RESEARCH SHOP

"know what's out there!"

Needs assessment for a coding teacher training program

Prepared for

Mathstronauts

In

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Contents

Executive Summary

Mathstronauts is a non-profit organization in Hamilton that helps middle school students with STEM (science, technology, engineering, and math) by giving them hands-on learning experiences. Since Ontario made coding a required part of the math curriculum for Grades 1 to 9 in 2020/21, Mathstronauts has noticed that many teachers from the Hamilton-Wentworth District School Board (HWDSB) and the Hamilton-Wentworth Catholic District School Board (HWCDSB) are struggling to teach this new material. To address this, they want to create a training program for teachers to help them feel more confident teaching coding. To better understand what the ongoing challenges are for teachers in teaching the coding curriculum, the Research Shop conducted a needs assessment using a comprehensive survey and key-informant interviews. This report summarizes our findings, providing insights into challenges faced by teachers when teaching coding, as well as the unmet needs a coding training program could fill.

Overall findings from the research suggest that teachers generally feel confident teaching math, but they are much less comfortable teaching coding. They struggle particularly with understanding coding concepts, integrating coding into math lessons, and using or assessing coding tools. There are several obstacles that make it hard for teachers to effectively teach coding. The two biggest issues are their lack of technical knowledge in math and coding and not having access to the right technology. Other major obstacles brought up by teachers include insufficient training opportunities, limited access to appropriate devices/technology, and a shortage of instructional materials to guide their lessons.

Most teachers expressed interest in participating in a coding training program. The majority preferred this training to take place during school hours with coverage provided for their classes, while the second highest preference was on professional development days. Nearly half wanted in-person training, but some were also open to online or hybrid formats. Most teachers were willing to spend two to four hours on training.

For coding training program content preferences, interview participants stated that teacher training should build confidence in applying and troubleshooting coding, while also providing strong pedagogical support. They recommended step-by-step lesson plans, assessments, and rubrics housed in one place, with unplugged options for low-tech classrooms and a clear, gradual learning progression for all students

The research team proposes five recommendations to guide Mathstronauts in the development of a coding teacher training program that successfully addresses teachers' needs and supports effective curriculum delivery. The first recommendation would be developing a practical scaffolded training program that starts with basic coding concepts and builds gradually to advanced topics, accommodating all experience levels. The second recommendation would be prioritizing in-class applications and pedagogy. To make coding lessons engaging and practical it is important to go beyond coding basics and include different teaching strategies, class management tips, and real-world math

integration. The third recommendation is to provide ready to use and flexible resources, offering customizable lesson plans, rubrics, and activities to suit different classroom needs. The fourth recommendation is to emphasize benefits and build confidence in coding by highlighting how coding enhances learning across subjects. The last recommendation is to collaborate with school boards and offer ongoing support to align training with board goals and integration into professional development.

Introduction

Context

Mathstronauts is a non-profit organization based in Hamilton that provides hands-on science, technology, engineering, and mathematics (STEM) learning opportunities for middle school students. In response to Ontario's 2020/21 curriculum changes, which mandated computer programming instruction for Grades 1-9, Mathstronauts has worked closely with schools to deliver in-class coding programming. Informal feedback from teachers within the Hamilton-Wentworth Catholic District School Board (HWCDSB) and Hamilton-Wentworth District School Board (HWDSB) suggests that many educators face challenges in implementing this new curriculum component effectively.

While Mathstronauts' current programming helps students develop coding literacy, the organization is now exploring the feasibility and potential impact of a coding teacher training program. By equipping teachers with the necessary knowledge, skills, and confidence to integrate coding into their math instruction, Mathstronauts hopes to create a more sustainable and long-term impact on coding education within the region's schools.

To inform the design and implementation of a potential teacher training program, Mathstronauts partnered with the McMaster Research Shop to conduct a needs assessment. This project investigates the challenges middle school (Grades 5-8) teachers face in delivering the coding curriculum and identifies gaps that a teacher training program could address.

Research Questions

The main research questions for this project are:

1. What are the ongoing challenges and unmet needs of teachers in delivering coding instruction?
2. How do middle school teachers perceive their confidence in teaching coding?
3. What resources or strategies could enhance the effectiveness of coding instruction for middle school students?
4. What gaps, if any, could a coding teacher training program fill?

The findings from this research will provide Mathstronauts with insights into the needs of teachers and help determine whether a training program would be a strategic investment. If so, the research will also help guide the development of the program's content to ensure it is tailored to address educators' challenges and professional development goals.

Methods

Methods

The research team used semi-structured interviews and a survey to answer the research questions.

The research team used semi-structured interviews (see guide in Appendix 1) to gauge the range of challenges with the coding curriculum and supports available to teachers to help inform the survey questions. Thematic analysis of the qualitative data also supplemented the survey data. In total, the team conducted five interviews.

The research team created the survey (Appendix 2) using LimeSurvey. The team designed the survey to collect information on four main subtopics: demographics and current experiences, available support and resources, future support and program design, and interest in joining a coding training program.

The community partner assessed the initial draft of the survey questions and provided feedback, which the research team incorporated. Additionally, the team took suggestions from an HWDSB math facilitator and representative from the HWCDSB into account, leading to minor revisions in the final version. After the completion of the review process, the research team conducted pilot surveys, and the community partner tested the online survey internally with their staff members. Based on the results of these pilot tests, the team further refined the survey questions and structure for logic and clarity. The community partner invited 50 teachers from the HWDSB to complete the survey from March 10-25, 2025, followed by 30 teachers from the HWCDSB from March 21-28, 2025.

Research team members analyzed quantitative data from the survey using descriptive statistics to identify trends in teachers' experience with coding, challenges with coding instruction, and preferences for a coding training program. Team members used content analysis for open-ended responses to identify categories and areas of interest or concern.

Limitations

This research project has some limitations that may affect the generalizability and accuracy of its findings. Teachers who opted to participate in the interviews may have had stronger opinions about coding in the curriculum, potentially causing selection bias. Reliance on self-reported information also introduces potential bias. Participants' views on their comfort, confidence, and resource utilization may not accurately represent their true classroom practices or effectiveness. Moreover, comfort and effectiveness assessments lack objective validation, and the open-ended feedback, though valuable, was extremely limited in quantity, making it hard to draw generalizable conclusions. While the survey sought to evaluate the effectiveness of different coding resources,

varying levels of resource usage complicates the ability to make definitive statements about which tools are most advantageous.

