements and 30+ assessments)	The IB curriculum is being revised and I am upgrading / changing and revising every single learning engagement and assessment. Students benefit from out-of-the gate expert knowledge and assessment.
	As a contributor to the curriculum review process (and spec paper writer, and category 2 author) I have unique and intimate knowledge of this curriculum to create resources which will greatly help our students reach the highest level of understanding.
	Students in grade 11, and 12 are advantaged by these resources.

## Learning improvements - after school computer club

After school computer club (grades 9 - 12)	
Sabbatical Learning Goal	Student Benefit
Complete a multiplayer text-based game I started when I was 17 years old	When a teacher shares their passion, students love it. There's a cool hook here into I&S and English I'd love to dig into. Students will be able to play, and hack a text based game which simulates running a contemporary nation-state
	Students in grade 9 through 12 can enjoy this aspect of software engineering and appreciate the story.
Complete a work of interactive fiction ( <a href="#">please click here for explainer video from MIT professor</a> )	Students can build an interactive fiction story and share it with their friends. This also has great potential connections with English. I will forge those connections. <b>Update: I attended an online conference this summer on interactive fiction and learned a great deal about writing interactive fiction.</b>

## The flow of skills, knowledge, and capacity

After this sabbatical, the software engineering / computer science pathway will look like this:



Graduated students have mastery of cutting-edge technical ecosystems and professional practices to solve highly complex problems. They can transfer their skills, practices and knowledge to novel situations. Students will be deeply skilled in a modern programming ecosystems having designed and created five major solutions to real-world problems. They will have a broad, deep, and solid foundation in computer science. They will also have a very high level of skill in version control and a professional IDE. This will enable them not only to apply and be successful in computer science programs, but also other disciplines within the broad field of computing.

## Current course overview

The American School of Warsaw offers three courses and one club related to system engineering / computer science:

Course	Grade level	Connected to	Enrollment (2021)	Syllabus link
<b>Designing Solutions Through Programming</b>	Grade 9, some grade 10's take the course	MYP Design	45 (2 sections, 23 and 22 respectively)	<a href="#">Class syllabus here</a>
<b>Solving complex problems through programming</b>	Grade 10	MYP Design	22	<a href="#">Class syllabus here</a>
<b>IB DP computer science year 1</b>	Grade 11	Group 4, sciences	SL - 6 HL - 12	<a href="#">Class syllabus here</a>
<b>IB DP computer science year 2</b>	Grade 12	Group 4, sciences	SL - 3 HL - 9	<a href="#">Class syllabus here</a>
<b>After school computer club / competitive coding club</b>	Grade 9 through 12	Student passion	Variable; between 10 to 15 students. Most students are enrolled in one of the courses above.	Developing a game.

We have a total student enrollment of 97 students taking computer science and software design engineering courses at the high school (about 30% of the total HS).

## Planned sabbatical course work

I have planned about 1200 hours of coursework and experiences, noted in the table below. I am aware of the language in the OH handbook regarding "...complete description of the course of study that will be undertaken at an accredited college or university". I believe the proposed course of study (below) is richly equivalent to a course of study at university level. This training is so cutting edge that very few universities offer it (rust, web-assembly, machine learning / AI, applied python, etc...).

I will translate these courses into student-facing learning experiences. I will build learning activities and assessments for each major topic of each course. Please know this list is not exhaustive, and as I become aware of better opportunities I will add / edit them here. Please also be aware the time is actual instruction time, and not time to complete projects within a course.

