

Concordia Academy

STEM₂

Class of 2017
Handbook

Preparing Christians to take the lead
in advanced fields of science, technology, engineering, math and
medicine

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Participants and Significant Dates

STEM ₂ Coordinator.....	Elizabeth Bohren
Faculty Mentor.....	Concordia Academy Science, Math, Health, or Technology Staff
Internship Supervisor.....	Company employee serving as student's direct supervisor
STEM ₂ Staff.....	Elizabeth Bohren Dave Boll Marc Paul Rick Kuhlman Hal Schmidt Bruce Urban Cindy Urban Bob Wolf

Senior Year 2016-2017 Dates to Note

Science Fair Registration of Project and Paper	Feb. 1, 2017
Twin Cities Regional Science Fair.....	February 24-25 2017 U of M Field House
Minnesota State Science Fair.....	April 2017 Bloomington
Presentation to CA Staff.....	May 3, 2017 2:50pm
Honors Convocation Recognition.....	May 17, 2017

STEM₂ Introduction

Concordia Academy's STEM₂ curriculum provides a significant step towards preparing Christians to take the lead in advanced fields of science, technology, engineering, math, and medicine. The program consists of the following components:

- A rigorous curriculum path that includes the equivalent of 5 years of science and the completion of four years of math. One semester of calculus counts as a year of math. (Students must maintain a minimum GPA of 3.0 in the above courses.)
- An internship with a STEM₂ company
- A senior research project and paper designed for and entered into competition through the Twin Cities Regional Science Fair (TCRSF) organization
- Presentation to a panel of teachers and invited guests of research project results
- Recognition of the graduating cohort at Honors Convocation

Although not required, STEM₂ students can take the STEM₂ Research Lab class. This class gives the students in school time to research, develop, and perform their experimental plan for the science fair.

Successful completion of the above results in a STEM₂ transcript certification and Honors Convocation recognition during the candidate's senior year.

Program Summary

Students, with the assistance of CAS' Guidance Councilor and STEM₂ Coordinator, plan their academic schedules to ensure that the academic requirements are met. The STEM₂ internship normally takes place during the summer between the junior and senior year. The internship requires a minimum of 40 hours work at a STEM₂ company site. Students, while assisted by the STEM₂ coordinator, are responsible for finding a mentor and intern site.

The senior research project and paper is normally planned during the beginning of a participant's senior year. Projects and papers are entered in a local competition with the hope of advancing on to the Minnesota State Science and Engineering Fair and possibly the International Science and Engineering Fair (ISEF). Students are required to keep a handwritten, anecdotal logbook for both their internship and research project experiences. Research projects may be chosen from one or more of the following categories:

1. Science (Natural or Physical)

This area focuses on biological, medical, environmental, or archeological fields, in addition to chemistry or physics. Medicine, laboratory testing, research, or fieldwork may be included.

2. Technology

This area focuses on computer program design, program application, data collection and collation, system design, scientific graphic applications, and the application of technology in conjunction with a topic of interest.

3. Engineering

This area focuses on materials and materials testing, materials application, engineering, structural design, robotics, and the application of engineering principles to solve real-life problems.

4. Mathematics

This area focuses on mathematics as applied to any field of interest including logistics, actuarial science, economics, financing, and statistical analysis.

*Concordia Academy acknowledges and credits St. Mary's County Public Schools of Southern Maryland for their leadership in STEM education. The above four categories of research are taken directly from their materials. Their program was also influential in the timeline and rubrics that follow.

Grade 11 and 12 Timeline

A general timeline of the Internship and of the Research Project and Paper is outlined below:

J u n i o r	January-May	Juniors brainstorm and research possible internships and research project topics. Juniors may meet with faculty members, and are required to meet with the STEM ₂ coordinator.
	May	Internship proposal is turned in to the STEM ₂ Coordinator. STEM ₂ Coordinator reviews internship proposals. Students will receive approval or requests for further clarification.
S e n i o r	June-August	Students complete internships and work on research projects proposals. Daily logbook entries are required throughout the internship. Students may contact the STEM ₂ coordinator should questions arise or circumstances occur that need clarification or assistance.
	August-January	Students complete internship portfolio and research projects and paper.
	February	Students enter project and paper in a regional science fair. Project and paper competitions.
	April	Internship and internship portfolio must be completed.
	May	Final review of student transcript for course performance requirements. Presentation to faculty. STEM ₂ Honors Convocation recognition.