Finally, only three teachers from the HWCDSB completed the survey, compared to 28 teachers from the HWDSB. This extremely small sample size could not stand alone as representative of the school board. Therefore, we have combined the responses from both school boards to provide a general understanding of the experiences of middle school teachers in the Hamilton-Wentworth District.

Findings

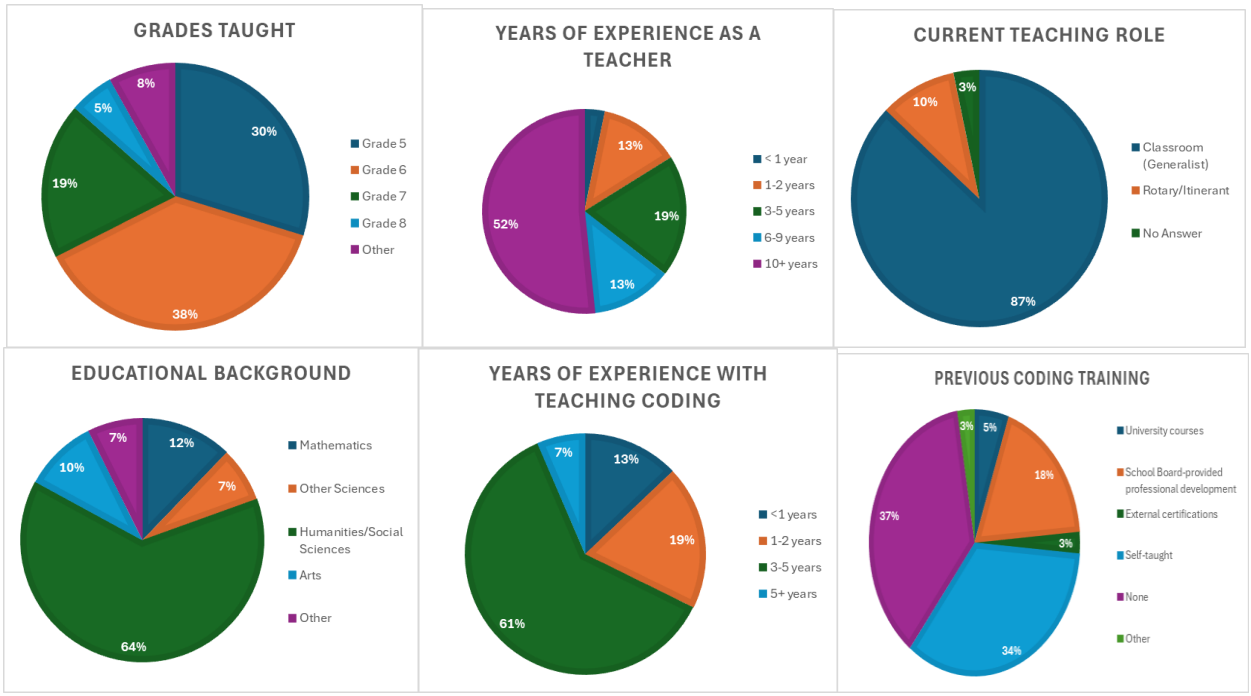
The survey was completed by 31 respondents, with 28 from the HWDSB, and three from the HWCDSB. None of the individuals completed the entire survey, so some questions have less than 31 responses. Additionally, a total of five people were interviewed from the HWDSB. Four were teachers and one was a math facilitator with whom the research team conducted a scoping interview for the project.

Participants

The survey asked respondents to provide responses to questions regarding their professional background and experience with coding (Graph Set 1). Categories with an asterisk (*) were ones where respondents could select multiple answers.

Grade 6 was the grade most frequently taught (n = 14) by teachers, followed by Grade 5 (n = 11). The highest number of teachers (n = 16) reported teaching for more than 10 years, and most respondents (n = 27) identified as generalist classroom teachers. In terms of educational background, the most common was Humanities or Social Sciences (n = 26). Not many respondents (n = 8) had a STEM background. No respondents had a background in Computer Science or Engineering.

Respondents reported varying levels of prior training in coding. The most common form was self-directed learning (n = 13), followed by school board-provided professional development (n = 7). Fewer reported university coursework (n = 2) or external certifications (n = 1). However, the greatest number of respondents (n = 14) reported having received no training. Respondents had diverse levels of experience teaching coding as part of the Ontario mathematics curriculum for Grades 5–8. Most (n = 19) had between 3–5 years of experience, followed by 1–2 years (n = 6).



Graph Set 1: Survey Respondent Characteristics (n = 31)

Comfort With Mathematics and Coding Instruction

The survey asked respondents to rate their comfort level with five mathematics and coding instructional tasks (Table 1). Comfort was rated on a scale from 1 (not at all comfortable) to 5 (very comfortable).

Teachers from the HWDSB reported the highest comfort with teaching mathematics in general (M = 4.00, SD = 0.98). Comfort ratings for coding-related tasks were much lower. Teaching coding concepts received an average comfort rating of M = 2.25 (SD = 0.93), while integrating coding into math lessons was the task rated lowest overall (M = 2.07, SD = 0.72).

Although the HWCDSB group was smaller, respondents reported slightly higher comfort levels across all tasks. Teaching mathematics in general had a mean rating of M = 4.67 (SD = 0.58). Using coding tools was the task rated lowest overall for this group (M = 2.67, SD = 0.58).

When looking at the distribution of the average comfort levels across all tasks (Figure 1), most respondents (n = 19) had a poor to middle level of comfort (M = 2.0, 3.0). For the individuals (n = 4) with a poor level of comfort (M = 1.0, 2.0), there were no significant common demographic characteristics (such as previous coding experience) that distinguished them from others with higher levels of comfort.

