Key Cognitive Processes in PBL Practices: Insights for PBL Facilitators

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Outline

- Introduction
- Psychological Power of Problems
- Thinking and Collaborative Learning
- Key Cognitive Processes in PBL
- Insights and Implications

Introduction

- 3Ps: Paradigms, Philosophy and Practicality
- Dynamism and proximity of change
- Call to re-examine knowledge and participation
- Expectation of greater congruence and alignment of activities of the university and society (e.g. graduate profile vs employers' expectations)

Singapore Example

Tan, O.S (2000). Reflecting on innovating the academic architecture for the 21st century: A Singapore perspective. Educational Developments, 1 (3), 8-11.

"Committee on Singapore Competitiveness" published in November 1998

To improve the longer-term competitiveness of Singapore, we should refine our education system to help foster

creative thinking and

entrepreneurial spirit

among the young."

This report identified three major components of the education system that should be addressed:

- *Content*
- *Mode of delivery*
- *Assessment*

EDB Publication: "A Knowledge-based Economy."

"For our knowledge-based economy to flourish, we will need a culture which encourages *creativity and entrepreneurship*, as well as an appetite for *change and risk-taking*"

(Economic Development Board, 1999, p.3).

Manpower 21: Vision of a Talent Capital

Universities need to respond to the "*lifelong learning for lifelong employability*" agenda.

The Singapore Context

Education has to cope with the

- Impact of Globalization
- Impact of Technology
- Impact of the Knowledge-based Economy

Should changes be incremental or drastic?
As educators how do we prepare our students?

Key Dimensions of a more Creative System of Education

- Opportunities and Chances
- Spectrum of Talents and Abilities
- Maximizing Individuals' Unique Potentials
- Initiative
- Enterprise
- Innovation

IT Master Plan (Ministry of Education, Singapore?)

- Linkage of School and the World
- Expand and Enrich the Learning Environment
- Encourage Creative Thinking, Lifelong Learning and Social Responsibility
- Generate Innovative Processes in Education

Problem of not creating value in education if we…

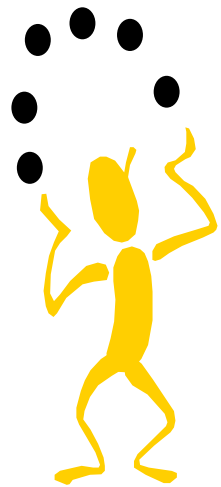
- Teach content that becomes obsolete
- Impart skills that are not sufficiently transferable to the work place
- Use learning processes that do not impact on life-long learning
- Use learning environments that do not encourage motivation and independence

Overall Ranking of Skills that Employers Rate as Very Important (NUS CDTLink, July 2000)

- Teamwork
- Problem solving
- Ability to take initiative
- Desire to learn
- Interpersonal skills
- Ability to work independently
- Oral communication
- Flexibility in applying knowledge

21st Century Skills according to IBM

- Problem Solving
- Teamwork
- Interpersonal Skills
- Creativity
- Project Management
- Systems Perspective



Top Ten Attributes employers are looking for in new graduates:

- Real Work Experience
- IT Literacy
- Problem-Solving
- Team-Building Skills
- Communication Skills
- Logic & Reasoning
- Leadership Ability
- Adaptability
- Professionalism
- Initiative

(Source: www.transworldedu.co.uk)

Paradigm Shift

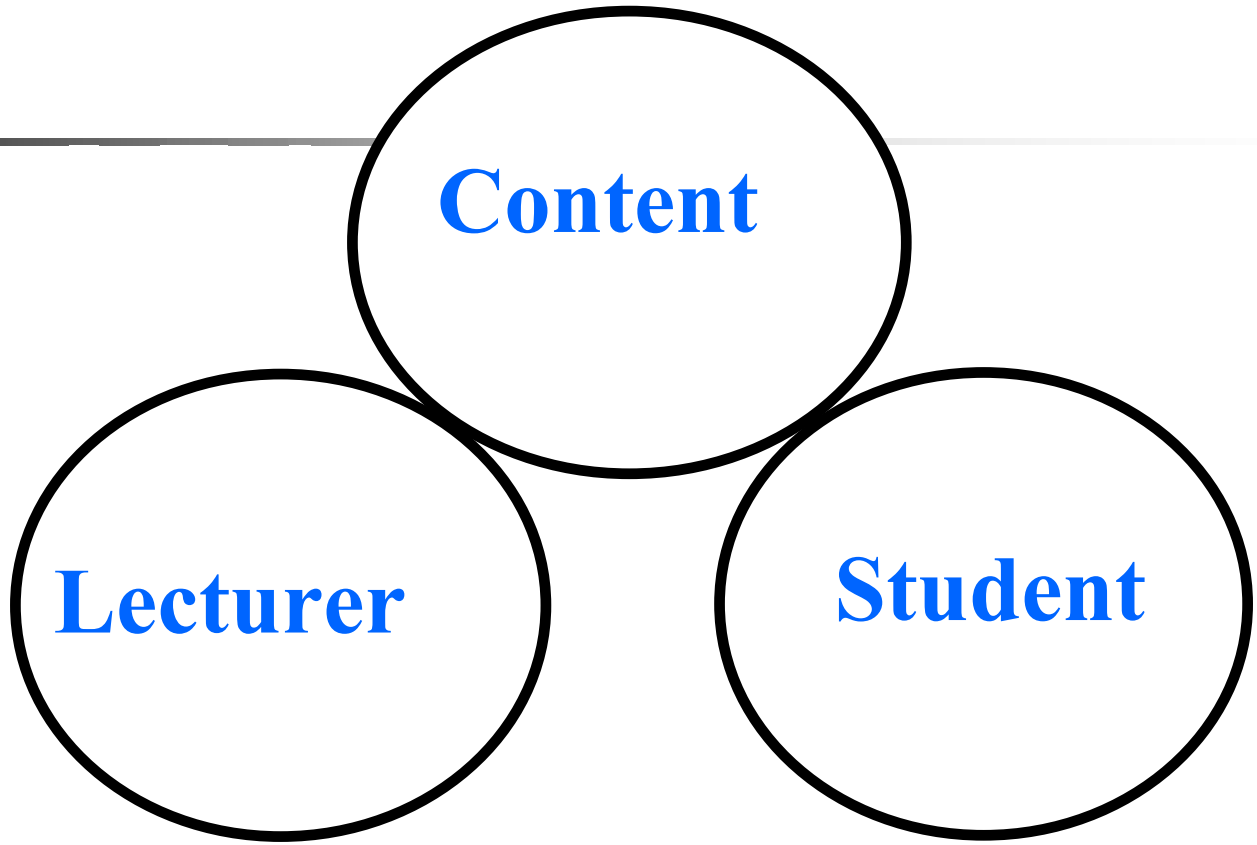
- Kuhn (1962) The Structure of Scientific Revolution.
- Shift in underlying assumptions
- Existence of conflict of “world views”
- Is there a need/search for a new educational paradigm?

Paradigm shift?

- Reductionistic
- Analytical
- Deductive
- Fragmented, linear and sequential
- Rational
- Theoretical

- Systemic, ecological
- Global, holistic, integrative
- Inductive + deductive
- Whole-brain
- Intuitive + rational
- Contextual

Traditional Style of Education



Content-Lecturer-Student Approach: Concerns

- Bulk of instructional time: Students listening passively? Little generation of ideas, imagination, or serious inquiry?
- "A Sahara of instruction…little thought" (Derek Bok, 1993)

I've been replaced by online multimedia of me teaching

Responses of Academic Staff (N=65) to Considerations Given to the Learner, the Subject Content and Society in Designing Courses

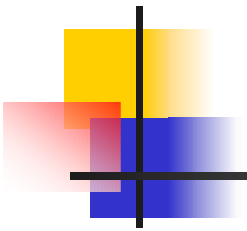
	Considerations Given		
	Very Little 1 2	3 4	Very Much 5 6
The Learner	30.7%	42.3%	27.0%
Subject Content	9.6%	25.0%	65.4%
Society	19.3%	48.0%	32.7%

Content

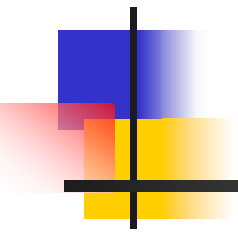
- What to teach?
- What do I want students to learn?
- Use of lesson plans and behavioral objectives
- Assumes that learning can be measured
- Defines all learning by that which can be measured
- Teaches what we can test
- Uses educational measurement system
- Teaching process is centred on presentation, memorization, imitation and recall
- Assumption about nature of intelligence, thinking and learning?

The Empty Raincoat (Charles Handy)

- The Macnamara Fallacy
- Measure what is easily measured (validity and reliability)
- Disregard what we cannot easily measure
- What cannot be measured becomes unimportant
- This is suicidal



The circularity of this model of interaction (content, lecturer, “reactive” student) assumes that education is about evaluation. In short, the concern is about those aspects of intelligence, thinking and learning that is measurable.

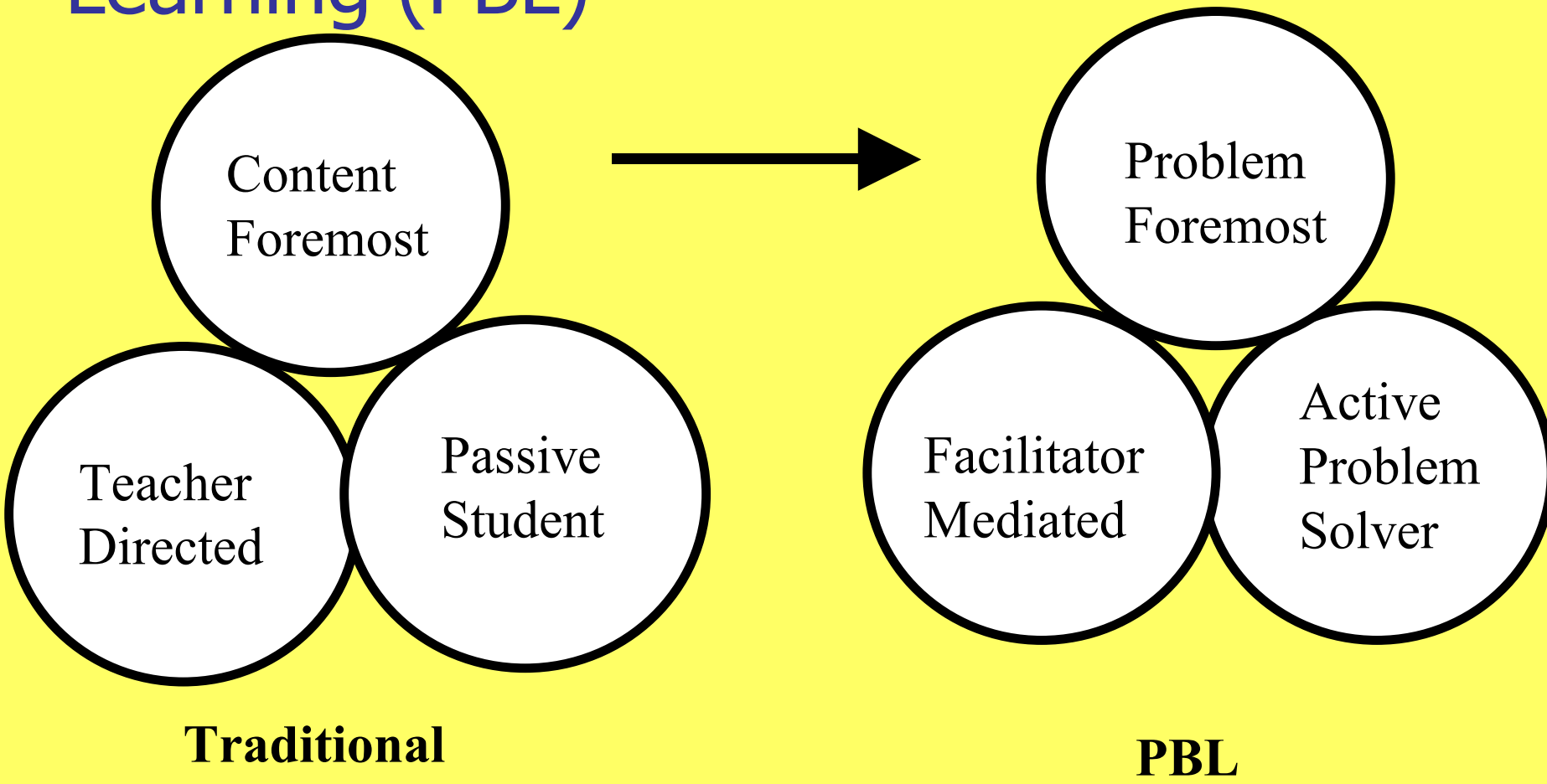


The underpinning belief-system of the tutor is a pre-requisite to him/her playing an effective coaching role.