Timeline and Check-off list Junior Year

January-May

	Date Completed
Brainstorm ideas for internship and research project	
Select a faculty mentor	
Meet with STEM ₂ Coordinator	
Internship Proposal turned in to STEM ₂ Coordinator	
Set up meeting with Internship Supervisor Bring: Letter of Introduction, Internship Agreement Forms, And Resume	IP
Complete Supervisor Meeting Reflection #1	IP

Summer

Begin internship and fill out daily logs	IP
Compile brochure, maps, schedules, business cards	IP
After 20 hours Meet With Supervisor for feedback/Reflect #2	IP
Exit Interview: Give Supervisor Internship Evaluation and self-addressed envelope Take picture of you and Supervisor for portfolio	IP
Send typed and signed thank-you letter to supervisor; save a copy	IP
Complete Final Student Reflection	IP

IP represents item to be put into Internship Portfolio

Internship Proposal for STEM Coordinator

Construct 5 skills and learning experience objectives. List them in bullet points and present to the STEM Coordinator.

Examples:

- Learn the different aspects of a career in environmental biology
- Learn how research is done in the field
- Learn how to observe and record data
- Learn how biologists impact conservation policy
- Learn how to educate the public about conservation efforts
- What kind of materials can be used to produce silica gel? How is it produced?
- What's the process of purifying silicon from raw materials like sand and stone?
- How are new kinds of agricultural seed invented?
- How is cooperation between a government oversight organization and a company managed?
- How does this company develop methods for preventing animal disease on such a large scale?

STEM₂ Letter of Introduction EXAMPLE 1

To Whom It May Concern:

Thank you for considering this proposal for internship/volunteer opportunity with your organization. I am a student pursuing an advanced science and math curriculum, called STEM₂, at Concordia Academy in Roseville, Minnesota. Your willingness to help me learn more about this field in a work environment is truly invaluable.

The internship is to comprise at least 40 hours on site, to be fulfilled in a way agreeable to all parties. I have listed below the objectives for my learning during this internship and I would be happy to discuss or amend these after you've had a chance to consider them.

Learning objectives:

1. Learn the different aspects of a career in environmental biology.
2. Learn how research is done in the field.
3. Learn how to observe and record data.
4. Learn how biologists impact conservation policy.
5. Learn how to educate the public about conservation efforts.

Attached you will find a resume and any other information you may find useful in approving this internship. I look forward to discussing the particulars of this opportunity. Again, thank you for your consideration.

Kind regards,

(Signature in ink here)

Student's typed name.

Student's typed contact information (telephone number and then email typed below the phone number)

STEM₂ Letter of Introduction EXAMPLE 2

To Whom It May Concern:

Thank you for considering this proposal for internship/volunteer opportunity with your organization. I am a student pursuing an advanced science and math curriculum, called STEM₂, at Concordia Academy in Roseville, Minnesota. Your willingness to help me learn more about this field in a work environment is truly invaluable.

The internship is to comprise at least 40 hours on site, to be fulfilled in a way agreeable to all parties. I have listed below the objectives for my learning during this internship and I would be happy to discuss or amend these after you've had a chance to consider them.

Learning objectives:

1. What kind of materials can be used to produce silica gel? How is it produced?
2. What's the process of purifying silicon (Si) from raw materials like sand and stone.
3. How are new kinds of agricultural seed invented?
4. How is cooperation between a government oversight organization and a company managed?
5. How does this company develop methods for preventing animal disease on such a large scale?

Attached you will find a resume and any other information you may find useful in approving this internship. I look forward to discussing the particulars of this opportunity. Again, thank you for your consideration.

Kind regards,

(Signature in ink here)

Student's typed name.

Student's typed contact information (telephone number and then email typed below the phone number)

STEM₂ Internship Agreement Forms

Intern Name:

Home Address:

Phone: _____

Email: _____

Internship Mentor/Supervisor:

Mentor/Supervisor Job Title:

Work Phone: _____

Work Email: _____

Company Name and Address:

I, (*mentor name/title*) _____ agree to supervise, guide, and direct the above student during his/her entire internship with the intent of exposing the student to learning opportunities in the following areas:

Dates and total hours of the Internship:

I, (*intern name*) _____, agree to complete the
Internship program at (*site*)

_____ under the supervision and
direction of (*mentor*) _____ with the intent of
achieving the following learning objective(s) as presented in the approved proposal.

The intern, mentor and parent understand and agree that Concordia Academy does not provide on-site supervision of students engaged in an internship, meetings with a mentor/mentee or other work-based learning experiences. Parents/guardians must arrange for the transportation of their student to and from the internship location and maintain such insurance coverage that they deem appropriate to protect their student. Under no circumstances will Concordia Academy, its employees, agents or insurers be held responsible to either the student, the parent/guardian or the mentor for any injuries or damages to persons or property arising out of the internship, mentor/mentee or work-based learning experience.