Table 1: Teachers' Average Comfort Levels with Mathematics and Coding Instructional Tasks (n = 31)

Instructional Task	HWDSB		HWCDSB	
	Mean	***SD***	***Mean***	***SD***
Teaching mathematics in general	4.00	0.98	4.67	0.58
Assessing students' coding skills	2.46	1.07	3.00	1.00
Using coding tools (e.g., Scratch, micro:bit)	2.36	0.87	2.67	0.58
Teaching coding concepts	2.25	0.93	3.00	1.00
Integrating coding into math lessons	2.07	0.72	3.00	1.00

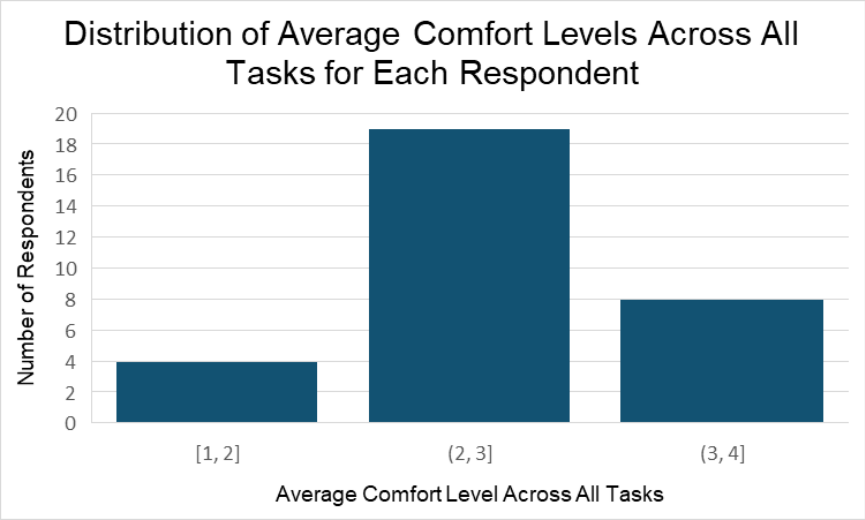


Figure 1: Distribution of Average Comfort Levels Across All Mathematics and Coding Instructional Tasks (n = 31)

Current Resources and Supports

Participants were asked to indicate which instructional resources they have used to support coding instruction and to rate each selected resource's effectiveness on a scale from 1 (not very effective) to 5 (very effective) (Table 2, Graph Set 2).

The most commonly used resource across both school boards was Code.org, which was selected by 21 respondents. MathUp Classroom resources was also a popular option, selected by 16 respondents. Since the resources had widely varying levels of usage, the research team cannot conclude that one resource is more effective than another. Additionally, 11 participants reported using resources not listed in the survey options. These included Mathstronauts (n = 4), Scratch (n = 4), Lego Coding for Kids (n = 1), Hour of Code (n = 1), Knowledgehook (n = 1), and recommendations from another teacher (n = 1).

Participants were also asked to elaborate on their experiences with the resources they used. Seven respondents provided open-ended feedback. Many highlighted the usefulness of Code.org, describing it as effective, easy to use, and engaging for students. Several noted that it allows students to work independently through lessons with minimal teacher intervention. However, some also pointed out limitations, such as difficulty keeping up with students' varied progress and difficulty troubleshooting student challenges. One respondent noted that they felt Code.org was too difficult for them to understand, while another mentioned that many of the resources were helpful but incomplete, often used to "fill the space" rather than as comprehensive teaching tools.

Table 2: Resources Used to Support Coding Instruction and Their Average Rated Effectiveness (n = 31)

Resources	Number of Respondents Who Used	Mean Rating (1–5)	Standard Deviation
School Board Online Learning Platform (e.g., HUB)	7	3.00	1.53
Ontario Association for Mathematics Education materials	3	4.00	1.00
Code.org	21*	3.65	0.75
ScienceNorth Professional Learning Series	1	5.00	N/A
Codingville.ca/Logics Academy resources	1	3.00	N/A
Inksmith Training	1	4.00	N/A
MathUp Classroom resources	16	3.06	0.77
Canada Learning Code materials	2	3.50	0.71
Teachers Pay Teachers resources	8	3.38	0.92

*The effectiveness of Code.org was only ranked by 20 individuals

Graph Set 2: Distributions of Individual Ratings for Resources with Most Ratings

Challenges in Implementing the Coding Curriculum

Teachers were asked to rank a set of seven common challenges they may face when implementing Ontario's coding curriculum, from most to least difficult (Figure 2).

The two challenges listed most frequently as a top choice for being most difficult (Rank 1 or 2) were a lack of technical knowledge in mathematics and/or coding (42.9%) and a lack of knowledge on how to integrate coding skills into math curriculum (41.4%). A limited/lack of access to appropriate technology and a lack of knowledge on how to integrate coding skills into the math curriculum were also popular top choices, each being around 40%. The challenge ranked most frequently as a bottom choice, or least difficult, was a large class size (57.1%).

Respondents were also invited to describe any additional challenges not included in the ranking list. Three participants offered responses. One respondent noted that they had a lack of enthusiasm and confidence in teaching coding, stating: "I can only help with basics. I also don't have a love for coding." Another emphasized continued difficulty with access to functioning technology. A third teacher highlighted the need for more classroom support and hands-on practice, explaining that limited time to explore coding tools and a lack of student support contributed to classroom frustration. They added that, "...a lot of students get frustrated and lack the confidence to continue 'debugging' the code if it doesn't work."

