

# Training the Next Generation of Pipeline Engineers: *The Post Graduate Certificate in Pipeline Integrity Management*

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*Penspen Ltd., UK*

**October, 2011**



## Presentation

Objective

Penspen Training & Teaching

The Need for Education and Training

Teaching/Training: The Future

The Northumbria University Initiative

Summary



## Objective of Presentation

- Explain the need for education and training our staff in the pipeline business.
- Highlight the shortage of education and training courses.
- Glimpse into the future...
- Show a 'way forward' using the 'PgC' in Pipeline Integrity Management.



## Presentation



## Industry Training by Penspen

- We have an international reputation in training courses.
- We present about 25 courses around the world, each year.
- We have trained over 5000 engineers worldwide, on all continents.



An Interactive  
Training Course

### ONSHORE PIPELINE ENGINEERING

4-7 September 2006, Sheraton Imperial,  
KUALA LUMPUR, MALAYSIA

**Course Highlights**

- Pipeline Design and Regulations
- Pipeline Materials Selection
- Pipeline Welding, Post-weld, Construction and Testing
- Corrosive Protection and Coatings
- Internal Corrosion: Mechanisms – Sulfide Corrosion, Sour Corrosion, Microbiological Corrosion
- Corrosion Morphology and its Impact on Integrity
- External and Internal Pipeline Corrosion and its Prevention
- Repair and Rehabilitation Methods
- Inspection Using Smart Pig
- Pipeline Integrity Management

**Ably Led by Expert Course Directors:**

**Professor Phil Hopkins**  
Peasepox Integrity, UK

**Dr Roger King**  
Corrosion Services, UK

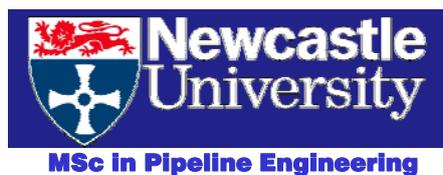
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 IChemE  
[www.icheme.org](http://www.icheme.org)

[www.icheme.org/pspe.htm](http://www.icheme.org/pspe.htm)



## University Teaching by Penspen

- Penspen has always worked with universities.
- A Masters programme in Pipeline Engineering was started in 2001 by local companies in North East England at Newcastle University.
- Penspen took lead.
- 30 students in 2011-12.



## University Teaching by Penspen

- Masters programme in Subsea Engineering and Management started in 2009.
- Penspen assist with lecturers and materials.
- 20 students in 2011-2012.



## Presentation



## Goal of Training: Competence

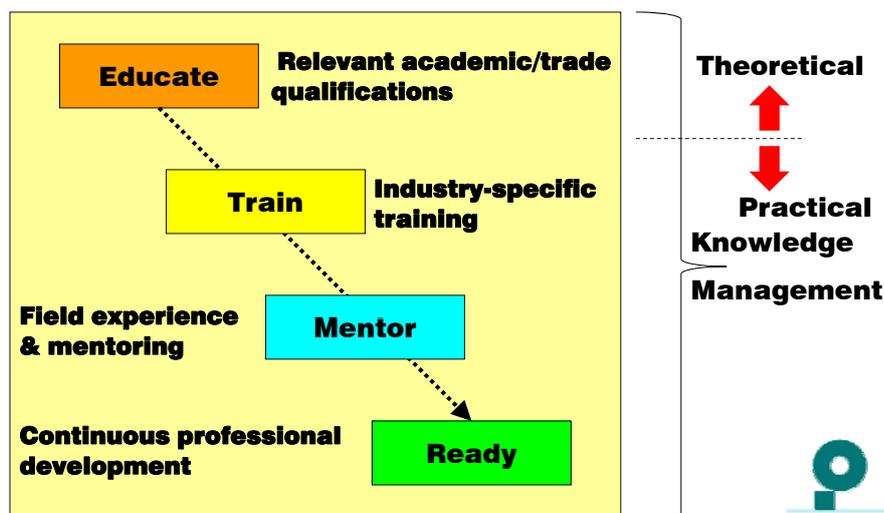
- Professional training must have a clear objective.
  - Pipeline staff must be 'competent'.
- A definition via UKOPA\* is:
  - 'A Competent Person should have **practical** and **theoretical** knowledge as well as sufficient experience of the particular machinery, plant or procedure involved to enable them to identify defects or weaknesses, and to assess their importance in relation to strengths and functions of the machinery'
- So, we need both:
  - practical (training, and on-job experience), and
  - theoretical
- learning programmes ('paths') for our engineers.



