WORKSHOP

the MPS program 36

The McMaster

Problem Solving Program

Unit 36

Self Directed Learning; PBL

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SELF DIRECTED LEARNING

We all are aware of the frightening prospect that half of the knowledge that we learn today will be out of date within the next 10 years. So we focus on centering our knowledge about fundamentals and a strong foundation that will not become dated. Yet how do we keep up-to-date? What new knowledge must we acquire as we progress through our career over the next 25 to 35 years?

Another dimension to the challenge is that new knowledge is growing so fast; how can we possibly assimilate it all?

Many of us have thought of our own answers to these two questions: we'll just read the new developments on our own and learn the new technologies as they burst on the scene. But, what does research about learning tell us about this skill of "learning on our own" or "learning from others"? Are there some learning tactics that we might become skilled in applying? Are there some pitfalls that we should not fall into?

36.1 Goals, Objectives, Pretest and Background

Here we consider the objectives of this unit, the pretest, the background and the route ahead.

36.1-1 Goals and Objectives

One key skill graduates must have is the ability to keep up to date. The goals of this Unit are to help you develop self learning skills and habits. These include the ability to self-assess and satisfy learning needs on an ongoing basis, to anticipate, adapt to and promote changes important to engineering. Our professional practice is not static. You must be comfortable with change and be capable of using change to further the goals of the profession as well as individual careers. You will learn the change process, the importance of **people** as resources, and how to take charge of your own learning. This is different from

> **dependent** learning, where you count on the teacher to set goals, tell you books to read and guide/coach you;
>
> **independent** learning, where you learn things on your own.

We want to help you develop these and **further**. We want

> **interdependent** learning where you count on others to work with you to share information; where you teach others and they teach you.

Table 2.

MPS 36 Self-directed learning or lifetime learning

1.1 given a term listed under "concepts introduced", you should be able to give a word definition, list pertinent characteristics and cite an example.

2.1 Given a problem, you will ask questions, explore issues so that within 30 min, as a group of five, you will be able to identify all of the five to six major issues, and these shall agree within 95% of those identified by the tutor.

2.2 Given a problem, you will be able to list the possible knowledge you would need to know to solve the problem; your list should agree within 80% of the list of others in your group and within 85% with the list of the facilitator/tutor.

3.1 Given a problem, a list of the possible knowledge and resource available, you will create learning objectives and methods of assessment. These will be 90% acceptable according to the criteria for self-performance assessment (in MPS **3**)

3.2 Given the learning objectives and methods of assessment, you will be able to identify reasonable and pertinent sources of information and be able to allocate the resources to achieve the objectives in the time available.

3.3 Given the learning objectives, you will create for yourself examination questions that are consistent with the objectives. These will be judged by peers and or tutor to be 90% acceptable.

3.4 Given that other members of the group have acquired key knowledge pertinent to the situation, you will ask questions so that you can learn from them the knowledge you need. You will interact such that they will rate a willingness above 70% to continue to share information with you.

Concepts introduced

Peers as resources, Perry's inventory, learning objectives, assessment.

36.1-2 Pretest

Activity 36-1: Pretest_____

Consider this skill of self-directed, interdependent learning. How aware are you of what you do. Rate your awareness by placing an x at the appropriate location on the following scale:

Unaware it just happens.		have some awareness				Yes, very aware.
1	2	3	4	5	6	7

_____

How skilled are you? Rate your skill by placing an "x" at the appropriate location on the scale.

Unskilled		have some skill				Yes, very skilled.
1	2	3	4	5	6	7

_____

36.1-3 Background and the Route Ahead

MPS Unit **12**, on Learning skills, outlines the principles used to facilitate learning. Since others will be depending on you to help them learn, ideas from this Unit will help.

In the Unit, you are assigned to a group. A problem is given to the group. You task is to identify what you need to know, decide who is going to learn what and then return to the group and teach each other the information. The MPS videotape on SDL illustrates the principles and procedures. You might wish to watch this.

36.2 Characteristics of "Self Directed Learners"

Knowles (1975) defines a self directed learner as one wanting to learn all he can on his own terms, at his own speed and in his own style. He should feel secure in taking responsibility for accepting or rejecting ideas. He can distinguish clearly between the traditional teacher-directed learning (that we have all experienced) and "self-directed" learning (that we may have not, knowingly, experienced). He sees himself as an independent and self-directed individual, sees peers as resource people with whom one can interact. He can diagnose his own needs realistically, can translate those learning needs into learning objectives, can take the initiative in making use of resources, can identify pertinent resources for obtaining information, can select and use effectively and efficiently a strategy for the use of the resources, and has the ability to collect and validate evidence of accomplishment. That is, he knows (because of evidence he has collected--instead of just a gut feeling) that he "knows" the new knowledge. He may learn as much from people as from the traditional

resources such as books and tapes. Self-directed learning is one where the learner takes the initiative.

