

# VIDEOCONFERENCING TO CONNECT STUDENTS WITH SCIENCE & STEM EXPERTS

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**Technology Focus:** Videoconferencing allows you to connect your class live to a guest speaker, to learn from them, and ask them questions. This is enabled through online tools such as Virtual Researcher on Call, Google Hangouts and Skype.

## Description:

Videoconferencing allows students to connect to science professionals, engineers and other STEM experts and provides relevant real-world contexts and personal stories that help students engage with science curriculum. It can also address STSE expectations (Science, Technology, Society and the Environment) and Strand A expectations

[http://www.edu.gov.on.ca/eng/curriculum/secondary/science910\\_2008.pdf](http://www.edu.gov.on.ca/eng/curriculum/secondary/science910_2008.pdf)

([http://www.edu.gov.on.ca/eng/curriculum/secondary/science910\\_2008.pdf](http://www.edu.gov.on.ca/eng/curriculum/secondary/science910_2008.pdf)). (Ontario Science, 9 and 10, p. 7, 48-49).

## Level:

Teachers need to be able to register for an account, access web-based videoconferencing, and turn on the microphone and webcam on a laptop, but there are step-by-step videos and support to do this.

Through the Partners in Research program ***Virtual Researcher On-call (VROC)***, the project support person (Stacey Joyce at the time of writing) is readily available to support teachers in setting up and testing of the videoconferencing before going “live” with their class and an expert. They will also assist you in finding an appropriate guest speaker to match your curriculum goals.

Some teachers partner with their teacher-librarian to host the video-conferences in the library if they are less comfortable with the technology.

## Audience:

Any grade level teacher can benefit from video conferencing with science professionals. Connecting through programs like ***Virtual Researcher On Call (VROC)***, provide teachers access to an ExpertBook that lists which science topics and grade levels the science professionals are comfortable speaking with.

Providing students with opportunities to ‘see themselves’ in STEM experts helps develop a STEM/Science identity and provides real world examples for students to apply themselves to science studies. It will provide a deeper real-world connection to the science curriculum, and enhance learning outcomes in any science topic. Videoconferencing engages students in dialogue with science professionals that brings careers to life in a way that textbook career profiles or career research projects cannot.

## Tool Highlights:

**Virtual Researcher On Call (VROC)** (<http://www.pirweb.org/en/vroc/>) requires registration for a teacher account (free) to set up access to Expert book and a web-based video conferencing tool called Zoom. The benefit of VROC over other tools is the access to a database of 100s of Science and STEM experts from across Canada who have experience conferencing with classrooms. Experts are also listed by grade level so you know ahead if they are comfortable chatting with younger or older grades.

**Google Hangouts** (<https://hangouts.google.com/webchat/start>) requires a Google Account. Some school boards are set up for Google Suite for Education, and teachers have access to Hangouts through their board google account. Teachers can also use their gmail. **Exploring By The Seat of Your Pants** (<http://www.exploringbytheseat.com/>) coordinates Google Hangouts with scientists and explorers from throughout the world, and offers teachers ‘spots’ in their Live Google Hangouts. More info on EBTSOYP is available in the resources section below.

**Skype** (<https://education.microsoft.com/skype-in-the-classroom/overview>) requires a login. Some school boards have registered for Skype for business but teachers can use their own login as well. Skype in the classroom provides resources to support classroom use of video conferencing, as well as a catalogue of experts in different fields.

### How to Use Video Conferencing:

Implementing Video conferencing in your classroom has many entry points.

**Scheduled Webinars:** A simple entry point is to connect with live webinars (<https://youtu.be/3zGaxN1pOS4>) offered at scheduled times. These are available on a variety of science topics and grade levels through the Partners in Research PIR Live Event (<http://www.pirweb.org/en/pir-live-event/>) program. These webinars “feature a Q&A with a different guest expert and/or a virtual tour of a research facility” (<http://www.pirweb.org/en/pir-live-event/> (<http://www.pirweb.org/en/pir-live-event/>)).

