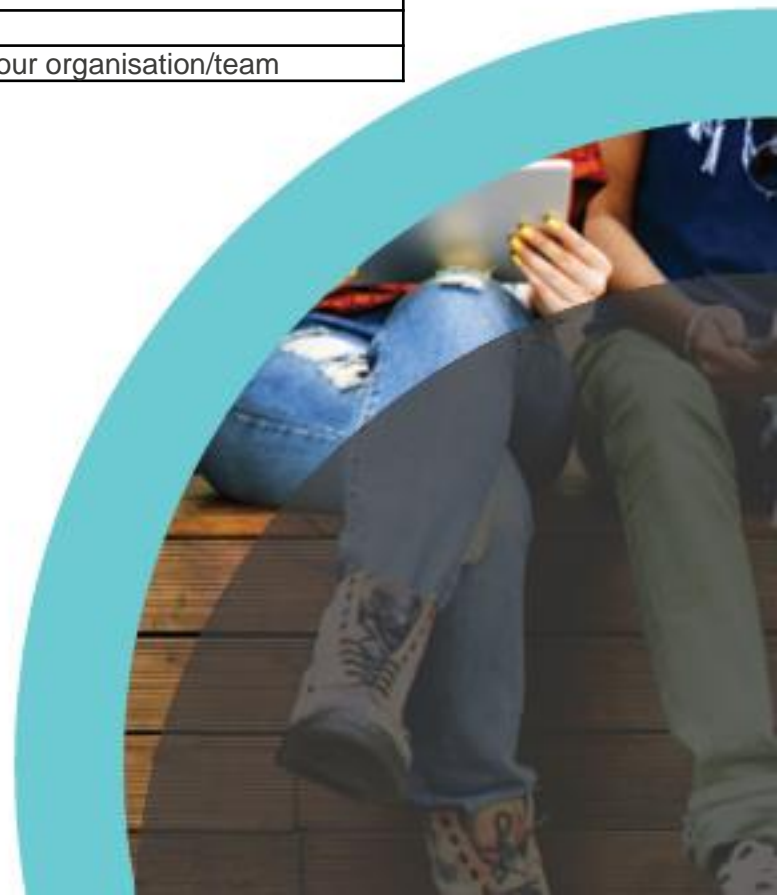


| | |
|---|---|
| This resource is intended to be read in conjunction with the case study on the project led by Derby College | |
| This is what this resource is | A set of slides that can support development of practitioners' knowledge and skills in using Problem-Based Learning |
| This is what it is for | A CPD resource for teachers in our sector |
| This is how it could be used | They could be adapted to be delivered in your organisation/team |

Outstanding Teaching, Learning and Assessment (OTLA) Technical Skills National Programme: sharing and developing effective practice

PBL CPD Materials 1 for Practitioners
May 2017- October 2017
Output 1



Beyond Competency

A paradigm Shift: Educating Engineers for the Future



Melanie Lanser
Team Manager: Academy of Professional
Education, Training and Development at
Derby College

Our original hypothesis

1. Problem-based learning is an effective pedagogical model to support learners to develop into technical professionals
2. Joint practice development is an effective model to support the development of employer relationships for T-Level delivery



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

So how do learners identify themselves as future engineers?

1. What is their calling to the sector and how do we know?
2. How can we broaden their minds as well as develop technical expertise?
3. How do we raise ambition?