Course / Training	Time	Course connections
Rust Strand:		
<a href="#">Learn Rust by Building Real Applications</a>	10 hours + project completion + incorporation into teaching	IB Computer Science year 1 and year 2
<a href="#">The Rust programming language</a>	20 hours + project completion + incorporation into teaching	IB Computer Science year 1 and year 2
<a href="#">WebAssembly Beginner to Advanced 2020</a>	3 hours + project completion + incorporation into teaching	IB Computer Science year 1 and year 2
<a href="#">Using WebAssembly with Rust</a>	15 hours + project completion + incorporation into teaching	IB Computer Science year 1 and year 2
<a href="#">Rust-learning</a>	(8 hours + project completion)	IB Computer Science year 1 and year 2
<b>TOTAL RUST STRAND:</b>	Rust strand is about 50 hours, plus project completion plus incorporation into my teaching, estimate total of 100 hours	
Python strand:		
<a href="#">Python OOP : Object Oriented Programming in Python</a>	5 hours + project completion	10th grade and IB Computer Science year 1 and year 2

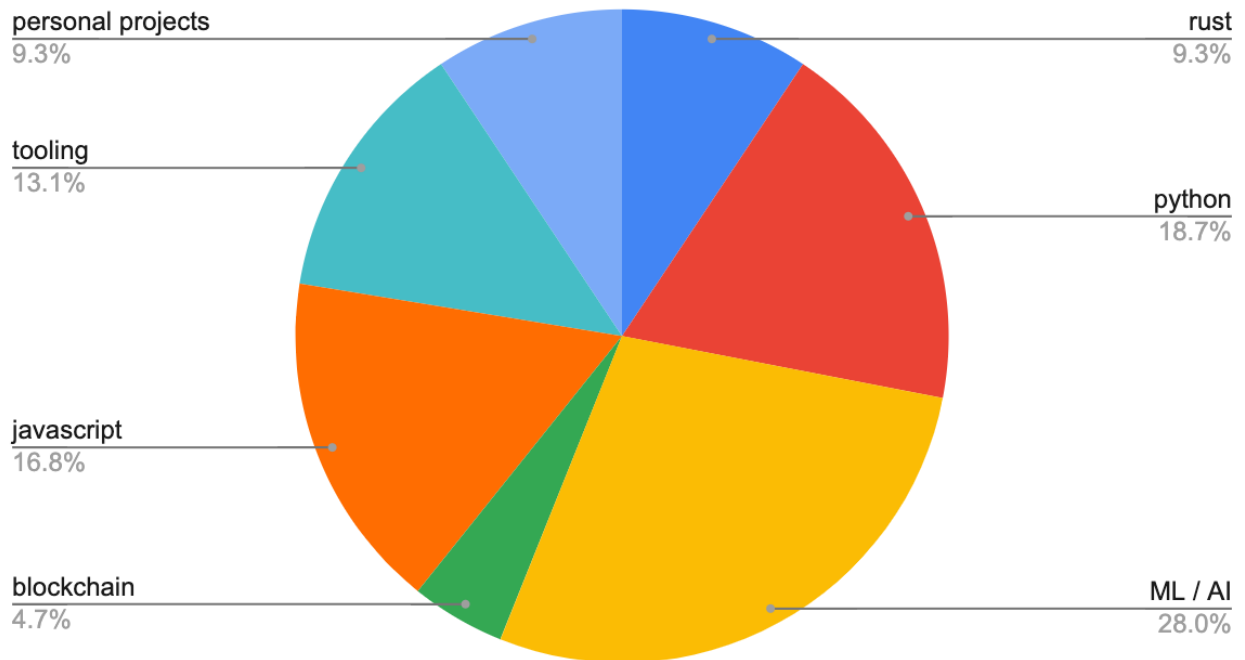


<a href="#">Python 201 - Interactively Learn Advanced Concepts in Python</a>	11 hours + project completion	10th grade and IB Computer Science year 1 and year 2
<a href="#">Investment Management with Python and Machine Learning</a>	2 months (4 hours a week) (32 hours)	10th grade and IB Computer Science year 1 and year 2
<a href="#">Jupyter Notebook for Data Science</a>	3 hours	10th grade and IB Computer Science year 1 and year 2
<a href="#">Python, MongoDB, Threading, Multiprocessing, Asyncio and Flask</a>	23 hours	10th grade and IB Computer Science year 1 and year 2 (mongo training can transfer to 9th grade mongo db strand).
<b>TOTAL PYTHON STRAND:</b>	Python strand is about 2 months, plus project completion plus incorporation into my teaching, estimate total of 200 hours	
Machine learning / AI strand:		
<a href="#">Machine learning with Python</a>	21 hours + project completion	10th grade and IB Computer Science year 1 and year 2
<a href="#">Machine learning course</a>	56 hours + project completion	10th grade and IB Computer Science year 1 and year 2
<a href="#">Advanced Machine learning</a>	6 months	11th grade and IB Computer Science year 1 and year 2
SOMETHING LIKE: <a href="#">Artificial Intelligence A-Z™: Learn How To Build An AI</a>	16 hours + project completion	10th grade and IB Computer Science year 1 and year 2
<b>TOTAL ML / AI strand:</b>	ML / AI strand is about 200 hours, plus project completion plus incorporation into my teaching, estimate total of 300 hours	
Blockchain strand:		
SOMETHING LIKE: <a href="#">A-Z™: Learn How To Build Your First Blockchain</a>	20 hours + project completion	10th grade and IB Computer Science year 1 and year 2
<b>TOTAL blockchain:</b>	Blockchain strand is about 20 hours plus project completion plus incorporation into my teaching, an estimated total of 50 hours.	
