

Interdisciplinary Studies (IDC4U)
Brock University Science Mentorship Program
Overview

The **Brock University Science Mentorship Program** was initiated by Dr. Joseph F. Engemann (Faculty of Education) in 1994. This program offers senior high school science students, who are highly interested in science, demonstrate high academic precocity, and are capable of working independently, with an opportunity to pursue a real-life scientific investigation under the supervision of a member of the Faculty of Mathematics and Science at Brock University. Each year, schools submit a list of students who they think would benefit from the program. These students are then matched with Mentors from the disciplines of Biology, Health Science, Physical Education, Chemistry, Physics, Earth Science, Psychology, and Computer Science. This labour intensive commitment by the faculty is really what makes the program so effective.

Mentorships take place during the first semester of the secondary school year. Students are matched with Mentors who are conducting research in areas of potential student interest. The primary aim of this program, therefore, is to encourage bright students to consider the pursuit of a career in science through close contact with a professional scientist as a Mentor.

Recruitment for the program is facilitated by Science and Co-operative Education Teachers, within each school. They are responsible for nominating potential student candidates and providing ongoing communication with students and their Mentors. These teachers periodically meet with the Mentor and maintain a continual dialogue with the student.

Each student, with his/her teacher, will initially meet a mentoring professor in May or June in order to:

- Discuss and select possible research question(s) for investigation;
- Establish Mentor-designated expectations for student acquisition of background knowledge and laboratory skills prerequisite to the investigation;
- Recommend background reading.

Early in September, the Mentorship students:

- Receive WHIMIS training and certification
- Orientation tour of the Brock Library. Students are also given library borrowing privileges congruent with those received by university undergraduate students.
- Search skill Seminar by the Brock Library professional. There is also a possibility for the Mentorship Students to enrol in a first year course that would assist their project.

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Credit

Students successfully completing the Brock Science Mentorship and Co-operative Education Programs will be granted three credits. Upon successful completion of the IDC4U course Mentorship students will be granted one credit. The IDC4U course will help students develop and consolidate the skills required to solve problems, make decisions, and present findings beyond the scope of a single subject or discipline. Students will apply the principles and processes of inquiry and research to analyze historical innovations and exemplary research; and to investigate real-life situations and career opportunities in interdisciplinary endeavours. They will also assess their own cognitive and affective strategies, apply general skills in both familiar and new contexts, create innovative products, and communicate new knowledge.

Cooperative Education Credits

The remaining two credits will be earned through the co-operative education curriculum. The co-operative education credits will be linked to an in-school university level course. The in-school course will be related to the associated discipline of their science research project. Additional information may be obtained through the District School Board of Niagara website: <http://www.dsbni.edu.on.ca/CoopEdu>

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In October, Mentorship Students outline their projects at the Mentorship Orientation Night. At this time, each student gives a two minute outline of what their project will involve. All Faculty, parents, teachers and school administrators are invited.

During the semester within which the Mentorship occurs, each student is expected to devote at least two hours per day to:

- Carry out their investigation and data analysis.
- Complete a Scientific Journal every two weeks.
- Maintain a dated lab notebook and log which is checked on a regular basis by the supervising teacher.
- Complete a written report and present the project at the Mentorship Symposium held in February.
- Enter the above project into the Niagara Regional Science and Engineering Fair. Success at this fair may provide an opportunity for these students to progress to participation in the Canada Wide Fair or the International Science and Engineering Fair.

At the Mentorship Symposium (usually in Reading Week), students present their research findings to an audience which will include all current Mentorship Students, potential students for the upcoming year, faculty, parents and teachers. Each Mentorship Student is given a 30 minute time limit, which allows for a formal presentation and a question-and-answer period. The Symposium mirrors the format used at professional science conferences.

Credit

Students successfully completing the Brock Science Mentorship and Co-operative Education Programs will be granted three credits. As explained below upon successful completion of the IDC4U course the student will be granted one credit. The IDC4U course will help students develop and consolidate the skills required for and knowledge of different subjects and disciplines to solve problems, make decisions, and present findings beyond the scope of a single subject or discipline. Students will apply the principles and processes of inquiry and research to effectively use a range of print, electronic, and mass media resources; to analyze historical innovations and exemplary research; and to investigate real-life situations and career opportunities in interdisciplinary endeavours. They will also assess their own cognitive and affective strategies, apply general skills in both familiar and new contexts, create innovative products, and communicate new knowledge.

