

# OUTSTANDING TEACHING, LEARNING AND ASSESSMENT TECHNICAL SKILLS NATIONAL PROGRAMME

**Output 13: CPD Resource for PBL Professional Development**  
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# From Factories to Communities of Discovery



**A study of how Problem-Based Learning  
can be used to develop students'  
behaviours, skills and knowledge**



**NOTTINGHAM COLLEGE**



**The Lakes College**

**GATESHEAD  
COLLEGE**  
EDUCATION  
WITH  
EMPLOYMENT  
EDGE



# Why are you here?

*Introductions*

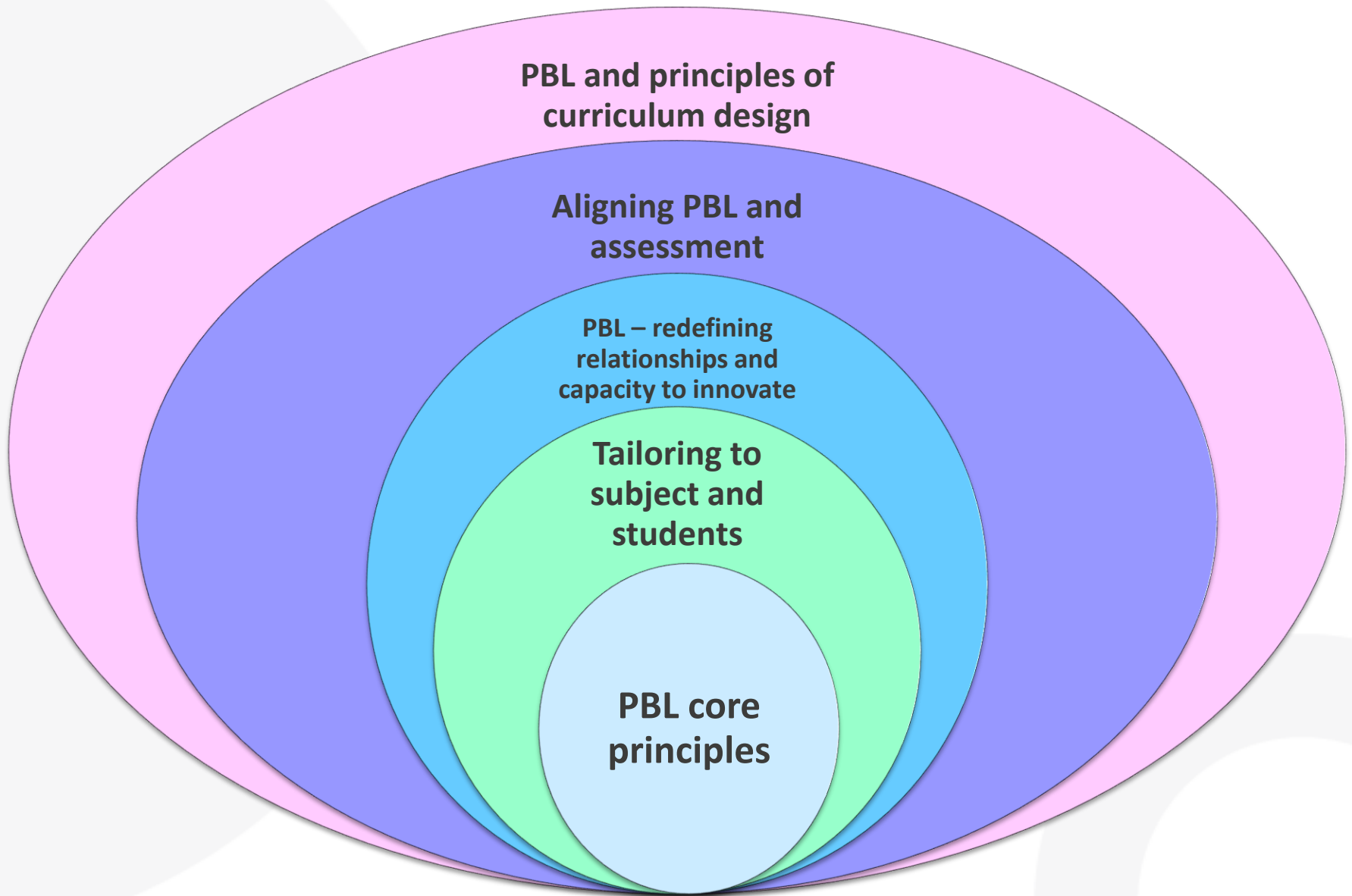
*What are your core values and beliefs about education and about teaching*

*What do you want to gain from this CPD? Jot down any personal objectives*

## Overarching success criteria

- What is Problem-based Learning (PBL)?
- Why do PBL to develop students' maths knowledge and skills?
- How can you trial PBL?
- What do you need to do to trial PBL?

# The Big Picture: Thoughtful PBL



# Planning PBL: Some critical questions to grapple with

Is it possible to translate this approach from one subject to another without considerable modification? How and why do you need to modify it?

What will be the learning outcomes of the PBL episodes and how will they be consistently covered? How will they develop mastery?

How can students be trained and trusted to take charge of their own group process, learning, problem-solving and self-assessment in a positive and safe climate for learning?

How can we balance PBL teaching, encourage failure and protect students' wellbeing?