Tutor's Belief System

- 12 tutors were ranked in terms of openness to PBL philosophy and approaches and need for education innovation.
- Correlation with students' feedback of overall effectiveness of PBL.
- There was a positive correlation between tutor's belief system and PBL effectiveness.

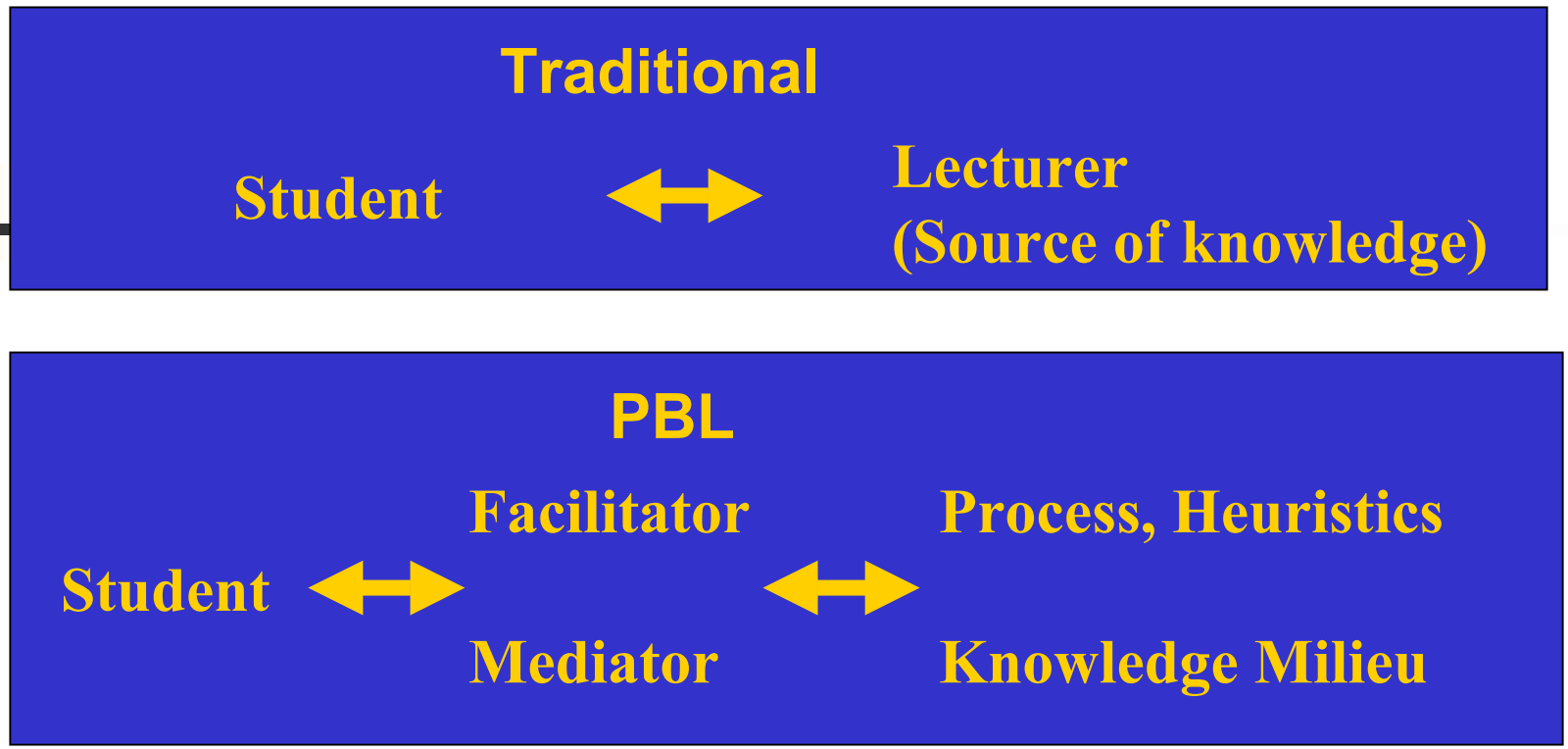
The shift towards Problem-based Learning (PBL)



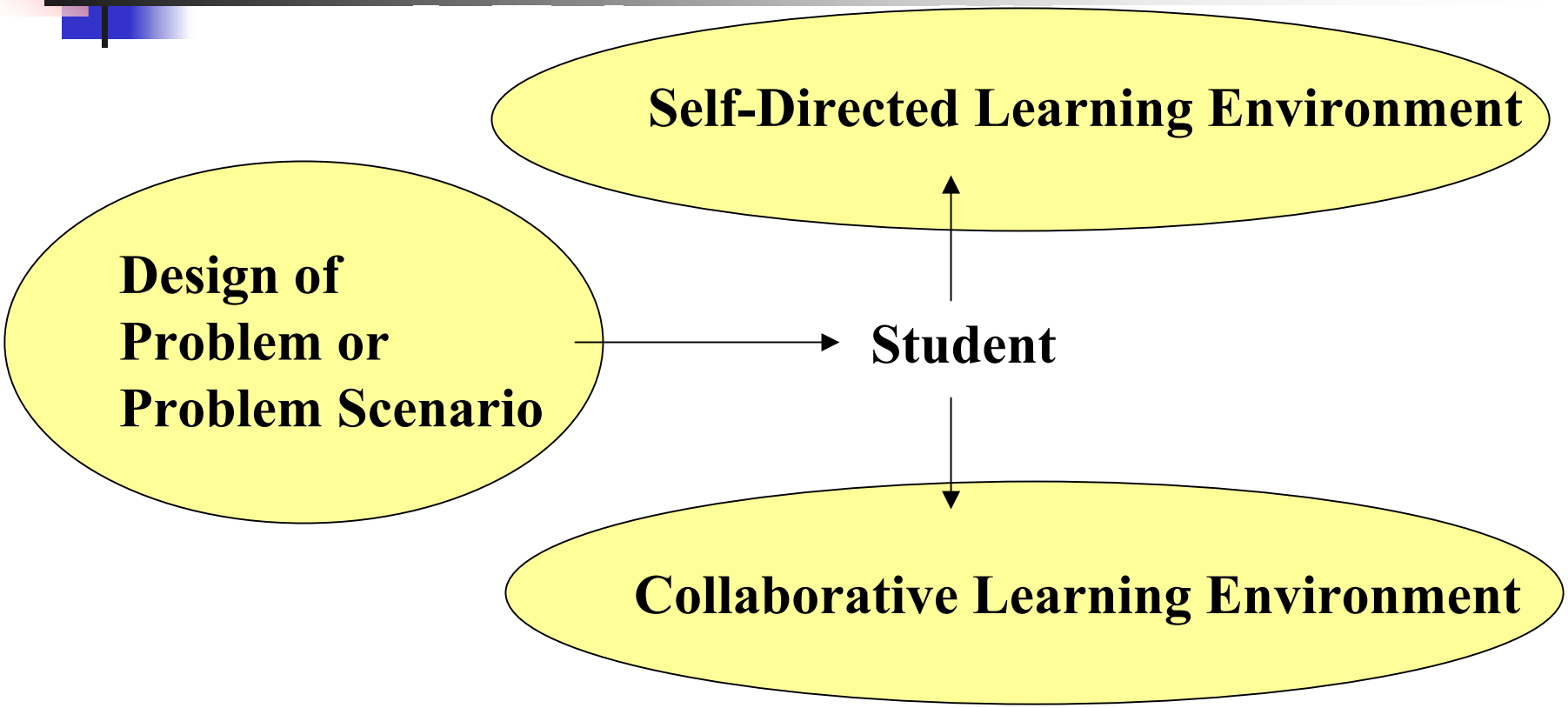
New Roles

- Process facilitator
- Mediator of learning
- Designer of the learning environment

Role of Facilitator-Mediator



Designer of the Learning Environment



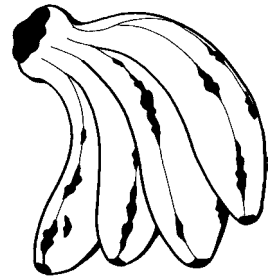
The Psychology of the Use of Problems

- Problems: Fuzzy, Troublesome, Irritating, Stressful
- Real-World Problems vs Exercises

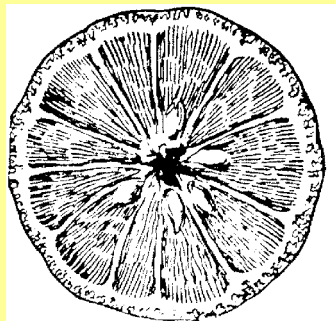
  (Routine, Not-so-routine, non-routine)
- Driving Force of
  - Motivation
  - Learning
  - Thinking
  - Collaboration

Great Ideas and Breakthroughs often begin with a fascination with problems (followed by *ownership* of the problems concerned)

Banana Problem



- Why does a banana turn brown when it is hit?
- This was a problem that got Albert Szent-Gyorgyi engaged…
- The biochemist discovered that there were two categories of plants. He went on to discover vitamin C.



Exercise, Nature and Music

- A Japanese engineer wanted to have rich music, outdoor beauty and a walking exercise simultaneously.
- His preoccupation with the problem led to the first conception of Walkman - the tiny stereo with headphones.

Cornfield experiment

- Genetic experiment: Sterility of pollen from the corn. The researchers observed certain discrepancies (from what was expected but which most did not bother about).
- Barbara McClintock, however, took ownership of the problem. Decades later, she said: “When you suddenly see the problem, something happens….”

Problem and Spin-offs

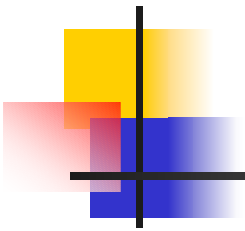
- Osheroff, D. was a graduate student of David Lee and Robert Richardson at Cornell University.
- There were looking for "a phase transition to a kind of magnetic order in frozen helium-3 ice" but owing to Osheroff's sharp observation they discovered a different phenomenon, namely, the Superfluidity of helium-3.
- The breakthrough in low-temperature physics won them the 1996 Nobel Prize for Physics.