The remaining two credits will be earned through the co-operative education curriculum. The co-operative education credits will be linked to an in-school university level course. The in-school course will be related to the associated discipline of their science research project. Additional information may be obtained through the District School Board of Niagara website:

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Evaluation Criteria

- Professor/ Teacher Evaluation 25%
- Symposium Presentation and Laboratory Report 50%
- Niagara Regional Science and Engineering Fair participation 20%
- Maintenance of a Laboratory Book 5%

*The written lab report will follow the same format as a journal to which the professor would submit his/her work

1. Professor/ Teacher Evaluation

The Co-operative Education Instructor and Professor will evaluate the mentorship student using the attached Interdisciplinary Studies Achievement Chart.

2. Symposium Presentation

The Mentorship student will be evaluated by the Co-operative Education Instructor using the attached Brock Mentorship Symposium Presentation Rubric.

3. Niagara Regional Science and Engineering Fair

Students will use the Niagara Regional Science and Engineering website www.niagarasciencefair.org to complete an Application Form. The website will describe the Application Procedure, Timetable of Events, Judges' Scoring Sheet, Project Categories, Display Dimensions etc.

4. Maintenance of a Laboratory Book

The Lab Book should contain an in depth daily log of work accomplished including such areas as research, experimentation, equipment, elapsed time, unusual circumstances/conditions, and assistance obtained to complete task.

Achievement Chart - Interdisciplinary Studies
Category: Communication

STUDENT _____

Categories	Level 1	Level 2	Level 3	Level 4
Communication of information and ideas	communication information and ideas with limited clarity	communication information and ideas with some clarity	communication information and ideas with considerable clarity	communication information and ideas with a high degree of effectiveness
Collaboration (e.g., interactive listening, team building, cooperative planning, leadership)	collaborates with others with limited effectiveness	collaborates with other with some effectiveness	collaborates with other with considerable effectiveness	collaborates with other with a high degree of effectiveness
Use of language, symbol, media, and technologies	uses language, symbol, media, and technologies with limited accuracy and effectiveness	uses language, symbol, media, and technologies with some accuracy and effectiveness	uses language, symbol, media, and technologies with considerable accuracy and effectiveness	uses language, symbol, media, and technologies with a high degree of accuracy and effectiveness
Communication for different audiences and purpose in real life situations across the disciplines	communication with a limited awareness of audience and purpose	communication with some awareness of audience and purpose	communication with considerable awareness of audience and purpose	communication with a high degree of awareness of audience and purpose
Use of various communication forms and technologies	demonstrates limited command of various forms and technologies	demonstrates some command of various forms and technologies	demonstrates considerable command of various forms and technologies	demonstrate extensive command of various forms and technologies

Achievement Chart - Interdisciplinary Studies
Category: Application

STUDENT _____

Categories	Level 1	Level 2	Level 3	Level 4
Application of ideas and skills in familiar contexts	applies ideas and skills in familiar contexts with limited effectiveness	applies ideas and skills in familiar contexts with some effectiveness	applies ideas and skills in familiar contexts with considerable effectiveness	applies ideas and skills in familiar contexts with a high degree of effectiveness
Application of ideas and skills in new context	applies ideas and skills in new contexts with limited effectiveness	applies ideas and skills in new context with some effectiveness	applies ideas and skills in new context with considerable effectiveness	applies ideas and skills in new contexts with a high degree of effectiveness
Application of process and technologies (e.g., the research process, multimedia and telecommunications technologies)	applies processes and technologies with limited effectiveness and creativity	applies processes and technologies with some effectiveness and creativity	applies processes and technologies with considerable effectiveness and creativity	applies processes and technologies with a high degree of effectiveness and creativity
Provision of explanations that incorporate new understandings	provides explanations that incorporate a few new personal understandings	provides explanations that incorporate some new personal understandings	provides explanations that incorporate a considerable number of new personal understandings	provides explanations that incorporate a significant number of new personal understandings
Finding connections (e.g., among disciplines, between a discipline and the world outside the school)	finds connections with limited success	finds connections with some success	finds connections with considerable success	finds connections with a high degree of success