The Challenge

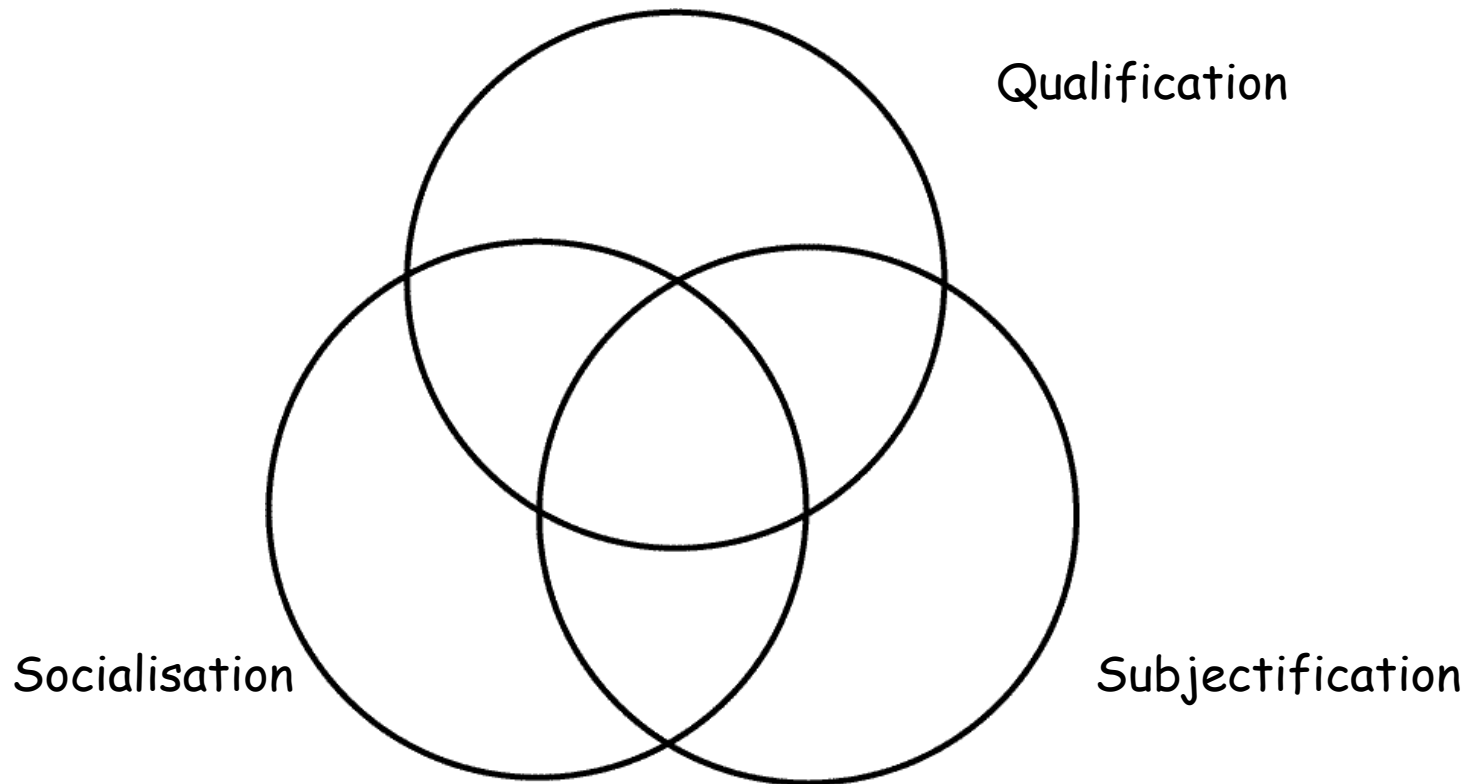
The challenge?

Developing rounded individuals,
as a future quality workforce, as
citizens and as contributors to
society?



Biesta's three domains of education

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



T-Levels – rebranding vocational education?



- Aimed at establishing parity between academic and technical routes
- The government describes its plans as the "biggest overhaul of post-school education in 70 years".
- T-levels will be full-time study programmes with 20% (minimum) comprising of work-experience.
- The aim is to have teenagers "work fit" in a number of key industries which will help bolster the UK's workforce after Brexit.
- It's worth noting that those who decide to study a technical T-level will spend 50 per cent longer learning than they do at the moment, equalling 900 hours of teaching a year.
- Creating the 15 routes was one of the key recommendations of [Lord Sainsbury's review into technical education](#)
- T-Levels to be phased in from 2019.....

The 15 new technical routes to skilled employment



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| 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 |

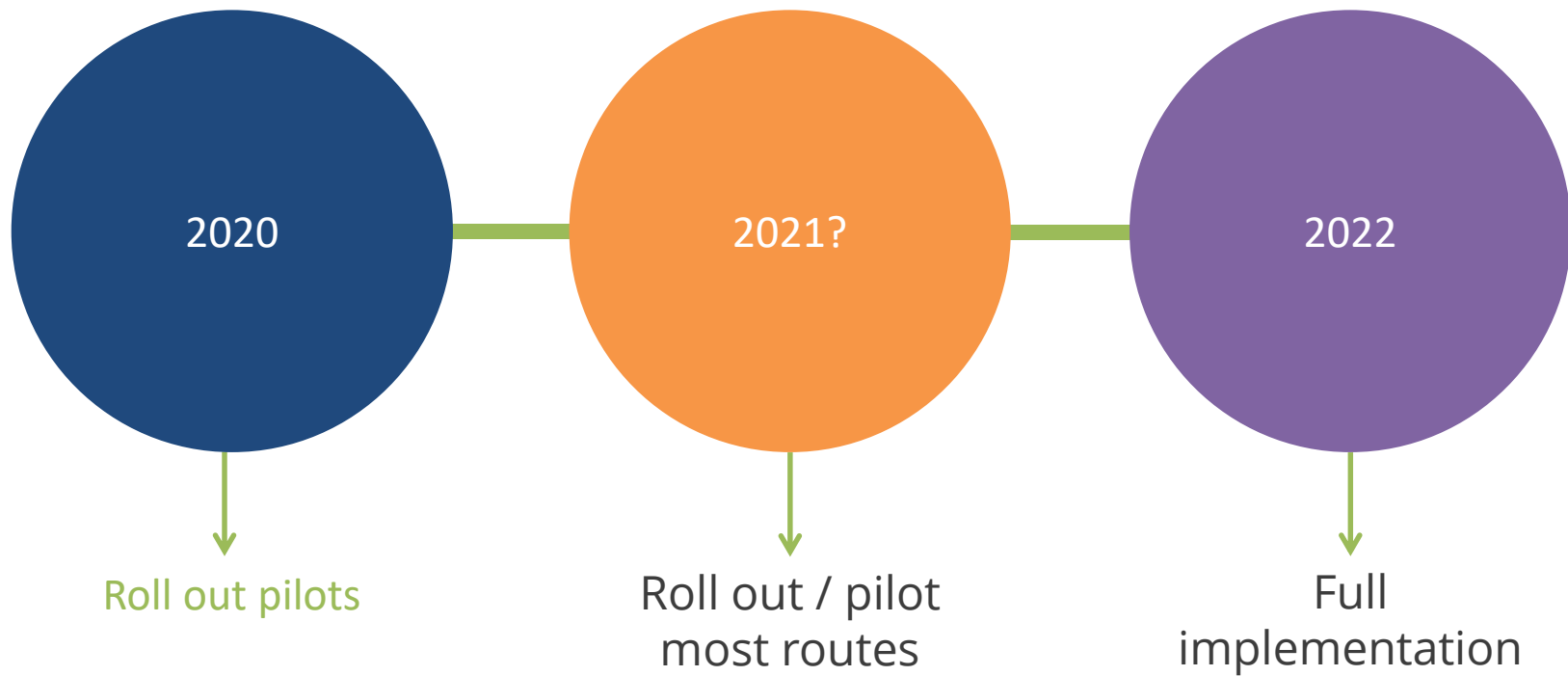
| Digital | Engineering and Manufacturing | Hair and Beauty | Health and Science | Legal, Finance and Accounting |
|--|--|---|---|---|
| (351,649) | (1,319,645) | (293,004) | (915,979) | (1,325,482) |
| IT Technician Web Designer Network Administrator Software Developer Programmer | Aircraft Fitter Electrical 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 Signalman HGV Driver |