Since some might feel that the preceding description sound like self study, let's be clear that a major component of that might be learning from others or, in turn, teaching others.

So what is new about all that? Isn't that what I have been doing all along?
Perhaps. But consider the following:

-do we write out objectives for ourselves and criteria to help us check that we have achieved the objectives?
-do we use resources other than "a good book"?
-how much do we depend on the teacher?
-how do we quantitatively check that we know something?
-what do we do when we get stuck and cannot understand a topic? do we blame the book and leave the subject...and hope that the topic doesn't matter anyway?
-when listening to various people share their experiences and knowledge, how much of what they say do we absorb? or do we only half listen and concentrate more on what we are going to say to show them how much **we know**?

Our first task is to clarify the distinctions between the familiar "teacher-directed" learning, the target of "self- directed" learning in a small group, and what we might do if we just "learned on our own".

Here are four different scenarios: "teacher-directed" learning (that most of us have experienced extensively), "learning on your own" (which might or might not represent what happens or will happen), "self- directed" learning (where we take over the duties and roles of the teacher for ourselves) and "self-directed learning in a small group (where a team of people take over the responsibility and teach each other what needs to be learned).

In "**teacher-directed**" learning, the teacher is seen as "the boss"; we are told what to learn, we know the hurdles we must jump to show that we know something; the pace and rules of the classroom are set by the teacher. The knowledge-- not the application of the knowledge-- is usually what we focus on ("Learn the law of gravity, and then we will illustrate different ways that the concept can be used.") The teacher selects the text, sets of objectives, creates the exam, plans the activities to illustrate how the knowledge is applied. The sequencing and the presentation of the concepts are based on principles of good learning.

Often when we are turned loose to **learn on our own**, we jump in to learn "what is needed to solve the problem" but we often miss peripheral but important concepts; we select one resource- usually a book or the web. We are not trained in educational or learning principles and so may not be as efficient as we could be. Often we think of evaluation and tests as being so fraught with stress that we do not quantitatively test ourselves to ensure that we have "learned" a concept.

Under **"self-directed** learning", our goal is to exploit all the educationally sound principles used by teachers into our personal approach. We take charge. To make the distinction between what "usually happens" when we learn on our own to what *should* happen, we call the latter or target skills "self-directed" learning.

For "**self-directed learning in a small group",** we use the self-directed ideas but now there is too much information to learn as a self-directed individual. We must take charge of our learning but we also must rely on the others to teach us what we need to know. We, in turn, must teach others.

Being a self-directed learner may not be easy. Perry's (1970) work has helped us to quantify the various attitudes we might hold toward learning.

Perry's levels:

Level 2: all knowledge is known, the answers to problems are either right or wrong. The instructor or textbooks know the truth and the instructor's role is to tell us that truth: "The sage on the stage". The student's role is to receive. Concerning assessment, the student's main concern is "what is going to be on the exam?" Students equate bad grades with being a bad person. Their preferred task is memorizing definitions. Their most difficult task is to decide which of two conflicting authorities is correct: the instructor or the text?

Level 3: Most knowledge is known, the answers to problems are either right or wrong. The instructor's role is to tell students how to learn. The student's role is work hard and learn how to learn. Concerning assessment, the students equate hard work with a good mark. Their preferred task is compare and contrast. Their most difficult task is to focus on the "process" and not on the answer.

Level 4: Some knowledge is known, there is no certainty; anything goes. My answer is as good as yours. The instructor's role is be a model - a model that can be discounted. The student's role is to think independently. Concerning assessment, they can separate assessment of work from personal worth. Students equate independent thought with good grades (even if their independent thought is presented without critical thought or evidence). Their preferred task is analysis. Their most difficult task is to provide evidence to support claims and learning to listen to authority again.

Level 5: Different knowledge is needed in different contexts. There is no absolute truth. Answers are relative but good answers exits once the conditions, criteria and constraints are known. The instructor is a resource and guide: "the guide on the side". The student's role is to identify the conditions and coose the best ideas. Concerning assessment, the students seek positive and negative feedback. Their preferred task is synthesis and relating concepts between contexts. Their most difficult task is to decide which conditions apply.

Instruments are available (in your required text Woods, "Problem-based Learning: how to gain the most from PBL" Chapter 1 pages 1-7 and 1-8) to help identify one's Perry level. Table 36-1 gives such a form.

The characteristics listed for Perry's levels suggest that if, for example, John's attitude toward learning is at level #2, then self-directed learning would be extremely difficult for him. He is placed is a "hostile" environment and cut adrift. He thinks all knowledge is known... but it depends on the context. Thus, John will be trying to learn "all the knowledge related in any way to the topic" whereas what he should be doing is selecting the knowledge based on the context. John is searching for the "instructor to tell him what to do and from whom he will receive all knowledge" but in this context "there is no instructor who tells him what to know... the instructor is playing the role of the guide". Indeed, he and his fellow students are the "instructors".