Achievement Chart - Interdisciplinary Studies
Category: Knowledge/Understanding

STUDENT _____

Categories	Level 1	Level 2	Level 3	Level 4
Knowledge of facts and ideas	demonstrates limited knowledge of relevant facts and ideas	demonstrates some knowledge of relevant facts and ideas	demonstrates considerable knowledge of relevant facts and ideas	demonstrates thorough knowledge of relevant facts and ideas
Understanding of concepts (e.g., connected-ness, interdependence, multiple perspectives)	demonstrates limited understanding of required concepts	demonstrates some understanding of required concepts	demonstrates considerable understanding of required concepts	demonstrates thorough and insightful understanding of required concepts
Understanding of relationships between concepts and/ or disciplines	demonstrates limited understanding of relationship between concepts and/ or disciplines	demonstrates some understanding of relationship between concept and/ or disciplines	demonstrates considerable understanding of relationship between concepts and/ or disciplines	demonstrates thorough understanding of relationship between concepts and/ or disciplines

Achievement Chart - Interdisciplinary Studies
Category: Thinking/ Inquiry

STUDENT _____

Categories	Level 1	Level 2	Level 3	Level 4
Use of thinking skills that go beyond the scope of a single discipline (e.g., prioritizing, solving problems, making analogies, predicting, inferring, reasoning)	uses a limited range of thinking skills	uses a moderate range of thinking skills	uses a considerable range of thinking skills	uses a wide range of thinking skills confidently and effectively
Use of critical-thinking skills (e.g., problem solving from multiple perspectives, decision making that uses a system approach)	uses critical-thinking skills with limited insight and effectiveness	uses critical-thinking skills with some insight and effectiveness	uses critical-thinking skills with considerable insight and effectiveness	uses critical-thinking skills with a high degree of insight and effectiveness
Application of an inquiry/ research process (e.g., formulating questions, planning, selecting resources and technologies, analysing and evaluating information) to understanding interdisciplinary relationship	applies a few of the required skills and strategies of an inquiry/ research process	applies some of the required skills and strategies of an inquiry/ research process	applies most of the required skills and strategies of an inquiry/ research process	applies all or almost all of the required skills and strategies of an inquiry/ research process
Application of creative thinking skills (e.g., generating models of thinking and synthesis)	applies creative skills with limited effectiveness and innovation	applies creative skills with some effectiveness and innovation	applies creative skills with considerable effectiveness and innovation	applies creative skills with a high degree of effectiveness and innovation

Brock Mentorship Symposium Presentation and Laboratory Report Evaluation

STUDENT _____

Categories	Level 1	Level 2	Level 3	Level 4
Topic Introduction and Background Information	Information presented was limited.	Information presented was limited but focussed on topic	Information presented was effective and topic focussed.	Exceptional information presented pertinent to understanding of topic.
Laboratory Research Skills	Little evidence of laboratory skill demonstrated or presented	Some evidence of laboratory skill and protocol. demonstrated	Demonstrates knowledge of laboratory protocol and practice.	Mastered relevant laboratory skill and protocol to complete project.
Problem Solving	Little evidence of problem solving	Some evidence of problem solving demonstrated	Recognized problem and attempted to solve.	Recognized problem and designed method to solve.
Evidence of Research and Knowledge of Topic	Little evidence of research and knowledge of topic	Some research and knowledge evident by depth of presentation.	Good research and knowledge evident by answers to question and discussion.	Exceptional research and knowledge exhibited in all aspects of topic.
Presentation of Assignment	Little evidence of preparation and concern for timing. No discussion.	Organized and adequately presented. Limited discussion.	Good presentation and evidence of organization. Fair discussion.	Exceptionally organized and presented. Good discussion.
Comments:				

Mentorship Program Appointment Form

Brock University recognizes the value of a mentorship program involving senior high school students volunteering as protégés in a research study or investigation in a specific discipline within the Faculty of Mathematics and Science, Applied Health Sciences and Social Sciences under the supervision and guidance of a faculty member or permanent staff member.

