



INNOVATION CHALLENGE

Program Overview: The Innovation Challenge (IC) is a unique and competitive program open to all undergraduate Concordia students. It is designed to foster innovation, creativity, and collaboration as students tackle a real-world contemporary question of importance to neuroscience and work together to develop a novel hypothesis and research proposal toward finding new solutions.

As a participant of the Innovation Challenge, you will gain invaluable research experience, sharpen your problem-solving skills, harness your creativity, and further develop your ability to work as a team. The program begins in October and finishes in March, giving you the flexibility to develop a schedule that works best for your team.

Who is eligible? Any undergraduate Concordia student – any major, any year! We encourage you to build teams that leverage complementary strengths and experiences so you can develop your research proposal with the advantage of multiple viewpoints, perspectives, and ideas.

What are the benefits of accepting the challenge?

- 💡 Demonstrate your ability to carry out research in a small team setting with significant independence.
- 💡 Work as a diverse team on a real-world research question.
- 💡 Build your resume or CV with a distinctive research experience that you can boast about when applying to jobs, grad schools, or health professions programs.
- 💡 Compete to receive \$1000 as a team at the end of the competition.
- 💡 Enjoy a unique creative research endeavor!

Which resources may be used? Participants will be driven by their own motivation to complete the challenge. Teams may use any resources they wish as they conduct their research, including faculty/staff and other subject matter experts, textbooks, scholarly journals, etc.

Do I need to work in a Team? Yes! Teams must consist of at least two students with a maximum of five students per team. There is no limit to the number of teams that can participate. Should someone from your team decide to drop out, you may replace them with another team member. This is only necessary, however, if a team of two becomes one person.

Expectations and Logistics:

- 💡 Students will register in teams of two, three, four, or five students.
- 💡 There is no limit to how many teams can register.
- 💡 Students must be undergraduate Concordia students (part-time or full-time).
- 💡 Each team will select one of the three questions provided.
- 💡 Multiple teams may select the same question.
- 💡 Teams will:
 - conduct a review of the scholarly literature relevant to the research question
 - develop a novel testable hypothesis that could be used to answer the question they choose
 - write a research proposal that describes the problem, states their hypothesis, and details their research plan for testing their hypothesis (teams will not be expected to carry out the research plan)
 - properly cite all sources consulted that support their research.
 - give an oral presentation to neuroscience faculty and any invited guests, presenting their research proposal (only if selected at the last checkpoint)
- 💡 There are four checkpoints for the program (see timeline) where you will receive feedback and direction on your progress. Passing each checkpoint allows teams to continue working toward the next checkpoint.
- 💡 After the fourth checkpoint, a maximum of three teams will be invited to give an oral presentation of their research proposal during Brain Awareness Week in mid-March. A winner will be chosen from the presenting teams. If no teams pass the fourth checkpoint, the competition will end without a winner.
- 💡 The winning team will receive \$1000 (shared amongst team members). This prize is made possible by the generosity of the Howard, Sonia, LaVern, and Lois Nornes families.
- 💡 If fewer than three teams register, we reserve the right to cancel the challenge.

Timeline

3 October, 9:50 – 10:20am, ISC 201: Kick-off. Q&A meeting and team registration opens.

7 November: First checkpoint. Team registration deadline.

Each team must provide:

- 1) names and email addresses of each team member
- 2) the question the team has selected
- 3) an annotated list of references the team has found so far
- 4) a paragraph outlining the team's understanding, thus far, of the selected question

23 January: Second checkpoint.

See Checkpoint 2 template document in Teams. Each team must provide:

- 1) a working hypothesis
- 2) a working reference list (do not need annotations)
- 3) a draft of their research proposal (5 - 6 pages, not including references)

20 February: Third checkpoint

Each team must provide:

- 1) final hypothesis
- 2) completed reference list (do not need annotations)
- 3) final research proposal (5 - 6 pages, not including references)

4 March: Fourth checkpoint

Up to three teams will be invited to present their hypothesis and research proposal in the final competition during Brain Awareness Week.

11-15 March (Brain Awareness Week): Final competition

Invited teams will present their hypotheses and research proposals to an audience of neuroscience faculty, Concordia students, and invited guests.

NOTE: A link to register and information about how to submit materials at each checkpoint will be covered in the kick-off meeting and subsequent checkpoints.

Questions: (choose one)

1. The gut has been referred to as our second brain, and the way the gut and brain communicate continues to be an area of intense study. Changes in the gut can have a variety of health effects, including on neural, hormonal, and immunological pathways. By selecting this topic, your team will be developing a testable hypothesis and research proposal to help answer the question:

What is the mechanistic link between the gut microbiome, neuroinflammation, and the development or progression of neurodegenerative disease?

Below is a paper to get your team started:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6813195/>

2. Spaceflight Associated Neuro-Ocular Syndrome (SANS) is a condition experienced by astronauts during and/or after long-duration spaceflights. Symptoms of SANS include swelling of the optic disc and changes to eye shape that affect visual acuity. Creating solutions for astronauts experiencing SANS may lead to advancements benefiting humans on Earth. By selecting this topic, your team will be developing a testable hypothesis and research proposal to help answer the question:

Describe the relationship between microgravity and Spaceflight Associated Neuro-Ocular Syndrome (SANS) and propose a solution for restoring visual acuity in people experiencing SANS.

Below is a paper to get your team started:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7005826/pdf/41526_2020_Article_97.pdf

3. Generative AI refers to a subset of artificial intelligence models and methods capable of generating new content (e.g. images, music, text). AI models learn patterns from a set of training data and then produce novel content that resembles the training data but is inherently original. By selecting this topic, your team will be developing a testable hypothesis and research proposal to help answer the question:

With ChatGPT and other generative AI tools being developed, how can AI technology contribute to the human condition? See examples below:

- a. How can AI contribute to enhancing human creativity?
- b. How can AI assist with the development and/or advancement of neuroprosthetics?
- c. How can the human visual system distinguish AI-generated images/content from natural images/content?

Below is a paper to get your team started:

<https://dergipark.org.tr/en/download/article-file/3307311>