Problem triggers

- Context for engagement
- Goal setting and goal-directed behaviors
- Need for knowledge, competence
- Active search for meaning, information and solution

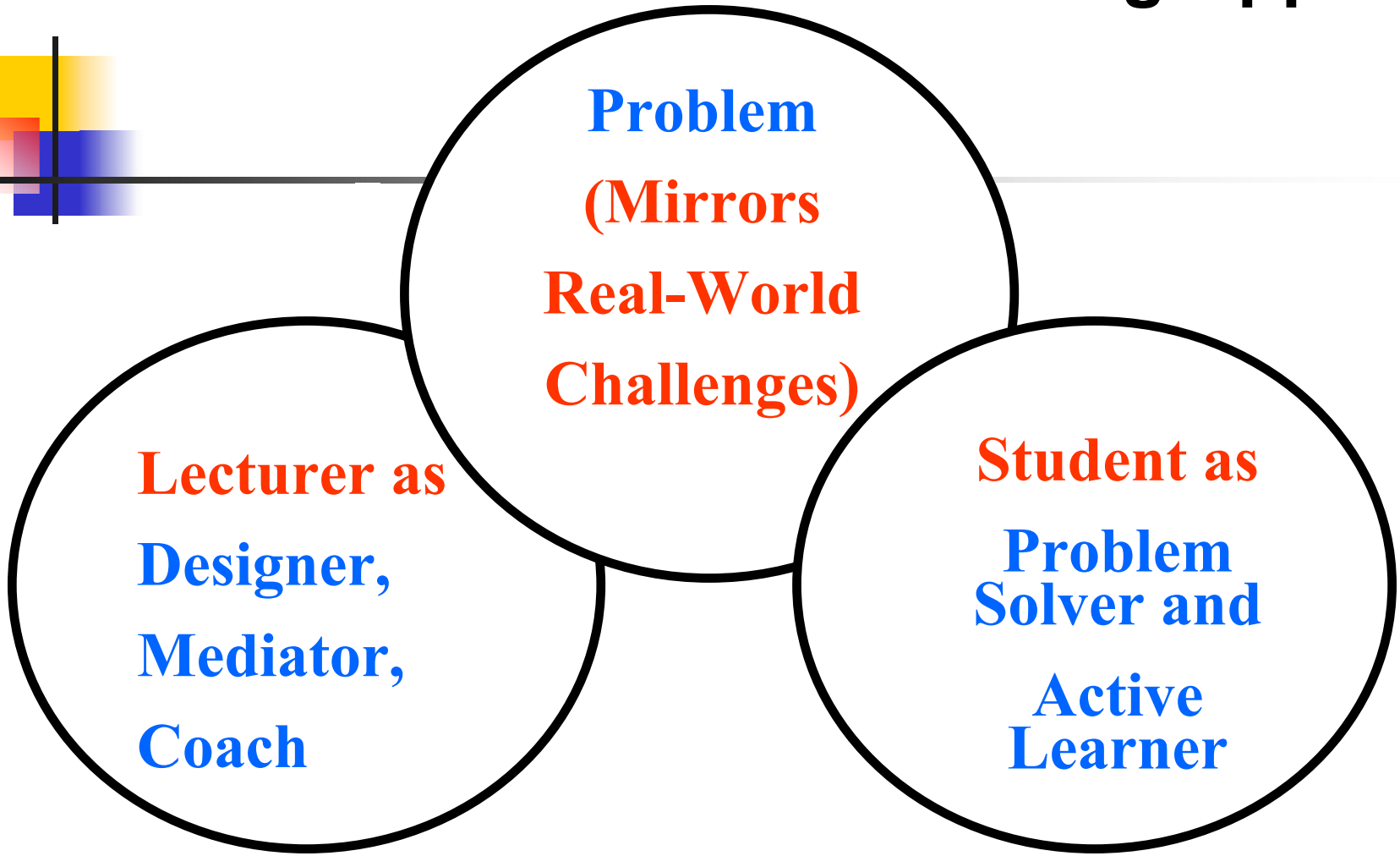
Research on learning:

- Brain preferences indicate that attention and arousal is enhanced with holistic, pictorial and broad-based presentation (rather than separate entities and single concepts)
- The learner is intuitively searching for context. Context provides meaning.



Making use of the power of problems has been a useful corollary of the PBL movement.

Problem-Based Learning Approach



Real-world problems form the anchor for the learning and thinking processes of students.

Essence of PBL

- Builds curricula around real-world problems.
- The problem is the starting point of learning.
- Self-directed learning is primary.
- Learning is collaborative, communicative and cooperative.
- Development of inquiry and problem-solving skills is as important as content acquisition.

Norman, G.R. and Schmidt, H.G. (1992) The Psychological Basis of Problem-based Learning: A Review of the Evidence. *Academic Medicine*, *67* (9), 557-565

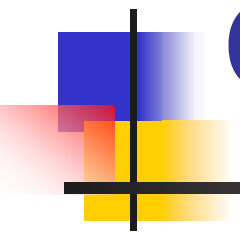
Evidence suggests enhancement of

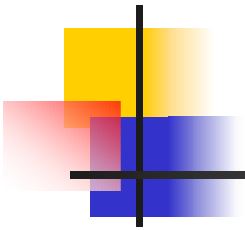
- Transfer of concepts to new problems
- Integration of concepts
- Intrinsic interest
- Self-directed learning
- Learning skills

Features of Learning:

- **Learn how to learn (self-directed, independent learning)**
- **Acquisition of content and professional knowledge**
- **Collaborative learning**
- **Inter-disciplinary learning**
- **Critical inquiry and reflective practice**
- **Adaptability and ability to confront novelty**

Thinking, Problem-solving and Collaborative Learning





Developing Cognition

- Ability to learn from experience
- Ability to adapt
- Ability to solve problems in context
- Dealing with novelty

PBL: Making Thinking More "Visible" through Collaborative Learning?

Two arguments for collaborative learning

- Collaboration as a competence
- Value of collaboration in the cognitive process

Eraut (1994, p. 46) highlighted that whilst a written syllabus may acknowledge skills such as "communication" and "learning to work in teams" as basic and important, in reality the learning process used does not cater to these developments. Writing a good essay on "interpersonal skills" does not necessarily reflect knowledge about people, working with people and real situations.

Collaboration as competence

- Importance of communication and presentation skills
- Key competence for all professions today
- Interaction: Inter and intra personal development
- Globalization of communication across cultures
- One of the most powerful features of PBL

Quantitative Feedback on Effectiveness of Approach (N=245, 10-point likert scaling)

- Working collaboratively to acquire knowledge and skills (7.63)
- Taking a more reflective approach to learning (7.44)
- Relevant knowledge (6.97)
- Overall effectiveness (6.80)

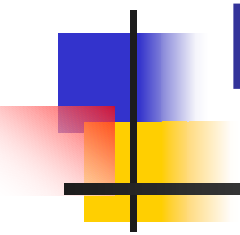
Usefulness of Process

- The collaborative approaches, group discussions and peer learning (7.41)
- Tutor facilitation (7.35)
- Self-directed learning process (7.19)
- Problem scenario (7.08)
- Group presentation (7.04)

Areas not so strong

- Use of Bb (6.03)
- Peer assessment (6.36)
- Depth of learning (6.56)

Cognition, Collaboration and Reflective Practices



Donald Alan Schön (1930-1997)

- Education: Brookline High School, Sorbonne and Conservatoire Nationale de Paris, Yale, Harvard.
- Taught at UCLA
- Consulting and industrial research firm
- Worked with over 30 major companies and over 100 industry clients
- Chaired and led numerous industry, professional, scientific and academic bodies
- Wrote The Reflective Practitioner (1983)

Schon (1983, p. 270)

- The practitioner has "relatively solid references"
- "Media, languages and repertoires" that the practitioner usea
- "Appreciative systems that they bring to problem-setting", to the "evaluation of inquiry" and to "reflective conversation"
- "Overarching theories by which they make sense of phenomena"
- "Role frames within which they set their tasks and through which they bound institutional settings"

Two typical reactions from students

- “I learn a lot in collaborative learning… within a short term I acquired more knowledge than I could alone.” *(post grad student from Ed Psy Tutorial*)

- “The discussions and group approaches are a waste of time. Better to have more organized presentations. I want to learn from the experienced and experts.” *(post grad student from Ed Psy Tutorial*)

Collaboration and Cognitive Processes

- Reflective Practitioner Approach (D. A. Schön)
- Reflection in-action and on-action
- Ideas need talking to working out
- Observations is enhanced by access to accounts of others' observations
- Reflective discussion involves repeated "viewing" from a range of perspectives
- Need for "talking about" and "talking to" the situations

When it comes to cognition such as getting “multiple perspectives” or “scanning” none of us is as smart as all of us.

By half-understanding the nature of thinking, teachers only half-understand how to teach, and students only half-understand how to learn. This kind of half-baked education harms us more than we know.

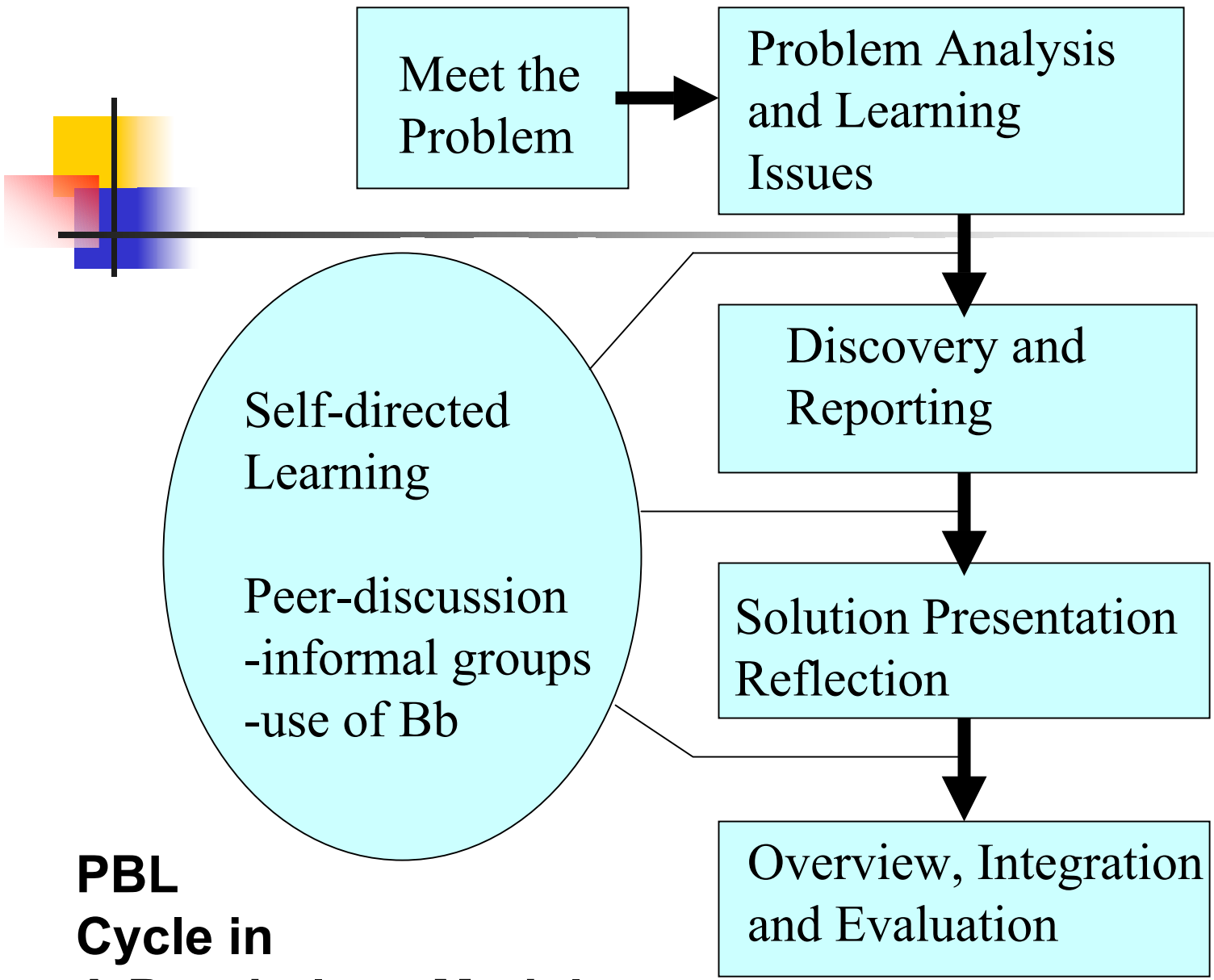
-Robert & Michele
Root-Bernstein

Key Cognitive Processes in PBL

- **Cognitive dissonance, Affective-motivational factors**
- **Systematic, Strategic, Systems Thinking processes**
- **Analytical and Inferential Thinking**
- **Generative, Divergent and Creative Thinking**

Typical Stages of PBL

- Problem encounter (Meeting the Problem)
- Initial Analysis
- Learning Issues and Objectives
- Discovery and Reporting
- Solution Presentation
- Overview, Integration and Evaluation



PBL Cycle in A Psychology Module

Extract from Problem in Developmental Psychology and Learning Theories

"Nowadays even at primary 1 I think you're expected to add and multiply… I don't remember having to do that when I was six years old," said Pakti.