Intern/Mentor/Parent Signatures

Intern name (printed)	Intern Signature	Date
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Mentor name (printed)	Mentor Signature	Date
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Parent name (printed)	Parent Signature	Date
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I, (*CA's STEM₂ Coordinator*) approve the above internship on behalf of the program.

Coordinator Signature	Date
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Internship Resume Template

Name

Address

Phone number and email address

Objective: What you hope to learn from the experience

Relevant Classes Completed

List classes that will pertain or relate to the internship experience

Relevant Skills, Experiences, and Interests

Once again, list only things that pertain to the internship experience

Future Plans

Introductory Meeting with Internship Supervisor

Helpful tips for a successful meeting

1. Dress professionally—no jeans, no t-shirts. Nice slacks and button shirt. Dress shoes.
2. Thank Supervisor for opportunity—remember it is to your benefit you are there, not theirs. Shake their hand and thank them up front for the opportunity.
3. Be flexible—remind them you need to complete 40 hours but that you are flexible to their schedule and will work around what works best for their business.
4. Share your letter of introduction, which also contains your learning objectives.
5. Let them know you are willing to explore any area they feel worthy.
6. Ask questions:
 - What can I contribute to your organization?
 - What are your expectations of me?
 - Are there any special projects you'd like me to complete?
7. Tell them preferred date you'd like to start and finish.

Student Reflection of Meeting with Internship Supervisor

Reflection Guidelines

For each reflection, type about one page, double-spaced. As you think back on your meetings, address the questions as described below. NOTE: Do not include these questions as headings or in the body of your writing. Simply use them as prompts.

Reflection #1: Following introductory meeting

- How would you characterize the meeting? Describe how you feel it went.
- What did your mentor seem to be most interested in?
- What expectations were described for you as an intern?
- What are you most looking forward to and what are you most nervous about?

Daily Log Template

For each day you attend your internship, complete a journal-type entry that logs your experience on that day. Use the template below.

Date: Day of week, day/month **Time worked:** 9:00-12:45 **Total hours today:**
Location: Where I spent my work time today.

Log: Go for a page. Here are some examples of appropriate topics to reflect on in these logs.

Include specific details about what you did today, what you learned today, and how you feel about how you did today. -

What questions arise for you now?

What feedback did you get from your supervisor?

What were you able to contribute?

What felt new and uncomfortable?

What was interesting and challenging?

Did you take any notes today? You may consider adding them here.

Maybe a sketch of a problem or solution is on your mind. Add it here.

Halfway Meeting with Supervisor for Feedback

Reflection #2: Following the half-way-through check-in

- How did you prepare for this meeting? Share some of the questions you asked your mentor about your performance.
- Describe how your mentor gave your feedback about your performance.
- What have you learned so far about working with others in this field?
- What are some of the skills you were surprised to learn are so clearly important for this type of work?

Exit Interview Tips

Be sure to thank them. Share with your supervisor what you have learned and what was valuable for you in this experience.

Ask Supervisor...

- What is my potential in this field?
- What advice do you have for me if I continue in this field?
- What do you see as essential skills to succeed in this field?
- Can I use you as a reference?

Give Supervisor evaluation sheet and self-addressed stamped envelope.

Double check that you have taken a photo with the Supervisor (preferably in front of the business log) for your portfolio.

CA STEM₂ Internship Evaluation

To Whom It May Concern:

Once again, thank you for mentoring this student as part of the STEM₂ curriculum at Concordia Academy. The purpose of the internship component is to expose the student to an agency or organization in a STEM₂ field and to have them contribute in a meaningful way to your work environment. Concordia Academy is very interested in your feedback regarding the performance of this student.

Please answer the following questions and return this form to me at your earliest convenience. Your assessment will play a role in the student's final program evaluation.

Assess the intern for the following items. Feel free to include comments if you wish.

1. Punctuality (Were they on time?)

2. Attendance (Did they come when they were supposed to?)

3. Dress (Appropriate and/or professional?)

4. Attitude

5. Preparedness

6. Ability to learn new things

7. Overall performance

8. Are you interested in having a Concordia Academy senior intern in the future?

9. Are there any qualifications you would like a new intern to have?

10. Additional comments?

Your name and contact information (I invite you to include a business card):

If you have any additional questions or comments, please feel free to contact me by phone or email; otherwise, please return the completed form to me by mail or email.

Once again, thank you!