An employable engineer?

“Employability skills are important to the UK.....that change (skills development, not assessment) has to be empowered and encouraged (and not impeded by policy, funding and assessment; it has to ***happen*** at the level of individual schools, colleges, universities and training providers”

Task and “scaffolds”

Your task (30 minutes maximum)

In your sub-group:

- Identify the skills, knowledge and attributes of an employable learner

Using this information:

- Articulate what should be at the heart of programme design and delivery?
- What does “successful” teaching, learning and assessment look/feel/sound like?

Prepare a brief presentation (5 minutes maximum)

“Scaffolds” that may stimulate ideas

1. Extract from UCKES (2009) **The Employability Challenge**
2. Extract from Lucas, B., Spencer, E. and Claxton, G. (2012). **How to teach vocational education: a theory of vocational pedagogy**

‘Spoon feeding in the long run teaches us nothing but the shape of the spoon’

– E M Forster



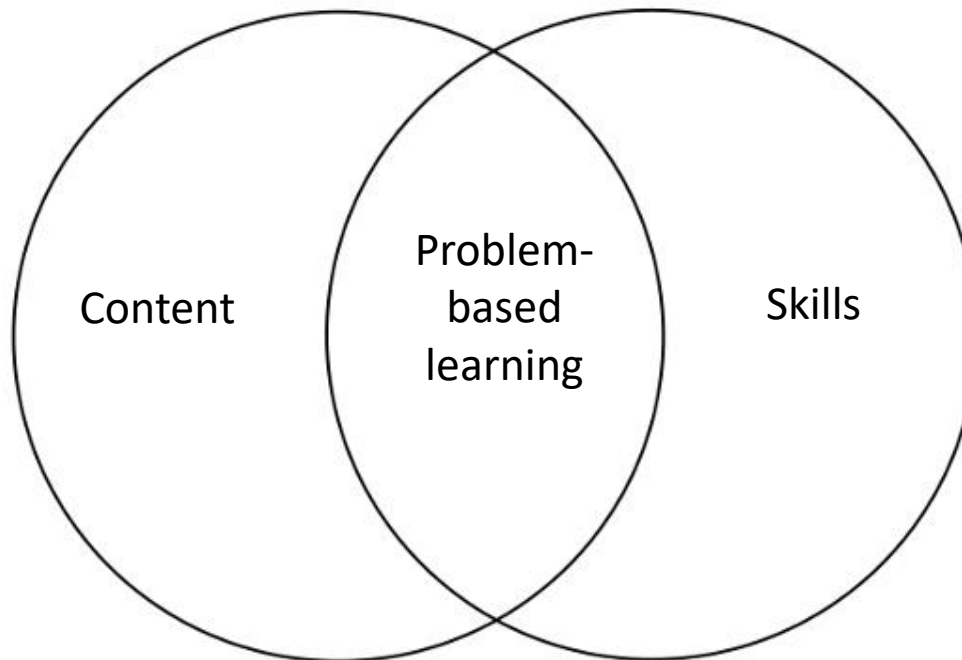


“True learning is based on discovery . .
. rather than the transmission of
knowledge.”