Without careful training, most college or University students seem to be about level 2 to 3. Self directed learning expects you to be about level 5. Hence, before you embark on a self directed learning task we should reflect on our attitude toward learning.

Table 36-2 provides a list of target skills used by those who are successful in lifelong, self-directed learning. Take this opportunity to reflect on your approach.

Table 36-1 Moore Fitch Learning Environment Preference

Each of us has an ideal learning environment. Think of how you learn best. Try **not** to focus on one particular course or one particular instructor. Focus on their significance in an **ideal** learning environment for you.

You have **10** check marks to distribute among 34 questions. Put a check mark in the * column next to the statement that best describes your ideal learning environment. The code column is for easy reference when we discuss the inventory.

code	*	**My ideal learning environment:**
63		would provide assignments with practical everyday applications.
22		would have the professor give me all the theory and information I need to know.
74		would be where I would have a lot of control over the course content and class discussion.
72		would be where I take effective notes on what is presented in class and reproduce that information on tests.
13		would emphasize class discussion but I would expect the professor to tell us the right answer.
24		would be where I have my own opinions and I can think for myself.
53		include grading that is by a prearranged point system (for homework, tests, final) since I think that is most fair.
42		would include straightforward, not "tricky" tests, covering only what has been taught and nothing else.
64		would let me learn on my own because I hate being spoofed by professors.
73		would be where the professor doesn't tell me the answers; rather he/she shows me how to find the answers for myself.
95		would provide a flexible class where I can explore independent learning options.
44		is where my opinion counts, but I have to support it with factual evidence.
52		would be where the professor is an expert who knows all the answers.
83		would provide experiences and material that is relevant to what I need to know later.

(over)

code	*	**My ideal learning environment:**
15		would be where learning is a mutual experience where I contribute to the teaching and learning in class.
12		would have the focus on having the right answers rather than on discussing methods on how to solve problems.
45		would value my classmates as sources of information, not only as companions.
14		would reward me with high grades for independent thought.
82		would be where the professor provides me with clear directions and guidance for all course activities and assignments.
65		would take learning seriously and be where I feel personally motivated to learn the subject.
33		would reward me with good grades when I worked hard to learn the material.
55		would provide me with a professor who is a source of expertise only in a particular subject area.
54		would let me learn from my classmates and peers.
35		would provide a classroom atmosphere of exploring and debating new ideas.
43		would encourage me to learn using lots of different learning methods.
84		would allow peers the right to have their own opinions.
25		would include exams and assessment as part of the learning process.
62		would be lectures since I can get the information I need to know most efficiently.
23		would have a professor who was not just an instructor, but more an explainer, entertainer and friend.
34		would be a "free-flowing" class that does not follow a strict outline.
85		would provide a workshop or seminar atmosphere so that we can exchange ideas and evaluate our own perspectives on the subject matter.
93		would provide a relaxed atmosphere where discussion is encouraged.
32		would be where I could listen intently to the professor and not to classmates and peers for answers to questions.
75		would be where I can make connections among various subject areas and am encouraged to construct an adequate argument.

Table 36-2. Some evidence-based targets for Lifelong learning skills, Form **3600**

Lifetime learning we define as learning how to learn so that whatever comes our way we empower ourselves to master the new knowledge.					
Evidence-based targets	Progress toward internalizing these targets				
	20%	40%	60%	80%	100%
● Consider peers and classmates as resources to help me see my learning needs, to help me plan my learning and to provide new ideas so that I can learn from them.					
● Able to assess learning needs realistically.					
● Able to create observable, unambiguous and achievable learning objectives to match or satisfy my needs. Use these to assess progress.					
● Can relate to teachers and instructors as resources, facilitators and helpers rather than as the sole source of knowledge. Have acquired an attitude toward learning comparable to Perry level 5.					
● Able to identify people and material resources needed to achieve my learning objectives.					
● Able to shift from being a dependent learner through being an independent learner to being an interdependent learner.					
● Able to devise a time plan and stick to it reasonably well.					
● Willing to assume responsibility and ownership for the tasks in learning: (goal setting, resource identification, learning, assessment).					
● Meets contract commitments to teach others.					
● When teaching others, uses the principles of learning and addresses differences in learning styles (instead of “reporting information” and expecting the learner to sort it out).					
● When learning a “difficult” topic, willing to accept the challenge to unravel the complexity (instead of skipping over it and “hoping it won’t be on the exam”).					

Activity 36-2: Complete the Self Test Given in Table 36-2. You might use a rating scale out of 10.

When you have completed this, contrast some of your answers with the Perry scale descriptors. Compare this with your score on the Perry Instrument.
What are the implications of any differences that you see?

