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Workshop Bonding via the Group Project

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Abstract
The Peer-Led Team Learning Program at the University of Texas at El Paso (UTEP) encourages peer leaders to develop many different methodologies to guide the students to better understand the subject material and to utilize the resources available to make students in Workshop better students. This is especially important because the majority of the students taking the course are freshman students. Each student learns in a slightly different way. For four semesters, the first author utilized a strategy called the 'Group Project' to promote student learning and personal review of the material. The Group Project provided a mechanism for students to learn how to employ resources beyond the text and how to work in a group as a team. The Group Project served as a tool for students to develop long-term study groups that the first author often observed working as functional study units in later semesters.

Introduction

The Peer-Led Team Learning (PLTL) (Gosser, 1998; Gosser et al, 2001; Cracolice, 2001; Tien, 2002) Program at UTEP (Becvar, 2004; Becvar et al, 2008) has evolved over the past twelve years to allow the peer leader some degree of independence in how each Workshop session is conducted and in how the semester's 15 Workshops are tied together. All the Leaders must cover the same content, same learning objectives, and in the same topic sequence, but the week-by-week specific details (which problems, which collaborative activities) are largely the choice of the individual leader. This has led to innovation. The program has developed many learning strategies to promote student understanding in first semester general chemistry (see 'Driving Innovation' article in these Proceedings).

In about 2010, the first author started to develop a strategy called the 'Group Project' to promote student learning and understanding of content among the students in her workshops. The Group Project provides a mechanism for students to learn how to utilize the text, the Internet and other resources in a team-based (Springer, et al, 1999) effort for content understanding. An initial idea is to form teams of about four students each.

Each Group Project entails giving the teams eight to twelve questions over the chemistry content covered prior to the Group Project assignment. Grading is weighted substantially (25 points, 50%) on anonymous group evaluations after the team presentations. Members of each team are chosen randomly by the leader to present answers to different questions in order to motivate them to help each other understand every question in the project. The activity develops understanding and works towards team-building.

In the spring 2012 semester, the first author led the first semester chemistry learning in three workshops (one on Wednesday, one on Thursday, and one on Friday). Each workshop was divided into four Teams; each team had four student members (e.g. S1, S2, S3, S4), and each team was assigned two Group Projects for the semester. Students were individually responsible to know the entire Project. Each member shared the grade earned by the team for each Project. If one student erred, all earned the responsibility for the error.

Project Instructions

1. Cl_2 + NaBr -> NaCl + Br_2

Group 1 Wed: S1, S2, S3 and S4
Group 1 Thurs: S1, S2, S3 and S4
Group 1 Fri: S1, S2, S3 and S4

2. Na_2S + $ZnCl_2$ -> NaCl + ZnS

Group 2 Wed: S5, S6, S7 and S8
Group 2 Thurs: S5, S6, S7 and S8
Group 2 Fri: S5, S6, S7 and S8

3. $MnSO_4$ + $CaCl_2$ -> $CaSO_4$ + $MnCl_2$

Group 3 Wed: S9, S10, S11 and S12
Group 3 Thurs: S9, S10, S11 and S12
Group 3 Fri: S9, S10, S11 and S12

4. $CuSO_4$ + Na_2CO_3 -> $CuCO_3$ + Na_2SO_4

Group 4 Wed: S13, S14, S15 and S16
Group 4 Thurs: S13, S14, S15 and S16
Group 4 Fri: S13, S14, S15 and S16

Part (every group does this)

1) Balance reaction and name the compounds in reaction by completing this...
   "Reactants _____ and _____ yield products _____ and _____ ."
2) What are the physical states of the products, and **if** there's a precipitate what is it?
3) Assume that l0 grams of each reactant is used. What is the limiting reagent?
4) Write the net ionic equation and show the steps of how you got it.
5) Write the oxidation number of each element in the reaction.
6) What are the oxidized elements (**if any**) and write their half-reactions. What are the reduced elements (**if any**) and write their half-reactions.
7) Pick any Practice Exercise in Chapter 5 and work it out.