John Dewey (1938) Experience and Education



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



The features of problem-based learning

- Curriculum content is framed as a series of complex questions, which generate open-ended student-led enquiries with multiple possible solutions
- Problems are as authentic as possible
- There is an emphasis on doing and making
- There is an explicit focus on the processes of problem-solving, critical thinking, collaboration and project-management

(Lucas, 2012)



Problem-based learning (PBL) is a student-centered pedagogy in which students learn about a subject through the experience of problem solving.



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Intro

- PBL was pioneered in the [medical school](#) program at [McMaster University](#) in [Hamilton, Ontario, Canada](#) in the late 1960s by [Howard Barrows](#) and his colleagues.





The intent is to challenge the learner with problems found in practice both as a stimulus for learning and focus for organizing what has been learned for later recall and application to future work.

Howard Barrows

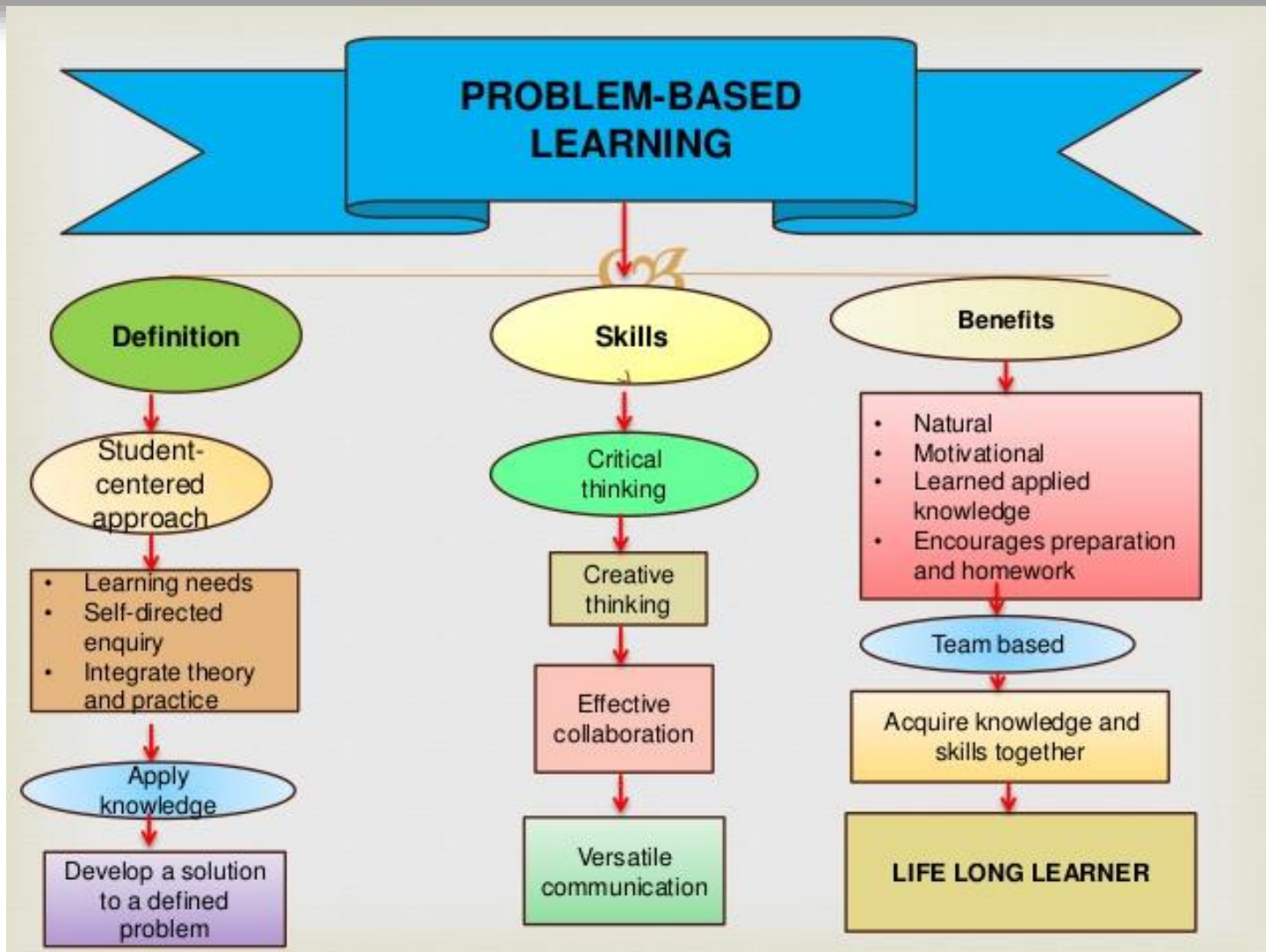
“...a process of acquiring understanding, knowledge, skills and attitudes in the context of an unfamiliar situation, and applying such learning to that situation.”