**Guest Speaker:** Another entry point is to book your own video conference with an expert. This provides a more intimate conversation with your class, and allows the talk to be better tailored to your curricular focus and age group. Virtual Researcher On Call coordinates an Expertbook of 100’s of STEM professionals from across Canada.

In Virtual Researcher On Call (<http://www.pirweb.org/en/vroc/>), you find a professional by searching ExpertBook (<http://www.vroc.ca/expertbook/>). For example, when studying Gr 4 Habitats, Gr 6 Biodiversity, Gr 7 or 9 Ecosystems, I can search “Ecology” and set the grade level and language (English or French). I would find a list of researchers that match my criteria. I can read their profile to see what areas of research might be relevant for my class, and email the researcher to inquire about possible video conference times and needs.

**Connect to Other Classes:** Partnering with other classes through video conferencing to share student solutions to STSE issues is a powerful way to engage students as global citizens. Students from classrooms across Ontario connected to share their climate change solutions in “Climate Change Where I Live” coordinated by GreenLearning Canada. They chatted by video conference, presenting their solutions to each other and interacting via social media.

### Examples of Videoconferencing:

- Interview a Scientist to learn about their career and research. Teachers in a #GirlsInSTEM workshop connected via VROC with University of Toronto Engineer Marianne Hatzopolou to discuss her research into transportation and climate change. She shed light on the issues girls face in pursuing engineering, and how seeing female role models could be for girls.
- Learn about current research on a topic you’re studying (e.g. speak with a climate scientist about recent research).
- Take a virtual field trip through a scientist’s lab. For example, through Skype in the Classroom (<https://education.microsoft.com/skype-in-the-classroom/virtual-field-trips>) Virtual Field Trips, teachers can register to book a virtual field trip for their students to explore a remote lab or site they wouldn’t otherwise be able to visit.
- In this example here, Brandon Zoras has used Facetime to connect with an Electroplating facility to learn more about electrochemistry. <https://youtu.be/CmxZzR8exG4> (<https://youtu.be/CmxZzR8exG4>).

### Ministry Expectations:

- Connecting with scientists and other STEAM professionals addresses Strand A in 9-12 Science, A.2: “identify and describe a variety of careers related to the fields of science under study, and identify science professionals.”
- For Grades 1-8 it supports scientific and technological literacy as outlined in Ontario Science Curriculum 1-8, pg. 4 “An important part of scientific and technological literacy is an understanding of the nature of science, which includes an understanding of the following: what scientists, engineers, and technologists do as individuals and as a community”.
- Connecting students to scientists from diverse backgrounds also supports anti-discrimination education. “Diverse groups of people involved in scientific and technological activities and careers should be prominently displayed” (Ontario Science Curriculum 1-8, pg. 37). Canadians, who have made contributions to those fields”.

### **Prior Skill Sets:**

The quality of your guest speaker video conference will be largely impacted by the preparation you give your students. Prior to connecting the class to a science expert via web-conferencing, spend time brainstorming questions for the expert, and organizing roles for students to maximize participation. (reference from <http://www.learnnc.org/lp/> (<http://www.learnnc.org/lp/pages/6559>) pages (<http://www.learnnc.org/lp/pages/6559>)/6559 (<http://www.learnnc.org/lp/pages/6559>))

### **Materials and Equipment:**

- Data Projector: to display the speaker to the entire class.
- Laptop with webcam and built-in microphone: To display the class to the speaker and to send audio from class questions. Alternately, a webcam and microphone could be added to a desktop computer.
- Speakers: to broadcast the speaker's audio.
- Stable internet connection, preferably ethernet cable (vs. WIFI). Video conferencing requires more bandwidth than a youtube video for example, and if possible, connecting to a hard ethernet line will help guarantee a steady signal. WIFI will work in most cases, but ethernet is more reliable.
- If possible, using a second laptop or desktop computer connected to the same video call will allow students to come up and take turns asking a question on the side, while leaving the main computer to project the whole class to the speaker and to show them to the class on the screen.
- For a detailed teacher checklist, view this resource created by Will Ferriter [http://digitallyspeaking.pbworks.com/f/Checklist\\_SkypePreparation.pdf](http://digitallyspeaking.pbworks.com/f/Checklist_SkypePreparation.pdf) ([http://digitallyspeaking.pbworks.com/f/Checklist\\_SkypePreparation.pdf](http://digitallyspeaking.pbworks.com/f/Checklist_SkypePreparation.pdf)).