To what extent does assessment for learning need to be consistent with this teaching and learning method? What do we want to assess and what do we need to assess?

To what extent does the 'assessment tail' wag the 'curriculum dog' in your specialism? What principles of curriculum design and implementation are non-negotiable?

What differences can we confidently say it makes to students? What will be the 'success measures'?

# Proposed Outcomes ahead

## Session 1 Monday am

### Beginning with the end in mind

- Background and context to this funded project – parameters/KPIs
- What is PBL? What are its core features and benefits
- What might PBL look like in Maths?

Why Bother?

## Session 3 Tuesday am

### Determining success criteria



- Reporting back
- What will you assess and how?
- How might PBL advance EDI?
- How will you know if it has “worked”?

## Session 2 Monday pm

### Co-constructing learning with employers

- What role can our employers have and why?
- How does it change relationships?
- Decision-making in planning successful PBL in FS Maths



## Session 4 Tuesday pm

### Getting ready



- Finalising the problems and processes
- What next?

# **This OTLA project is researching into an effective pedagogy which supports ...**

## **Purpose**

- **Progression to skilled employment**
- **Towards higher learning**
- **Active member of the community**
- **Lifelong learning**

## **Experience**

- **Engaging**
- **Accessible**
- **Effective**
- **Personalised**

## **Skills, knowledge & behaviours**

- **Creativity and social interaction**
- **Problem solving**
- **Ability to improve own learning**



## **Our original hypotheses**

1. PBL is an effective pedagogical model to support students to develop into technical professionals progressing to skills employment and higher level learning
2. JPD is an effective model to support the development of employer relationships for T-Level delivery

## **We set out to:**

- Use problem-based learning (PBL) to create a future workforce with higher-level skills, knowledge and behaviours who can drive and respond to rapidly changing industry needs;
- Trial a totally different approach to longitudinal development of fledgling engineers, in partnership with employers with a view to using this approach in the forthcoming T-Levels as a way of forming highly skilled professionals for students undertaking study programmes

## Our new hypotheses

1. PBL needs to be adapted in different technical routes to develop excellent technical professionals
2. PBL is an effective pedagogy for *learning* maths
3. There is a process which can lead to effective PBL curriculum design

# Set primarily against a background of T-Level development: The 15 new technical routes to skilled employment

Agriculture, Environmental and Animal Care	Business and Administrative	Catering and Hospitality	Childcare and Education	Construction	Creative and Design
(454,726)	(2,204,478)	(568,998)	(1,060,804)	(1,625,448)	(529,573)
Park Ranger Conservationist Agricultural Technician Horticulturalist Farmer	Office Manager Human Resources Officer Administrative Officer Housing Officer	Baker Butcher Catering Manager Events Manager Chef	Youth Worker Teaching Assistant Early Years Officer Nursery Assistant	Carpenter/Joiner Construction Supervisor Building/Civil Engineering Technician Electrician Bricklayer/Mason	Journalist Upholsterer Audio-visual Technician Graphic Designer Arts Producer

Digital	Engineering and Manufacturing	Hair and Beauty	Health and Science	Legal, Finance and Accounting
(351,649)	(1,319,645)	(293,004)	(915,979)	(1,325,482)
IT Technician Web Designer Network Administrator Software Developer Programmer	Aircraft Fitter Electrical Engineer Energy Plant Operative Engineering Technician Vehicle Mechanic	Barber Beauty Therapist Hairdresser	Nursing Assistant Sports Therapist Pharmaceutical Technician Laboratory Technician Dental Nurse	Payroll Manager Legal Secretary Financial Account Manager Accounting Technician Paralegal