36.3 Attitude Changes that Might Occur

If we are used to the usual way of teacher-directed learning or if our attitude toward learning seems to be on a Perry scale around 2 to 4, then we might encounter emotional and frustrating difficulties when we try self-directed learning. Research into how we can change from one Perry level to another suggests that we experience "disequilibration". In other words, our familiar world is upset. We need to reassess the environment and what is expected of ourselves. Taylor (1986) has done more detailed research on the emotional changes that we might encounter when we first try self-directed learning. She identified the patterns that those used who felt "this form of learning was very productive and satisfying for them." In particular, she modeled the stages the successful students went through as they shifted from the traditional lecture, teacher-directed-and-evaluated learning to the self-directed approach. She identified four different phases of experience in self-directed learning, with transitions between each phase. These are summarized in Table 36-3. Not all students went through the same phases at the same time; some did not get beyond the second phase in a 13 week semester. Yet, the pattern shown in Table 36-3 represents a connected flow of events over time that follows a specific chronology; the pattern involves a major, personal reorientation (that is far more complex than getting skills and memorizing procedures) and finally, the growth occurs because of changes in meanings and interpretations that happen within the learner. This growth pattern may be triggered by the tutor, other learners in the group or the environment but the work has to be done internally by you, the student.

The information given in Table 36-3 helps you to realize that the feelings you might have toward self-directed learning are felt by others. It isn't just you or this particular self-directed program. It is OK to feel this way. Next, the model and data in Table 36-3 helps you to cope with the changes and feelings. You can see where you have been. It can help you to focus on the next activities that you might experience.

For example, you might feel that you want to skip going to the next meeting-- you are fed up with the whole thing. From Table 36- 3, you can see that are a group you should try to identify the cause of the frustration you are feeling. Others in the group probably are feeling the same. Go to the meeting.

Table 36-3: Taylor's Model to Cope with Change Working through the process

	Anticipate & describe; shock	Anxious, angry, disbelief, guilt of loss of previous; resist returning to work		Sense of direction; "Leap of faith"		Organization, control, calm begins; lack patience	
Equilibrium		disorientation		explore		reorient	
feel +; good about self; small emotional intensity	"discomfort" frustrated & confused because usual & expected norms have collapsed. Discrepancy between expectations & experience.	Confusion Anxiety Tension Anger	identify problem" search try to identify problem without blaming self or others	Feel confident; you are on the right track but are unsure as to where it is going	"Reflect" desire to consolidate ideas & experience	light comes on! realize that you as individual is where the change actually occurs	"Share" personally satisfied with change and want to share with others.
confident		crisis in confidence; negative self talk; self blame; not productive		relaxes with change & new approach; accepts without having fully resolved or understood it.			
Consolidate approach. Have new perspective; private reflection		withdraw from others associated with the source of confusion; no participation; Aggression & hostility toward change agent	reaffirms contract. Discovers others. help identify "productivity ". Identify cause of confusion or the problem.	intuitive-guided-exploration. Focus on the present time; "What will I do now?" Collaboration . series of insight episodes. Gain confidence & satisfaction.	withdrawal from collaborative activity. Private reflection about the change process.	Personal start to synthesize ideas & experiences into perspective.	Share major insight with someone.
Suggestions to help people through. Describe the above stages as the change is about to occur.	realize that disorientation & anxiety are to be expected; study the change process	as a change agent: refrain from fighting back at criticism. Be gentle but firm; help them to see where they are in the process	help them identify the problem	help bring the group together; help focus the change process & encourage them to continue on even if they don't have a complete resolution.	Help others see the need for personal reflection (especially of all are not at the same stage)	encourage individuals to write reports about their experiences; share with others	allow time for feedback, discussion, reflection and discovery.

36.4 Toward Consolidating Skill at Self-Directed Learning

Recall from MPS Unit **12**, some general principles of learning:

-1. we need to set goals. These can be short term but they also should be consistent with a global set of long term goals. Focus on the questions you should ask, the issues that should be explored... rather than starting off with what do I need to know? Use "fishing questions".

-2. try to put the situation into perspective. Get the overall picture. Don't jump in and grab a fine detail first.

-3. consider many different options; exploit the ones that best relate to your style and your preferences.

-4. draw on all the options and resources available; match the accuracy and extent of new knowledge with the resources available.

-5. embed the new knowledge into the structure...see the key fundamentals; explore the applications and enrich it with your episodic or background experience. Elaborate about the new knowledge. This can be done by answering questions about the text, making notes, discussing, teaching others, summarizing, and by formulating and criticizing hypotheses used or posed by the knowledge.

These principles are fine, but how do I apply these?
Usually, we become aware that we need to know some new knowledge because of a problem or decision that we need to resolve. Indeed, we may have several related problems that we are wrestling with.
Perhaps, we can couple the problems to be solved with some career goals that we wish to achieve. Thus, there might be two entries into the situation: a set of goals and/or a problem to solve.