### **Instructional Strategies:**

1. Learning Goals
  - Develop learning goals for the video conference and make these explicit to the students. This will aid in post-conference reflection and consolidation.
2. Activate Prior Knowledge
  - Before the conference, invite students to brainstorm what they already know about the topics the guest speaker will speak on (e.g. what do you think might be the most difficult/interesting/boring about this career?). A [graffiti](http://www.eworkshop.on.ca/edu/pdf/Mod36_coop_graffiti.pdf) ([http://www.eworkshop.on.ca/edu/pdf/Mod36\\_coop\\_graffiti.pdf](http://www.eworkshop.on.ca/edu/pdf/Mod36_coop_graffiti.pdf)) activity could be done in groups, or brainstorm ideas scribed on the board. See this sample checklist for students to record their thinking before and during a conference [http://digitallyspeaking.pbworks.com/f/Handout\\_TrackingYourVideoconference.pdf](http://digitallyspeaking.pbworks.com/f/Handout_TrackingYourVideoconference.pdf) ([http://digitallyspeaking.pbworks.com/f/Handout\\_TrackingYourVideoconference.pdf](http://digitallyspeaking.pbworks.com/f/Handout_TrackingYourVideoconference.pdf)).
3. Brainstorm Questions
  - **Before** the conference, brainstorm questions for the science professional ahead of time. If possible, send these to the speaker via email beforehand.
4. Assign Roles
  - Assign roles for students to maximize engagement. Some roles include greeter, questioner, runner, reporter, technician, Suggestions for roles can be adapted from this "[Skype Jobs](https://www.scholastic.com/content/dam/teachers/blogs/genia-connell/migrated-files/skype_jobs.pdf)" card from *Geography Skills Sore with Mystery Skype*, Genia Connell, Scholastic.
  - Provide time for individual reflection and/or small group discussion directly after the talk.
5. Document Learning - Quick Write or Graffiti
  - **During** the conference, students should record key ideas. They might do this through a template like the one linked above, in a [quick write & draw](http://www.readwritethink.org/files/resources/lesson_images/lesson1053/quick_write_draw.pdf) ([http://www.readwritethink.org/files/resources/lesson\\_images/lesson1053/quick\\_write\\_draw.pdf](http://www.readwritethink.org/files/resources/lesson_images/lesson1053/quick_write_draw.pdf)).
6. Dialogue - Turn & Talk
  - Depending on the time the speaker can provide, incorporating a short period for the speaker to ask the group a question and allow pairs to "[turn and talk](http://www.theteachertoolkit.com/index.php/tool/turn-and-talk)" (<http://www.theteachertoolkit.com/index.php/tool/turn-and-talk>) would

provide more learning opportunity for student voice. It would also allow students to reframe if there was something the speaker said that they wanted to ask more about, or didn't understand.

#### 7. Reflect on Criteria & Goals

- **After** the conference, ask students to reflect on the learning outcomes of the video conference. Scaffold this by starting with a small group or pair conversation with guiding questions. Here is a sample reflection checklist from Will Ferreter at Digitally Speaking  
[http://digitallyspeaking.pbworks.com/f/Handout\\_ReflectingDigitalConversations.pdf](http://digitallyspeaking.pbworks.com/f/Handout_ReflectingDigitalConversations.pdf)  
[http://digitallyspeaking.pbworks.com/f/Handout\\_ReflectingDigitalConversations.pdf](http://digitallyspeaking.pbworks.com/f/Handout_ReflectingDigitalConversations.pdf)

#### Safety:

- Register and connect with video conferences using your school board account wherever possible.
- Check with your board policies on guest speakers. Some boards now require the same procedure for booking guest speakers with virtual guest speakers.
- Check your board requirements for media release when connecting students via video conference

#### Teaching Suggestions/Hints:

- If you're new to video conferences, VROC provides a great tips page: <http://www.pirweb.org/en/support/#tips> (<http://www.pirweb.org/en/support/#tips>).
- Group video conferencing can be arranged with multiple classes if you're booking time with a prominent researcher.