Involvement in the Mentorship Program is intended to provide a rewarding experience for all participants – protégé and mentor. Science laboratories, field research, and other research activities often do involve risk to the participants. Brock University is committed to ensuring that the research of its members is carried out in a safe and responsible manner. Hence, while Brock encourages protégés to engage in the Mentorship Program it does so under conditions intended to minimize the risk to the health, safety and security of all individuals and to identify clearly the responsibilities of University, University employees and their protégés.

The following are conditions under which individuals may participate as protégés within this Program. The Department Chair and the Dean of a Faculty must authorize in writing the protégé to take part in a specific Faculty activity. This authorization will only be provided after the conditions described herein are satisfied. The duration of the authorization will be specified but will not be greater than twelve months.

Each protégé must be supervised by a Mentor who is a Brock University faculty member or full time staff member. Protégés are not permitted to access laboratories or to participate in field research work without the supervision of the faculty Mentor or another, appropriately qualified and responsible individual. The Mentor must agree to accept the health and safety responsibilities of the supervisor detailed in Appendix 2.

Each protégé must participate in all required WHMIS; environment, health and safety training; and training in the use of any apparatus prior to starting their assigned activities. The Mentor is required to certify in writing to the Chair the training required and the date at which the training was received. The Environment, Health and Safety Officer may be requested to provide advice on the training required.

Where use of animals is involved, the protégé is required to participate in a University-sponsored course in the use of animals. The Animal Care Technician is required to certify in writing that the protégé has received the required training and education. The faculty Mentor is required to obtain necessary Animal Care and Use Committee approval prior to the start of the project, as appropriate.

Each protégé and her/his parents and/or legal guardians will sign a statement relinquishing Brock University of any legal responsibility should the protégé be injured while taking part in the approved research activity. The protégé will be required to accept responsibility for adhering to all University or laboratory requirements related to Good Laboratory Practices and the health and safety of the protégé and other individuals who may be engaged in research activity in the laboratory or surrounding environment.

Where the research or investigational study involves human participants as defined by University policy, the faculty Mentor is responsible for ensuring the protégé is familiar

with University policies related to the involvement of human subjects in research and is required to obtain necessary Research Ethics Board approval prior to the start of the project.

Each protégé and Mentor are required to discuss and agree in advance to the disposition of any intellectual property that may arise from the research activity. The Office of Research Services is available for consultation.

Description of the Mentorship Project:

(Specify parameters of the research activity; the required training including WHMIS, use of apparatus or care of animals; the dates of the projects; and the degree of access required.)

Acknowledgement of Responsibility of the Mentor:

I agree to supervise and provide mentoring to: as my protégé in the Mentorship Project described above. This supervision includes the duties and responsibilities to the protégé as outlined in Appendix 2. I further agree to supervise the protégé's work closely until he/she has reached an appropriate level of competence in her/his assigned tasks. I will ensure that the protégé is supervised in all activities by myself or a qualified co-supervisor. (Competence is defined as being qualified because of knowledge, training and experience to perform the work; being familiar with the health and safety rules and regulations that apply to the activity, having knowledge of all potential or actual dangers that could develop in the work, and being familiar with Brock's emergency response system.)

NAME

Signature of Mentor

Date

Acceptance of Responsibility as a Protégé:

I have read, understand and accept the duties and responsibilities of a protégé as outlined in Appendix 1 in the context of my participation in the Mentorship Program at Brock University. I agree to be subject to the authority of Brock University and of as my Mentor. In addition, I agree that the University may terminate my involvement as a protégé at any time and without any commitment to provide a reason.