The project will be graded out of 50 points (your participation grade). Show all your work. If you have any questions email me, see me during my office hours, seek another peer leader, or ask your professor. The project is due next workshop and each group will have no more than 10 minutes to explain. This must be in a PowerPoint presentation. Also, I will randomly choose who in each group will explain what, so I suggest you make sure every group member knows how to do every part of the project. Also, to make sure everyone pays attention dining the presentations, if you find an error in another group's project and can explain why, I will give extra credit to your group. Each group will have to answer all the questions on only **one** equation, but I will be choosing the equation your group must use at random. Let me know if I messed up who's in what group. And even if you were absent, you are still responsible for contacting your group members and completing the project. It is everyone's responsibility to work on this project with your group because the majority of your grade is based on the anonymous group evaluation.

The grading will be as follows:
Group evaluation = 25 pts
Correct answers = l0 pts
Individual grade (knew what they were talking about) = l5pts

Figure 1. Sample Instruction Sheet for a Group Project

Figure 1 gives details of one of the Group Project instruction sheets as they were assigned to the students in the Workshops. Note that for this Project each Workshop Group received a different chemical reaction, but all Groups had the same set of instructions ('Parts') for which they were responsible.

The Instruction Sheet included details about grading and how a given Group could earn extra credit by discovering, revealing, and correctly explaining an error made by another Group or a member of another Group during the presentation phase of the project. This extra credit method kept all students in Workshop at attention at all times and provided for lively and competitive discussions. The instruction sheet also made clear that the peer leader could interrupt any presentation at any time and ask a question or make any member take over and carry on with the presentation that someone else had started. This had the impact of making every member of the team accountable for the Group Project and for the grade of every member of the Group.

Figures 2 and 3 present a second example of an instruction sheet for Group

Project Instructions

1. Calculate ΔH for the following reaction using the thermochemical equations given

$2C_{(S)} + H_2 \rightarrow C_2H_2$ $\Delta H = ?$

$C_{(S)} + O_{2(g)} \rightarrow CO_{2(g)}$ $\Delta H = -393.5$ kJ

$H_{2(g)} + ½O_{2(g)} \rightarrow H_{2(l)}$ $\Delta H = -225.3$ kJ

$2C_2H_{2(g)} + 5O_{2(g)} \rightarrow 4CO_{2(g)} + 2H_2O_{(l)}$ $\Delta H = -2598.8$ kJ

2. Calculate the wavelength (λ) of waves with the following characteristics.
Assume the speed of the wave is 3.0 x 10^8 m/s. Here, the variable "A" is amplitude.

1	**2**	**3**	**4**
A=0.05 m	A=0.5 m	A=1 m	A=l0 m
F=1.5 x l0^{15} Hz	F=2 x l0^{15} Hz	F=5 x l0^{15} Hz	F=10 x l0^{15} Hz

λ =? Is it a visible color light wave? If yes, approximately what color?

1 → **Group l Thurs:** S1, S2, S3 and S4
Group l Fri: S1, S2, S3 and S4

2 → **Group 2 Thurs:** S5, S6, S7 and S8
Group 2 Fri: S5, S6, S7 and S8

3 → **Group 3 Thurs:** S9, S10, S11 and S12
Group 3 Fri: S9, S10, S11 and S12

4 → **Group 4 Thurs:** S13, S14, S15 and S16
Group 4 Fri: S13, S14, S15 and S16

Figure 2. The initial parts of a second sample Group Project instruction sheet.

3 and 4. Answer Examples 7.4 and 7.5 and Practice Exercises in your Chemistry book.

5. Write out the electron configuration and draw out the electrons in the orbitals for every element from H to Kr. (Long and short hand configurations) **ALL MEMBERS MUST PARTICIPATE WITH THIS PART.**

6. What are n, l, m_l, and m_S for n=1, 2, and 3. Explain what the variables and numbers for all mean.

7. Explain the periodic trends concerning atomic radii, ionization energy, electron affinity and valence electrons.

8. Explain the concept of valence electrons and the octet rule.

9. Draw the Lewis structures for H to Cl the Lewis structures for all of the halides (up to I), and the Lewis structures for CO_2, F_2, and H_20.