#### Assessment Strategy:

##### Assessment AS Learning

Using the Learning Goals developed as a class, success criteria for a successful video conference can be established as a class prior to the conference. For example:

##### Learning Goal (Strand A, 9-12 Science)

- I can identify and describe a career related to the field of science we're studying
- I can identify the main duties of the science professional

The assessment checklist here ([https://drive.google.com/open?id=15nD\\_0Kj68ztd1nYBrOirUwgimw7aRe-y](https://drive.google.com/open?id=15nD_0Kj68ztd1nYBrOirUwgimw7aRe-y)) provides some examples. After the video-conference, students can not only reflect on the Learning Goals of the conference as they relate to Curriculum expectations, but also in relation to Learning Skills for communication and collaboration.

Depending on the time the speaker can provide, incorporating a short period for the speaker to ask the group a question, and allow pairs to "turn and talk" (<http://www.theteachertoolkit.com/index.php/tool/turn-and-talk>)." would provide more learning opportunity for student voice. It would also allow students to reframe if there was something the speaker said that they wanted to ask more about, or didn't understand.

##### Assessment FOR Learning

Incorporating Traffic Light Cards would allow the speaker to get visual feedback on how easily the students are understanding the talk, or to get answers from them on discussion questions. Students can self-asses the criteria for the conference with this self-assessment checklist ([https://docs.google.com/document/d/1XLFGMISBmv71JANK\\_yyyxv6rFj1TZei7NVqbPfbJrAI/edit?usp=sharing](https://docs.google.com/document/d/1XLFGMISBmv71JANK_yyyxv6rFj1TZei7NVqbPfbJrAI/edit?usp=sharing)). Here are sample **Success Criteria** connected to Achievement Chart, Thinking & Inquiry, Communication, Application.

- I formulated question(s) for the speaker and predicted what the speaker's responses might be (T/I)
- I communicated my question effectively to the speaker, and recorded my reflections on the speaker's key ideas with effectiveness
- I made connections between the science we're studying, and the real-world applications to society, technology and/or the environment that the speaker shared

### **Next Steps/Extensions/Accommodations/Other Topics for this Tech Tool:**

Video-conferencing can be incorporated into any curriculum expectation. Teachers have used videoconferencing to connect with authors for their Language/English program, with researchers studying applications of Math concepts, and VROC includes experts that span Math and Geography as well as science.

You can also connect your class with other classes, to allow students from different cities, provinces or countries to connect and share diverse global perspectives on the topics they're studying.