1. If our focus is on our career objectives,then consider how the present situation offers an opportunity to further our goals. In the current context these could be to identify the educational objectives for the activity. These could be: to learn knowledge, to develop understanding and the applicability of knowledge, to develop skill, to alter an attitude and /or to develop values. Not all the members of the group may want the same objectives. Thus, the group should see how it can best satisfy all members. Each could prepare an "educational prescription" for each activity that might include objectives, possible learning resources, probable forms of evidence to show accomplishment, and criteria and means of validating the evidence. Or, it could include: a) the overall goal of the school, training program, department, company or institution; b) the individual's objective for this particular "problem situation" or opportunity, and how these relate to the individual's present concept of his probable career c) a listing of the individual's present strengths in knowledge and skills as they relate to this particular area of study; d) may include desired behaviours and competencies and possible criteria for assessment of achievement of those.

Use a "learning contract"
Thus, objectives, resources, criteria and methods of gathering validating evidence are outlined. Knowles calls this a learning contract. The contract asks each to list:

- the learning objectives,
-the learning resources and strategies that might be used,
- the type of evidence to be gathered to show accomplishment and mastery of the knowledge and
- the criteria to be used to decide the degree to which the goals have been achieved.

The learning goals might include: subject knowledge, applicaiton of that knowlegde, skills, attitudes and value or merit of the new knowledge, skills and attitudes.

Sometimes students prefer to sign a “contract” in which they agree to accept responsibilty.

Initial agreement:

“We, the undersigned, promise to do the research on the topics assigned to us during the SDL portion of this course. We realize that other group members ae dependent on the information we obtain and present just as we are dependent upon them and that we will do as much research as possible to have the most thorough information possible to present to our group.”

_____ _____ _____
_____ _____ _____

After each teach meeting

After each “teach meeting” we will sign that wew feel that the other group members did the work assigned to them to a sufficient degree. That is, we feel that their contribution has strengthened our knowledge of the topic to the degree that was outlined in the “goals” meeting.

PBL case #1 #2 #3 #4 #5 #6 #7 #8

names of members

_____
_____
_____
_____
_____
_____
_____

The learning contracts created by each member of the group are discussed within the working groups and used to guide the selection of the "problem" to be used for the next activity. Alternatively, you might want to read a "problem " first and use this to help focus on objectives. If you prefer this style, then you might start with topic 2 (below) first and then come back and consider objectives. Whichever approach (start with objectives and explore different "problems" that help you to achieve the objectives OR start with a "problem" and then decide on the issues, knowledge and objectives) we need to consider both the objectives and the problems and how they interact.

2. Interaction with the problem: this is focused to help the individuals achieve their objectives. The students need to identify when active, ongoing work with a problem is seriously impeded because of lack of knowledge. During the interaction, the group notes: a) questions raised ; b) specific learning tasks identified and c) any difficulties the problem poses.

3. The group compares these "questions, educational tasks and difficulties" with the "educational prescriptions" and ranks the knowledge and skills needed. The learning resources are then evaluated based of the tasks to be done. Some criteria are listed. Individuals decide who is going to do what task.

   The chairperson should not have a task to do other than to facilitate the meeting and the learning process during the meeting.

4. Self-directed study. Students learn on their own to match their learning objectives and to be able to bring appropriate knowledge back to the group for application in the problem setting. But, each brings back to the group -- not just the new knowledge he/she has acquired but rather -- new knowledge in a form such that the others in the group can "learn it easily". Each is not reporting back to the group; each is teaching and sharing experience with the group.

5. Application of the information into the problem: the problem analysis process may be interrupted at different stages to learn or obtain more knowledge. How to apply the new knowledge to refine the situation depends, to some extent, on when the interruption occurred. In this process each brings his/her new knowledge to the group.

Part of this experience is to learn from others.

6. Review and synthesis of what has been learned: a vital step is to formalize and integrate the newly acquired knowledge. They should review their work with the problem, explore what has been learned and its significance, and explore how this might be applied to future situations. One might try a related problem at this time to see the applicability of the newly acquired knowledge and skills.

7. Evaluation: of the knowledge and skills acquired is vital. Additionally, each should be evaluated on the skill used in teaching the others the new information.

36.5: Getting Started: Overview

A first task is to set goals- either by starting with goals and then exploring the situations that might help you achieve the goals OR by considering the problems and situations you face and extracting goals and objectives that will be achieved while solving the problems. Consider two situations: the academic world and your future professional world.

36.5-1 Academic Scenarios

In University, we are using this self directed activity to increase your knowledge, and to develop your understanding in a subject discipline--like Chemical Engineering or Capital Cost Estimation. The activity also develops our skill at asking questions, problem solving, being a self-directed learner, and alters our attitude toward learning, our confidence about ourselves and the value of information. Thus, we would scrutinize the objectives for the subject unit, and fold into these any additional personal objectives. Such as, to improve my interpersonal skills, or my chairperson skills.