Elizabeth Bohren
STEM₂ Coordinator
Concordia Academy
2400 North Dale Street
Roseville, MN 55113
651.328.1758
elizabeth.bohren@concordiaacademy.com

Final Student Reflection

Reflection #3: Following your exit interview

- Describe what you learned about this field.
- Describe what you learned about this company.
- Describe what you learned about yourself.
- What feedback did your mentor give you about your contribution during the internship?
- What advice was offered to you during the internship regarding education, interpersonal skills, technology skills, finding purpose in work, etc.
- What do you see as the role of your faith in this kind of work?

Internship Portfolio Contents

1. Cover page
2. Table of Contents
3. Signed forms
4. Reflection on your first meeting/interview for the internship
5. Daily logs
6. Brochures, site map if applicable, business cards, any and all documents that help to tell the story of what you did, with whom, and where.
7. Photographs of you on-site.
8. Final reflection on the whole internship.
9. The evaluation your supervisor filled out.
10. Copy of the thank you letter you sent.
11. A copy of the daily log rubric that will be used to score your portfolio.

STEM₂
Internship Portfolio Assessment Rubric

All components will be scored on the following scale:

- + Far exceeds expectations
- ✓+ Exceeds expectations
- ✓- Does not meet expectations
- Far below expectations

NOTE: Any score below a ✓ must be amended before portfolio is approved as meeting STEM₂ program requirements.

Items	Quality Target	Score
<u>Format</u> <ul style="list-style-type: none"> • Cover page • Table of contents • This rubric 	<ul style="list-style-type: none"> • Cover page and Table of Contents in APA format as shown on the Purdue OWL. • Table of Contents accurately organizes all components includes in portfolio. 	
<u>Personal reflections</u> <ul style="list-style-type: none"> • Following first meeting • Following half-way progress check • Final reflection after evaluation meeting 	<ul style="list-style-type: none"> • Dated and titled • References are made to specific details brought up in the meetings with supervisors. • Shows evidence of critical thinking and posing questions that have come from that thinking. 	
<u>Forms</u> <ul style="list-style-type: none"> • Signed agreements • Learning objectives form • Evaluation • Copy of thank you letter that was sent to supervisor(s) 	<ul style="list-style-type: none"> • Appropriate pre-internship forms are signed by supervisor, parent, student, and STEM₂ Coordinator • Final evaluation is included, either having been given back to student or mailed to STEM₂ Coordinator 	
<u>Company Documents and Photos</u> <ul style="list-style-type: none"> • Brochures and other organizational literature • Maps • Required photos with supervisor; 	<ul style="list-style-type: none"> • Documents which help to clarify the nature of the company and of the work is included. • Appropriate floor plans, grounds map, etc., is included • Required photographs of student on site with supervisor is included 	
<u>Daily Logs</u> <ul style="list-style-type: none"> • Entries are written at the end of every day spent interning. 	<u>Daily Headings</u> <ul style="list-style-type: none"> • Include date, location, times, and number of hours <u>Entry Content</u> <ul style="list-style-type: none"> • Clear and specific, with detailed information • Sketches/notes/data are included in most or all entries 	

STEM₂ Coordinator Comments:

Timeline and Check-off list

Senior Year

September

	Date Completed
Turn portfolio into STEM Coordinator	
Complete the research plan	
Print out student handbook from tcrsf.org	

October

Submit research plan to STEM Coordinator and faculty mentor for feedback	
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November

Conduct Literature Review	
Complete Annotative Bibliography in APA format	
Refine research plan using Literature Review	
Submit final research proposal to STEM Coordinator	

January

Register project and paper to regional science fair	
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February

Attend regional research project and paper competitions at U of MN	
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March-April

Attend state research project and paper competition at Doubletree Hotel	
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May

Final review of student transcript for course performance requirements	
Presentation of CA faculty and invited guests	
STEM Honors Convocation	

STEM₂ Research Project and Paper

Concordia Academy's STEM₂ students are required to complete a research project and write a scientific paper. Both the project and paper are designed to qualify for and be entered in the Twin Cities Regional Science Fair. The expectation is that students will advance beyond this initial competition to the Minnesota Academy of Science State Science Fair. Students may work on their projects with one or two other students. Students are required to pay the entry fee for both the paper and the project. The 2015 entry fees were \$20 for the paper and \$20 for the project.

A wealth of information on both the research project and paper can be found on the Twin Cities Regional Science Fair website which is located at <http://www.tcrsf.org>. Student research projects and papers are to follow the rules and guidelines found on this site. Students should pay particular attention to the "Forms and Rules" and "Student" tabs. CA's STEM₂ Coordinator will assist students in sifting through the information found on this site.