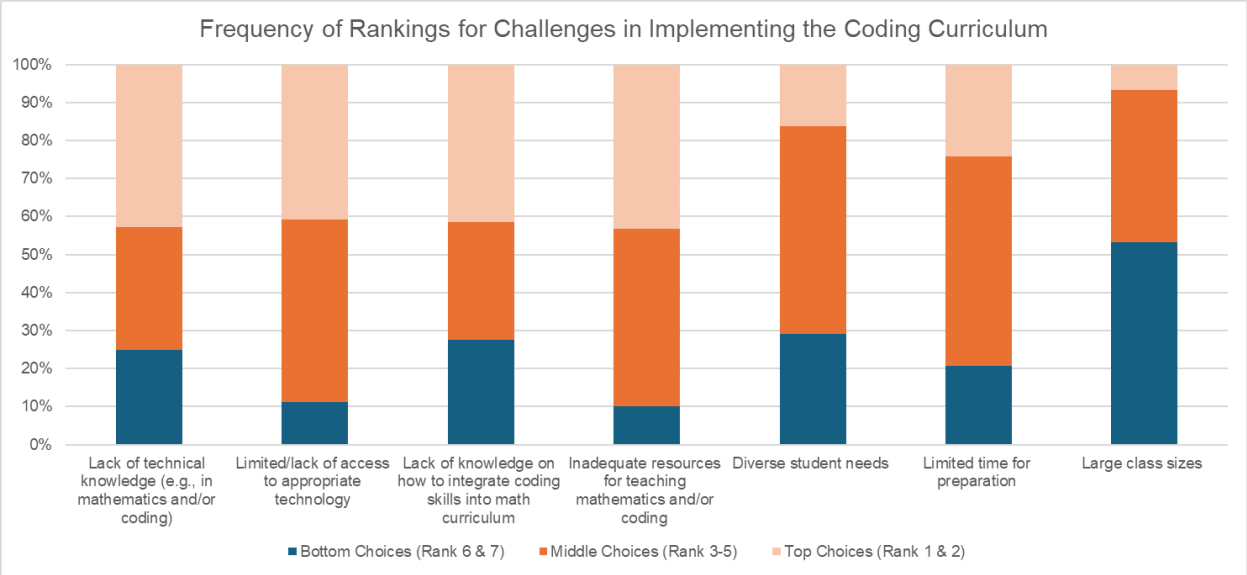


Figure 2: Frequency of Rankings for Challenges in Implementing the Coding Curriculum (n = 29)

Interview participants expressed that they encountered obstacles such as limited access to appropriate devices/technology, students having difficulty grasping coding vocabulary and conceptual leaps, especially when moving from simple to more complex activities like sub-programming, and students struggling to stay on track with curriculum demands, particularly among those with special education needs or little previous

experience. Additionally, learning gaps can result from uneven coding exposure across grade levels, which can make students fall behind and lose interest before they even reach high school. Interviewees also mentioned struggling with insufficient training opportunities, time constraints that restricted their ability to upskill, a lack of confidence in teaching coding, and a shortage of instructional materials to guide their lessons. There was a clear concern that coding was introduced without adequate notice or guidance, leading to a disconnect between Ministry expectations and the implementation of it in the classroom. One interview participant said:

"We were already very overwhelmed with switching over. But I do recall during that time period, the school board and the Ministry were working really hard to put something out there for teachers because this was kind of thrown in the curriculum without any notice and we were then expected to teach it."

However, despite these challenges, some interview participants indicated that they are finding success in integrating coding into their classroom through simple but effective ways. For example, one teacher noted that setting up basic coding activities such as learning the blocks and making a sprite had strong student engagement alongside platforms such as Minecraft and Star Wars. As students get to play games, there is clear enthusiasm and an eagerness to code. Additionally, teachers have started to find new ways of using coding in the classroom beyond the expectations in the math curriculum. For example, one teacher gave their students the option to code during a science project about the solar system and found high student engagement. Finally, many teachers are modeling a growth mindset by learning alongside their students during class time, turning this challenge into a collaborative approach.

Support Needed for Coding Topics

The survey asked respondents to select all coding topics they needed the most support with from a list of five topics (Table 3). 'Understanding basic coding logic (e.g., loops, conditional statements, variables, and data types)' was the option that was selected the most number of times (n = 22) across participants from both school boards. However, the other four topics were also selected about just as frequently.

Respondents were also asked to elaborate on what coding topics they needed the most support with. Three respondents provided answers including teaching diverse students, having slide decks to refer back to, problem-solving strategies, and integrating the benefits of coding into the curriculum.

Table 3: Coding Topics Respondents Need Most Support With (n = 31)

Topic	Respondents Who Selected This	
	Count	***Percentage***
Understanding basic coding logic (e.g., loops, conditional statements, variables and data types)	22	70.97%

Using coding to solve math problems	21	67.74%
Using coding platforms (e.g., Scratch, Python)	17	54.84%
Assessment methods	17	54.84%
How to teach coding to students (coding pedagogy)	20	64.52%
No Answer	1	3.23%

Coding Training Format Preferences

Survey respondents were asked if they would be interested in a coding training program for teachers if it was available at a time and in a format that worked for them. Across both school boards, 23 said yes, seven were unsure, and one did not answer.

Respondents were asked what would help them make their decision if they were unsure about attending the coding training program. Answers included being unsure if the program would be enough to become confident teaching professionally, not wanting to attend on their own time, virtual sessions being too fast to keep up with, and how holding the program during the school day would help the teacher attend.

Respondents were then asked to state whether they would prefer for the coding training program to be delivered in person, online, or both (hybrid) (Table 4). 48.39% of respondents indicated they prefer the in person format.

Table 4: Coding Training Program Online or In Person Preferences (n = 31)

Delivery Format	**Respondents Who Selected This**	
	Count	***Percentage***
In person	15	48.39%
Online	7	22.58%
No preference	5	16.13%
Hybrid	3	9.68%
No Answer	1	3.23%

The survey asked respondents whether they preferred a synchronous or asynchronous coding training program, or a mix of both (Figure 3). Synchronous means that the training program would be delivered live, either virtually or in person, with participants learning/doing activities together in real time. Asynchronous means that the activities of the training program could be done whenever the participant wants, at their own time and pace, such as an online training module. The most popular choices were a mix of both (35.48%), and synchronous (32.26%).