C. E. Engel, University of Newcastle

Reasons behind Problem Based Learning

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- Grades did not predict success
- Many students could not apply knowledge
 - Diagnosis
 - Problem solving
- Education is a continuous process and requires life-long learners
- PBL adopted to better prepare people for handling real life situations



PBL Paradigm Shift

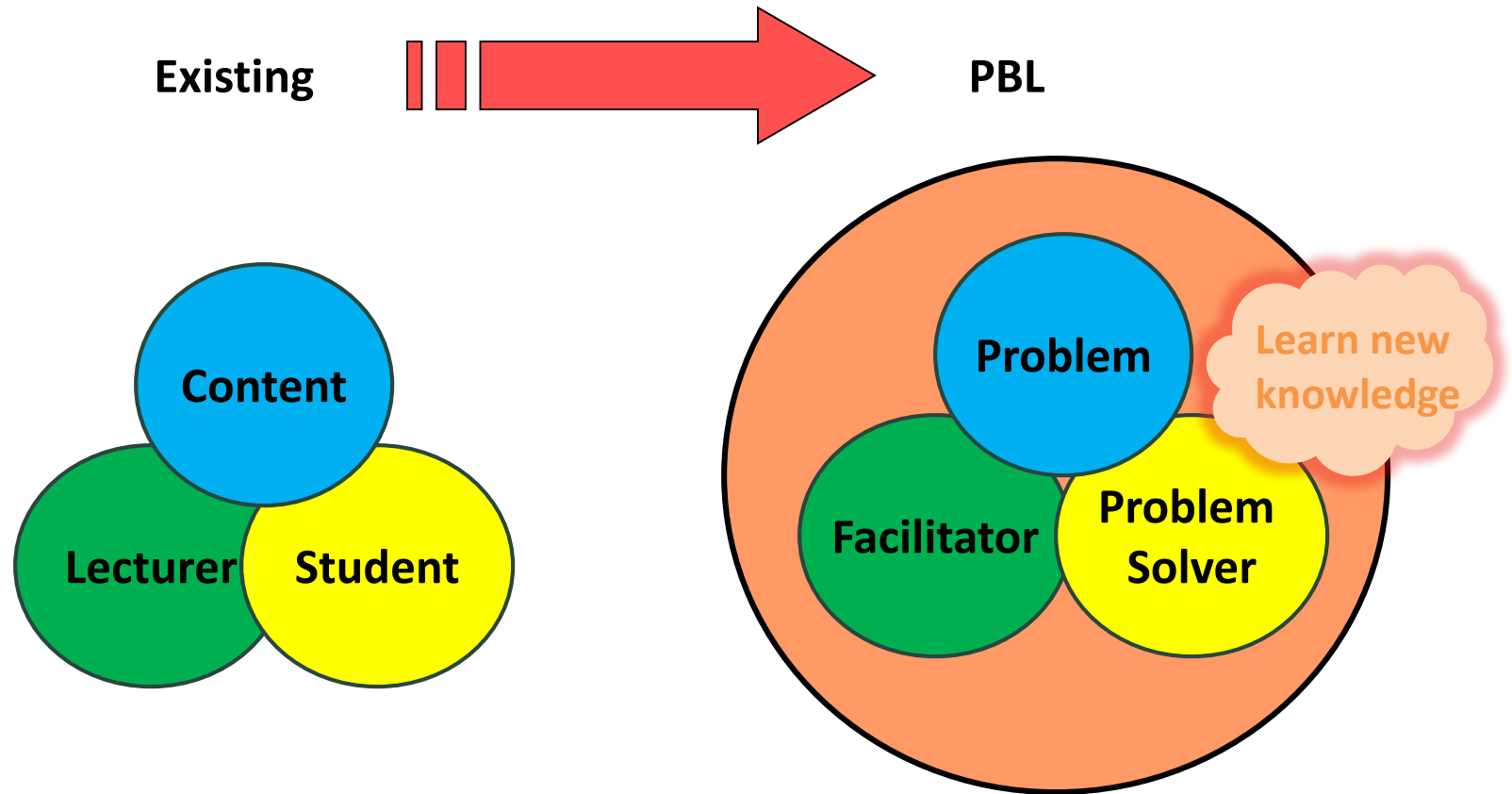
- From focus on **teaching**
 - To focus on **learning**
 - Investigation of real world problems
 - Engages students as stakeholders
 - Utilizes cooperative learning
 - Instructor becomes coach
- The **ill-structured** problem is based on
- desired learning outcomes
 - learner characteristics
 - compelling, real world situations