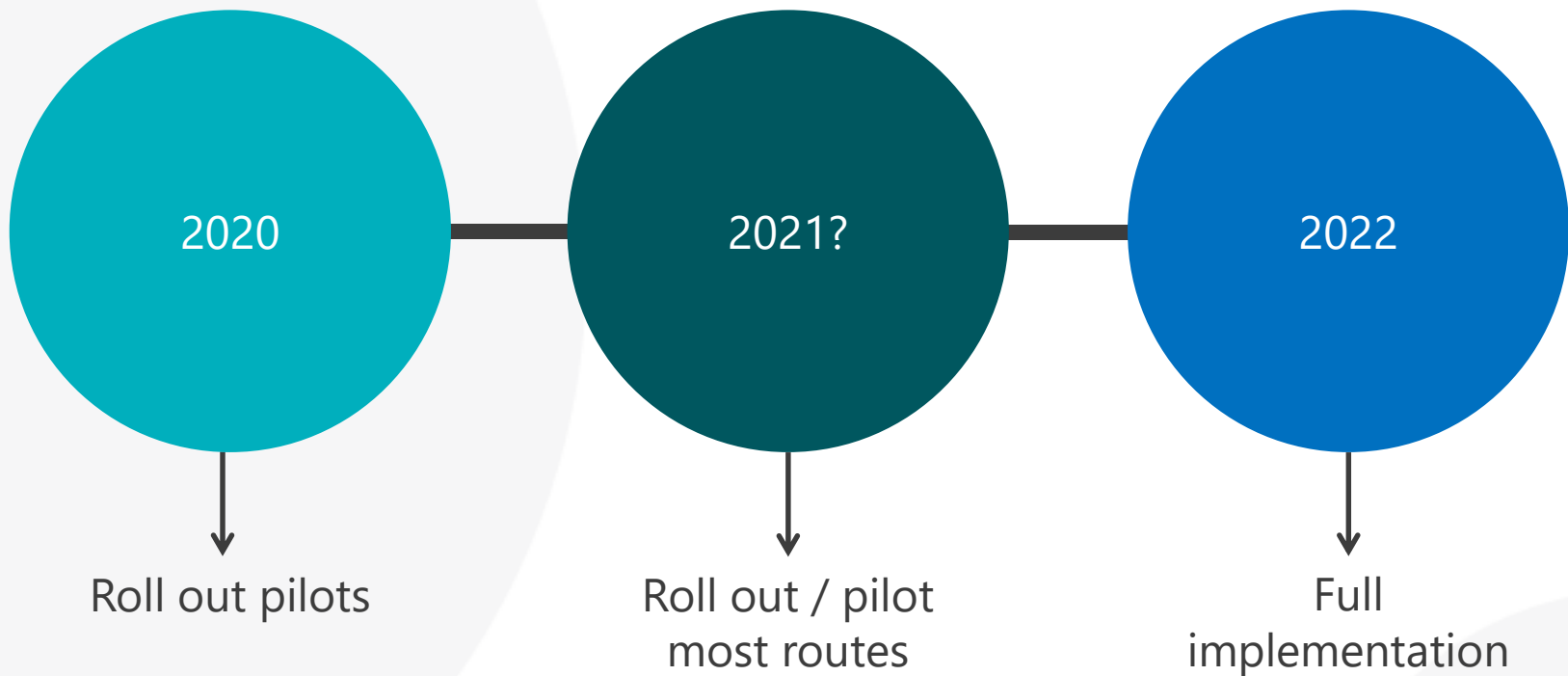
## Key

Route name
(Number employed in occupations within route)
Examples of occupations to which the route could lead

## We expect these routes to be delivered primarily through apprenticeships.

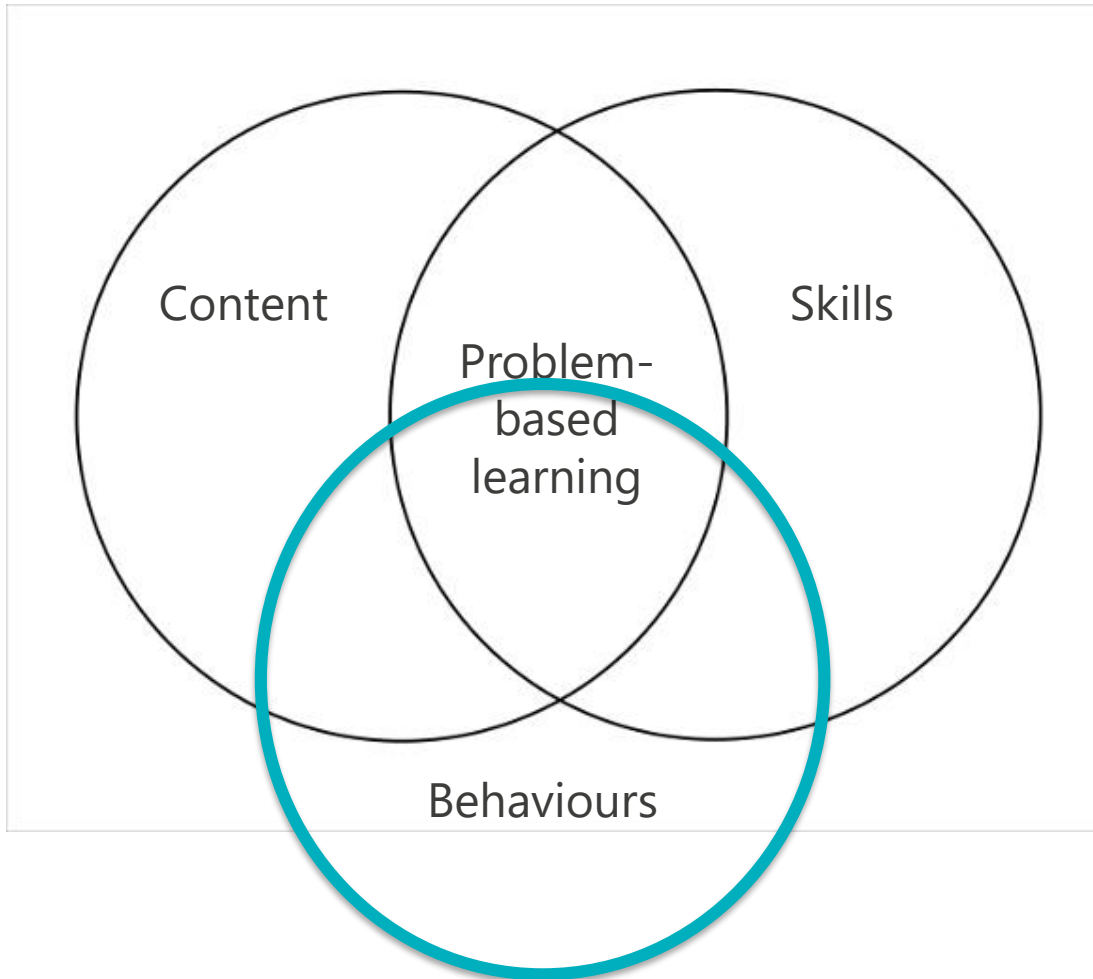
Protective Services	Sales, Marketing and Procurement	Social Care	Transport and Logistics
(398,400)	(957,185)	(865,941)	(589,509)
Police Officer Fire Service Officer NCO	Buyer Procurement Officer Sales Account Manager Market Research Analyst Estate Agent	Care Worker Residential Warden Welfare Counsellor Probation Officer Home Carer	Ship Officer Railway Signaller HGV Driver