36.5-2 Professional Scenarios

Here we are not explicitly given objectives, either for our life or for the company. Inferred objectives abound; but explicit objectives are missing. Thus, we should create for ourselves life and professional objectives that we can use as we consider the daily problems that are to be solved.

Example 36-1:

> You have joined a company recently, and have set as your tentative career goal to be promoted within five years to be head engineer responsible for a group of 15 professionals. You feel insecure about supervising engineers that are 20 years older than you; yet, when you achieve your goal, that is what you will be expected to do. Today, you are asked to select and lead a small project team of four that is to improve the yield in the isopropyl acetate reactor. You have not worked on that plant before and the design records and files for that plant contain very dated, and sketchy data about the current reactor design, configuration and operation. You have 15 days to complete the task. What objectives might you create?

An Answer:

> Here is an ideal opportunity to combine the technical objective-- of improving the reactor-- with your personal objectives. Include on your team experienced, older engineers and give them a chance to share their knowledge. Approach the task not as "I am going to show those experienced engineers how smoothly I run a design group!". Rather, use the attitude that I will try to facilitate the pooling of information -and giving credit where credit is due- to solve a problem. What can I learn from the experienced engineer? In this small environment, you will then begin to build your confidence-- and theirs-- about how you would supervise older engineers.

Now consider the practical stages in facilitating your skill at self directed learning.

Activity 36-3: For problem #1, everyone read the problem carefully.
We have the MPS 6 step approach. Step 1: Read it carefully. Check any words whose definitions we don't understand. Say "I want to and I can"
Step 2: Define: Is it clear what we are asked to do? Usually not. Usually a situation is described. Is everyone clear about the situation. In this situation: Who is involved ? who is not? Where is? where is not? When is? when is not? What is? what is not?
Step 3: Explore: create our group "internal representation" of this situation. Brainstorm the kinds of issues, factors, stuff we need to know for this situation. Do this from a variety of different perspectives. Try for at least seven different viewpoints. Keep, in general mind, the context of the course and subject we are considering. For example, this scenario is in the context of a course in "Chemical Engineering" and about energy. Let's make sure that that is one perspective we consider.
Step 4: Plan: let's cycle through the various issues and see which ones **all** of us know already, which ones some of us know about and which ones none of us have a clue. Then we will prioritize these using the criterion that each of us has about 5 hours we can devote to researching and preparing to teach and we have six members in our group.
Step 5. Do it: systematically follow the plan
Step 6: Look back. Is it achieveable? Let's get the tutor to check that our list is consistent with the program's goals for this case.

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Once this activity is complete, and objectives are enunciated, individuals will identify topics they would like to research/teach. Once agreement has been reached then each should explicitly create a learning contract.

36.6: Creating Learning Contracts

Your first reaction may be to skip this step because

-we are only a small group and we don't need to be this formal,
-we don't need to be this rigorous because we know how to do this anyway,
-time is so short, this will only take up more time. Besides we'll know when we know the stuff anyway!

Despite all these comments, please do this step.

Ensure that the problem situations that you want to use to test your knowledge and your ability to apply the knowledge are stated and clarified before you go on to the next section.

36.7 Resources and Allocation of Resources

By this time you and your group will have identified goals, considered the problem situation and the issues raised from it. Now we need to think of learning resources available to help us achieve the knowledge expeditiously. We then need to think of how best to exploit the resources.

Some resources include people, tapes/movies; the internet, books, journals, short courses, experiements, and games and simulations. Bearing in mind the type of objectives we are trying to achieve, which resources might be most appropriate and who is going to use them? for what purpose? and who will report back? what form will the reporting back take?
To determine appropriateness of the resources, the criteria could include pertinence for the level of knowledge needed, availability, ease in using and am I likely to be able to satisfy my objectives with these resources in the time available? What happens if the resource is not available? Some contingency plans should be explored. Above all, the person reporting back to the next meeting should not say, "I couldn't do my part because the books aren't available".

Activity 36-4: For the objectives agreed upon for Unit 3, what resources might be most appropriate? are they likely to be available?
Who is doing what?
What form of the information is expected from me? duplication of the key pages? summary notes? list of key references for others?
How can I best teach the others what I have learned?
Which of the objectives do I satisfy from what I have learned? How would this be applied to solve the "problem"?

Answer these and other pertinent questions from within your group. Use jiffy memos to record in writing what you agreed to do. Each is contracting with the other group members. Consider creating a written contract with the group

_____

***

Some possible methods that could be used in presenting information and knowledge back to the group are:

handouts, list of key references, concept maps, brief essay, example problem and soilutions, copies of key articles or paragraphs from key papers, CD, computer disk, role playing game, interactive computer model, verbal, play, structured controversy, spreadsheet.

Some suggested questions that might be used for the Day 1 group meeting are given in Table 36-4. Also shown is the activities in the Day 2 group meeting.