PBL : Change in Starting Point

Change in



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Starting Points

Essential question

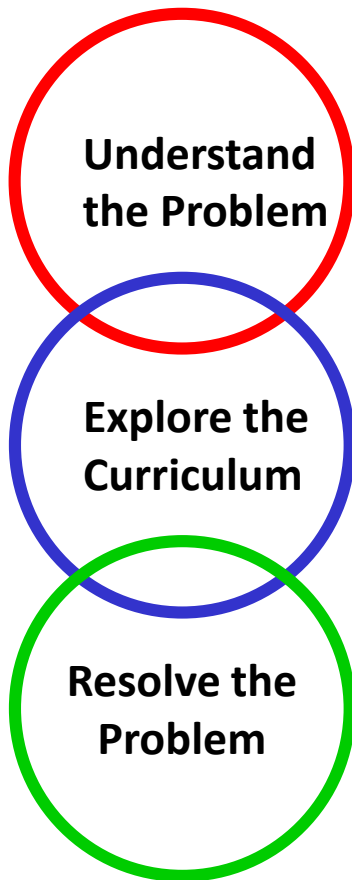
- **Interesting/inspiring** questions that requires students to conduct **serious research**
- Questions that people ask in the '**real world**'
- Questions with **no easy answer**, which will stretch students' intellectual muscles
- Questions which ignite **students' imaginations**

Ill-Structured Problems

- need more information before it becomes clear
- act as triggers
- are interdisciplinary
- only have guidelines to *approach* problem
- Often have several alternative solutions



The Flow of the Problem



- Meet the problem
- Know/Need to Know
- Define the Problem Statement
- Gather Information
- Share Information
- Generate Possible Solutions
- Determine Best Fit Solution
- Present the Solution
- Debrief the Problem



| ‘Conventional’ | PBL | Expected effects | |
|-----------------------|------------------------|-------------------------|---|
| Teacher-centred | Student-centred | Motivation | ↑ |
| Rote learning | Active learning | Retention | ↑ |
| Discipline-based | Integrated | Applicability | ↑ |
| Competitive | Collaborative | Interpersonal | ↑ |
| Information gathering | Problem-solving | Relevance | ↑ |
| Assigned resources | Information management | Professional | ↑ |
| Examinations | Progressive learning | Life-long learning | ↑ |



PBL in and for the future needs to be as an approach to learning that is not just about employability... or the “happening” new genre in higher education learning. It needs to be seen as an approach to learning that really does help learners to engage with and live in a complex world.

Savin-Baden, M. & Major, C.H. (2004)

Let's think about teachers and employers

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Discuss.....

What skills, knowledge and attributes does an outstanding teacher need

In what ways can employers help in relation to successful teaching, learning and assessment



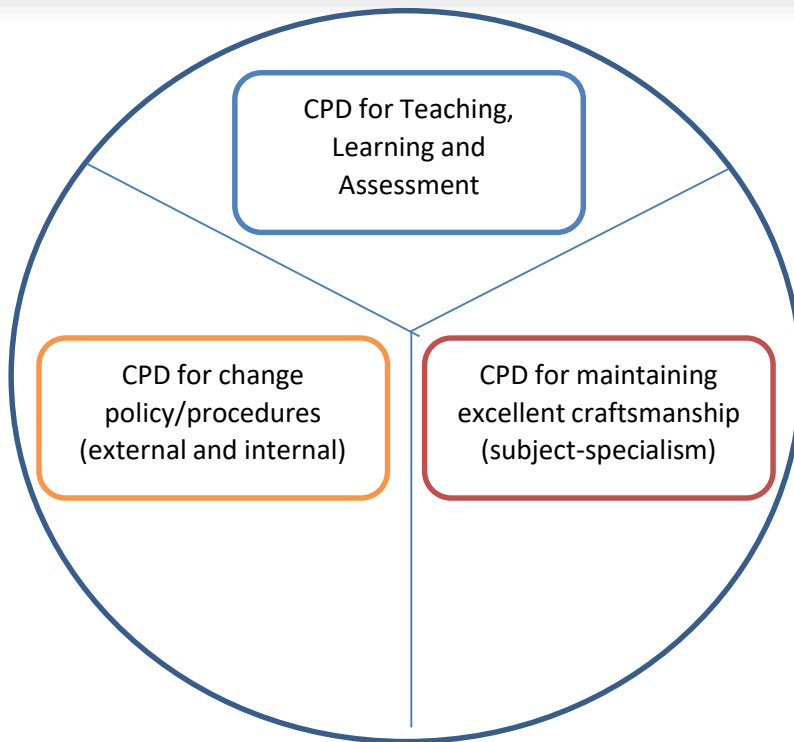
PBLs informed by employer visits



An employer visit informs the PBL scenarios, such as.....

- Real-world content
- Focus on employability
- Learning spaces
- Contribution to assessment

Triple professionalism?



The Professional Standards in Three Minutes

Reflect

- Why do any CPD?
- Which CPD do you engage in most? Why?
- What would you like to engage in more? Why?

Designing a PBL Episode



- Determine content – what you want students to learn
- Identify the stakeholder
- Create the problem
- Layout the plan & identify the constraints
- Plan assessment

Putting it simply.....