# Timeline



Occupational maps (IfA) out for consultation

# Delivering content and developing skills and behaviours for the future – alliance or discord?

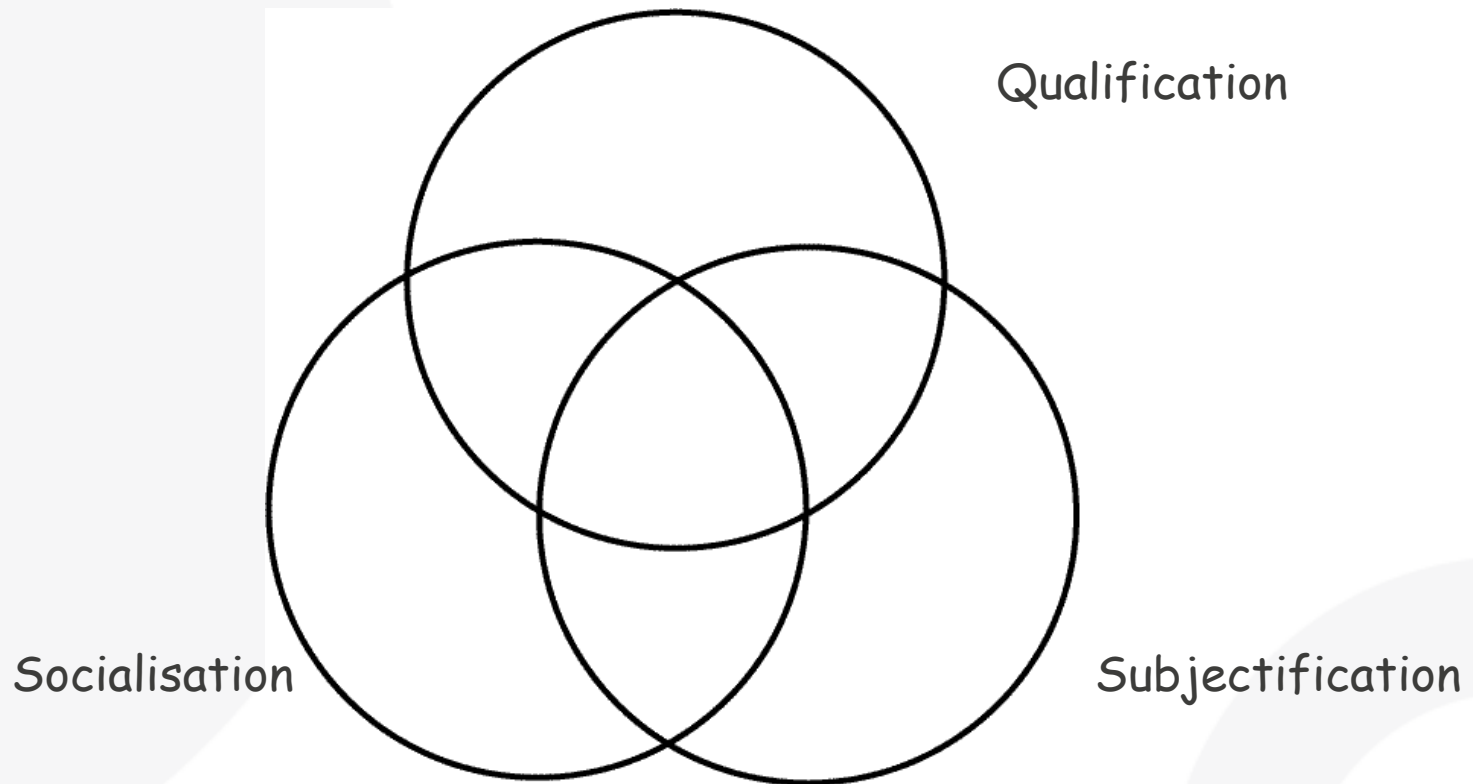


- What do you want them to know and do?
- What are their goals and aspirations?
- Does your awarding body qualification achieve these goals and aspirations?

# Original inspiration

## Biesta's three domains of education

"Do we measure what we value or value what we measure?" (Biesta, (2010)