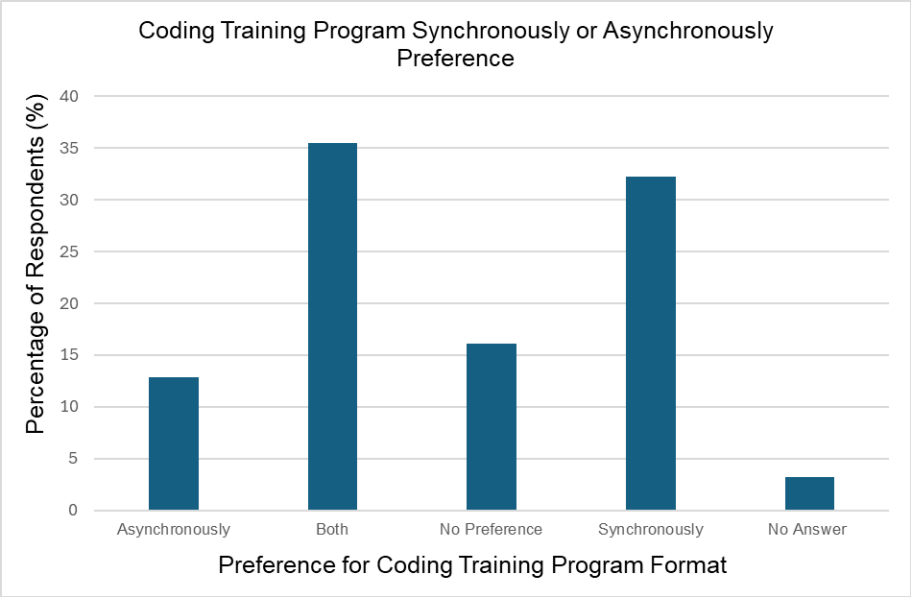


Figure 3: Coding Training Program Synchronously or Asynchronously Preference (n = 31)

The survey then asked the participants to select all the times they would be willing to attend the coding training program (Figure 4). Most respondents (93.54%) indicated that they were willing to attend during school hours (with supply teacher coverage). Very few indicated they were willing to attend during the summer break (3.22%), and zero indicated they would be willing to attend on weekends.

Interview participants expressed that having access to a coding instructor during lesson delivery would be ideal. However, training where an instructor explains a concept, works through a solution, answers questions from teachers and provides further resources for practice would also provide the hands-on experience that teachers require to gain confidence disseminating a lesson themselves. For a meaningful number of teachers to participate in this training, it would need to be free and be available during work hours, as shifting the responsibility onto teachers to complete it during evenings or weekends would be a significant barrier given the number of other curriculum requirements that need to be satisfied.

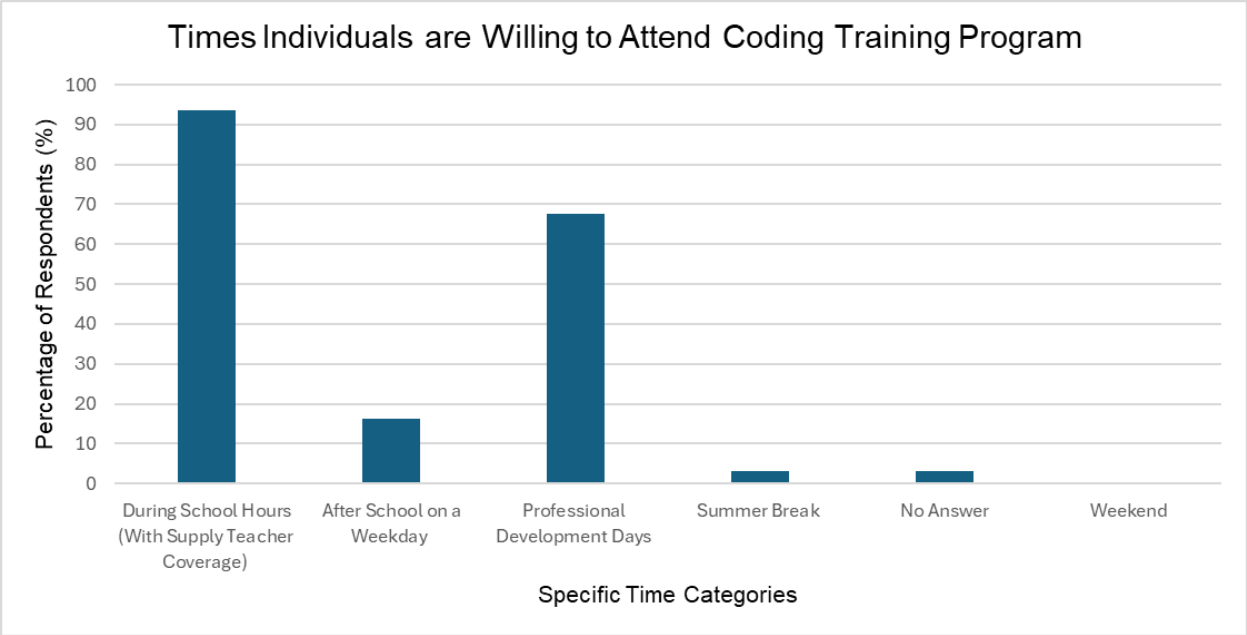


Figure 4: Times Individuals are Willing to Attend Coding Training Program (n = 31)

Respondents were asked to select the number of hours they were willing to spend on a coding training program (Table 5). The most popular choices were two to four hours (35.48%) and five to eight hours (32.26%).

Table 5: Time Willing to Spend on Coding Training Program (n = 31)

Number of Hours	Respondents Who Selected This	
	Count	***Percentage***
2-4 hours total training time	11	35.48%
5-8 hours total training time	10	32.26%
<2 hours total training time	5	16.13%
8+ hours total training time	4	12.90%
No Answer	1	3.23%

Coding Training Program Content Preferences

The survey asked respondents to rank the types of support that would be most beneficial for teachers from most beneficial to least beneficial (Figure 5).

The results across both school boards show that the highest number of teachers found a pre-developed curriculum, lesson plans, and ready-to-use resources to be the most beneficial (Ranks 1 or 2) type of support (72.4%). Interactive coding software with written teacher guides was ranked as most beneficial the least number of times by respondents (11.1%) and was ranked as least beneficial the most number of times (48.1%). Coding teacher training, whether delivered by the school board or third-party professionals, received more mixed responses.