Javascript strand:		
<a href="#">Beginning modern javascript</a>	22 hours	9th grade, 10th grade, Possible IA for 11th and 12th grade

<a href="#">Advanced javascript concepts</a>	25 hours	9th grade, 10th grade, Possible IA for 11th and 12th grade
<a href="#">Debugging Sites Using Chrome DevTools</a>	2 hours	9th grade, 10th grade, Possible IA for 11th and 12th grade
<a href="#">The complete developers guide to mongoDB</a>	14 hours	9th grade, 10th grade, Possible IA for 11th and 12th grade
<a href="#">The complete node.js developers course</a>	35 hours	9th grade, 10th grade, Possible IA for 11th and 12th grade
<a href="#">Develop with vue.js</a>	50 hours	9th grade, 10th grade, Possible IA for 11th and 12th grade
<b>TOTAL javascript:</b>	Javascript strand is about 100 hours, plus project completion plus incorporation into my teaching, an estimated total of 180 hours	
<a href="#">Open Source Software Development, Linux and Git Specialization</a>	4 months (5 hours a week) 80 hours	Grade 9 through 12
<a href="#">Learn Visual Studio Code</a>	20 hours + project completion	Grade 9 through 12
<b>TOTAL tooling:</b>	Total tooling is 100 hours, plus project completion plus incorporation into my teaching estimate total of 140 hours.	
Personal passion project strand:		
SOMETHING LIKE: <a href="#">[Seminar]</a> 'Building AI Dialogue Tools for Non-Technical Authors' by Emily Short	70 hours	Computer club
SOMETHING LIKE: <a href="#">Enough to be dangerous: Conceptual models for MUSHcode</a> - and - <a href="#">MUSHCode: Functional Programming the Really Hard Way</a>	60 hours	Computer club

SOMETHING LIKE: <a href="#">WINTER SURVIVAL SKILLS WEEKEND COURSE</a> and <a href="#">WILD FOOD FORAGING AND PREPARATION WEEKEND</a>	Four weekends + 2 week trip	I run an outside flex activity focusing on primitive cooking, this would enable me to competently and safely chaperone outside trips and help ASW attune students to nature. Happy to write a curriculum around this.
<b>TOTAL personal passion:</b>	Personal / passion is harder to estimate time, but I estimate total time for all of them is about 100 hours.	
Grand total for coursework	Total hours are estimated at about 1000 hours. Re-writing the DP learning engagements should take about 200 hours. I've got about 1200 hours worth of work planned!	

## Sabbatical Coursework Breakdown



## Value for us

From this sabbatical, ASW gets a cutting-edge, meaningful, world-class, highly competitive computer science curriculum which very few other high schools in the world can match. Students will graduate from our school with meaningful AI, machine learning, block chain, github, rust, PHP, and javascript programming experience. Students will have skills, knowledge and frameworks to computationally solve truly complex problems.

Thank you for considering this request,

Bill MacKenty