Protégé Name

Signature of Protégé

Date

Liability Release:

We have read and understand the conditions under which protégés may take part in Brock University activities and we are aware that there may be risks inherent in the activity for which is being mentored. As a consideration of Brock University accepting as a protégé in the specific activity described above, we, on behalf of our heirs, executors, administrators, successors, and/or assigns, agree to and hereby release Brock University, its employees, agents, affiliates, scientific staff, and cooperating institutions from, and agree to indemnify and hold them and each of them harmless against, any and all liabilities they may jointly or severally incur to her/his heirs, executors, administrators, successors, and/or assigns, in respect of any claim, suit, or cause of action, including attorney's fees and expenses of litigation, including any such injury, loss of health, financial loss, or damage to property, including any such injury, loss or damage resulting from the negligence of Brock University, its employees, agents, affiliates, scientific staff, and/or cooperating institutions, directly or indirectly by participation in the aforementioned Brock University activity. However, we do not release any Brock University employee, agent, affiliate, scientific staff member, or cooperating institution from liability on account of any injury, loss, or damage to directly caused by the gross negligence of that employee, agent, affiliate, scientific staff member or cooperating institution.

Protégé Name

Signature

Date

..... is granted permission to participate in the Mentorship Program in the specific activity described above under the supervision of

This authorization is valid from until (no more than 12 months.)

Department Chair/Signature and Date:

.....

Dean's Name/Signature and Date:

.....

APPENDIX 1

Health and Safety Responsibilities of a Protégé Worker

To comply with the Occupational Health and Safety Act and its regulations.

- To comply with Brock University policies and procedures, including but not limited to the Science Safety Manual, Animal Care and Use, Safety and Liability in Field Research, and all other policies and procedures.
- To use the equipment and clothing provided or required.
- To report dangers in the workplace to the Mentor or other appropriate individual.
- Not to make any safety device ineffective.
- Not to use any equipment or machine or apparatus without the permission of the supervisor and required training.
- Not to engage in any horseplay or other dangerous activity.
- To treat colleagues with respect.

APPENDIX 2

Health and Safety Responsibilities of a Supervisor of a Protégé in the Faculty of Mathematics and Science

To comply with the Ontario Occupational Health and Safety Act and its regulations.

- To comply with Brock University policies and procedures and Faculty of Mathematics and Science policies and procedures related to occupational health and safety, good laboratory practices, care and use of animals, and research involving human subjects.
- To ensure that all protégés under their supervision comply with #1 and #2 above. To ensure that all protégés under their supervision receive any and all required training in the use of equipment and apparatus necessary for the protégé's project.
- To ensure that all protégés use the safety equipment, devices and clothing provided and/or required for the safe conduct of the protégé's project.
- To advise all protégés of any danger in the workplace.
- To provide specific written and verbal instructions for the protection of the protégé for the safe conduct of her/his project.
- To take every precaution reasonable in the circumstances for the protection of the protégé.
- To ensure that all protégés are supervised at all times when conducting work under the guidance of the Mentor.
- To record and retain a record of all instructions provided to protégés, including, where necessary, sign in and sign out logs for laboratory use.
- To treat protégés with respect.

BROCK UNIVERSITY MENTORSHIP PROGRAM

The Brock University Mentorship Program was initiated by Dr. Joe Engemann in 1995. This program offers grade 12 students, who are highly interested in science, demonstrate high academic precocity, and are capable of working independently, with an opportunity to pursue a real-life scientific investigation under the supervision of a member of the Faculty of Mathematics and Science at Brock University. Selected students are matched with Mentors from the Departments of Biology, Chemistry, Physics, Earth Science, Psychology, and Computer Science.

The following Sir Winston Churchill Secondary School students have successfully completed the Brock University Mentorship Program while earning as many as three credits toward graduation:

The following chart identifies the pairings of SWC students with Brock University professors since the program's inception.