A possible issue is attendance. We have matured; we decide whether we go to class or not. That is our decision. Well, for the self directed learning components, attendance is mandatory. Nothing is more frustrating and demoralizing to a group to have someone attend the planning meeting, accept a responsibility and then just not show up to teach the others about the topic. Equally discouraging is it for someone to miss the first meeting and then show up at the learning meeting and say "hey, what is going on?" "Will someone please explain this to me." In self directed learning, each contracts with the group to attend all the sessions and to participate fully.

36.8 On Your Own

You are on your own. You have a task to do. The resources you thought might be there, are not. The resource that you hoped would be helpful is useless. But through it all you obtain the knowledge needed by the group.

Before you return, however, you realize that you are the only one assigned this topic and you must, in a very short time, teach this information/ knowledge to the others. How to do this? Recall from MPS Unit **12**.

-start with an overview, highlight the structure, where this fits in;

-provide clear definitions - if for no other reason than to facilitate communication.

-do something in writing; clearly cite references,

-perhaps you each want to type up your material on Word Processing; bring your diskettes to discussion with a printout. Then, all of the information can be discussed, elaborated on and collapsed into one set of composite notes.

-embed the information into the problem;

-perhaps supply beetle diagrams or Gowin Vees.

Now, consider the learning preferences and styles of your group members (as summarized in Table 36-5). Recall how best they learn. Reconsider your notes. Did you only give an example? Then the Jungian **S** people will like that approach but the dominant **N** people will not. Vice versa if you gave only the theory.

Learning it on your own, for yourself is one thing. Being able to share, teach and communicate it effectively to your colleagues might be a challenge. Be prepared to SHARE your experience.

Table 36-4: Suggestions for Self-directed Learning Activities

Day 1 Is the Focus to be Objectives? or problems? or both?
Use facilitation checklist as guide MPS 20, asking questions
What do we know already?
What questions should be asked?
What are the issues and components that should be considered?
What resources are available?
How do the learning Contracts of all members compare? How best can we satisfy them all?
Who does what?

Provide feedback to the chairperson about skills.

Day 2: Share Findings,
teach each other; don't just report!

Embed new knowledge into the problem and past experience.
make sense out of it.

Present and summarize validating evidence
Elaborate, what other problems/situations can you now solve using the same fundamentals?

Provide feedback to the chairperson about skills.
Provide feedback to each person about the teaching process.

36.9: Learning Together

The group reconvenes and each teaches the others. Do not belabour the troubles you had; focus on the knowledge to be shared.
This may be very frustrating at first because your learning styles will differ among the members of the group. (At some time, you might want to return to MPS Unit **11**, Unique You or Personal Preference, and the way individuals completed the Kolb and MBTI and Jungian typologies. Does this help you see what is happening in the group?)

Please resist the temptation to collect a set of references from everybody and then dash off and learn it on your own. Try to listen intently, ask probing questions to discover the meaning and structure of the knowledge and use the other people as your "only" source of learning the material.

Ensure that there is enough time to:

-review the learning contracts and the validating evidence, "did you achieve your objectives?" how do you know?

36.10: Applying Together

Knowledge must be related to past experiences, applied to current problems and considered in the context of future situations.

36.11: Feedback

Check the validating evidence about the knowledge and skills acquired. Evaluate the self directed learning as a process, and, if you wish, evaluate the chairperson, group process and problem solving activities. Focus, especially, on how the process you used differed from what you used to use when you "learned on your own". Use Table 36-2 to help focus on the issues.

Provide some feedback to each on how they facilitated your learning of the material. A sample feedback form is given in Fig 36-1.

36.12: And Next?

Next, we continue applying the same technique to learn new information. Please keep the groups the same. Appoint a different chairperson.

MPS 36 Table 36-5: Learning preferences and attitudes a120

Name	Attitude: Perry scale		Learn style			Jungian			
	before	now	strategic	rote	meaning	S value and implications for learning		T value: combine with S and implications on test questions	
						value	implication	value	implication
You									

a120

Fig 36-1: Feedback to _____ for Unit ____
on the Learning components Date _____
Present & on time: ☐ Present but late by _____ min.
All members of our group present except for _____

Quality of Knowledge: good intellectual understanding of the topic, the material supplied was complete and appropriate.

None of these — A few but major omissions — Most of these — All of these

O_____O_____O_____O_____ O_____O_____O_____O
1 2 3 4 5 6 7 8

Quality of Instruction: he/she was here on time, the presentation was focused on the new knowledge; good choice of material and medium with effective communication and resource material supplied.

None of these — A few but major omissions — Most of these — All of these

O_____O_____O_____O_____ O_____O_____O_____O
1 2 3 4 5 6 7 8

Followup: from this presentation I will have to:

O_____O_____O_____O_____O_____O_____O_____O
| |
study the subject on my own; I learned nothing from the presentation — practice on some problems; however, I have all the fundamentals I need to know.