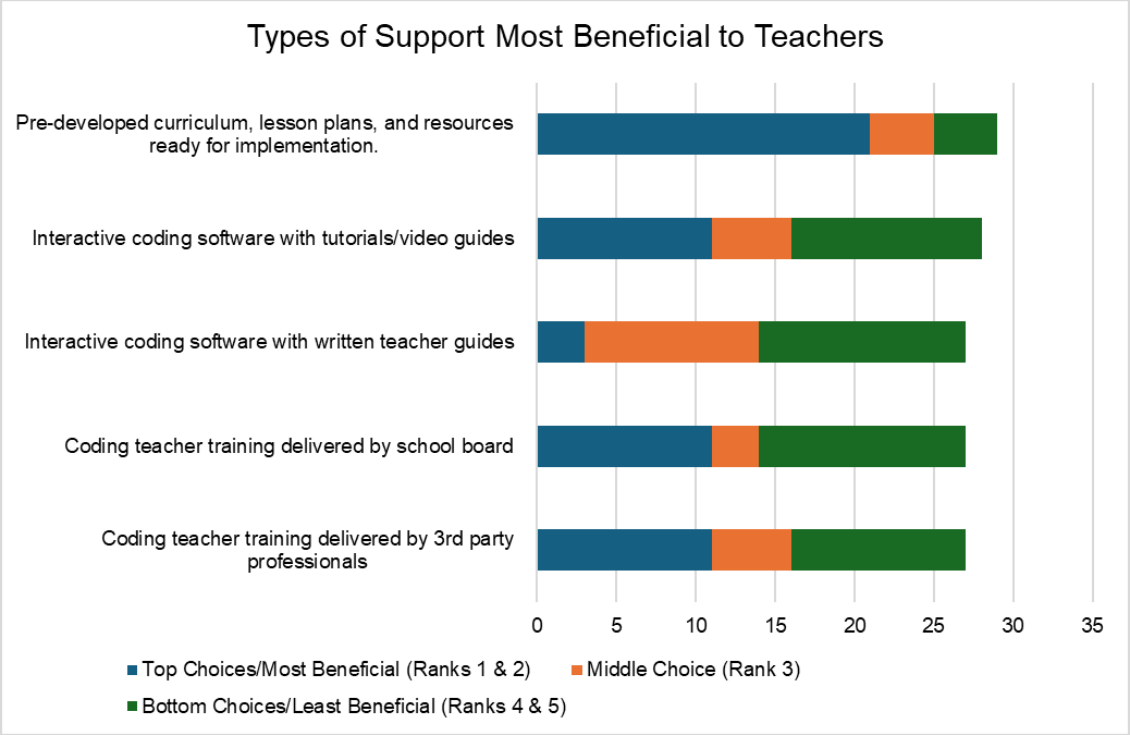


Figure 5: Types of Support Most Beneficial to Teachers (n = 29)

Finally, survey respondents were asked to share what would make participating in a coding training program most valuable for them. Key themes that emerged from their answers include hands-on resources and experiences with coding (n = 1) classroom applications and confidence (n = 3), foundational understanding and practice (n = 2), pre-made lessons, and teaching readiness (n = 5).

Interview participants echoed this, stating that the role of an ideal teacher training program would be to expose teachers to the possible applications of coding, build confidence teaching the material, and enhance comfortability with troubleshooting and answering student questions. The interviewees expressed that a training program should emphasize how to use, apply, and troubleshoot coding technology, but also supply the pedagogical resources necessary to teach students.

Interview participants stated that teachers would also benefit from a comprehensive and cohesive series of pedagogical resources which would include step-by-step lesson plans, assessments and rubrics in a centralized location. These lessons should translate into unplugged contexts for classes that do not have access to a sufficient number of iPads or tablets. These lessons should increase in terms of difficulty but would need to start at a common entry point for all so that the class can progress without significant disparities in students' skills developing.

Key Takeaways and Next Steps

Key Takeaways

This research reveals some insights into the current needs of middle school teachers in Ontario when it comes to implementing the math coding curriculum. Overall, the responses suggest that while several resources are considered effective and accessible, their success often depends on teacher confidence, student support needs, and access to appropriate technology.

A lack of teacher confidence can be attributed to a baseline unfamiliarity with coding combined with a variety of barriers to acquiring comfortability including insufficient training opportunities, constraints that restrict their ability to upskill, and a shortage of instructional materials to guide their lessons. Teachers expressed that ideal support would combine technical confidence in coding technology with pedagogical resources necessary to teach students. Teachers tended to favour training if it was synchronous and offered during school hours due to the multitude of other demands placed on their time.

Many students demonstrate enthusiasm for coding once they have mastered the fundamentals, particularly when teachers give the latitude to apply concepts outside of the mathematics context. However, learning gaps often emerge due to uneven exposure to coding across grade levels which makes it increasingly difficult to sustain momentum while moving to more complex activities like making conceptual leaps and sub-programming.

There is often variation in the technology consistently available for classrooms with many teachers not being able to access enough devices to run coding lessons that would meaningfully engage all students. Teachers expressed the need to have flexible or “unplugged” lesson plans that would accommodate discrepancies in technology access.

Recommendations for Next Steps

Based on the findings from both the survey and interviews, the following recommendations are proposed to guide Mathstronauts in the development of a coding teacher training program that addresses teachers’ needs and supports effective curriculum delivery.

Develop a Practical, Scaffolded Training Program: Design a hands-on training program that begins with foundational coding concepts and gradually increases in complexity. Training should be no less than two hours in total and no more than eight hours. Training should begin at a shared entry point and include a clear progression of skills to support varying levels of prior experience among teachers. This will help reduce disparities in comfort and competence when delivering coding instruction.

Prioritize In-Class Applications and Pedagogy: Teachers consistently expressed a desire for training that goes beyond coding concepts to focus on how to teach coding effectively. The program should include pedagogical strategies, classroom management techniques for coding instruction, and troubleshooting tips. Modules should demonstrate how to embed coding into real-world math lessons in ways that are engaging and accessible for students.

Include Ready-to-Use, Adaptable Resources: Develop and provide lesson plans, rubrics, assessments, and activities that can be implemented immediately in the classroom. Resources should be customizable and include both digital and unplugged versions to accommodate classrooms with limited access to technology. Centralizing these resources in an easy-to-navigate platform would further enhance accessibility.

Highlight Practical Benefits and Build Confidence: To support teacher motivation and confidence, the program should emphasize how coding instruction benefits students across subjects and grade levels. Training should showcase success stories and examples of high student engagement to inspire teachers and alleviate anxiety. Encouraging teachers to learn alongside their students may also promote a growth mindset in the classroom.