10. What are the electron pair **and** molecular geometries for CH_4, CO_2, and H_2O?

-All projects must be done on PowerPoint except for numbers 5 and 9 (write these out).
-All members need to participate. **I** will be the one to randomly choose who presents what, so make sure you understand everything.
-The project will be graded out of 50 points (your participation grade).
-You are responsible for contacting your group members, even if you were absent and missed the announcement.
-Show all your work. Explain thoroughly but no more than 15 minutes.
-The same quick anonymous evaluations will be turned in
-Also, the same extra credit opportunity is available. During the presentations, if you find an error in another group's project and can explain why, your group will receive extra credit points.
-If you have any questions email me, see me during my office hows, seek another peer leader, or ask your professor (whatever fits your schedule).

Figure 3. Parts 4 through 10 of the second sample Group Project instructions sheet.

Projects. In this second example, the numerals 1, 2, 3, 4 (seen under Instruction 2 in Figure 2) represent variants on information (data) each Group was responsible to explain. Again the instruction sheet included information about the grading rubric to be used for the Project.

An example of student work (the PowerPoint slides) for a Group Project for the second assignment is shown in Figure 4.

$CuSO_4 + Na_2CO_3 \rightarrow CuCO_3 + Na_2SO_4$

Group 4: Alma
Edgar
Leidy
Stephanie

Balance and name the reaction, include the states of the products

$CuSO_{4(aq)} + Na_2CO_{3(aq)} \rightarrow CuCO_{3(s)} + Na_2SO_{4(aq)}$

Reactants copper(II)sulfate and sodium carbonate yield to products copper(II) carbonate and sodium sulfate

The precipitate is $CuCO_3$

Assume that 10 g of each reactant is used. What is the limiting reagent?

- 10 g (1 mol $CuSO_4$/ 154.436 g/mol) = 0.063 moles of $CuSO_4$
- 10 g(1 mol Na_2CO_3/ 105.972 g/mol) = 0.094 moles Na_2CO_3

Molar ratio is 1:1, so...
Copper(II)sulfate is the limiting reagent

Ionic Equation

$$Cu^{2+}{}_{(aq)} + \cancel{SO_4^{2-}}{}_{(aq)} + \cancel{2Na^+}{}_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow CuCO_{3(s)} + \cancel{2Na^+}{}_{(aq)} + \cancel{SO_4^{2-}}{}_{(aq)}$$

Net Ionic Equation

$$Cu^{2+}{}_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow CuCO_{3(s)}$$

Oxidation Numbers

- Cu = 2+
- S = 6+
- O =2-
- Na = 1+
- C = 4+

(throughout the whole equation)

No Redox Reaction

A sample of chlorine gas occupies a volume of 946 mL at a pressure of 726 mmHg. Calculate the pressure of the gas (in mmHg) if the volume is reduced at constant temperature to 154 mL.

Use: $P_1V_1 = P_2V_2$

P_1 = 726 mmHg = (0.96 atm)

V_1 = (946 mL/1000 L)= 0.946 L

V_2 = (154 mL/ 1000 L)= 0.154 L

P_2 = 5.90 atm = 4.46×10^3 mmHg

Figure 4. An example of slides representing a student Group Project.

Figure 5 gives a sample grading record for the students in a Workshop. In this example all students within the team share the same score in each category. This grading scheme, i.e. so that all students within a team earn an identical score within a category, does not have to be the case.

The Group Project represents team learning at its best. Competition and group grading provides ownership of the 'all for one and one for all' aspect within the team. The Group Project provided a mechanism for students to learn how to employ resources beyond the text. Students practice how to function within a team for the greater benefit of all. The Group Project served as a tool for students to develop long-term functional study groups that the first author often observed working as study units in later semesters.

Project Grade (out of 50pts)

Group	Correct Answers (10pts)	Good Understanding (15pts)	Group Eval. (25pts)
1-S1	10	10	25
1-S2	10	10	25
1-S3	10	10	25
1-S4	10	10	25
2-S5	6.6	0	25
2-S6	6.6	0	25
2-S7	6.6	0	25
2-S8	6.6	0	25
4-S9	10	10	25
4-S10	10	10	25
4-S11	10	10	25
4-S12	10	10	25

Figure 5. Sample Grade Summary for a Group Project in a PLTL Workshop

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