Strengths

_____
_____
_____
_____
_____
_____

Areas to Improve on

_____
_____

36.13 Embed

This coming week and the weeks after, keep track of how you do this task. Complete a reflection form; identify the specific problem you worked on for homework; comment on what you learned about this particular topic from your problem solving activities.

36.14 Expand

This coming week, and the weeks after, think of how this skill applies to your solving of your everyday problems. Reflect on them and write them up in your journal.

36.15: Summary

Self directed learning is when you assume all the characteristics of a teacher; you take control of your own learning, set explicit goals, establish and apply evaluation criteria.

Because these activities occur in a group, you learn to evolve objectives that will help all in the group. You learn to learn from each other by listening and asking questions and by presenting and sharing information to facilitate learning.

Activity 36-7:

Return to the pretest and note your awareness and skill for this Unit. Use an "o".

Complete the DISCOVERY form for this Unit.

Reflect on your personal skill; set goals for yourself. Perhaps this is a Unit you might select for personal enrichment.

36.16: References

Barrows, H.S. and Tamblyn, R. (1980) "Problem Based Learning" Springer

Knowles, Malcolm (1975) "Self Directed Learning" Follett Publishing Co., Chicago Ill

McMaster University Medical School, Hamilton Ontario, personal communication with Dr Elizabeth Brain. (1986)

Perry, W.G. Jr., (1970) "Forms of Intellectual and Ethical Development in the College Years" Holt, Rinehart and Winston, New York.

Taylor, M. (1986) "Learning for Self-direction in the Classroom: the pattern of a Transition Process" Studies in Higher Education, **11** p. 55

36.17 Exercises

36.1 "A company has just telephoned you to ask you to come in and give a series of courses to improve the communication skills for the engineering section of the company. The supervisor says " No one in this whole division can write a decent report!" Fix the situation."

Given this scenario, apply the principles of self-directed study to determine what you might do to fix the situation.

36.2 "The only thing that prevents us from installing this new process is that we want to electro-reduce ferric to ferrous ion in the liquid stream. Design such a unit."

Given this scenario, apply the principles of self-directed study to write out the design procedure for this problem.

36.3 Write out the principles you use to prepare "teaching session" about your topic and contrast this with the approach you use if you "reported back" to your group about a topic.

36.4 You have 6 meetings coming up for self directed learning. Bill showed up for your first meeting and volunteered to teach the rest about what many of you think is the "key" concept in the Unit. Bill did not show up at the second meeting. When asked what happened later, he replied "Oh, I just couldn't make the meeting." Meet as a group and discuss what you might do about this situation.

File a120

Feedback for PBL/SDL a120
Situation$1
Issues
Number identified: 1 2 3 4 5 6 7 >7

Agreement with tutor <50% 50% 60% 70% 80% 90% 100%

Knowledge/skills to be learned
Consensus among group little some a lot complete

Agreement with tutor's list little some a lot complete

Learning objectives
Quality poor fair OK good excellent

Learning
Quality of questions asked during the teach session none some astute excellent
Willingness to continue to contribute <50% 50% 60% 70% 80% 90% 100%

Your Attitude
Perry shift 2 3 3.5 4 4.5 5
****
Situation $2
Issues
Number identified: 1 2 3 4 5 6 7 >7

Agreement with tutor <50% 50% 60% 70% 80% 90% 100%

Knowledge/skills to be learned
Consensus among group little some a lot complete

Agreement with tutor's list little some a lot complete

Learning objectives
Quality poor fair OK good excellent

Learning
Quality of questions asked during the teach session none some astute excellent
Willingness to continue to contribute <50% 50% 60% 70% 80% 90% 100%

Your Attitude
Perry shift 2 3 3.5 4 4.5 5

Situation $3

Issues

Number identified: 1 2 3 4 5 6 7 >7

Agreement with tutor <50% 50% 60% 70% 80% 90% 100%

Knowledge/skills to be learned

Consensus among group little some a lot complete

Agreement with tutor's list little some a lot complete

Learning objectives

Quality poor fair OK good excellent

Learning

Quality of questions asked during the teach session none some astute excellent

Willingness to continue to contribute <50% 50% 60% 70% 80% 90% 100%

Your Attitude

Perry shift 2 3 3.5 4 4.5 5

****

Situation $4

Issues

Number identified: 1 2 3 4 5 6 7 >7

Agreement with tutor <50% 50% 60% 70% 80% 90% 100%

Knowledge/skills to be learned

Consensus among group little some a lot complete

Agreement with tutor's list little some a lot complete

Learning objectives

Quality poor fair OK good excellent

Learning

Quality of questions asked during the teach session none some astute excellent

Willingness to continue to contribute <50% 50% 60% 70% 80% 90% 100%

Your Attitude

Perry shift 2 3 3.5 4 4.5 5