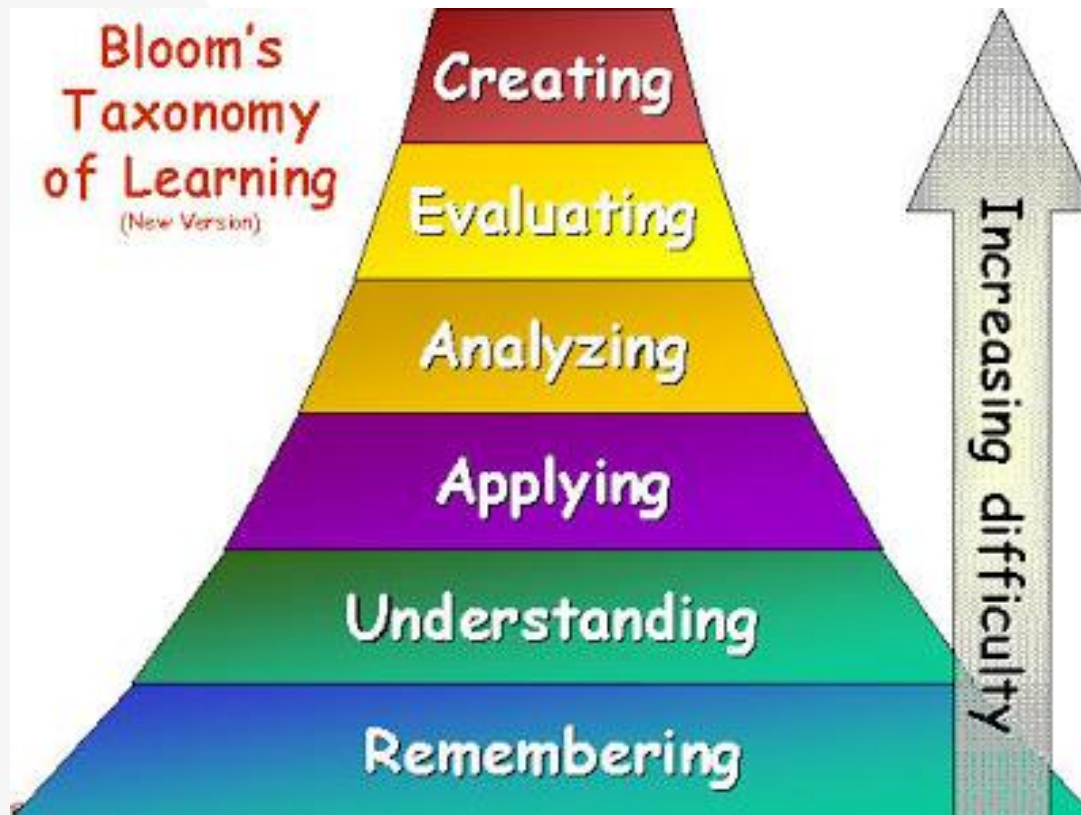


Which domain dominates in your professional practice? Represent this visually with different size circles for each "domain"

## Another inspiration.....

It is only by talking about trust, and trusting, that trust can be created, maintained and restored  
(Solomon and Flores, quoted in Hargreaves, 2012: 15)

**Bloom's  
Taxonomy  
of Learning**  
(New Version)





# Theoretical foundations of PBL

And an unhappy relationship  
with Bloom's ***cognitive***  
taxonomy

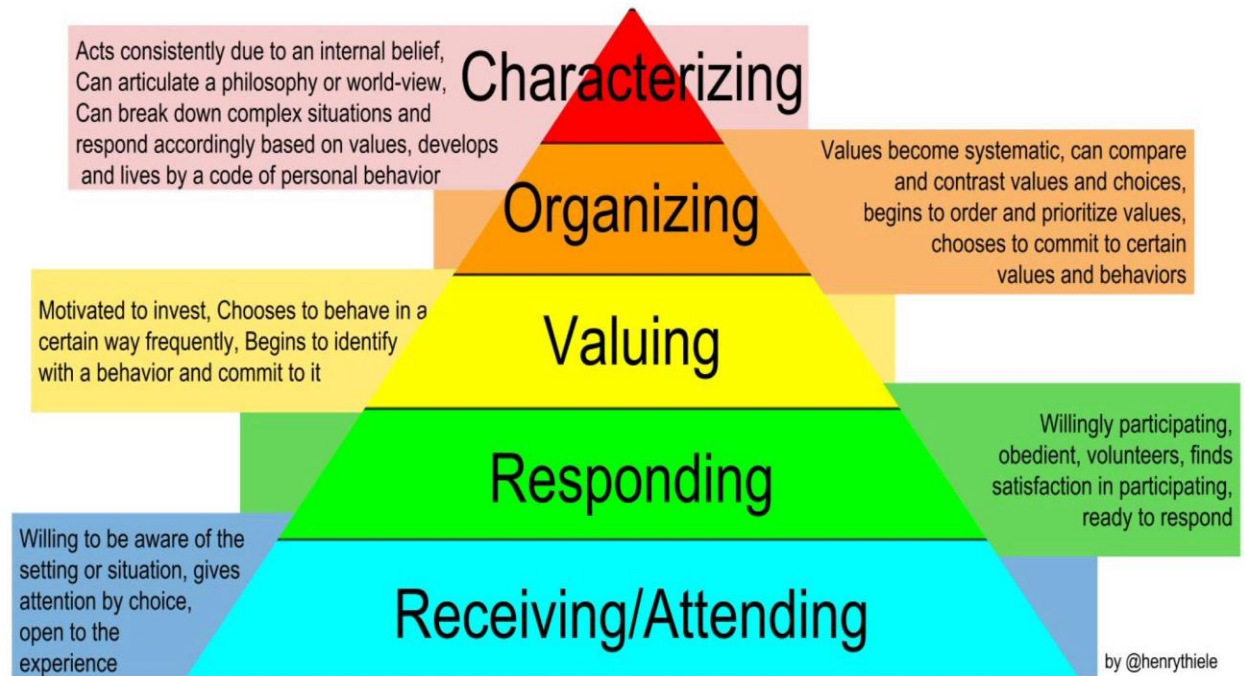
Maybe ...Bloom's  
taxonomy of ***affective***  
domain