"Sometimes I wonder if children are ready to learn these things at that age… there must be certain ages at which children are ready to learn something," added Seow Jing.

Con't Problem Scenario

"You know…even for secondary one students I find that it's not easy to teach them abstract concepts," Pakti added.

"How do children and adolescents acquire concepts?" asked Seow Jing.

"Think of your own experience… how did you learn in school?" offered Jerry.

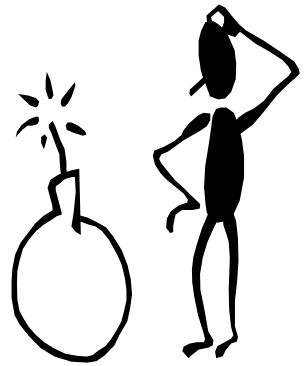
"I can't really remember but I think people around me – my older brothers, parents and teachers….. played a big role," responded Seow Jing.

Parki remarked, " For me I think it was discussing with my classmates that helped…."

Con't Problem Scenario

Toon has this to share: "I had the opportunity to observe lower and upper secondary students in the Normal stream. I found that there was this teacher who taught Chemistry and Biology to Secondary 3 class. He seemed to use a "drill and practice" method rather successfully. He was very organized. What he did was to have a few objectives clearly stated and then he went on to explain the content. He then had a number of short fill-in- the-blank questions at the latter part of the lessons. The students would complete the exercise and he would have them check in pairs as he went through the answers. At the end of each lesson he… It seems to me that the method he used appeared to help students master the basic vocabulary, concepts and principles pretty well."

Meeting the Problem

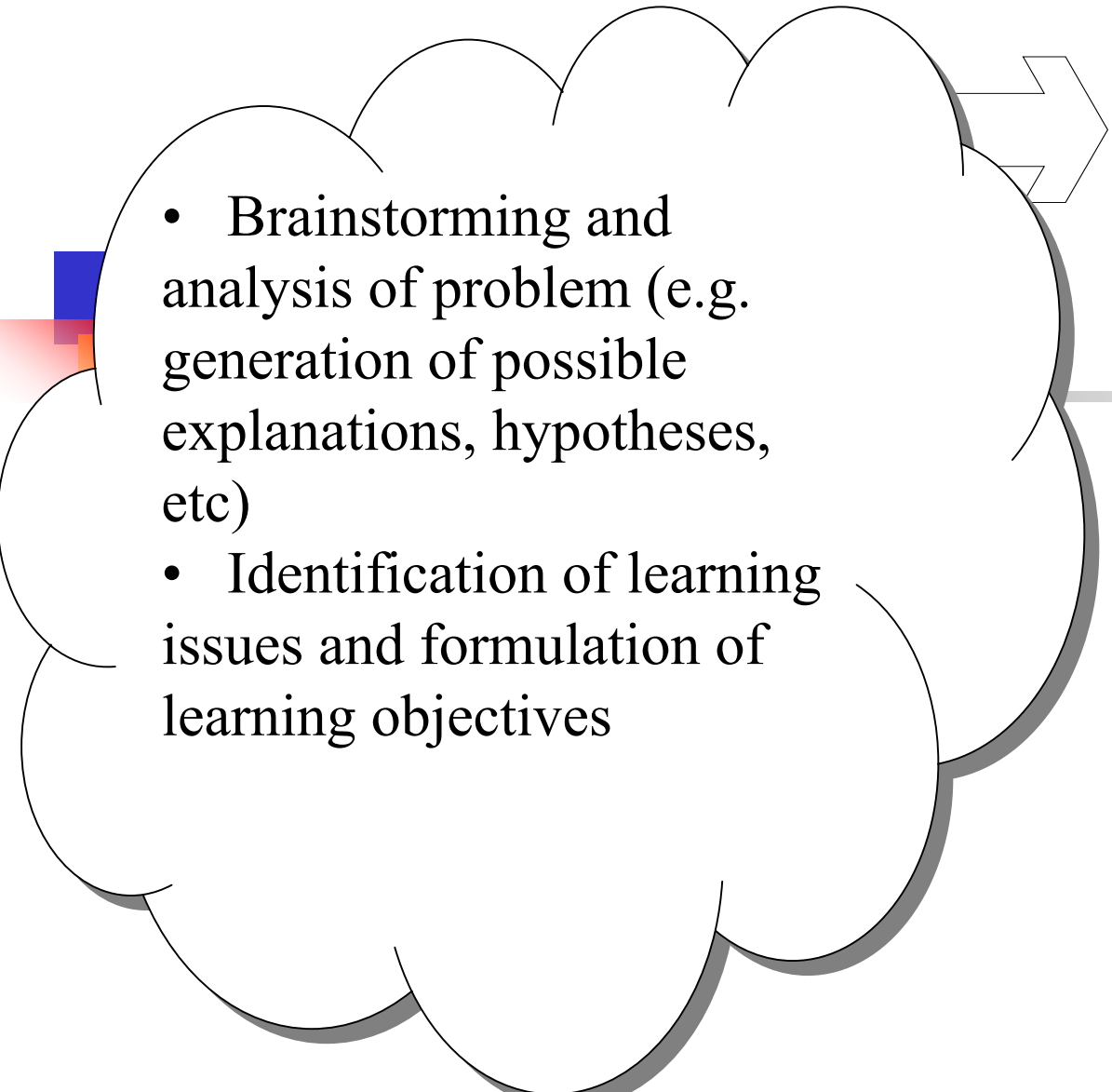


Learners' Activities

- Individual reading, reflection and inquiry
- Commitment to team roles and group
- Brainstorming and articulation of probable issues
- Commitment to deliberate on scenario and problem analysis

- Notes or mind-map of discussion
- Journal of problem statement

Problem Analysis and Learning Issues



- Brainstorming and analysis of problem (e.g. generation of possible explanations, hypotheses, etc)
- Identification of learning issues and formulation of learning objectives

- Journal of problem inquiry
- List of inquiries, explanations, ideas and hypotheses.
- Statement of learning issues and objectives
- Assignment of self-directed learning and peer-teaching

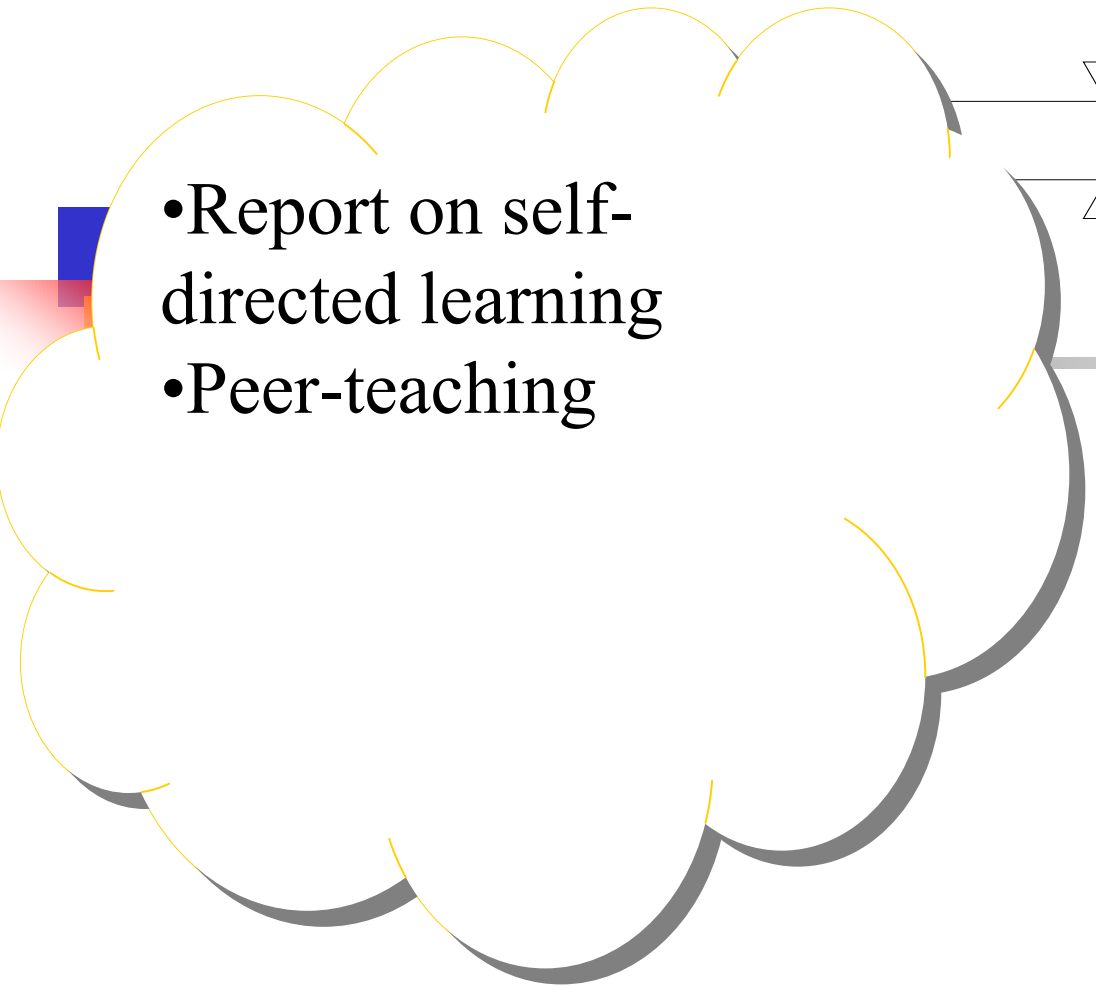
Students' Formulation of Learning Objectives

- Commitment to the cause of the problem and development of motivation to learn, manage and solve
- Learning issues are aligned and connected to learning process and related to practical solving of the problem
- Learning issues can be multi-disciplinary
- Know what is important to know, asking key questions

Self-directed learning and self-study

- Activate prior knowledge, goal-directed reading
- Immersing into the relevant resources (rich learning environment is essential: books, literature, video, CDs, computer internet access, models, charts, experts, etc)
- Learn how to learn
- Learn with a view to share
- Evaluate sources of information

Discovery and Reporting



•Integration and consolidation of information as a group and as individuals.

