Learning through Problem-solving: Issues for Research and Design
15:295:550
Instructor: Dr. Anandi Nagarajan

Face to face meetings on 5/27, 6/2, 6/9, 6/16 from 5:00 - 8:30 pm
Rutgers Location: PSB 205 A, http://rumaps.rutgers.edu/location/public-safety-building

Asynchronous Online Meetings: login to sakai.rutgers.edu using your Rutgers NetId

Google Hangout: nagarajan.anandi@gmail.com

Phone conferences: Appointments can be made via email on a need basis.

Course Goals:
My goals for you during this course are to have you:
- become familiar with the basic components of the PBL process,
- read and critique the theoretical background of PBL,
- understand the differences between PBL and other related active learning/teaching approaches
- discuss and critique the promise and challenge associated with design, collaboration, facilitation, and assessment components of PBL,
- research whether and how PBL has been used for learning/teaching in your area of interest or professional practice
- identify potential "problems" in your area of interest or professional practice
- design a PBL unit in your area of interest or professional practice, adapting steps from the frameworks discussed in the course
- review and provide feedback on "problems" and PBL units designed by peers in your class

Course Information:
Have you ever wanted to do problem-based learning? Have you wondered how problem-based activities help students learn? What makes a good problem for learning? What is the role of the facilitator in a PBL experience? How can we assess learning and understanding in PBL? This seminar will tackle these questions as we consider constructivist approaches to learning and teaching. These approaches emphasize student-centered instruction situated in complex, meaningful tasks. We will discuss the factors that contribute to the success and failures of these approaches as well as explore the research issues inherent in these learning environments. We will examine the nature of knowledge construction, collaboration, facilitation, and assessment issues in PBL by discussing the relevant literature, review suggested frameworks for PBL unit design, and look at some examples of problem-based learning. In addition, the course will offer opportunities for you to design a PBL unit in your own area of professional practice or personal interest.

Required Readings:

Torp, L. and Sage, S. (2002). *Problems as possibilities: Problem-based learning for K-16 education.* (2nd ed.). Alexandria VA: ASCD. **ISBN-13:** 978-0871205742

The textbook can be ordered on amazon.com. This is an introductory textbook that will offer practical insights into design, facilitation, and assessment of a PBL unit. In addition to the textbook, additional articles and chapters are available online on Sakai. You must have a Rutgers NetID to use Sakai and the Rutgers Library Resources. If you do not have an account yet, it may take a few days to get one so it is important that you take care of this immediately**.**

Course Logistics:

We will meet in person a total of four times this summer session. Class has been scheduled from 5:00 – 8:30 pm on 5/27, 6/2, 6/9 and 6/16. For the rest of the classes, we will "meet" online on Sakai and discuss the assigned readings. Although there is an assigned meeting time for the face to face classes, the online discussion will be "asynchronous" which means we don't have to be logged in at the same time. However, due to the short duration of our course, <u>daily login and participation is a must</u>. If anyone misses a topic discussion, there will be no catch up time as the next topic starts the following day. I will use midnight as the official time for switchover between topics. For certain topics and assignments, if there is a need to have a "synchronous" discussion, we can use google hangouts to have one-on-one or small group discussions. I will also be available to discuss ideas and course-related topics on the phone as needed. Considering that we have 4 classes a week, I am assigning a lighter and shared reading load to make it manageable. Please check the tentative course schedule included in this document.

Office Hours, Correspondence:

Office hours are by appointment. The best way to contact me is through email. I will use your GSE email address for all correspondence. If you prefer a different address, it is your responsibility to have your mail forwarded to that address. If you opt not forward your mail to a personal/work email address, be sure to check your GSE email account DAILY and ensure that the right account is linked to the Sakai mailtool. You will need a gmail account to use googledocs.

Course Requirements:

1. Class and Online Participation & Facilitation	20%	Ongoing
2. Independent Research on PBL	20%	Due 6/1
3. Design of a PBL unit draft	20%	
a. *Initial "problems" and comments-10%*		Due 5/29, 5/30
b. *Completed PBL unit draft - 10%*		Due 6/7
4. Peer Critique of 3 PBL unit drafts	15%	Due 6/9
5. Final Project	25 %	
a. *Presentation -10%*		Due on 6/16
b. *Paper - 15%*		Due on 6/22

Letter Grade Equivalents

93-100	A	78-82	C+	60-67	D
88-92	B+	73-77	C	Below 60	F
83-87	B	68-72	D+		

Academic Integrity Policy

- All students must follow the RU Code of Student Conduct which can be accessed at:
  http://rci.rutgers.edu/%7Epolcomp/judaff/ucsc.shtml

- For information on the academic integrity policy, please go to:
  http://www.rci.rutgers.edu.~polcomp/integrity/policy.shtml

- A multimedia presentation on plagiarism can be found at:
  http://www.rci.rutgers.edu/~polcomp/integrity/realifeexamples.html

Related regulations may also be found in the Rutgers Graduate School of Education Catalog
Important Note: This syllabus, along with course assignments and due dates, are subject to change. It is the student's responsibility to check Sakai for corrections or updates to the syllabus. Any changes will be clearly noted in course announcement or through Sakai email.