Engage with School Boards and Facilitate Ongoing Support: Mathstronauts should collaborate with school boards to align the training with board priorities and ensure its integration into professional development offerings. Creating a community of practice or ongoing support network (e.g., through follow-up workshops, online forums, or mentorship) would provide continued learning and foster collaboration among teachers.

Appendix 1: Teacher Interview Guide

A Comprehensive Interview Guide for Addressing Challenges in Coding Curriculum Delivery for Middle School Teachers – Mathstronauts

Verbal Information and Consent:

[Interviewer to say]: Hello, my name is [introductions]. I'm a student volunteer with the McMaster Research shop – a program that works with local organizations to help them with research. I want to thank you for agreeing to participate in this interview. Our team is working on a project with Mathstronauts and working directly with Priska Handojo and Sehrish Zehra. The purpose of this project is to understand what middle school teachers might need help with in delivering the Math coding curriculum. I'll be asking you about your experiences with delivering coding instructions as part of the Ontario math curriculum, challenges you've faced (if any), as well as any suggestions you have for a coding training program. The information I gather today will be used to help Mathstronauts determine whether there's a need for a teacher training program for coding curriculum delivery and what the content of the training might be. The interview will take about 30 minutes.

Do you have questions about the project at this time?

Before we begin, I want to spend a few moments going over some basic ground rules for today:

- Your participation is voluntary. You can leave or stop participating in this interview at any moment you choose with no repercussions on yourself.
- You do not have to answer any questions you're not comfortable with.
- The information which we collect from these interviews will be anonymous. However. keep in mind that we can be identified through the stories we tell when deciding what to tell me.
- With your permission, this interview will be recorded to increase accuracy and to reduce the chance of misinterpreting what you say.
    - All audio files and transcripts will be securely stored in a Microsoft Teams folder that only the Research Team has access to.
    - We will also be taking notes throughout the discussion.
    - Only the research team will have access to transcripts from this discussion.
    - The tapes and transcripts will only be used for this project and will be destroyed once the report is complete.
- We ask that when using abbreviations or acronyms, you say the full name at least once to aid transcription.
- If at any point you feel tired or fatigued please let us know and we can take a short break.

Do you have any questions before we begin?

Do you give your consent to participate in this interview?

Introduction (Building Rapport)

Purpose: These questions serve as an icebreaker, helping the interviewee feel comfortable while providing context about their background and experience.

[Interviewer to say]:
Thank you for taking the time to speak with us today. To start, we'd love to hear about your background.

- Can you tell us a little about your role and experience in teaching coding? How long have you been teaching coding, and what grades do you typically work with?
- Have you received any formal training or professional development in coding instruction? If so, what did that training look like?

Topic 1: Understanding the Current Landscape (Experience/Behavior Questions)

Purpose: To gain insight into how teachers are currently delivering the coding curriculum and their experiences with implementation.

[Interviewer to say]:
Now, we'd like to learn more about how coding is currently being taught in your school.

- How is coding currently integrated into the way you teach math?
- What resources or tools do you typically use to teach coding? (E.g., specific platforms, lesson plans, external programs)
- How do students generally respond to coding lessons? Do they find them engaging, challenging, or frustrating?

Potential Follow-Up Questions:

- Can you describe a particularly successful coding lesson or activity you've facilitated?
- Have you noticed differences in student engagement between different coding topics or tools?

Topic 2: Identifying Key Challenges (Feeling and Opinion/Value Questions)

Purpose: To uncover the main obstacles teachers face when implementing the coding curriculum.

[Interviewer to say]:
We understand that teaching coding can come with unique challenges. We'd like to explore some of those difficulties in more detail.

- What are the biggest challenges you face when teaching coding? (E.g., lack of resources, student engagement, time constraints, curriculum alignment)
- Are there specific coding concepts that students struggle with the most? If so, which ones?
- Are there specific coding concepts that you struggle to teach? If so, which ones?
- What kind of support do you currently have for teaching coding? Do you feel it is sufficient? Why or why not?

Potential Follow-Up Questions:

- How do you currently address these challenges in your classroom?

Topic 3: Enhancing Coding Training for Teachers (Feeling and Opinion/Value Questions)

Purpose: To gather insights on what support or training would be most beneficial for teachers.

[Interviewer to say]:
We want to understand what resources or training would be most useful for educators like yourself.

- What additional training or resources would better support you in delivering the coding curriculum?
- What format would be most useful for a coding training program for teachers? (E.g., workshops, online courses, peer mentoring, self-paced materials)
- If you could design an ideal coding training program for teachers, what key elements would it include? What would be most helpful to include in terms of content?

Potential Follow-Up Questions:

- Are there particular teaching tools you wish you had access to?
- Are there specific coding languages or platforms you feel need more focus in teacher training?

Wrap-Up and Additional Feedback (Closing Questions)

Purpose: To give the interviewee a chance to offer any final thoughts or suggestions.

[Interviewer to say]: Before we finish, is there anything else you'd like to share about your experience with teaching coding?

[Interviewer to say]: Thank you so much for your time and thoughtful responses. We appreciate your participation and insights.

Appendix 2: Survey Questions

Mathstronauts Coding Traning Program Survey – Winter 2025

Dear Participant,

Thank you for your interest in our survey. We are volunteers from the McMaster University Research Shop, helping Mathstronauts to assess the challenges middle school teachers in Ontario face when delivering the coding curriculum. Your feedback is valuable and will be used by the Mathstronauts to assess the need for and design of a prospective coding training program for teachers.

The survey takes about **15 minutes to complete** and asks about your experiences with teaching coding, the supports and resources you access to deliver the coding curriculum, and how (if at all) a coding training could be designed to support you. It's completely **voluntary** and **anonymous**. No identifying information will be collected unless you indicate interest in participating in a pilot teacher training program, where you will provide your name and email. In this case, your name and email will be kept separate from your survey responses.

Participation will not affect your access to Mathstronauts programs. You may skip any questions you're uncomfortable answering.