•Statement on Sources of Learning, Information and Research

Student Reporting to the Group

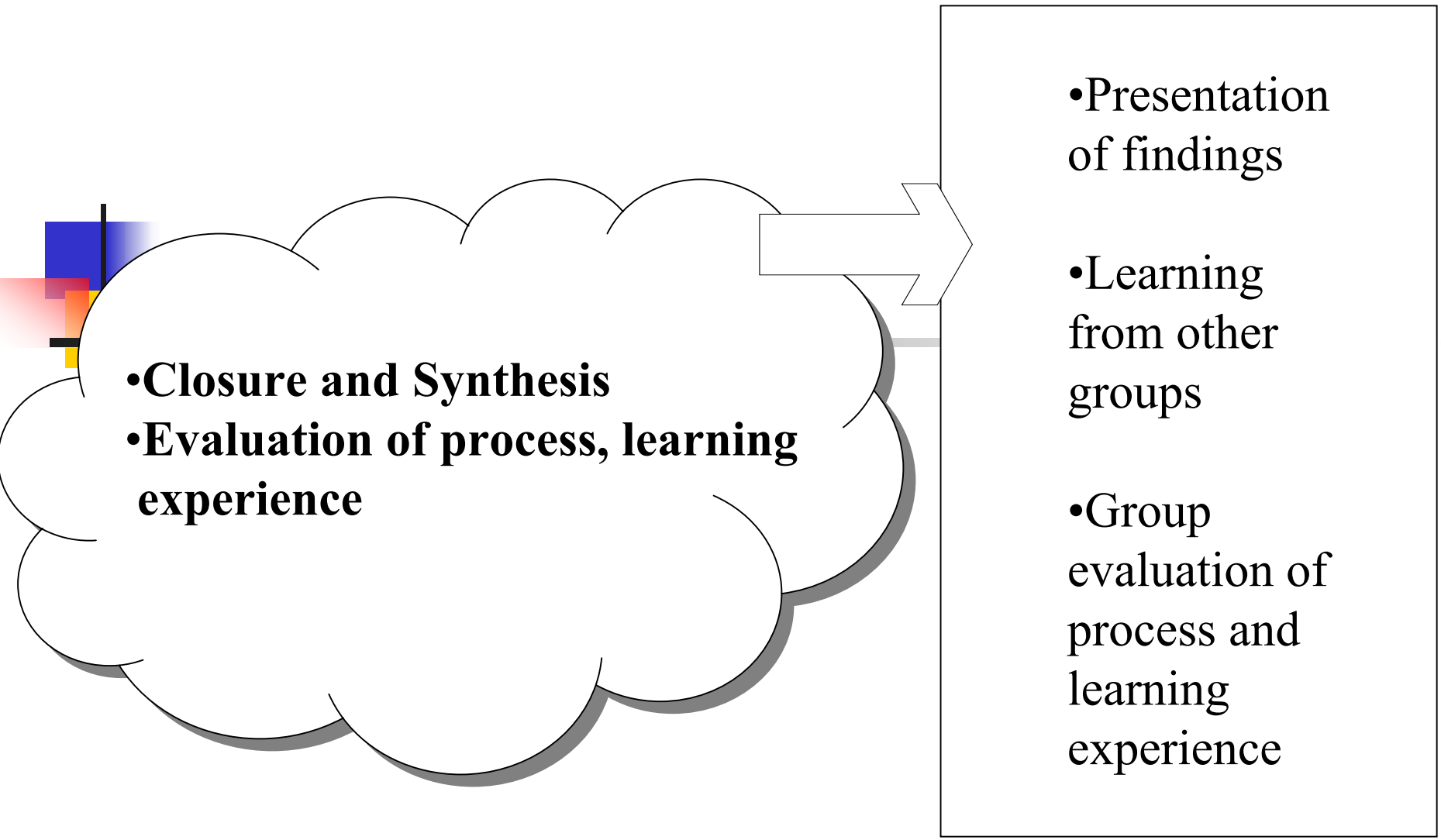
- Re-phrase knowledge acquired,demonstrate mastery of knowledge
- Integrate knowledge from different disciplines
- Correct misconceptions
- Explanations and application of knowledge from various sources to solve the problem

Solution Presentation and Reflection

- **Group presentation of findings**
- **Queries, questions and answers**

- Presentation of findings
- Learning from other groups

Solution Presentation, Overview and Evaluation



Review and Evaluation

- Critique of learning resources (value, reliability, etc)
- How do you apply new knowledge to the problem? Have you learned everything you need to know?
- Reflection and critique of prior thinking and knowledge
- New hypothesis in the light of new learning?

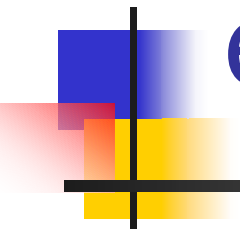
Review and Evaluation

- Closure: Lecturer's summary and integration of what has been learned (major principles, concepts, gaps, etc)
- Evaluation of PBL processes
  - problem-solving
  - self-directed learning
  - group support and teamwork
  - self-evaluation

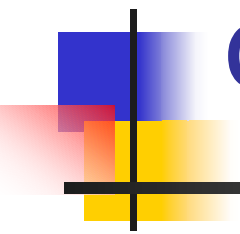
Peer Evaluation

- Attitude (Positiveness & Helpfulness)
- Participation (Commitment & Sharing)
- Communication (Clarity & Sensitivity)
- Enthusiasm (Motivate Self & Others)
- Resourcefulness (Quality & Comprehensiveness of Contribution)

What goes on in students' minds at the Problem encounter (MTP) stage?



Examples: Quotations from case vignettes



Tutors were “not teaching” for a start and these were what some students were saying:

“Frustrated because I think I need to browse through the whole textbook to get a feel of the theories… to digest so much information in such a short time.”
“I am keen to know how to solve the problems faced by teachers, as I will be able to apply the solutions in my classrooms…”
“The method forces me to really understand what I’ve read in order to teach my peers.”
“The sheer amount of research and reading is terribly daunting.”

Axis of Cognitive Dissonance is two-fold:

- Getting into the PBL process itself (overwhelmed by the approach…)
- Process of understanding the problem – identifying the problem (can't think of a familiar or similar problem situation or apply a lateral process to it)

The need to prepare the students…

- Mindset shift (big picture, what employers want, etc)
- Briefing on PBL expectations (reading, self-directed learning, collaborative learning)
- Use Bb to present the problems
- Get them to read and think well before the first tutorial

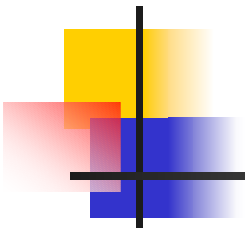
Affective-motivational processes

- Belief in the value of the process
- Expectancies
- Motivation – ability for self-directed and peer learning
- Ownership of the problem
- The provision of rationale
- Mediation of intentionality-reciprocity, meaning and transcendence.

Examples of Students' Work

Group A:
"As beginning teachers we realize that our prior experiences as students (the way we were taught) and even our recent experiences at the school attachment do not provide us with sufficient knowledge to understand many of the challenges going on in the actual classroom. Putting ourselves in the shoes of Jerry, Seow and Pakti we were concerned about addressing the issues of understanding how children and adolescents acquire concepts."

Group B:
"As educational researchers we are interested to find out (i) how children learn, (ii) the role of peers, siblings, parents, and teachers in helping children learn."



Dealing with the problem itself…

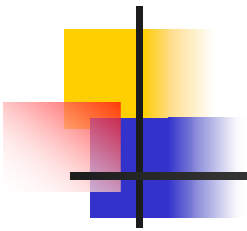
Cognitive Processes: Meet the Problem

- Read, observe, reflect
- Group discussions: Learning to clarify and ask questions
- Understanding: Clarifying terms, concepts, assumptions, vagueness, etc
- Clarifying perceptions

Cognition of Observation and Reflection

- Ask them what they think?
- What do the groups think?
- Get them to
  - Describe the scenario, Paraphrase
  - Interpolate, Extrapolate,
  - Elaborate, Link to their own experience, prior knowledge, etc
- NOTE: This can be frustrating initially!

Problem Definition and Reframing



- Contextualize, understand the nature of the problem confronted
- Reframe the problem (it's only when you can state the problem in your own words that you you can solve it!)
- Understand limitations, delimitations; make choices, task descriptions, etc
- Use questions to identify (state) the problem
- Cognition: "Why" and more Whys…

Examples of Students' Work

Group A:

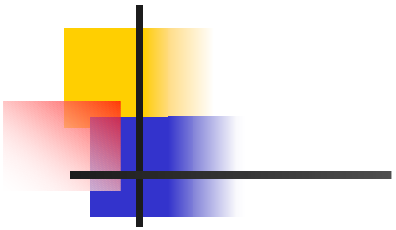
How do children and adolescents acquire concepts?

- How does concept formation happen in the child's mind?
- How does using concrete objects help learning?
- How does learning move from concrete to abstract?
- When is a child ready for different levels of knowledge?
- Are there certain prerequisites for the learning of certain mathematical concepts?

What is the role of language in learning?

- Do some children learn better visually?
- Do children have different preferences in terms of verbal, visual and kinesthetic styles of learning?
- What methods can teachers use to ensure that concepts are clearly understood?
- What strategies can teachers adopt to make learning meaningful and easy?

Examples of Students' Work



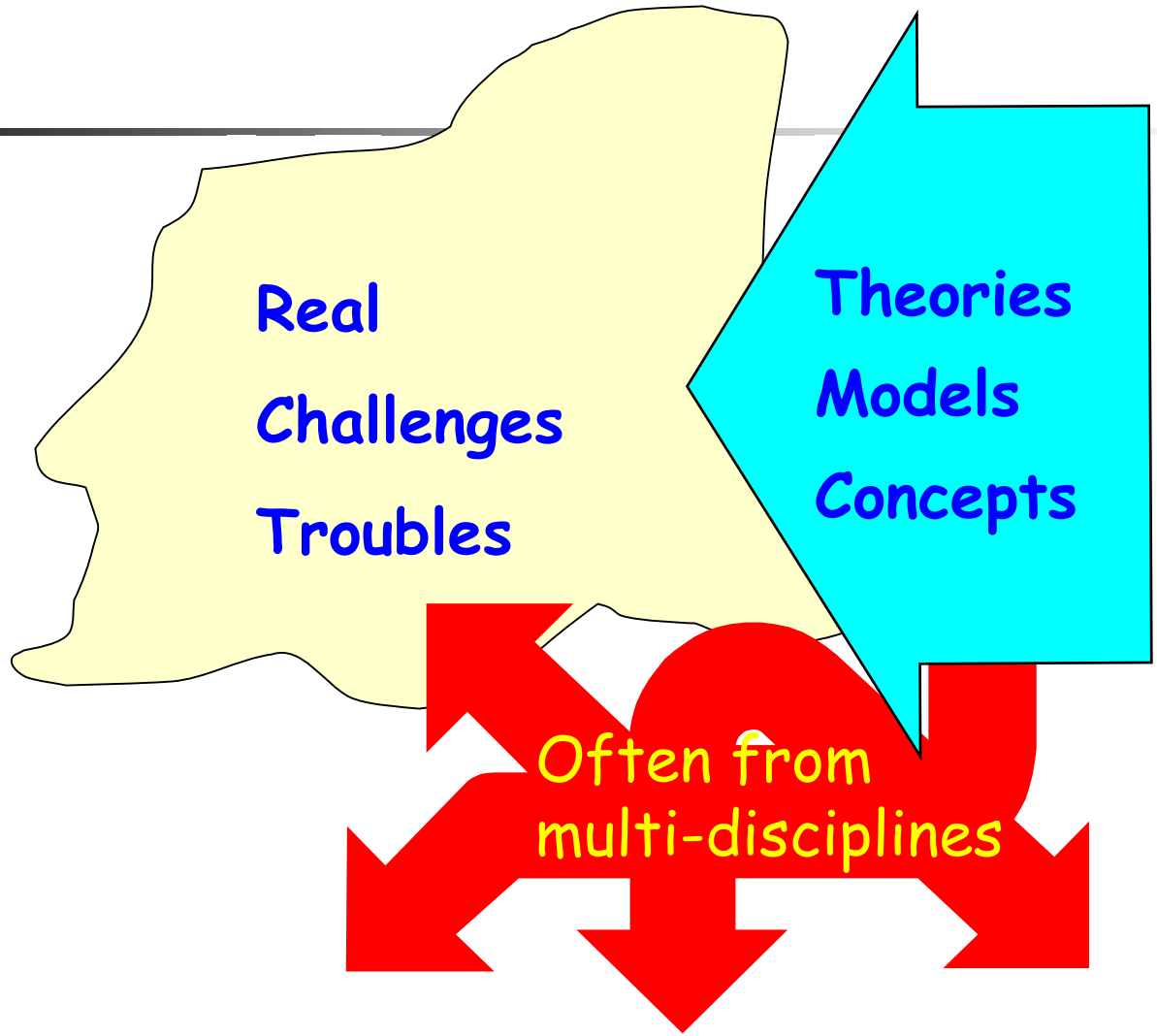
Group B:

How children learn?

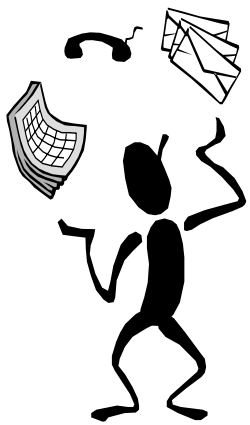
- Concrete to abstract?
- Breaking complex into simpler parts?
- Trial and error?
- Correcting misconceptions?

Role of peers, siblings, parents and teachers?

- Support?
- Modeling?
- Socialization?
- Breaking complex into simpler parts?


Real
Challenges
Troubles
Theories
Models
Concepts
Often from
multi-disciplines

"The goal of education is to further the process of inquiry…"



Bruner, J.S. (1960)
The process of education

The knowledgeable person is a problem solver ... one who interacts with the environment in testing hypotheses, developing generalizations...