Course Requirements

Participation & Facilitation (20%)
Ongoing

All students **are required** to complete the daily readings before coming to class and also before participating in the online discussions. All required readings are listed on the schedule (at the end of the document) and can be downloaded from the Sakai course site.

For the face to face classes on 5/27, 6/2 and 6/9,. These classes will follow a workshop model where I will share relevant information and materials, model relevant techniques, and facilitate class discussion and activities. Please come prepared to participate actively and make connections with the course material and your own area of professional practice. You will present your final PBL projects in the last class on 6/16.

The remaining 8 classes will be online and we will share the responsibility of facilitating the asynchronous discussion. I will model and facilitate the asynchronous discussion on 5/28 and 5/29. All students will be responsible for leading and facilitating at least 1 discussion on the assigned readings starting 6/3. The facilitators will lead the online discussion by posting questions that can get the whole class involved in critical discussion of the important theoretical, methodological and pragmatic issues raised by the readings. Facilitators must email the questions to me and get it approved before posting it on the discussion forum.

The role of the facilitator is to get the discussion started by either summarizing or asking *big idea* questions from the readings. The facilitator should also keep the discussion moving forward by asking students to justify their thinking and explain their ideas and how they fit with others in the

class or group. If some students are not participating or haven't posted a single idea or comment, the facilitators can and should encourage and politely nudge these students to express their opinions. If a comment seems ambiguous, you can ask for elaborated explanations or clarifications. Since our discussion topics will switch every day, it is important to log in several times in order to post initial comments, review the comments of others, and also to comment on what your class members are posting. The discussion forum will close at midnight.

All remaining students (non-facilitators) are expected to respond to the discussion questions, share additional questions that they may have about the readings, and/or share critical ideas that stem from the readings. You are also required to read the posts of others and comment on them. Remember, these posts need not be perfect or represent your final understanding on the topic. These are your thoughts, ideas, and reactions to the reading. Your understanding and final stances on the topics will evolve after sharing, discussing and reflecting on these ideas. You will learn more if you focus on the content and depth of discussion rather than the number of posts required.

A set of expectations and related grading criteria related to participation and facilitation will be shared on the first day of class and on Sakai. You will also get a chance to sign up for the day you wish to facilitate the online discussion.

Independent Research on PBL in your area of Professional Practice (20%)
Due on 6/1

The best way to learn about PBL, and how to incorporate and design a PBL experience for learners in your professional context, is to do research on what is being done currently in your area. The class readings will enable you to understand the basic framework of PBL, theoretical background, and examples of implementation. In order to make this experience more relevant and meaningful to you, you are required to find 4- 6 research articles in your field where PBL has been implemented. This exercise will enable you to see how PBL is interpreted, ways in which a learning/teaching unit has been developed and implemented, potential issues and challenges, as well as potential benefits of this approach to student learning in your specific field of professional practice. Specific guidelines on structure, format, and submission will be provided in class and on Sakai.

Design of a PBL unit draft: (5+5+10= 20%)
Sub-parts are due on 5/29, 5/30 and 6/7

As a precursor to designing a full-fledged PBL unit/project, you will develop a PBL unit draft adapting a template that will be provided. We will discuss this template in greater detail in class and you will have some flexibility to modify the template as needed. Considering the intensive and time-constrictive nature of the course, I would highly recommend that you use this PBL unit draft as the basis for the final class project. These PBL unit drafts will be submitted in the online forum so all students can see the different interpretations and potential implementation of PBL in different professional contexts.

This assignment has been broken down into 3 parts.

1. Before working on developing your PBL unit draft, you will need to select and develop a "problem". The best way to do this is to brainstorm ideas in class or online with me and/or your peers and:
   - Identify 3-4 potential "problems" in your field of professional practice that can become possible topics for designing a PBL unit. Email or post on Sakai to get feedback as you are initially thinking of ideas. Share the shortlisted "problems" on Sakai and Review the "problems" shared by others. Specific guidelines on structure, format, and submission will be provided in class and on Sakai.
   - Due on 5/29 and worth 5%.