- What **content** do you want them to learn?
- What is your **time-line** for completing the project?
- 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?
- Is it sufficiently **real-world**? Check!
- What **learning environments** can you use?
- What **resources** can you make available?
- Can an **employer** be one of your resources? In what way?
- How will you **assess** the content, skills, attributes of the learners during the problem-based learning experience?

Write Problem Introduction



- You are a land developer who has just discovered that you will not be able to build on a parcel of land in which you have already invested a large sum of money. Plans have been drawn up and workers have been hired. You must find a way to develop the land or risk losing your money and reputation.
- Follow-up with minutes from public hearing explaining the issue with developing this particular area of land: it is home to a salmon spawning stream that would be threatened by development

Plan Assessment

- Facts
- Skills
- Analysis
- Reflection

Ideas: Problem Log, Portfolios, Rubrics

Differentiation

- You can use the same tools that you would use in any other lesson
- Many of the learning strategies are tools to differentiate
- Examples: providing research materials, breaking the problem into steps/tasks, graphic organizers with fill-in-the-blanks, researching in pairs, vocabulary list

PBL and Equality, Diversity and Inclusion (EDI)

Are there any equality challenges in your PBL scenario?

How will your PBL experience advance equality (Equality Act 2010)?

Does it value diversity; is it accessible to diverse individuals?

What strategies are in place to promote inclusion?

What are we aiming to achieve?



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Here's just a few.....

- Making learning exciting, engaging and relevant – empowering learners and developing employability
- Simultaneously developing knowledge, skills and behaviours in the sector, particularly pertinent in the new world of T-Levels
- Going beyond the qualification
- Strengthening relationships between teachers and employers in the sector and fostering a genuine 2-way street

Exploring Perspectives: THE BIG PICTURE



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What sort of student feedback have you received?

Did PBL tackle what you wanted it to? Were there any barriers

What would you do differently next time you facilitate a PBL activity

Reflections

How can PBL activities be constructed to advance equality and diversity?

Do teachers need to create PBL activities to be able to facilitate them?

Constructing a PBL activity

Do we need to co-create PBL activities with employers?

What do employers need to know to be able to effectively contribute to the co-creation of PBL activities?

PBL

Does PBL better support progress to higher level learning/employment

PBL learning and assessment

How effective are PBL activities in supporting the holistic development of students' skills, knowledge and behaviours?

Can PBL be used effectively for both learning AND assessment

Teacher role and skills

Does PBL require teachers to develop a different skills set?

How do PBL activities need to be deployed to be effective?

Do teachers need to create PBL activities to be able to facilitate them?

What do students need to know to effectively engage with PBL

Returning to our original hypothesis

1. Problem-based learning is an effective pedagogical model to support learners to develop into technical professionals
2. Joint practice development is an effective model to support the development of employer relationships for T-Level delivery

Summary of activities undertaken to explore these hypotheses

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Some visits to and from employers

Development of a PBL Activity trialed (so far with 130 students)

Feedback and Reflections from Students and practitioners

Associated with the following Professional Standards (at least)

Reflect on what works best in your teaching and learning to meet the diverse needs of learners

Evaluate and challenge your practice, values and beliefs

Be creative and innovative in selecting and adapting strategies to help learners to learn

Value and promote social and cultural diversity, equality of opportunity and inclusion

Build positive and collaborative relationships with colleagues and learners

Maintain and update knowledge of your subject and or/vocational area

Maintain and update your knowledge of educational research to develop evidence-based practice

Apply theoretical understanding of effective practice in teaching, learning and assessment drawing on research and other evidence

Evaluate your practice with others and assess its impact on learning

Motivate and inspire learners to promote achievement and develop their skills to enable progression

Maintain and update your teaching and training expertise and vocational skills through collaboration with employers

Contribute to organisational development and quality improvement through collaboration

Tentative recommendations

- Essential conditions for success with PBL, emerging from the data are
 - Problems need to be perceived as real world situations
 - That intertwine theory and practice
 - Effective employer involvement at the outset is beneficial for tutors and students
 - Students benefit from being equipped for this learning approach – explanations of why/team building
 - Discussing Bloom's with students
 - Creating a problem that is appropriate for students' starting points
 - Planning the scaffolding carefully in advance of briefing the students, in light of starting points, confidence of students, students' mind-sets and the task difficulty
 - Using employers to support scaffolding and or/higher level students
 - Allocating group roles to promote inclusion
 - Fostering a supporting environment, where there is trust and space to make mistakes
 - Ensuring outcomes to be assessed link to development of skills and behaviours (process-led outcomes) as well as/instead of content-driven outcomes (product-led outcomes)

Tentative recommendations

- Teachers require additional CPD to successfully facilitate PBL as it goes beyond current practices, training and current CPD
- Decisions need to be made about curriculum design:
 - Initially start with a single unit/units?
 - Move to a carefully planned “funnel” approach?
 - Move to an integrated approach for T-Level delivery?

Tensions that may arise.....