- J. Bruner

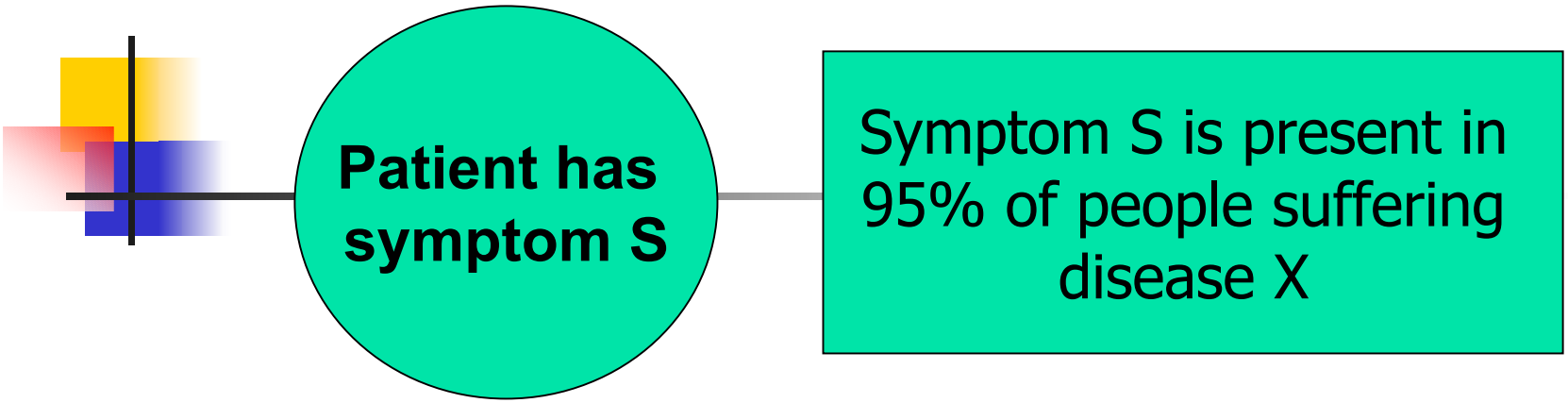
Problem Analysis: Thinking and Collaboration

- Brainstorming approach
- Divergence and generative
- Give possible explanations
- Generate hypothesis
- Use PBL inquiry processes

Cognitive Processes in Reasoning

- Superficial perceptions, bias, errors in reasoning and judgment are widespread (Manktelow, 1999)
- Overcome sweeping perceptions, unwarranted narrow perceptions.
- Develop systematic, thorough information gathering, accuracy, precision, breadth and depth of perception
- Implicit and explicit processes

Evans et al. (2002)



- S is suffering from X
- Likelihood of X relative to other diseases?
- Likelihood of S to be present in other diseases?

Evans, J.B.T., Venn, S. and Feeney, A. (2002). Implicit and explicit processes in a hypothesis testing task. British Journal of Psychology, 93, 31-46.

Evans et al. (2002)

- People tend to focus on single hypothesis
- Background beliefs and PD
- Context influences choices via implicit system (with personal rationality)
- Influence of "instruction" on "explicit" reasoning

Evans, J.B.T., Venn, S. and Feeney, A. (2002). Implicit and explicit processes in a hypothesis testing task.

British Journal of Psychology, 93, 31-46.

Problem Analysis Inquiry: Scaffolding Cognitive Processes

- Questions: What we know, What we Need to Know, What are our Ideas
- Distinguishing between Ideas, Facts, What we Need to Learn
- Questions: What is the Situation in Need of Improvement (SINI)? Hypotheses, Learning Issues

How people evaluate data

- Chinn & Brewer (2001)
- Constructing an accurate model (mental model)
- Elaboration and constraints
- Searching for alternative causes

Chinn, C.A. & Brewer (2001). Models of Data: A Theory of How People Evaluate Data. Cognition and Instruction, 19(3), 323-354.

How people evaluate data

- Using covariation evidences
- Inductive and analogical generalizations
- Refrain from bias and implausible alternatives
- Seeing, accepting and denying LINKS

Problem Complexity

- Chinn & Brewer (2001)
- Lee & Anderson (2001)
- Value of complex problems
- Train learner's cognition in multiple learning mechanisms that they are often not aware of

Lee, F.J. & Anderson, J.R. (2001). Does learning a Complex task have to be complex? A study in learning Decomposition. Cognitive Psychology, 42 (3), 267-316.

“Only Connect” – E.M. Forster

PBL is about getting minds to make connections through reflection, articulation and learning to see different perspectives.

Learning + Thinking

= **f (connections)**

= f (C_1, C_2, C_3, C_4, ….)

C_1 Connecting with Prior Knowledge and Experience

C_2 Connecting with Real-World Context

C_3 Connecting with Theories

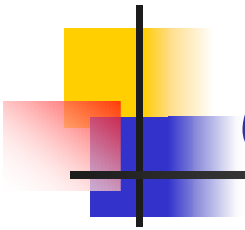
C_4 Connecting with Peoples' Perceptions (Peers, Others, etc)

Problem Analysis

- Cognition: Connecting with prior knowledge (C-C-C activated), further clarification, scan-span-searching, "organizational" thinking, systematic exploration, open-mindedness,creativity and divergence
- Tutor's prompting to ensure key areas to be learned are not overlooked

Problem Summary and Synthesis

- Get an overview of what has been analyzed, hypothesized – e.g. what are the significant information?
- Help individual members synthesize information and communicate information in an organized fashion



Cognitive Coaching

- learning to identify/define a problem
- gaining repertoire of heuristics
- solution construction
- process skills

What we imagine does not necessarily take on a concrete form and may remain in a state of virtuality, whereas invention is not conceivable apart from being worked out … not imagination itself but rather creative imagination: the faculty that helps us pass from the level of conception to the level of realization.

- Stravinsky

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i found that the process disorientating at first, because i was trying to look for a solution to the problem.during the group presentation i realised that there was no solution as such or there were mult ways of looking at the problem using the pedagogies that we've read.i had to admit that i did not read the theories in time nor necessarily understood how to apply them and sometimes the direction was muddled.

i liked the fact that the problems posed were real or could be some of the questions that we might be looking at in future.learning how to deal with some of them now i think is better than having to 'gabra' later.

on another note, having read the papers for the past few days i can't help but notice that education is constantly brought up in parliament. but out of the cacophany of voices there was a particular quote th caught my eye.it went something like 'there is theory that states that a child's cognitive development h different stages and beyond twelve there is another stage...' hmm, i thought to myself, that looked quit familiar, the quote goes on to say that the MP was talking abt streaming and the ed psych. theory he was quoting was none other than the name that has been occupying our lips for weekd now..PIAGET! nothing like real-time re-enforcement hehe..the irony is that it needed a MP to bring up something that MOE should already know..ahh but that topic is for another day...

Rep

◄◄ Previous Message Next Message ►►

Current Forum: Reflections on PBL Approach

Read 10 times

Date: Sat Apr 6 2002 11:55 am

Author: LIM LI KIANG (PGDESec0201), . <NS7537567J@mail.nie.edu.sg>

Subject: Re: 3 quotes worth thinking about

Remove

hi, just some of my thoughts. I agree with Roy that students need to be motivated in the first place before they can cope with PBL, otherwise, teachers need to come into the picture to provide enough scaffolding to the students. On the other hand, I agree that learning by insight or discovery etches a deeper impression on the students, thus more retention of knowledge will take place. Aboveall, it is the process of searching and constructing the knowledge that makes for the learning. But, I would prefer an integrated approach for the students in class where the system can tailor to the differing needs of the students and has in place some guidance for the weaker students to fall back on...well...maybe for the first time...

Apart from the above, I think this module is very useful ...Whether we are examing behaviorism, cognitivism, or neo-behaviorism, all these theories are crucial to teachers because they help us understand what goes on behind those little but fascinating minds that we teach.

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Socrates likened his role in this process to that of a midwife
(PBL terminology: facilitator) who brings forth an infant from his mother's womb to the world.

Socrates' views on philosophic method were based on his epistemology. He believed that all human beings have all knowledge stored in their minds at a subconscious level. Knowledge, then, had to be brought out rather than crammed in.
Through interrogation, the Socratic (or dialectical) method elicits knowledge already present within.

Doesn't this sound very much like the problem-solving approach expounded by AP Tan Oon Seng?
(Quote: "In most instances to every question you ask the tutor will throw you another question"; source: Course_Information.doc)

Stanley

Reply

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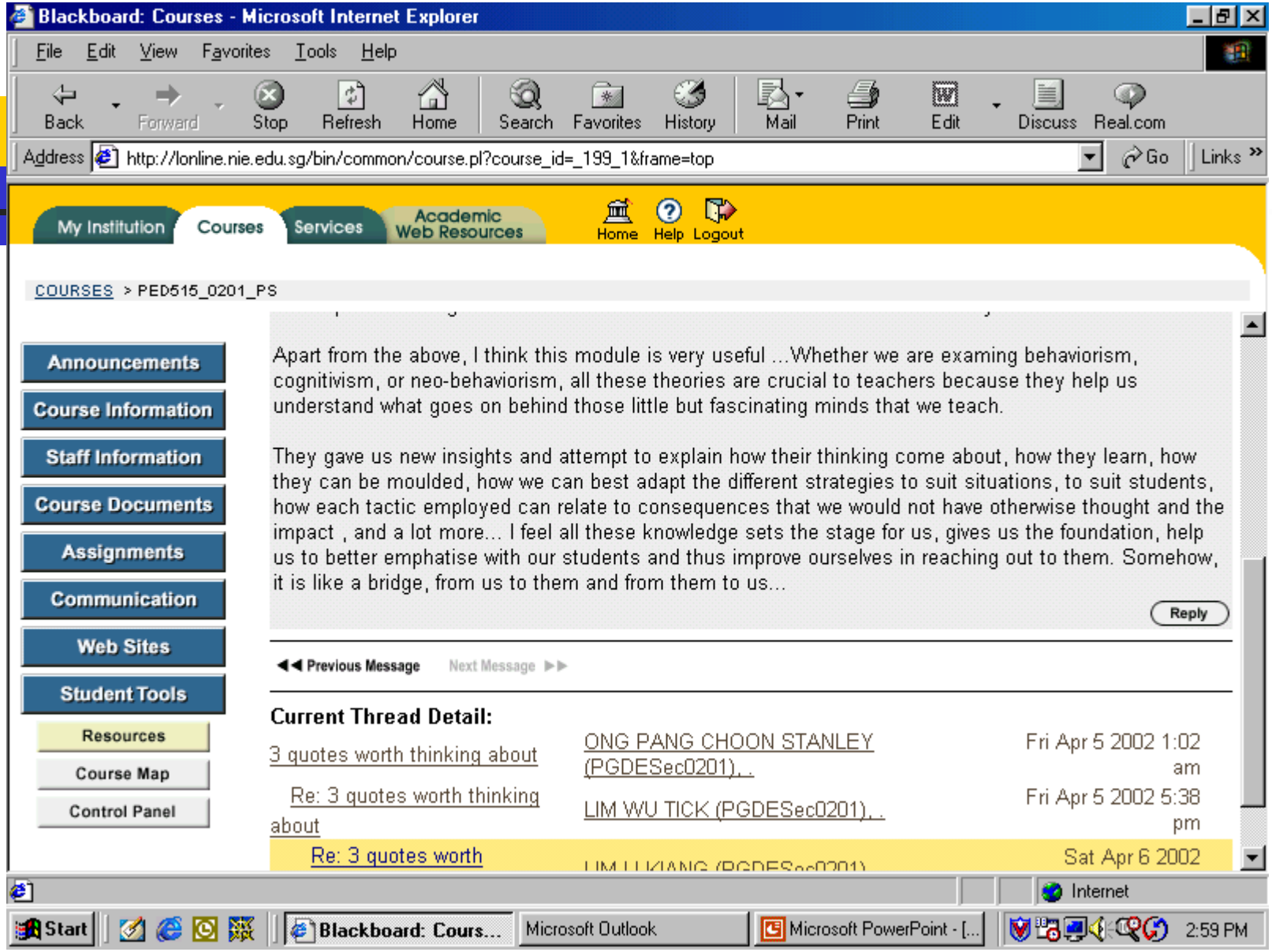
Current Thread Detail:

Similarity between the PBL approach an...	ONG PANG CHOON STANLEY (PGDESec0201), .	Fri Apr 5 2002 12:41 am


Blackboard: Courses - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss Real.com
Address http://lonline.nie.edu.sg/bin/common/course.pl?course_id=_199_1&frame=top
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My Institution Courses Services Academic Web Resources
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Apart from the above, I think this module is very useful ...Whether we are examing behaviorism, cognitivism, or neo-behaviorism, all these theories are crucial to teachers because they help us understand what goes on behind those little but fascinating minds that we teach.
They gave us new insights and attempt to explain how their thinking come about, how they learn, how they can be moulded, how we can best adapt the different strategies to suit situations, to suit students, how each tactic employed can relate to consequences that we would not have otherwise thought and the impact , and a lot more... I feel all these knowledge sets the stage for us, gives us the foundation, help us to better emphatise with our students and thus improve ourselves in reaching out to them. Somehow, it is like a bridge, from us to them and from them to us...
Reply
◀◀ Previous Message Next Message ▶▶
Current Thread Detail:
3 quotes worth thinking about ONG PANG CHOON STANLEY (PGDESec0201), . Fri Apr 5 2002 1:02 am
Re: 3 quotes worth thinking about LIM WU TICK (PGDESec0201), . Fri Apr 5 2002 5:38 pm
Re: 3 quotes worth Sat Apr 6 2002
Internet
Start
Blackboard: Cours...
Microsoft Outlook
Microsoft PowerPoint - [...
2:59 PM

The Heart of PBL: Students' Experiences

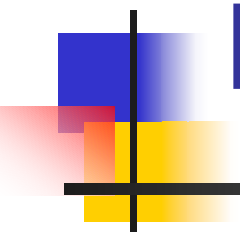
Case Vignettes

- Selection of 15 students
- Open, frank, anonymous
- Interviews: 15 – 90 minutes
- Qualitative, Flexible protocol of questions
- Focus on students' perceptions of empowerment or frustrations with PBL Problems, experienced with facilitator, themselves

Limitations

- Students were all from professional courses: business, engineering, IT and applied sciences
- PBL for professional action model
- Polytechnic students in Singapore are high school/first-year college equivalent (17-21 years)
- Institutional-wide endorsement

Experiences with PBL Problems



Observations?

What is the impact of the PBL problem on learning for the student in this case?

Jot down your observations and discuss with the person next to you.

Student A

I think the problems were very helpful because they kept us focused on thinking the learning issues and the solutions. Even when we were not using the library or checking the net we continued thinking about them. My lecturer taught us to use lateral thinking, so because we had been working on the problem we sometimes got new ideas from thinking about other things not necessarily in the subject area.

Observations

- Making thinking visible
- Broaden scope of thinking skills – generative, lateral
- Autonomous Engagement

Student B

In the course we were given real-world problems and we really wanted to work on them because we knew that's the kinds of things we would face in the future. For example, we had this problem where we were told about a tank made of certain material that's part of a system in an industrial plant. When the tank was used with concentrated nitric acid everything was working fine but one day someone used that same tank with a more diluted form of nitric acid. After sometime the tank began to leak. Why did reducing the concentration seem to lead to a leakage? We were told it was a real case that happened and we were very curious to find out. There were many learning issues about the properties of the kinds of metal and material used for making tanks. This problem we were solving really required a lot of knowledge on materials. We also learnt a great deal about acids in the industry…. I can say that although we worked on this problem many months ago I can remember most of what I had learnt.

Observations?

- Power of context
- Meaningfulness
- Motivation
- Transfer
- Durability

Student C

Doing PBL is like solving a jigsaw puzzle but it is frustrating because we are not given any big picture, not even the scope, in the beginning … it is like giving us a few jigsaw pieces and asking us to find the rest of the pieces. The worst thing is that at the end of everything I still don't get an overall picture…

Observations

- Prior knowledge?
- Context insufficient?
- Quality of Design/Presentation of the problem?
- Students' cognitive readiness?

Student D

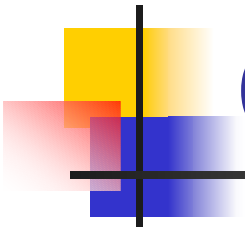
There are too many learning issues. We don't have the foundation knowledge. Because there are just too many things left for us to find out on our own we just can't cope. Activating prior knowledge? How can we activate prior knowledge if we don't even know where to begin. My group lost interest because of PBL. There were times when the tutor could have just pointed out and explain some things instead of sending us on a wild goose chase….

Observations

- Foundation knowledge?
- Limitation and delimitation of learning issues?
- Different strokes for different folks?
- Cognitive capacity?

Student E

At the debrief we had already submitted our solutions but everybody, even the worst student, turned up. We had a guy who was one of the least committed and laziest students. Even he came. Because all of us had spent a tremendous amount of time we were really curious about the solution by this time. At the debrief the lecturers revealed to us the various solution scenarios. They emphasized that although in that case there appeared to be an optimal or best solution, they also showed us how alternative solutions were also possible.



Observations

- Contingencies and locus of learning?
- Importance of closure?

Student G

In PBL we really learn to think. We always use brainstorming sessions to come up with ideas. We also learn to distinguish facts from ideas. Through the tutor's prompting and questioning we also learn to ask good questions and to prioritize what is important after we have come up with possible ideas and issues… The tutor also taught us to use various thinking tools such as CAF (consider all factors)…

Experiences with Facilitators

Experiences with Facilitators

Student F

I really enjoy PBL because we have a very understanding and caring tutor. She does not give us the answers but she really listens and tries to understand where we are. I don't know about other groups but our tutor really guides us in addressing the important issues. She is very good at probing and persuading us to want to find out more about the things important for solving the problems. Through her probing she is able to help us see the many gaps and this causes us to reflect and think….

Student H

I think through PBL we really become better in problem-solving. We learn to clarify our assumptions and concepts. We also ask more "why" questions and apply logical, critical and creative thinking at various stages. I learn that one has to flexible rather than be fixed in a particular mindset…. Yes I think the tutor plays an important role in helping us develop problem-solving skills in PBL.

Observations

- Tutor attitudes? (empathy, care, listening, guidance….)
- Tutor skills? (probing, persuading, effecting metacognition, prompting, questioning, thinking tools,….)

Observations

- Lack of camaraderie, collegiality, group dynamics (failure of facilitation of group learning?)
- Tutor's lack of commitment to PBL process?

Student K

Looking back I think PBL can work better if the tutors prepare us for it. We were very lost at most of the early stages and did not know what to expect…

Student C

The PBL tutorial process doesn't work…. We don't really like the tutor. She is very businesslike and assumes that we have all the time to work on the problem. We know that she is against "spoon-feeding" and that she has a good knowledge herself but we hope she can understand what we are going through. She can give us more encouragement and guidance. Sometimes in our group discussion when we are working up to a certain point which is quite critical, all we need is just a bit of hint or something…or someone to tell us if we are going in the right direction but we can only consult the tutor at certain specific times and even then it is like a lot of things we are not supposed to ask!

Student E

We were allowed to email lecturers but mainly for appointments. Some allowed us to call them on the phone – even their handphones. However each of us had timecards. The timecard allowed us to get 30 minutes of consultation or information feeding outside of the usual tutorial hours. We used a group combination of timecard resources to get a 2-hour session. In that session we tried to close all the gaps to our solutions.

Student I

I had a … tutor. I think the tutors were told that they were not allowed to give us any hints or solution and this tutor really could not guide us. His famous statement was " So what do you think?" All that he could say was "What do you think?" Even when we were not asking for solutions or hints but some pointers to resources, his answer was, "So what do you think?!"

Student J

I think it is ok if tutors don't want to give us answers straightaway but I feel that the tutor should be prepared and be able to offer guidance when we need it. When we ask things about the problem the tutor always says "I don't know – you are supposed to find out" or "I don't know, what do you think?" In the first few tutorials we thought he wanted to make us think but after so many sessions we have come to the conclusion that the tutor really doesn't know. I think they should prepare and experience the problem themselves….

Student L

For some of us the groups did not work so well because the tutor assumed that we would start working with each other once we were assigned to the groups. The good tutors helped the students to get to know each other and took care to organize many activities that helped to develop class and group spirit.

Student D

How to make PBL more effective for us?
I think PBL's greatest enemy is unfeeling lecturers.

Observations

- Tutor's failure to prepare students?

  (But how?)
- Dealing with cognitive and knowledge gaps?
- Coaching and facilitation skills?
- Tutor's lack of immersion in the problem?

Experiences as Problem Solvers

Student M

I am just a very average student and I find that I am sometimes very slow in understanding the lecture-type courses. Once I can't follow I get more and more lost. In PBL however I can learn at my own pace. I can tell my group members that I don't get it and they will explain it to me. Sometimes I really try hard to read but I still cannot get it but the other members know my difficulty and will take time to explain to me….

Student N

PBL requires us to work in groups and to find things out for ourselves, identify the learning issues and then teach each other. I have to say that I do not find the group learning helpful at all. All of us have very little knowledge of the subject. We don't have enough basic knowledge and we don't understand what we read. Plus how much time do we really have to read up? I'd rather the lecturer be the one to explain things to us, instead of leaving us to struggle and learn nothing much even after the whole PBL unit is completed.

Student O

I learn best on my own. I prefer a course in which we are told what to study and I will spend my time to work on it. I don't think PBL is better than the lecture method. If I read on my own I can go into much more depth. Most of the sharing in PBL is superficial. It's not my style of learning.

Student H

I think I receive a lot of benefit from PBL, like learning from each other. You know there was this lecturer in the non-PBL subject; we redly don't what he is teaching. But for the PBL subject, because we read up and then share with each other, I really enjoy it. We speak in our own language. You know sometimes we even speak in Hokkien to explain the points. It's very different when we start talking to each other and check things out together. By myself I sometimes cannot understand it, like certain formulae and equations. I find it very hard but when we talk through I could get it…

Student A

Talking about my current attachment, I must really say that PBL has really helped me. The working environment is really different. You have to work with people you do not know. My trainer left me alone right from the first day. I was asked to do a number of things on my own without guidance and I really felt very insecure because I had to operate the machine all by myself. I really had to find things out. I think the PBL experience prepared me to learn to find things out and to how to ask for information.

Student B

I learn how to get information. In my case I had to deal with HF in the company. This HF acid is very dangerous and you need to know what kinds of gloves to use to protect yourself because different gloves are made of different materials to withstand different categories of corrosive chemicals. In solving a PBL problem previously, I had learned to go to various websites that give information on these things as well as using the MSDS (material safety data sheet). So this time at the work place I knew where to get such information, which is not found in the textbooks.

Student F

I really learn how to use the net and the library to get information. All tutors do not even give us any hint about keywords. I found that keywords are very important. You see, if a keyword doesn't work we think of associated and affiliated terms and so on and all of that helps. You have think of related terms to make connections. To me this is a new skill I have really learnt.

Student K

We also learn from each other the right tool and resource. By myself I am really unsure how to surf the web for information but some of my friends are really good at this. They are on the net all the time. I have a friend who never seems to sleep so he is very good at helping us get information and he even links up with other people worldwide. Because we have to solve the problem together, I also pick up a lot of web skills from him….

Observations (-)

- Issues of individual learning style?
- Issues of self-directed learning?
- Issues of peer learning?
- Superficial group teaching and learning?
- Is there a minimal foundation and threshold knowledge for PBL to take off?