2. In order to effectively select and refine a "problem" that will be the focus of your PBL unit, getting and giving feedback is a useful process. After completing the first part,
   - Comment on the "problems" shared by others based on new information read and discussed, and your own ideas on what may work or not. You are required to comment on the "problems" of at least 5 students. This is beneficial for you as well as it will allow you to: see how "problems" are framed in different learning/teaching contexts, evaluate the viability and learning potential of a "problem", determine if it is framed correctly, and consider alternative ways to present "problems" to students. Specific guidelines on structure, format, and submission will be provided in class and on Sakai.
   - Due on 5/30 and worth 5%.

3. After giving and receiving feedback on the "problem statements", you are to select one problem and develop it using the template provided in class. This fleshed out template is the PBL unit draft.
   - More details will be shared in class and on Sakai.
   - Completed PBL unit drafts are due on 6/7 and worth 10%.

*Peer Critique of PBL unit draft (3*5 = 15%)*
Due on 6/9

After submitting your PBL unit draft, all students will provide feedback on at least 3 other PBL units. These will particularly helpful as your classmates can use your feedback to modify the design of the PBL and/or identify additional components or pieces that can enhance their final PBL project. Specific guidelines on structure, format, and submission will be provided in class and on Sakai.

Final Project (25%)
Due on 6/16

The final project will include a paper (20%) and a class presentation (5%) on 6/16. You can work on the final project alone or with a partner. There are 3 options for the final class project. You will need to declare an option by 6/2 and also decide whether you are working alone or with a partner.

Option 1: Students will design a complete PBL unit to meet specific learning objectives/goals in their area of professional practice. Students may use the PBL unit draft submitted earlier as a starting point and build on it to design a fleshed-out PBL unit that is ready to be implemented. Students will write a paper that will address theoretical back of PBL, the need and potential value in your area of professional practice, and a detailed plan that includes design, implementation, and assessment of the PBL unit in a learning/teaching setting. This paper should help integrate the theoretical and practical issues that we have discussed in class. Suggested page length is 10-15 pages.

Option 2: Students will conduct an integrative literature review of research on problem-based learning environments. This will involve reading and synthesizing results from data-based research. Such a paper should begin with a theoretical framework and conclude with issues for further research. Various approaches to PBL should be compared and contrasted with the research methods and results critically evaluated. Specific topic and scope of the paper can be discussed on a case by case basis. Suggested page length is 10-15 pages.

Option 3: Students will develop an online PBL unit (webpage) which will present the problem, provide essential materials and links to relevant learning resources, provide collaborative tools and online support for facilitation and collaboration, scaffold the development of solution/product and include assessments. A short paper (approximately 5 pages) with the design rationale and evaluation criteria must be turned in. This online PBL unit must actually be a working website that can be implemented readily as a PBL unit.

Detailed guidelines and sample papers will be shared in class. There is *some* scope for modifying the requirements for the final project if it will help you in developing something that is meaningful, useful, and implementable in your area of professional practice. The scope of your project must be shared with and approved by me before any modifications to the requirements are made.

Formatting Written Work

In this class and for all courses in the Ed.D. program, your written work should conform to the formal standards articulated by the American Psychological Association. Most importantly:

- ○ Times New Roman, 12 point font
- ○ One inch margins on all sides
- ○ Page numbers
- ○ Cover page that includes title, course, student, professor, date
- ○ Left alignment with default spacing between words and letters
- ○ Double spaced lines with only one hard return between indented paragraphs

Incorrect formatting may result in a loss of points. All assignments will be submitted electronically as a Word document. Please refer to guidelines for each assignment for other content related requirements.

Required Course Readings

Additional Readings may be added as needed. All articles are available on the Sakai Course Site. I will also add a Resources folder on Sakai that will have links to numerous articles that can serve as optional reading. The textbook must be purchased as soon as possible.

Week 1

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review, 16*(3), 235-266).

Hung, W. (2006). The 3C3R model: A conceptual framework for designing problems in PBL. *Interdisciplinary Journal of Problem-based Learning, 1*(1), 55-77.

Jonassen, D. H., & Hung, W. (2008). All problems are not equal: Implications for problem-based learning. *Interdisciplinary Journal of Problem-based Learning, 2(2)*, 6-28.

Savery, J. R. (2006). Overview of problem-based learning: Definitions and distinctions. *Interdisciplinary Journal of Problem-based Learning, 1*(1), 9-20.

