



Problem-based learning in the middle school classroom - lessons in first time implementation

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AIM OF POSTER

In this poster we address issues of first-time implementation of the PBL method in a middle school classroom including optimal group size, time allotment, facilitator involvement, focused research, lab use, resource constraints, and student products.

BACKGROUND

While the PBL method was conceived in the context of a medical school curriculum and audience, its merits and applicability are being increasingly realized in broader and more varied settings, including middle and high school sciences.



THE WATERWORKS CASE

We created a case about a giardia outbreak to introduce 7th grade life science students to the PBL method while simultaneously covering Georgia science standards related to the digestive tract, sanitation and food poisoning, and microorganisms. As part of the case, students "became" CDC field epidemiologists and tracked the history of the index case, used web and text based resources to research possible causes of disease, analyzed water samples in a microscope lab, and interpreted medical tests to identify the causative agent. Student teams created investigative journals that tracked their progress through the case and each team member developed an educational pamphlet on a specific waterborne diseases.

STUDENT LEARNING OBJECTIVES

1. Identify the organs of the digestive tract and describe each organ's function.
2. Define diarrhea and list common causes. Distinguish between pathogenic and non-pathogenic causes of diarrhea.
3. Explain how diarrhea and dehydration are related. Discuss how this connection relates to the medical advice given for managing / treating diarrhea
4. Define the following terms: pathogen, infection, outbreak, parasitic disease, food poisoning, sanitation
5. Identify common diarrhea-causing water-borne pathogens in the US and how people can be infected.
6. Identify common pathogens that cause food poisoning in the US and how people can be infected.
7. List general recommendations to prevent food poisoning and waterborne diseases. Evaluate the effectiveness of these recommendations
8. Use a microscope and taxonomic key to identify organisms in a water sample
9. Distinguish between members of the following kingdoms / groups: Viruses, Monerans, Fungi, Protista. Discuss detrimental and beneficial contributions of each group.
10. Research learning issues using a variety of appropriate sources and evaluate the validity of the sources
11. Present learning issue findings in a clear, concise manner to their teams
12. Translate knowledge learned into an educational pamphlet for public health use

FACILITATION

GENERAL FACILITATION

- 5-7, 7th grade life science students per facilitator
- 8 case scenes / 3 days
- 4-6 in-class "Learning Issues" research days
- Boardwork: Data, Hypotheses, Case Questions, Learning Issues

STUDENT ACTIVITIES / PRODUCTS

- Identify aquatic organisms in a "suspicious" water sample using microscopes and taxonomic keys
- Complete a kingdom comparisons chart
- Create an educational pamphlet on a water or food borne pathogen
- Research diarrhea-causing pathogens

CHALLENGES

- Computer / Internet access
- Library resource capabilities
- Reading level-appropriate resources
- Student organization of case-related information and research
- Student background knowledge and reading levels

TABLE 1: WHAT WE LEARNED FROM THIS FIRST CASE: TRADITIONAL PBL AND PBL IN THE MIDDLE SCHOOLS –COMPARISONS BASED ON STUDENT / TEACHER / FACILITATOR EVALUATIONS

COMPONENT	TRADITIONAL	MIDDLE SCHOOL
<i>Ideal Group Size</i>	5-7	<ul style="list-style-type: none"> • 4-5; Students benefit from smaller groups and more focused attention; • More focused
<i>Researching Learning Issues</i>	Very open-ended; unguided Students must recognize valid references	<ul style="list-style-type: none"> • Provide students with references and websites that they can use as starting points • One on one help often necessary in beginning • More time required than might expect
<i>Facilitation</i>	Hands off	<ul style="list-style-type: none"> • More guided and probing; extra "silent" facilitator per group helps with student desire for attention, behavior problems and note-taking • More time needed to move through case than originally scheduled - flexibility • Students wanted less time to pass between facilitation days
<i>Hands-On Activities</i>	Not traditionally a part of PBL	<ul style="list-style-type: none"> • Students prefer to have hands on projects as a part of the case -Maintains interest and motivation
<i>Group Organization</i>	Not emphasized with the exception of student roles (data keeper, writer, manager)	<ul style="list-style-type: none"> • Identifying team rules and student roles critical at beginning of case - students prefer to maintain roles instead of switching midstream • Maintaining group notebooks / case logs helpful for organization and motivation • Requiring students to do learning issues as homework assignments helpful to motivate students to do research
<i>Wrap-Up</i>	Can be left open ended	<ul style="list-style-type: none"> • Students want wrap up; want to know how it all ends

IN SUMMARY...

- Students enjoyed the PBL process, especially the more intimate learning environment
- Students and facilitators found smaller groups (4-5) more effective than larger groups (5-7)
- Students preferred case-related hands-on activities and labs to classical learning issue research
- Students were frustrated with the process of research due to material constraints and insecurity about expectations - providing starting points and references and allowing students to share topics helped students engage
- Students were more engaged with facilitation occurring twice a week rather than once a week.
- Keeping groups the same throughout an entire semester rather than case by case may allow for improved rapport building with facilitator and each other

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