### **Additional Resources:**

- Virtual Researcher On Call
  - Partners in Research Youtube Channel - PIR Live webinar recordings to watch with your class [https://www.youtube.com/channel/UCNY\\_X-DSaxfdGryv1fICxTQ](https://www.youtube.com/channel/UCNY_X-DSaxfdGryv1fICxTQ) ([https://www.youtube.com/channel/UCNY\\_X-DSaxfdGryv1fICxTQ](https://www.youtube.com/channel/UCNY_X-DSaxfdGryv1fICxTQ)).
  - Support <http://www.vroc.ca/vroc/en/support/> (<http://www.vroc.ca/vroc/en/support/>). Set-up VROC account, set up for Zoom, tips for ExpertBook, and tips for hosting video conferences (with how-to videos)
  - Teacher video: Brandon Zoras speaking about how he used Virtual Researcher On Call <https://youtu.be/PLIRNAH2Qeo> (<https://youtu.be/PLIRNAH2Qeo>).
  - Overview Video: Why to Use VROC: <https://youtu.be/3KUYkgXnbxw> (<https://youtu.be/3KUYkgXnbxw>).
- Grabowski, J. (2015). Exploring By The Seat of Your Pants. Retrieved August 31, 2017, from <http://www.exploringbytheseat.com/> (<http://www.exploringbytheseat.com/>). Developed by Joe Grabowski, connects classrooms with world explorers to learn about their research and explorations. Classes can register to ask the explorers questions, or to watch the session. Topics in EBTSOYP connect to science, geography, history and more
- Google Hangouts for Educators resource sites Tips from educators about how to organize a video conference through hangouts, and how to engage your class with a hangout. <https://sites.google.com/a/lsr7.net/hangoutsforteachers/additional-resources> (<https://sites.google.com/a/lsr7.net/hangoutsforteachers/additional-resources>).
- Google Hangouts for Educators Google+ Group <https://plus.google.com/communities/109532576382533836103> (<https://plus.google.com/communities/109532576382533836103>). Educator community where teachers ask each other questions and share ideas, as well as search for particular classes or experts to connect with.
- Skype in the Classroom <https://education.microsoft.com/skype-in-the-classroom/overview> (<https://education.microsoft.com/skype-in-the-classroom/overview>).
  - Overview video of Skype in the Classroom <https://youtu.be/zni56lVckb0> (<https://youtu.be/zni56lVckb0>).
  - Connect with science professionals from around the world <https://education.microsoft.com/skype-in-the-classroom/find-guest-speakers> (<https://education.microsoft.com/skype-in-the-classroom/find-guest-speakers>).
  - Some speakers have pre-organized lessons to offer educators that you can browse
  - Virtual Field trips into Science Labs <https://education.microsoft.com/Story/VirtualFieldTrip?token=Xis9w> (<https://education.microsoft.com/Story/VirtualFieldTrip?token=Xis9w>).

### **Tips for Videoconferencing:**

- Ferriter, Bill, Digitally Speaking: "Videoconferencing" Retrieved Mar 17, 2018 from <http://digitallyspeaking.pbworks.com/w/page/17791583/Videoconferencing> (<http://digitallyspeaking.pbworks.com/w/page/17791583/Videoconferencing>). Thorough resource outlining [teacher steps](http://digitallyspeaking.pbworks.com/f/Checklist_SkypePreparation.pdf) ([http://digitallyspeaking.pbworks.com/f/Checklist\\_SkypePreparation.pdf](http://digitallyspeaking.pbworks.com/f/Checklist_SkypePreparation.pdf)) to prepare for videoconference, and student checklists.

- Mason, S. and Davis, M.: “A Teacher’s Guide to VideoConferencing” retrieved Sept. 10, 2017 from [https://www.nps.gov/lecl/learn/news/upload/teacher\\_guide\\_videoconferencing.pdf](https://www.nps.gov/lecl/learn/news/upload/teacher_guide_videoconferencing.pdf) ([https://www.nps.gov/lecl/learn/news/upload/teacher\\_guide\\_videoconferencing.pdf](https://www.nps.gov/lecl/learn/news/upload/teacher_guide_videoconferencing.pdf)).
- Article on the importance of exploring science beyond classroom walls, and the positive impact it can have on students <https://scienmag.com/schools-need-to-encourage-broader-participation-in-science-learning-outside-of-the-classroom/> (<https://scienmag.com/schools-need-to-encourage-broader-participation-in-science-learning-outside-of-the-classroom/>).



  
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## RESOURCES

-  Videoconferencing - Overview Video (<https://docs.google.com/presentation/d/1yVncCiPKwJHbuGCqikCOMHCnBc4boe0r88LbwjSqLnc/edit>)
-  Quick - Write-Draw (<https://docs.google.com/document/d/13sLlNhjiOrsLVXweF2mvNrJRhls8WxhQeW5HshCM6fg/edit>)
-  Video Self-Assessment ([https://docs.google.com/document/d/1XLFGMlSBmv71JANK\\_yyyxv6rFj1TZeI7NVqbPfbJrAl/edit](https://docs.google.com/document/d/1XLFGMlSBmv71JANK_yyyxv6rFj1TZeI7NVqbPfbJrAl/edit))
-  STAO Technology Enabled Learning (TEL) Project - Videoconferencing ([https://docs.google.com/document/d/1AutkMh\\_X-jas5XSbCfcCztnMkC-peLyF/edit](https://docs.google.com/document/d/1AutkMh_X-jas5XSbCfcCztnMkC-peLyF/edit))




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