Torp, L. and Sage, S. (2002). *Problems as possibilities: Problem-based learning for K-16 education.* (2nd ed.). Alexandria VA: ASCD. *Chapters 1 - 5*.

Week 2

Azer, S.A. (2005). Challenges facing PBL tutors: 12 tips for successful group facilitation. *Medical Teacher,* 27(8), 676-681.

Donnelly, R. (2006). The academic developer as tutor in PBL online in higher education. In Maggi Savin-Baden & Kay Wilkie's (Eds.), *Problem-based learning online* (pp. 79-97). Berkshire, UK: Open University Press. *

Ertmer, P. A. , & Simons, K. D. (2006). Jumping the PBL implementation hurdle: Supporting the Efforts of K–12 Teachers. *Interdisciplinary Journal of Problem-based Learning, 1*(1), 40-54.

Hmelo-Silver, C. E., & Barrows, H. S. (2006). Goals and strategies of a problem-based learning facilitator. *Interdisciplinary Journal of Problem-based Learning, 1*(1), 21-39.

McCaughan, K. (2013). Barrows' integration of cognitive and clinical psychology in PBL tutor guidelines. *Interdisciplinary Journal of Problem-based Learning, 7*(1).

Pecore, J. L., & Haeussler, B. C. (2012). Problem-based learning: Teachers who flourish and flounder. *Curriculum & Teaching Dialogue, 14*(1),125-138.

* I will hand out a copy of Donnelly, 2006 in class.

Torp, L. and Sage, S. (2002). *Problems as possibilities: Problem-based learning for K-16 education.* (2nd ed.). Alexandria VA: ASCD. *Chapter 6.*

Zhang, M. , Lundeberg, M. , McConnell, T. J. , Koehler, M. J. , & Eberhardt, J. (2010). Using questioning to facilitate discussion of science teaching problems in teacher professional development. *Interdisciplinary Journal of Problem-based Learning, 4*(1), 57-82.

Week 3

Belland, B. R., French, B. F., & Ertmer, P. A. (2009). Validity and problem-based learning research: A review of instruments uses to assess intended learning outcomes. *Interdisciplinary Journal of Problem based Learning, 3 (1), 59-89*

Dalrymple, K., Wong, S., Rosenblum, A., Wuenschell, C., Paine, M., & Shuler, C. (2007). PBL core skills faculty development workshop 3: Understanding PBL process assessment and feedback via scenario-based discussions, observation, and role-play. *Journal of Dental Education, 7*1(12), 1561-1573.

Dalrymple, K., Wuenschell, C., Rosenblum, A., Paine,M., Crowe,D., von Bergmann, H.C., Wong, S., Bradford, M., & Shuler, C. (2007). PBL core skills faculty development workshop 1: An experiential exercise with the PBL process. *Journal of Dental Education, 71*(2), 249-259.

Hung, W. (2011). Theory to reality: A few issues in implementing problem-based learning. *Education Technology Research & Development, 59*, 529–552

Pellegrino, J. W. (2006). *Rethinking and redesigning curriculum, instruction, and assessment: What contemporary research and theory suggests.* National Center on Education and the Economy for the New Commission of the Skills of the American Workforce.

Torp, L. and Sage, S. (2002). *Problems as possibilities: Problem-based learning for K-16 education.* (2nd ed.). Alexandria VA: ASCD. *Chapters 7- 8.*

Wuenschell, C., Dalrymple, K., & Shuler, C. (2007). PBL core skills faculty development workshop 2: Training faculty in group learning facilitation skills through role-modeling and role-play activities. *Journal of Dental Education, 71*(5), 606-618.

Tentative Course Plan and Schedule

<table>
<tr><td colspan="2">WEEK 1: Intro to PBL, Design of PBL Units, Individual Research in Professional Contexts</td></tr>
<tr><td>Date</td><td>Topic Readings, Activities & Assignments</td></tr>
<tr>
<td>Class # 1
5/27, T
Rutgers</td>
<td>Readings: Torp & Sage, Chapters 1, 2, 3; Savery, 2006

Class Discussion: Course Logistics, Overview of PBL design and process
Hands-on Activity: Working through a PBL</td>
</tr>
<tr>
<td>Class # 2
5/28, W
Online</td>
<td>Readings: Torp & Sage, Chapter 4; Hmelo-Silver, 2004

Online Discussion: PBL model, Theoretical background
Assignments:

Identify 3-4 potential "problems" in your field of professional practice that can become possible topics for designing a PBL unit. Email or share on Sakai to get feedback.
Share these "problems" on Sakai and Review the "problems" shared by others - Due on 5/29