- Articulating and agreeing the employer role and required relationships for successful PBL
- Successfully managing the “audit” culture we work in, FE assessment regimes and the holistic learning through PBL
- Shifting perspectives of educational leaders
- Developing suitable learning environments which are conducive to PBL

A paradigm shift in educating engineers for the future



Effective transition from classroom to workplace



Creating outstanding teaching, learning and assessment to effectively develop problem solving, professional enquiry, and an analytical approach



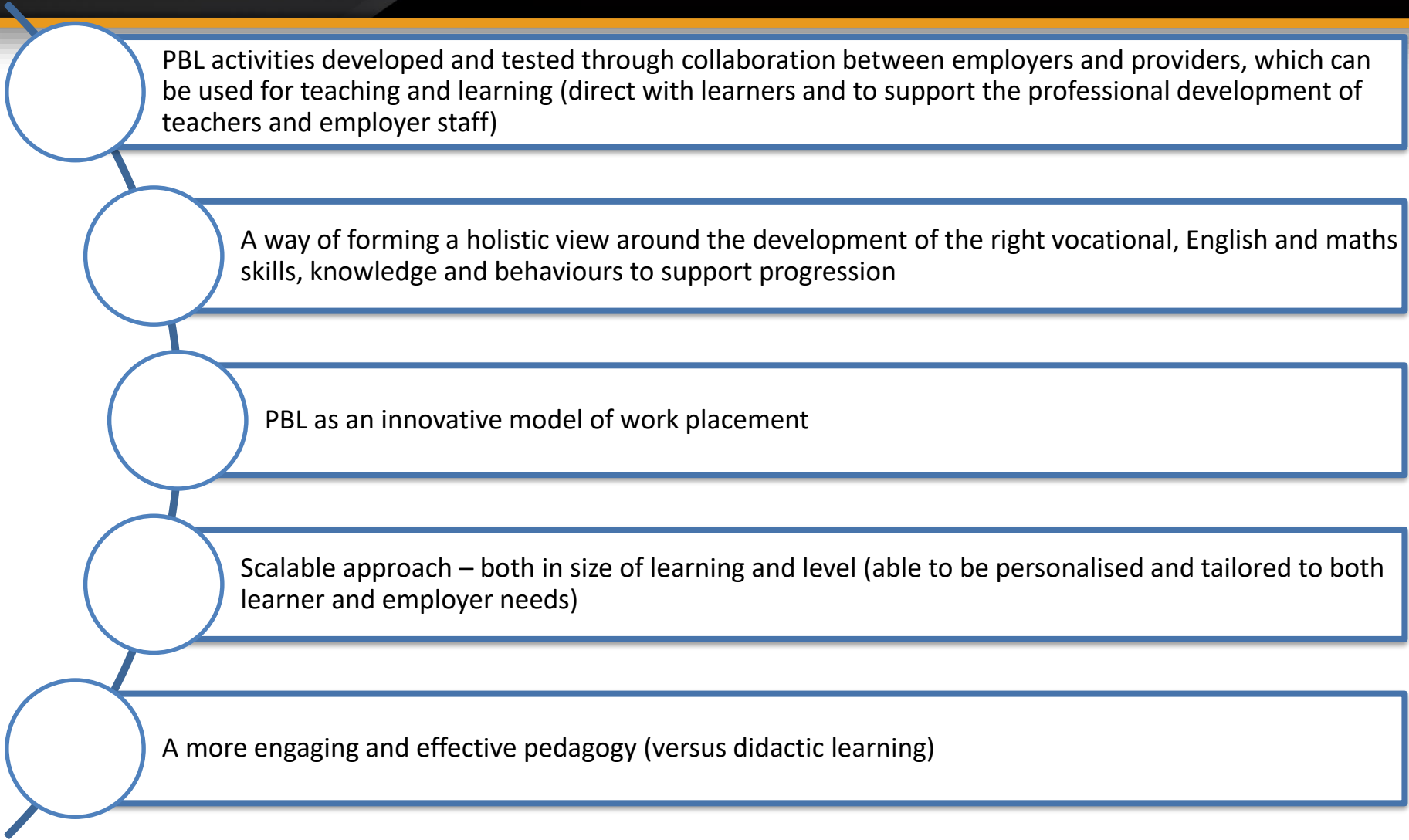
Including the stuff that isn't taught in schools



Taking a holistic view: skills, knowledge and attributes (needed even more with BREXIT)

Project focus to create world class teaching, learning and assessment that's been designed (problem based learning)

Five potential impacts on the education and training sector



PBL activities developed and tested through collaboration between employers and providers, which can be used for teaching and learning (direct with learners and to support the professional development of teachers and employer staff)

A way of forming a holistic view around the development of the right vocational, English and maths skills, knowledge and behaviours to support progression

PBL as an innovative model of work placement

Scalable approach – both in size of learning and level (able to be personalised and tailored to both learner and employer needs)

A more engaging and effective pedagogy (versus didactic learning)

Reflections

Are there sufficient “green shoots” to do it again?



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