

## Activity **8**

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# Lab Reports: Getting Better Results with Less Work

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Activity developed at Cégep régional  
de Lanaudière à Terrebonne  
By **STÉFANIE HÉNAULT**

## Lab Reports: Getting Better Results with Less Work

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Author's Name

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Scientific Discipline

Chemistry

Average Age of Students

17-18 years old

Course Title and Number

Chemistry of Solutions  
(202-NYB-05)

Duration of Activity

**8 weeks, during the laboratory portion of the course,  
spread over almost the entire semester**

### NOTE

In this document, the masculine is used without discrimination and solely to make the text easier to read.

Appendices are available in PDF and Word format on the CD provided with this document.

In addition, an instructional analysis of the activity is available in the pedagogical treasures section (*Trésors pédagogiques*) on the Saut Quantique Web site at:

<http://www.apsq.org/sautquantique>.

Use of this text is authorized for instructional purposes, provided that author's name and college are mentioned.

Adherence to these recommendations will encourage authors to share their experience.



## Lab Reports: Getting Better Results with Less Work

### Description of Activity

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#### OVERVIEW

Lab reports very often cause a lot of frustration for both students and teachers. From a student's point of view, writing reports is too time-consuming, the work required is poorly explained, correction criteria are not clearly defined or understood, and results are frustrating. From a teacher's perspective, correcting the reports is a heavy burden, and the quality of the work improves only very slowly. Students and teachers feel overwhelmed by the workload, and results are considered disappointing.

This pedagogical strategy allows students to acquire a writing method that can be applied to any subject. It also makes them well aware of the correction criteria and lets them be active in their own learning. It allows for regular feedback and reduces the students' and teacher's workload.

Learning to write lab reports is a gradual process. Students pair up and, during their initial encounter, work on writing the report plan, introduction, manipulations and results. The second time they get together, they then focus on writing the results, discussion and appendix (calculations).

From the third experiment onwards, students submit a complete report.

The evaluation is formative for the first three reports. Some time is set aside for a self-evaluation during the next laboratory period. Students use **descriptive correction grids** for that purpose.

As for the last two reports, the teacher completes a summative evaluation.

The teacher gives students a **scoring grid** that shows the types of errors (major, medium and minor) to grade the assignments.

#### RELEVANCE AND ORIGINALITY OF ACTIVITY

This strategy leaves plenty of room for summative, self and peer evaluations. A clear definition of correction criteria and the use of formative evaluations contribute to frequent feedback and lead to a dramatic improvement of results. Self-evaluations and correction by peers allow students to develop their critical thinking skills. In addition, the spirit of cooperation helps to develop a non-competitive positive learning environment.

Progressive learning, i.e. a few lab report sections at a time, allows students to reduce their workload. In addition, since students learn how to write a report, they waste less time and are more effective in their work.

Formative corrections by peers reduce the teacher's workload. And this workload reduction is not at the expense of student progress. Quite the contrary. Since corrections are done after the teacher's explanations when returning to class, students are capable of a second self-evaluation, and can correct another team's work. The second self-evaluation allows students to adjust the assessment of their work, taking into account the information provided by the teacher. Students can also review their idea of a good assignment before and after explanations, and see an improvement throughout the semester. Students therefore develop their critical thinking skills in addition to getting better results with less work.

## Objectives and Relation to the Program

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### PEDAGOGICAL OBJECTIVES OR TARGETED COMPETENCIES

This activity allows students to learn how to write lab reports, makes them well aware of the correction criteria, helps them develop their critical thinking skills and the habit of doing self-reviews, perform peer corrections, develop a cooperative environment, and get frequent feedback, which will contribute to great results.

### LINK BETWEEN THE ACTIVITY AND THE PROGRAM

#### *General Program Goals Targeted*

This activity targets the following general goals of the *Science* program:

- To adopt attitudes that are useful for scientific work;
- To reason logically;
- To apply the experimental method;
- To take a systematic approach to problem solving;
- To apply what they have learned to new situations;
- To communicate effectively;
- To use the appropriate data processing technologies;
- To work as members of a team;
- To learn autonomously.

#### *Link with Course*

Learning to write lab reports is done during laboratory sessions (two of the five hours per week). It is spread over the entire semester, but does not necessarily require two hours of practical

work each week. The detailed schedule is shown in Appendix S.2.

Time spent on writing the report is justified by one of the performance criteria of the course competency, i.e. "Laboratory report in line with established standards".

#### *Link with Other Courses*

This activity will serve in the subsequent chemistry course (organic chemistry), and indirectly in any other course requiring students to write lab reports. Even if requirements may vary from one field to another, students will have learned how to write lab reports and be able to adapt their writing method to specific situations.

## Number of Students and Educational Support

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### APPROXIMATE NUMBER OF STUDENTS IN CLASS

About 24 students

The activity can involve more or less students, but if the number is too high, teacher support may be limited.

### NUMBER OF STUDENTS PER TEAM

2 people

### EDUCATIONAL SUPPORT

The teacher shows students the process involved in writing lab reports, at the beginning of the semester. He hands them the Student Writing Guidelines (Appendix S.1) and the Laboratory Assignment Schedule (Appendix S.2).

After each experiment, the teacher spends the next laboratory period on a formative review.

During the initial formative review, he presents a sample lab report (see Appendix T.2), encouraging student participation. He then guides students in their self-evaluation and in the



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correction of another team's sections (peer correction).