1996/1997 <ul style="list-style-type: none"> • Greg Tkaczyk Dr. John Brennan • Adrian Jakibchuk Dr. Fiona Hunter 	1997/1998 <ul style="list-style-type: none"> • Ben Lichty Dr. Jeff Atkinson • Chris Mol Dr. Fereidoon Razavi • Patti Yik Dr. Bill Cade • Katie Gregg Dr. Doug Bruce
1998/1999 <ul style="list-style-type: none"> • Jennifer Janzen Dr. Ed Sternin • Erin Sen Dr. Cam Lewis • Dean Raso Dr. Francine McCarthy • Alastair Gillespie Dr. Frank Fueten • Adrian Chin Dr. Dawn Good 	1999/2000 <ul style="list-style-type: none"> • Karen Glazebrook Dr. Bob Ogilvie • Doug Bauman Dr. Maureen Reedyk • Colin Holland Dr. Frank Fueten • Erik Wilhelm Dr. Miriam Richards • Chip Hogg Dr. Fereidoon Razavi
2000/2001 <ul style="list-style-type: none"> • Evan Mercier Dr. Fiona Hunter • Blake Yarascavitch Dr. Stefan Brudzynski • Stephen Wegener Dr. John Mensies • Roland Wilhelm Dr. Keith Tinkler 	2001/2002 <ul style="list-style-type: none"> • Katherine Glowacz Dr. Fiona Hunter • Jonathon Paul Dr. Francine McCarthy • Alessandro Virgulti Dr. Gaynor Spencer • Lucas Parafianowicz Dr. Frank Fueton • Russ Dickson Dr. Heather Gordon • Jaisal Chauhan Dr. Keith Tinkler • Tom Wojciechowski Tom MacDonald • Annie Lam Dr. Stefan Brudzynski • Mehala Tharmabala Dr. Bob Carlone • Kim Purslow Dr. John Menzies
2002/2003 <ul style="list-style-type: none"> • Jackson Mou Dr. Miriam Richards • Dimitri Skandalis Dr. Francine McCarthy • Tiffany Kyer Dr. Andy Reynolds • Oliver Ngyuens Dr. Rick Cheel 	2003/2004 <ul style="list-style-type: none"> • James Tordiff Dr. Heather Gordon
2004/2005 <ul style="list-style-type: none"> • Julien Turcotte-Novosedlik Dr. Miriam Richards • Steven Martinez Dr. Maureen Reedyk 	2005/2006 <ul style="list-style-type: none"> • Catherine Sukkau Dr. Ian Brindle • Jon Samosh Dr. Stefan Brudzynski • MaxTurcotte-NovosedlikThomas MacDonald • Mike Behring Dr. D. Crandles • Elsa Fridriksson Dr. Art van der Est
2006/2007	2007/2008 <ul style="list-style-type: none"> • Matthew Thiffault Tom MacDonald

<p>2008/2009</p> <p>2008/2009 Huh Ustina</p> <p>2008/2009 Ling Emilia</p> <p>2008/2009 Piatrou Kostya</p> <p>2008/2009 Wang Victor</p>	<p>2009/2010</p> <p>2009/2010 Byskov Brandon</p> <p>2009/2010 Choi Jason</p> <p>2009/2010 Irwin David</p>
<p>2010/2011</p> <p>Lopez Joan (University of Guelph)</p> <p>Bork, Annuschka</p> <p>Cornett, Colleen</p> <p>Groux, (Gaelle)</p> <p>Huh, Deborah</p> <p>Khudoyarova, Olga</p> <p>Vandermolen, Scott</p>	<p>2011/2012 Laekeman Taylor</p> <p>2011/2012 Gaiero Angela</p> <p>2011/2012 Han Jerry</p> <p>2011/2012 Fugard Bella</p> <p>2011/2012 Lin Amy</p>
<p>2012/2013</p> <p>Carfagnini, Christina</p> <p>Chemnitiz, Emily</p> <p>Lu, Jielin</p> <p>Jayasankar, Varsha (University of Guelph)</p> <p>Lopez, Jessica Dr. Cathy Mondloch</p> <p>Ryu, Rachel</p> <p>Deng, Arlinda</p> <p>Climenhage, Luke (Vineland Station)</p> <p>Falk-Dotan, Biran</p> <p>Wu, Jailing Dr. Liang</p>	<p>2013/2014</p> <p>Abdulla, Adam Belding, Lee</p> <p>Chan, Harmonie</p> <p>Elwerfalli, Rafik Vasseur, Liette</p> <p>Jayasankar, Varsha Dr. Jayasankar Subramanian</p> <p>Upadhyay, Mohak Hui Di Wang</p>
<p>2014/2015</p> <p>Jany, Katie</p> <p>Kennedy, Emma</p> <p>Matthew Nickel</p> <p>Jeff, Zhou (University of Guelph)</p>	<p>2015/2016</p>