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</tr>
<tr>
<td>Class # 3
5/29, Th
Online</td>
<td>Readings: Torp & Sage, Chapter 5; Hung, 2006; Jonassen & Hung, 2008

Online Discussion: Flow of a PBL unit, Nature and conceptual framework of problem design
Assignments:

Comment on the "problems" shared by others based on new information read and discussed - Due on 5/30
Identify 4-6 research articles related to "problems" and PBL in your field of professional practice or personal interest. Independent Research on PBL - Due on 6/1
</td>
</tr>
</table>

By end of Week 1, you should have:
- become familiar with the basic terminology and components of the PBL process,
- read, critiqued, and discussed the assigned readings,
- understood the differences between PBL and other related active learning/teaching approaches
- identified or developed examples of "problems" that could be used to design a PBL unit
- conducted a library search of articles related to PBL in your field of professional practice or personal interest
- participated in online discussions, shared "problems", and commented on others' "problems"

WEEK 2: Problem Design, Facilitation and Collaboration	
Date	**Topic Readings, Activities & Assignments**
Class # 4 6/2, M Rutgers	**Readings**: Torp & Sage, Chapter 6; Hmelo-Silver & Barrows, 2006 **Workshop**: • Review "problems" shared by class • Problem Design Workshop using the PBL Design template. Students must come to class with a chosen "problem" that they would like to develop into a PBL unit. Please bring a laptop **Class Discussion**: Facilitation and Collaboration Issues, What are good questioning techniques, Student and Teacher Roles, Challenges with facilitation, Face to face versus Online
Class # 5 6/3, T Online	**Readings**: McCaughan, 2013; Zhang, M. et al., 2010 **Online Discussion**: Facilitation techniques in different contexts *Student Facilitators:* **Assignments**: Continue working on template for PBL unit draft. Seek feedback from instructor as needed.
Class # 6 6/4, W Online	**Readings**: Azer, 2005; Donnelly, 2006 (copy will be shared in class) **Online Discussion**: Challenges facing PBL tutors, Challenges with online facilitation *Student Facilitators:* **Assignments**: Continue working on template for PBL unit draft. Seek feedback from instructor as needed.
Class # 7 6/5, Th Online	**Readings**: Ertmer & Simons, 2006; Pecore and Haeussler, 2012 **Online Discussion**: Scaffolding learning, Facilitator role *Student Facilitators:* **Assignments**: Design of PBL unit draft - due on 6/7 Peer critique of PBL unit draft - due on 6/9

By end of Week 2, you should have:
• become familiar with the PBL design template and steps of the PBL process
• become familiar with issues of PBL implementation, particularly teacher facilitation and student collaboration
• read, critiqued, and discussed the assigned readings
• selected a "problem" and developed it further by using the PBL design template
• completed the draft of a PBL unit
• participated in online discussions, shared the completed draft of a PBL unit and commented on the PBL units of 3 other students.

WEEK 3: Assessment in PBL	
Date	**Topic Readings, Activities & Assignments**
Class # 8 6/9, M Rutgers	**Readings**: Torp & Sage, Chapters 7, 8 **Workshop**: • Review PBL unit drafts, self-assess and peer-assess PBL units and make notes for revision • Identify and evaluate potential assessment approaches • Identify assessments that may work well in your PBL unit **Class Discussion**: Assessment types, Formative/Summative, face-to-face/online **Assignments**: Continue working on final project. Seek feedback from instructor as needed.
Class # 9 6/10, T Online	**Readings**: Belland, French, & Ertmer, 2009; Pellegrino, 2006 **Online Discussion**: Measuring outcomes, Rethinking instruction and assessment *Student Facilitators:* **Assignments**: Continue working on final project. Seek feedback from instructor as needed.
Class # 10 6/11, W Online	**Readings**: Dalrymple et al. 2007; Wuenschell et al. 2007; Dalrymple et al. 2007 **Online Discussion**: Developing a faculty development workshop *Student Facilitators:* **Assignments**: Continue working on final project. Seek feedback from instructor as needed.
Class # 11 6/12, Th Online	**Readings**: Hung, 2011 **Online Discussion**: Final reflections *Student Facilitators:* **Assignments**: Continue working on final project. Seek feedback from instructor as needed.

By end of Week 3, you should have:
- become familiar the differences assessment approaches in PBL
- evaluated the pros and cons of different assessment approaches in PBL
- adapted ideas on measuring learning outcomes in your PBL project
- read, critiqued, and discussed the assigned readings
- continued to revise and refine your final PBL project

Class # 12
WEEK 4: Last Class on 6/16 Monday : Final Project Presentations