During subsequent formative reviews, he acts more as a guide and facilitator, as students evaluate their own or another team's report.

The teacher does a summative evaluation of the last two reports at the end of the semester.

## Conducting the Activity

### CONDUCTING THE ACTIVITY AND TIME REQUIRED TO COMPLETE EACH STEP

#### *Before*

After the first laboratory experiment, students read the plan and report correction criteria for the sections they are about to write: introduction, manipulations and result (see Appendices S.2, S.3 and S.5). They write the required lab report sections (plan and report) and complete the self-evaluations (Appendices S.4 and S.6) at home.

As for the teacher, he writes the report plan for the required sections.

#### *During*

During the initial formative review, students participate in the development of the lab report plan with the teacher, on the blackboard. They do a second self-evaluation of their report, and then correct another team's assignment.

They correct each other based on their self-evaluations. The purpose of this exercise is to target errors and provide feedback for student improvement. Corrections are not graded. Please note that students do not use the scoring grid (Appendix S.7), which would be too time-consuming, tedious and useless. This Appendix is for the exclusive use of the teacher, to compile summative evaluations.

The peer correction process gives students the

opportunity to see the quality of other team assignments, and adopt some of the good ideas in their own future assignments.

The amount of time required may vary, depending on the number of lab report sections involved. Experiment reviews can take anywhere between 30 minutes and two periods.

#### *After*

Students ask questions as required, and prepare the second laboratory experiment.

During this experiment, they write a new report plan and the results, discussion and appendix (calculations) sections, followed by the same formative evaluation process as in the first experiment.

From the third experiment onwards, students write a complete report, which will also be corrected for formative purposes.

For the last two reports, the teacher will conduct a summative evaluation.

To learn more about how these experiments are conducted, see Appendices S.1 and S.2.

## Evaluation and Required Material

### SUGGESTED EVALUATIONS

Thirty points count towards the laboratory portion. Fifteen count towards the average of the two summative reports, and fifteen are to grade other aspects of the laboratory work.

The teacher does a summative correction of the last two reports (plan and complete report). He refers to the correction grid used by the students throughout the semester for self-evaluations and peer corrections (see Appendices S.4 and S.6). The work is graded based on the types of errors. Major, medium and minor errors are counted, and the scoring grid is used to determine the

student's total (see Appendix S.7).

## APPENDICES

### *Teacher*

Appendix T.1: Writing Tricks

Appendix T.2: Sample Report Plan

Appendix T.3: Using the Scoring Grid

### *Students*

Appendix S.1: Student Writing Guidelines

Appendix S.2: Laboratory Assignment Schedule

Appendix S.3: Correction Criteria for Plan

Appendix S.4: Correction Grid for Plan

Appendix S.5: Correction Criteria for Report

Appendix S.6: Correction Grid for Report

Appendix S.7: Scoring Grid

### **Note:**

Appendices are available in PDF and Word format on the CD provided with this document.

Use of this text is authorized for instructional purposes, provided that author name and college are mentioned.

## Other Suggestions and Media Directory

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### NOTES

To ensure effective learning of lab report writing, the number of laboratory experiments should be reduced if class time is to be scheduled for formative reviews.

It is more difficult to prompt students to endeavour in formative assignments, and there might be a relaxation of efforts. It is important to discuss with students, explain to them how they will benefit from this method, and make them aware that they are at the centre of their learning experience. They must be brought to understand that their schoolwork is chiefly a source for learning, and will be submitted to a summative evaluation at the end of the semester.

To avoid student absenteeism during experiments related to formative reports, a rule can be applied whereby students shall not miss more than 15% of their classes. In this case, students would not be allowed to miss more than one of the six laboratory sessions.

Students work in pairs to conduct their experiments and write their reports. To make sure that the grade is representative of the work done by individual students, each member could be asked to evaluate the participation of his colleague.



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## OTHER IDEAS TO EXPLORE

The correction criteria and evaluation grid are merely suggestions. They can be adjusted, as required, to reflect current procedures or to put more or less emphasis on certain criteria.

The same type of correction criteria and correction and scoring grids could be used for the *Organic Chemistry* course. Some of the criteria could be fine-tuned or simplified, depending on the course level.

## MEDIA DIRECTORY

HOWE, Robert (May 1991). "Formules pédagogiques et évaluation formative : une combinaison gagnante", *Pédagogie Collégiale*, vol. 4, no. 4, p. 8-13 (*Carrefour de la réussite au collégial, Trousse 6*)

AYLWIN, Ulric (March 1995). "Apologie de l'évaluation formative", *Pédagogie Collégiale*, vol. 8, no. 3, p. 24-32 (*Carrefour de la réussite au collégial, Trousse 6*)

Please note that the above texts are available on line at: [http://www.fedecegeps.qc.ca/index.php?section=10\\_1](http://www.fedecegeps.qc.ca/index.php?section=10_1) (texts no. 12 of Trousse 6: *Une pratique professionnelle enseignante commune à toute nouvelle stratégie pédagogique : l'évaluation formative*).

CHAMBERLAND, Gilles, et al. (2000). *20 formules pédagogiques*, Sainte-Foy, Presses de l'Université du Québec, 176 p.

ARCHAMBAULT, Guy (1998). *47 façons pratiques de conjuguer enseigner avec apprendre*. Laval, Presses de l'Université de Laval, 93 p.