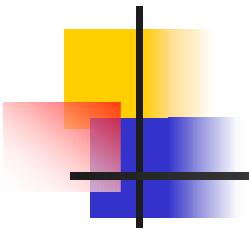
Obervations (+)

- Catering to individual differences – pace of learning, diversity
- Learning from others
  - Learning ask
  - Peer learning
  - Teamwork
  - Network
- Learning to learn
  - Learning to get information intelligently
  - Real-life learning curve

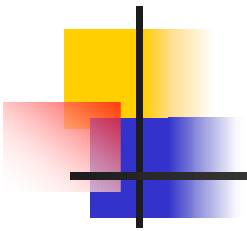
Summary of Insights and Implications

Summary of Insights and Implications

- Problem designers need to get into the real world to collect and document a repertoire of good real-world problems
- Real-world problems provide the context, scenario and meaning that best engage students
- Whilst problems are unstructured there is a delimitation needed to provide a good scenario of the overall context. Layers and hyper-scenarios should be available in a well-designed problem.



- A good closure is essential in a PBL unit. Whilst the PBL process oscillates between divergence and convergence, induction and deduction, closure as a way of synthesizing the state of the art and a holistic map for further inquiry
- The issue of foundation and prior knowledge is highly relevant and hence there are implications of the when and nature of PBL problems to be given in particular disciplines



- PBL is not an all-encompassing approach to learning – it builds on other approaches to learning
- The quality of tutor-student interaction is important
- The quality of peer interaction is critical in PBL
- Cognitive processes are key in PBL

Cognitive processes are important

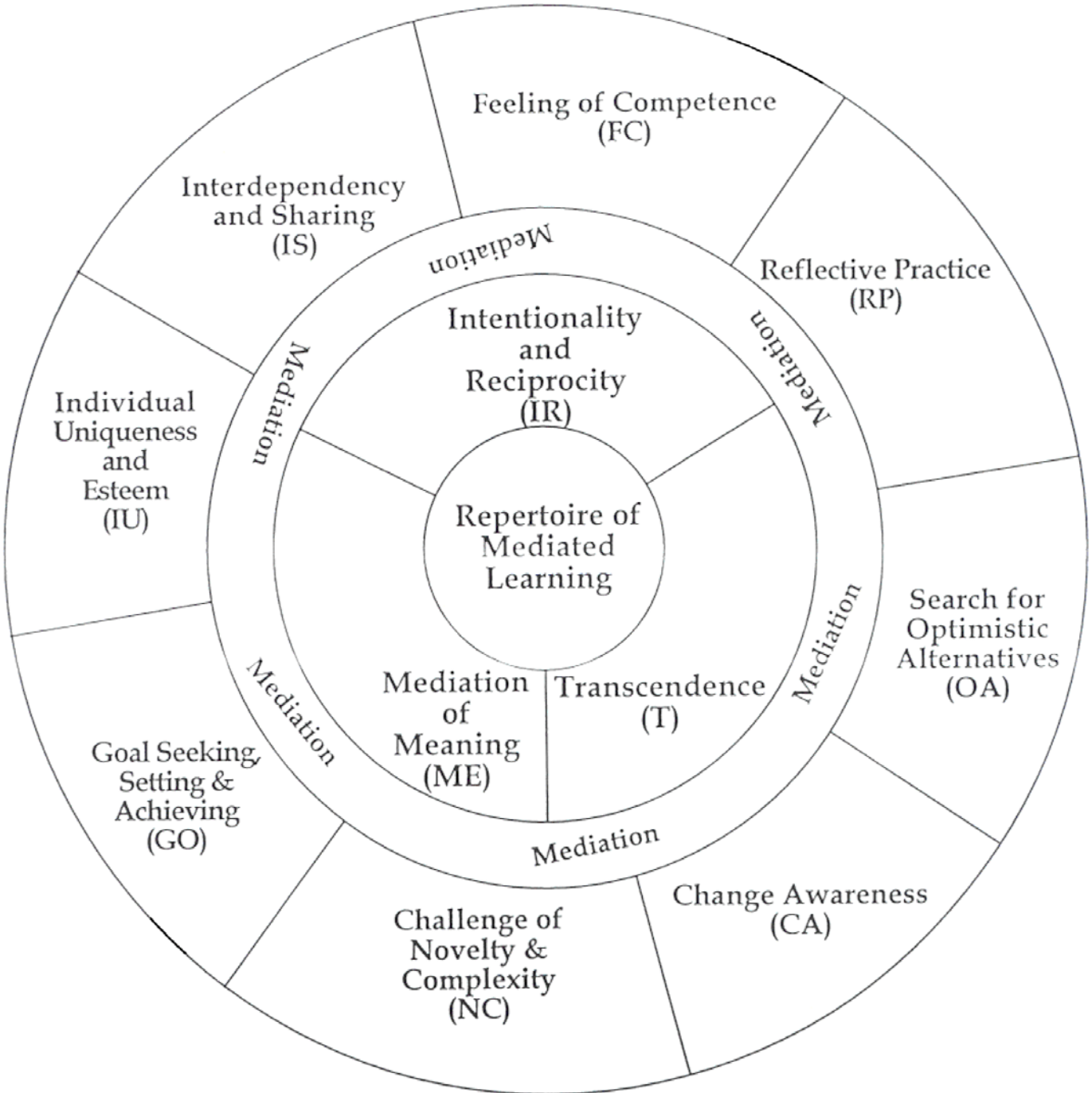
- Cognition of reading, reflection and thinking
- Cognition of clarification - terms, concepts, assumptions, vagueness, etc
- Cognition of activation of prior knowledge and experience
- Cognition of links and making connections

Cognitive processes are important

- Cognitive coaching: dealing with perceptions, reasoning
- Developing good thinking "dispositions": systematic, thorough information gathering, accuracy, precision, breadth and depth of perception

Cognitive processes

- Scaffolding of various levels and complexity
- Understanding mediation and cognitive functions


Feeling of Competence (FC)
Reflective Practice (RP)
Search for Optimistic Alternatives (OA)
Change Awareness (CA)
Challenge of Novelty & Complexity (NC)
Goal Seeking Setting & Achieving (GO)
Individual Uniqueness and Esteem (IU)
Interdependency and Sharing (IS)
Mediation
Mediation
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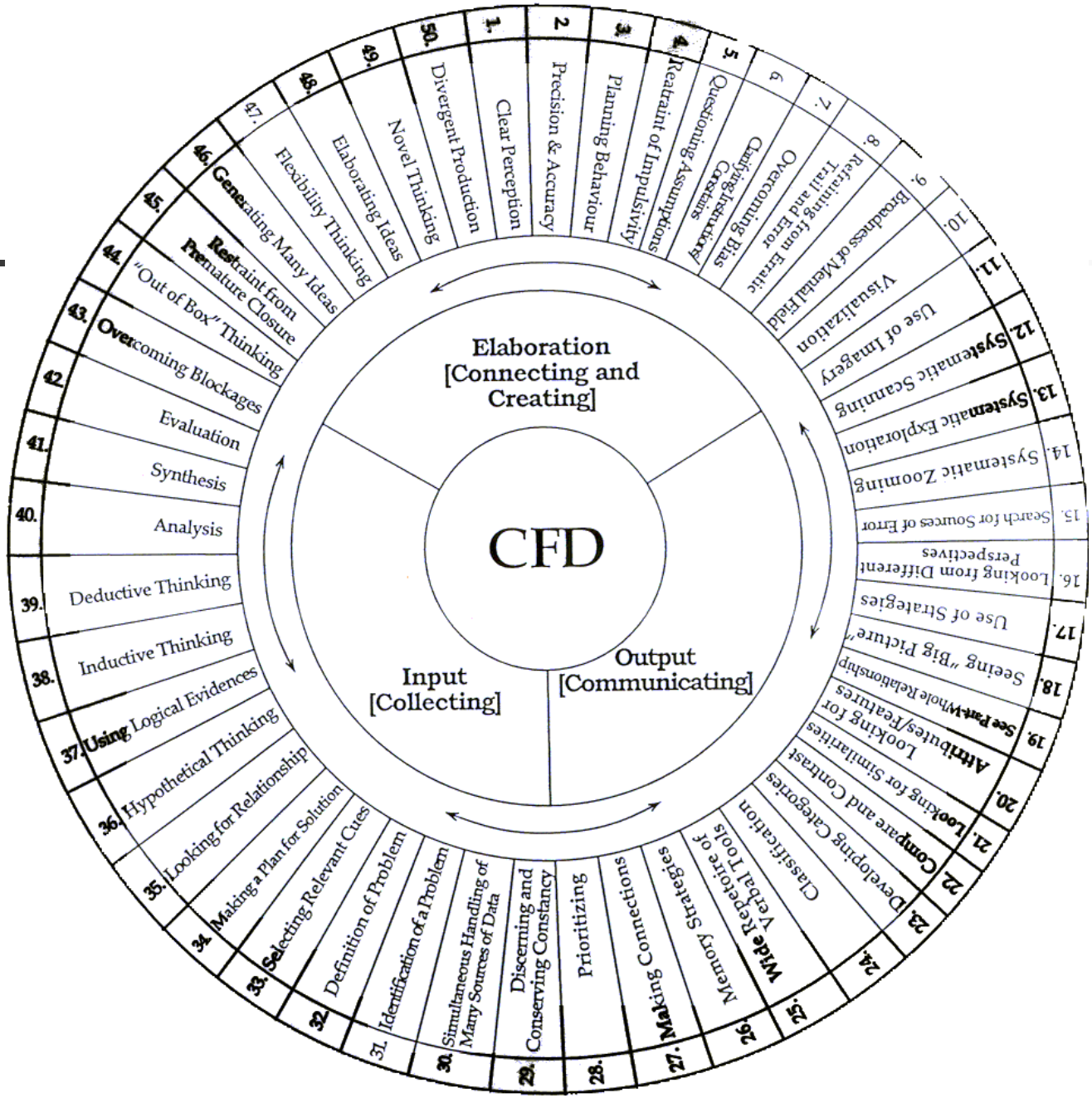
Mediation
Mediation
Intentionality and Reciprocity (IR)
Repertoire of Mediated Learning
Mediation of Meaning (ME)
Transcendence (T)


CFD
Elaboration [Connecting and Creating]
Output [Communicating]
Input [Collecting]
1. Clear Perception
2. Precision & Accuracy
3. Planning Behaviour
4. Restraint of Impulsivity
5. Questioning Assumptions
6. Clarifying Jargon
7. Overcoming Bias
8. Refraining from Erratic Trail and Error
9. Boundaries of Mental Field
10. Visualization
11. Use of Imagery
12. Systematic Scanning
13. Systematic Exploration
14. Systematic Zooming
15. Search for Sources of Error
16. Looking from Different Perspectives
17. Use of Strategies
18. Seeing "Big Picture"
19. See Part-Whole Relationship
20. Attributes/Features
21. Looking for Similarities
22. Compare and Contrast
23. Developing Categories
24. Classification
25. Verbal Tools
26. Pictorial Tools
27. Memory Strategies
28. Making Connections
29. Prioritizing
30. Discerning and Conserving Constancy
31. Simultaneous Handling of Many Sources of Data
32. Identification of a Problem
33. Definition of Problem
34. Selecting Relevant Cues
35. Making a Plan for Solution
36. Looking for Relationship
37. Hypothetical Thinking
38. Using Logical Evidences
39. Inductive Thinking
40. Deductive Thinking
41. Analysis
42. Synthesis
43. Evaluation
44. Overcoming Blockages
45. "Out of Box" Thinking
46. Restraint from Premature Closure
47. Generating Many Ideas
48. Flexibility Thinking
49. Elaborating Ideas
50. Novel Thinking
Divergent Production

Promising areas on learning

- Empowerment in learning how to learn
- Learning interdependence and socialization
- Preparation for real-world work
- Importance of the interplay of The Problem, The Coach, and The Problem Solver
- Need for more interaction with industry, understanding of cognitive coaching processes and student cognition.

Some Suggestions

- Infuse PBL approaches in some parts of the curriculum
- Research on cognition can inform PBL practices
- Staff development: Cognitive coaching
- PBL and the reflective practitioner

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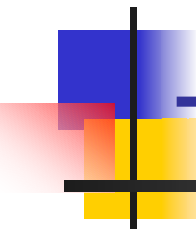

Thank you for your attention!