Zone of Proximal  
Development  
Vygotsky

Mind-set theory  
Dweck

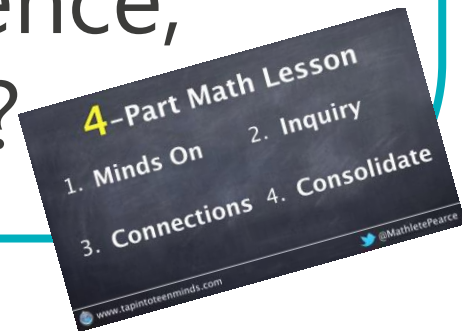
Constructivist  
learning  
Dewey, Bruner

Mastery Learning



# Thinking about your students....

1. What are the learning characteristics and behaviours of your students and how do you know?
2. How can we broaden their minds as well as develop maths?
3. How do we raise confidence, aspiration and ambition?



# “Pure” PBL

- Complex, real world situations that have no one “right” answer are the organising focus for learning;
- Problems weave theory to practice;
- Students work in teams to confront the problem, to identify learning gaps and to develop viable solutions;
- It focuses on communication and interpersonal skills, skills that go beyond the area of technical expertise;
- Students gain new information through self-directed learning;
- Teachers act as ‘facilitators’;
- The focus is on the processes rather than the products of knowledge acquisition.

Barrows and Tamblyn (1980); Boud (1985)

PBL is a way of constructing and teaching courses using problems as the stimulus

The problems are the starting point, moving students forwards to acquisition and mastery of knowledge, skills and behaviours through a sequence of problems presented in a context

PBL focuses on learning for capability rather than for the sake of acquiring knowledge

The knowledge valued is that what can be used in context

The learning is authentic – through involvement of employers in developing the “problems” (80/20 teacher/employer?)

PBL on a continuum from ‘pure’ to guided and scaffolded?

### Core Principles of PBL

Holistic learning and development

What do we call it? Problem-based? Enquiry-based? Situational?

Progression and mastery through cumulative, spaced learning

Communication, collaboration, critical reasoning, logic, analysis, reasoned decision-making and self-evaluation

Behaviours for higher level learning and employment

- Initial ideas on what PBL might look like for functional skills maths students
- Explore in teams
- Share with the wider group



# Proposed Outcomes ahead

## Session 1 Monday am

### Beginning with the end in mind

- Background and context to this funded project – parameters/KPIs
- What is PBL? What are its core features and benefits
- What might PBL look like in Maths?

Why Bother?

## Session 2 Monday pm

### Co-constructing learning with employers

- What role can our employers have and why?
- How does it change relationships?
- Decision-making in planning successful PBL in FS Maths



## Session 3 Tuesday am

### Determining success criteria



- Reporting back on tentative ideas
- How might PBL advance EDI?
- How will you know if it has “worked”?

## Session 4 Tuesday pm

### Getting ready



- Finalising the problems and processes
- What next?

# Co-Constructing the curriculum with employers

Employers will inform one of the PBL scenarios such as.....

- Real-world content
- Focus on employability and careers
- Contribution to assessment

Employers engaged  
McDonalds (Vikki Roberts)  
East Midlands Airport (Colleen Hempson)  
Derby Museum Trusts (Janine Derbyshire)  
Events/Music (Jon Beckley)

# PBL – Redefining relationships

with subject content	with self	with students	between students	with parents	with employers
Deconstructing “units” or “topics” and reconstructing them around problems Making connections and forming relationships between different ideas and concepts Wider skills development <i>time in lessons</i>	Outside of comfort zone Increased level of professional and personal awareness of self; intervening at just the right moment and in just the right way to maximise learning and facilitate the group process Mediating the students’ prior learning experiences, curriculum content, assessments and holistic development for the future	Trusting students to do the work of learning Becoming a partner in their learning	Experiencing new relationships with each other; working as part of a team responsible for accomplishing shared goals. Cooperation rather than competition	Developing parent partnerships Helping parents understand the strategies	Co-constructing problems/the curriculum Involving employers in assessment/feedback



# Thinking about PBL and assessment

1. What will guide assessment? What outcomes could and should be assessed?
2. How will assessment align with the qualification requirements? (if at all)
3. How and when do we assess:
  - Knowledge?
  - Defined skills?
  - Process of learning?
  - Effort?
4. Feedback – on what and how?