For further information or questions about this project, please contact Research Shop Team Lead, **Jeanna Pillainayagam (pillainj@mcmaster.ca)**, or the Mathstronauts representative, **Priska Handojo (p.handojo@mathstronauts.ca).**

By consenting to participate in this survey, you:

- Understand that your participation in this survey is completely voluntary and that you can stop taking the survey at any time.
- Understand that your individual responses to this survey will be kept anonymous and will not be shared with anyone outside of the research team (including McMaster Research Shop volunteers and Mathstronauts staff).
- Understand that you have had the opportunity to ask any questions about this survey.

Do you consent to participating in this survey?

- Yes
- No

Demographics and Current Experience

1. Which grade(s) do you currently teach? (Select all that apply)
    a. 5
    b. 6
    c. 7
    d. 8

2. How long have you been a teacher?
    a. < 1 year
    b. 1-2 years
    c. 3-5 years
    d. 6-9 years
    e. 10+ years

3. How would you describe your current teaching role from the following options?
    a. Classroom (Generalist)
    b. Rotary/Itinerant
    c. Other (please specify)

4. What is your educational background? (Select all that apply)
    a. Mathematics
    b. Engineering
    c. Computer Science
    d. Other Sciences
    e. Humanities/Social Sciences
    f. Arts
    g. Other (please specify)

5. What training have you received in coding, if any? (Select all that apply)
    a. University courses
    b. School Board-provided professional development
    c. External certifications
    d. Self-taught
    e. None
    f. Other (please specify)

6. How long have you taught coding as a part of the Ontario math curriculum to middle school (Grades 5-8) students?
    a. < 1 year
    b. 1-2 years
    c. 3-5 years
    d. 5+ years

7. On a scale from 1 to 5 (1 = Not at all comfortable, 5 = Very comfortable), how comfortable are you with:
    a. Teaching mathematics in general
    b. Teaching coding concepts
    c. Integrating coding into math lessons
    d. Using coding tools (e.g., Scratch, micro:bit)
    e. Assessing students' coding skills

Current Supports and Resources

8. Which of the following resources have you used to support coding instruction? (Select all that apply)
    a. School Board Online Learning Platform (e.g., HUB)
    b. Ontario Association for Mathematics Education materials
    c. Code.org
    d. ScienceNorth Professional Learning Series
    e. Codingville.ca/Logics Academy resources
    f. Inksmith Training
    g. MathUp Classroom resources
    h. Canada Learning Code materials
    i. Teachers Pay Teachers resources
    j. Other (please specify)

9. For each resource you've used, please rate its effectiveness in helping you to implement Ontario's math curriculum expectations for coding on a scale from 1-5 (1 = Not very effective, 5 = Very effective).

    [Matrix question for each selected resource]

10. Feel free to elaborate on the question above. If you have indicated that any resources are effective, why? If any resources aren't particularly effective, why not? (Open-ended)

11. What are your biggest challenges in implementing the coding curriculum? Please rank the following options in order of most to least challenging.
    a. Lack of technical knowledge (e.g., in mathematics and/or coding)
    b. Lack of knowledge on how to integrate coding skills into math curriculum
    c. Limited time for preparation
    d. Inadequate resources for teaching mathematics and/or coding
    e. Limited/lack of access to appropriate technology
    f. Large class sizes
    g. Diverse student needs

12. Are there any other challenges you face in implementing the coding curriculum that were not listed in the previous question? (Open-ended)

Future Support and Program Design

13. Which coding topics do you need the most support with? (Select all that apply)
    a. Understanding basic coding logic (e.g., loops, conditional statements, variables and data types)
    b. Using coding to solve math problems
    c. Using coding platforms (e.g., Scratch, Python)
    d. Assessment methods
    e. How to teach coding to students (coding pedagogy)
    f. Other (please specify)

14. Feel free to elaborate on the question above. What do you feel you need most support with when it comes to teaching and/or coding within the current curriculum? (Open-ended)

15. What type of support would be most beneficial? Please rank the following options in order of most to least beneficial:
    a. Coding teacher training delivered by 3rd party professionals
    b. Coding teacher training delivered by school board
    c. Interactive coding software with written teacher guides
    d. Interactive coding software with tutorials/video guides
    e. Pre-developed curriculum, lesson plans, and resources ready for implementation.
    f. Are there any other types of support that would be beneficial that were not listed in the previous question? (Open-ended)

16. If a coding training program for teachers was available at a time and in a format that works for you, would you be interested in attending?
    a. Yes
    b. No
    c. Unsure

17. (If no to Q18) Feel free to elaborate on your answer to the question above. Why would you not be interested in attending a coding training program for teachers? (Open-ended)

18. (If unsure to Q18) Feel free to elaborate on your answer to the question above. Why are you unsure if you would attend a coding training program for teachers? What additional information might help you make a decision? (Open-ended)

19. Would you prefer a coding training program that is online or in person?
    a. Online
    b. In person
    c. Hybrid
    d. No preference

20. Would you prefer a coding training program that is delivered synchronously or asynchronously? *Synchronously means that the training program would be delivered live, either virtually or in person, with participants learning/doing activities together in real time. Asynchronously means that the activities of the training program could be done whenever the participant wants, at their own time and pace, such as an online training module.*
    a. Synchronously
    b. Asynchronously
    c. Both
    d. No preference

21. When would you be willing to attend a coding training program? (Select all that apply)
    a. During school hours (with supply teacher coverage)
    b. After school on a weekday
    c. Weekend
    d. Professional development days
    e. Summer break
    f. Other (please specify)

22. How much time would you be willing to dedicate to a coding training program in total?
    a. <2 hours total training time
    b. 2-4 hours total training time
    c. 5-8 hours total training time
    d. 8+ hours total training time

23. What would make participating in a coding training program most valuable for you? (Open-ended)

24. Overall, is there anything else you would like to add about your experience with delivering the coding curriculum to middle school students, and/or supports needed? (Open-ended)

Interest in Participating in Coding Training Program

25. Would you be interested in participating in a pilot program for teacher training in coding organized by Mathstronauts?
    a. Yes
    b. No
    c. Maybe / I need more information

26. (If yes OR Maybe/I need more information) If you would like to be contacted about participating in a future pilot coding training program for teachers, please enter your name and email address into the text boxes below. (Open answer)