# Example assessment form

## Annex (1): Students' Assessment Form

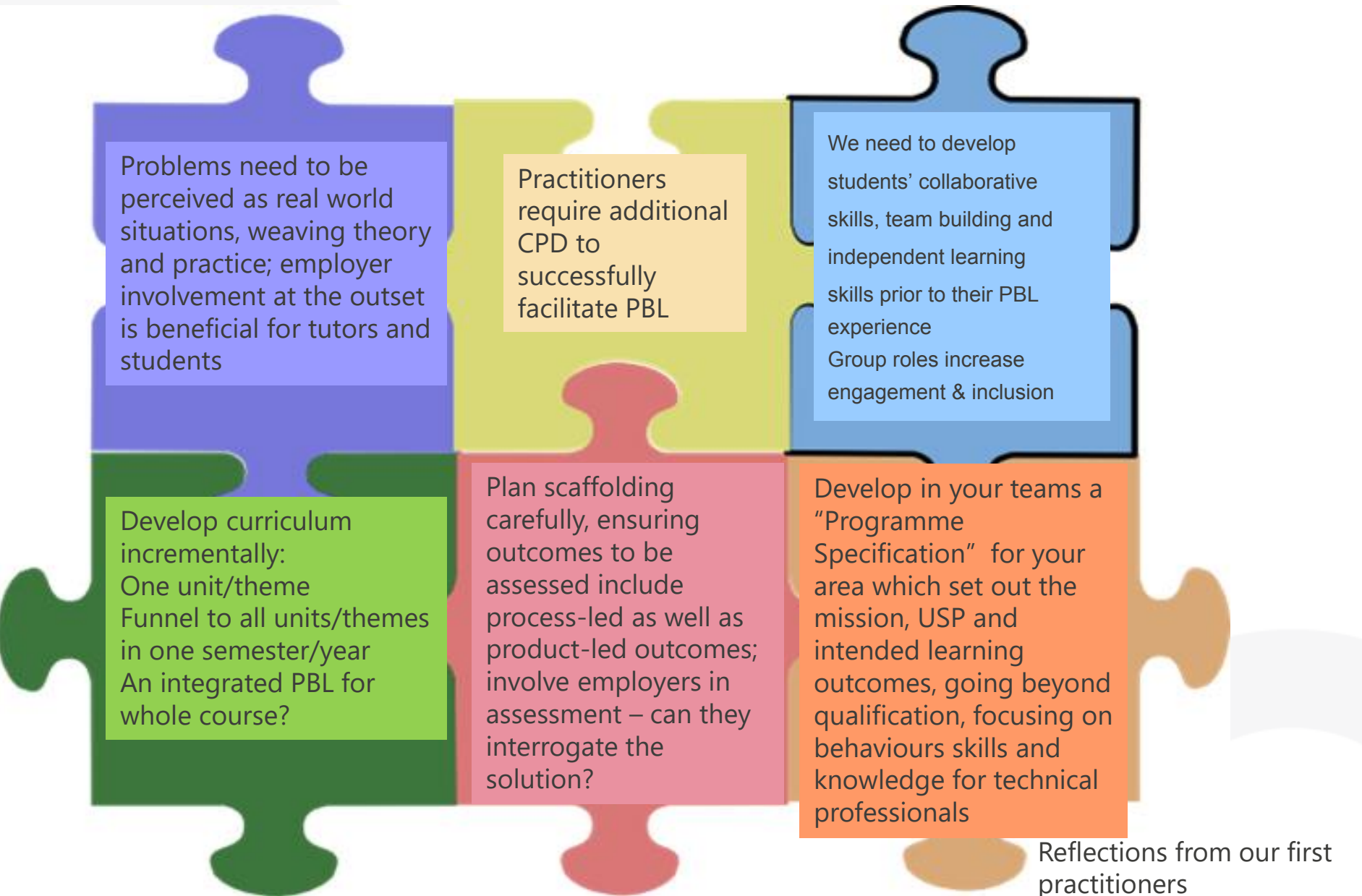
Module Name: ..... Tutor Name: ..... Date: .....

PBL subject (title):..... PBL session No.:.....

Students names	Punctuality	Completing the assignment tasks at the appropriate time	Participation actively in the Discussion	Brining relevant information to the discussion	Using variety of sources to bring information	Communicating the ideas clearly in the tutorial discussion	Justifying the comments made by him/her	Assessing personal weakness and strength	Accept criticism	Overall Assessment (Total)

Assessment Scale: 1 (Bad) - 5 (Excellent)

# Our Findings so far: characteristics needed for successful PBL



Problems need to be perceived as real world situations, weaving theory and practice; employer involvement at the outset is beneficial for tutors and students

Practitioners require additional CPD to successfully facilitate PBL

We need to develop students' collaborative skills, team building and independent learning skills prior to their PBL experience  
Group roles increase engagement & inclusion

Develop curriculum incrementally:  
One unit/theme  
Funnel to all units/themes in one semester/year  
An integrated PBL for whole course?

Plan scaffolding carefully, ensuring outcomes to be assessed include process-led as well as product-led outcomes; involve employers in assessment – can they interrogate the solution?

Develop in your teams a "Programme Specification" for your area which set out the mission, USP and intended learning outcomes, going beyond qualification, focusing on behaviours skills and knowledge for technical professionals

Reflections from our first practitioners

# Planning a PBL experience.....

- What **content** do you want them to learn?
- Is it sufficiently **real-world**? Check!
- Can an **employer** be one of your resources? In what way?
- What is your **time-line** for completing the problem?
- What assessment do you use to assess “learning” of that content?
- Could you turn the current assessment into a problem (back to front planning)? Is it sufficiently engaging and challenging?
- Do you want to “**drip-feed**” further information/facts at specific points?
- What **learning environments** can you use?
- What **resources** can you make available?
- How will you **assess** the content, skills, attributes of the learners during the problem-based learning experience?

# Over to you.....

- Teams?
- First ideas on what you will do to trial PBL (curriculum design)
- First ideas on problems
- Discussion and Decisions on:
  - Developing students' interpersonal skills, critical appraisal, self-evaluation, communication
  - Competency/systematic coverage and mastery
  - Mastery v Progression
  - Sequencing of learning based on qualification requirements
  - Assessment methods
  - What knowledge to teach and when to teach it (key concepts/frameworks/new conceptually difficult info)
  - Employer involvement in design for authenticity
  - PBL, failing and protecting students' well-being
  - How you really feel about "Trust and faith"/developing a positive and productive climate for learning
  - Capacity to innovate within the team – potential barriers
  - Capacity to innovate within the organisation – potential barriers

# Proposed Outcomes ahead

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## Session 3 Tuesday am

### Determining success criteria

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## Session 2 Monday pm

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## Session 4 Tuesday pm

### Getting ready

- Finalising the problems and processes
- What next?

WHAT NEXT?

# Feedback from today – 12 noon

- Each group to informally present their tentative plans developed today

- What role can our employers have and why?
- What will we assess and how?
- How can we make this work?
- What might go wrong? Anticipation and constraints

Feedback and questions?

# Advancing EDI through PBL

## Inclusivity

```
graph TD; A[Inclusivity] --> B[Belonging and Engagement]; A --> C[Enabling potential];
```

### **Belonging and Engagement**

The creation of environments and learning experiences in which all students can feel like they belong, in which they are not made to feel isolated and excluded, in which they all have the opportunities to be engaged and which, to some extent, are shaped by those students acting as partners

### **Enabling potential**

The creation of environments and learning experiences in which all students are given the opportunity to reach their potential and in which no student is automatically disadvantaged by teaching practices and curricula



## **Might PBL be positive for our “educationally disadvantaged”?**

- By providing a positive experience of education and learning
- By mitigating barriers to learning
- By providing students with the opportunity to actively use their knowledge, and make connections within the subject
- By redirecting their overwhelming preoccupation about their ability to succeed
- By teachers enabling integration – through content of problems, assessment and feedback, composition of learning groups, facilitation skills, tutor support and intervention to avoid marginalisation

# Advancing Equality (EDI) through PBL

- So how could using PBL pedagogies advance EDI in Maths learning?

- And how can we evidence it to the sector?

- Safe and collaborative environment of mutual respect and honesty
- Recognising and handling tensions, strong emotions
- Being sensitive to students' feelings and beliefs
- Recognising and managing potential and actual power differentials
- Identifying and planning to overcome barriers that prevent students from diverse backgrounds from learning
- Providing opportunities for students to relate content and learning methods to their own experiences
- Empowering students to take responsibility for their own and each others learning
- Providing opportunities, acting as partners in their learning experiences

# PBL – how will we know if it “works”?

- Success criteria for you?
- How can we distinguish between short term gain when participating in something new with longer term outcomes
- How can we measure attitudinal change?
- How might we be able to justify it to others? And improve on it?

Let's agree  
some  
success  
criteria

# Proposed Outcomes ahead

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- Finalising the problems and processes
- What next?

# Outstanding teaching, learning and assessment because.....

- We are rethinking technical education as T Levels emerge
- We are trialling a new pedagogy, we are experimenting, we are taking risks
- We are reflected and systematically analysing our findings
- We are working collaboratively to develop our own professional skills
- We are contributing to developing an evidence-based pedagogy
- We are embracing being a research-informed profession
- We will disseminate to the sector

# Progress, reflections, evaluation and next steps

- Progress made? Barriers
- Reflections on our two days?
- Next steps? Action Plan
- Evaluation form
- Mid-Point ETF Professional Standards to be emailed out to you

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# References/Bibliography

- Boud, D.(1985). **Problem-based Learning in Education for the Professions**. Sydney: Higher Education Research and Development Society of Australasia.
- Boud, D. and Felletti, G (1997). **The Challenge of Problem-Based Learning**. 2<sup>nd</sup> Ed. London: Routledge
- Ballard, A. (2012). **Problem-Based Learning**. Online @ <https://www.slideshare.net/asballard/problem-based-learning-12794529>
- Barrows H. (1994). **Practice-Based Learning: Problem-Based Learning Applied to Medical Education**. Springfield, IL: Southern Illinois University School of Medicine.
- Camp, M.G. (1996). Problem-based learning: A paradigm shift or a passing fad?. **Medical Education online**. 1:2
- Conway, J. and Little, P. (2000). Adopting PBL as the preferred institutional approach to teaching and learning: Considerations and challenges. **Journal on Excellence in College Teaching**. 11:2/3, 11-26
- Dewey, J. (1938). **Experience and Education**. New York: Collier and Kappa Delta Pi
- Hattie, J (2009). **Visible Learning**. Abingdon: Routledge
- Kahn, P. & O' Rourke, K. (2005). **Understanding Enquiry Based Learning** in T. Barrett, I. Mac Labhrainn & H. Fallon (eds). Handbook of Enquiry and Problem based Learning. Galway: Celt
- Rogers, C. (1969). Freedom to Learn. What Education Might Be). Columbus, Ohio: Charles E. Merrill Publishing Company
- Sahoo, S.S. (date unknown). **Problem-Based Learning**. Online @ <https://www.slideshare.net/drswaroopsoumya/problem-based-learning-38568683>
- Savin-Bladen, M. and Major, C.H. (2004). **Foundations of Problem-Based Learning**. Maidenhead: McGraw-Hill