\*www.ukopa.co.uk. Taken from Brazier v. Skipton Company (1962) His Lordship Winn J.

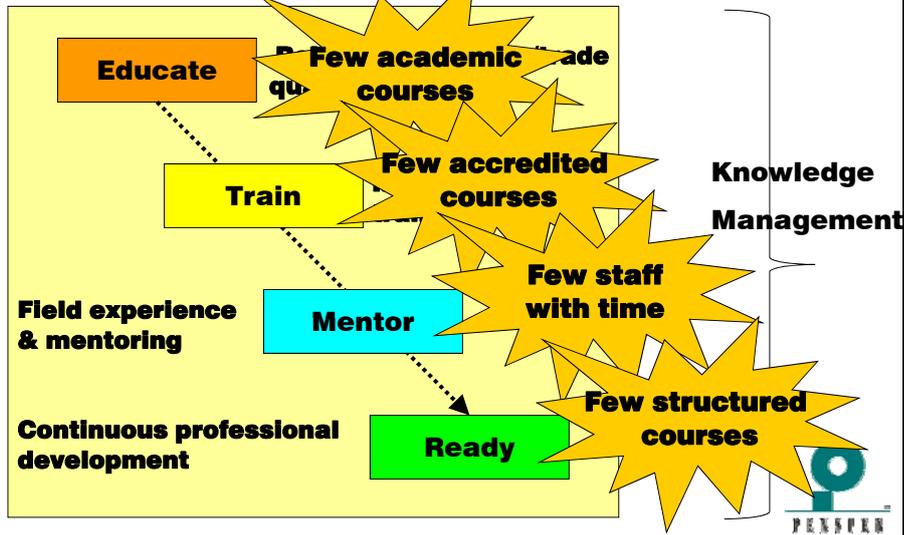
## The Knowledge Process

- The path is mainly 'practical':



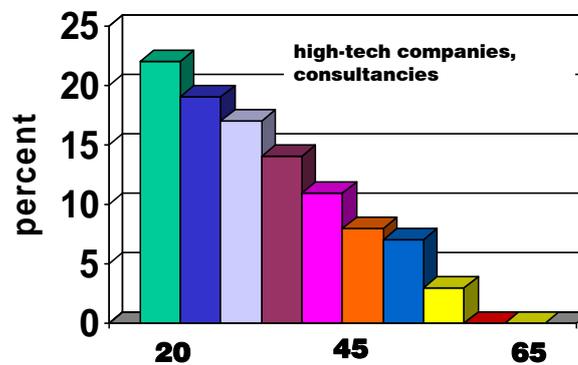
## The Path to Competence... is Blocked....

- The path to competence is blocked...



## Need for Training: Ageing Staff

- The oil and gas business has an ageing staff profile.
- The age profile for a modern, technology company would be:



## Need for Training: Ageing Staff

The oil and gas business has this age profile:



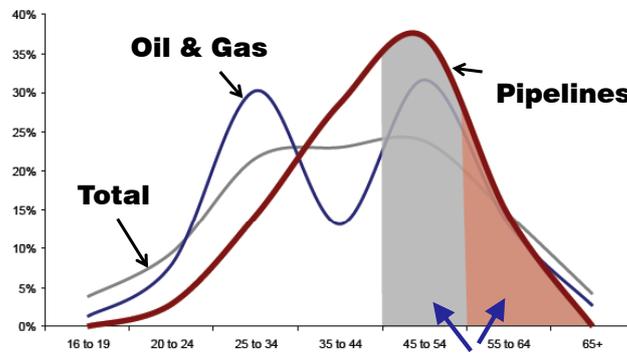
We need to rapidly train our existing workforce to replace the 'boomers'.



## Need for Training: Ageing Staff

Here is the overall picture from the USA:

US Pipeline Sector Demographics



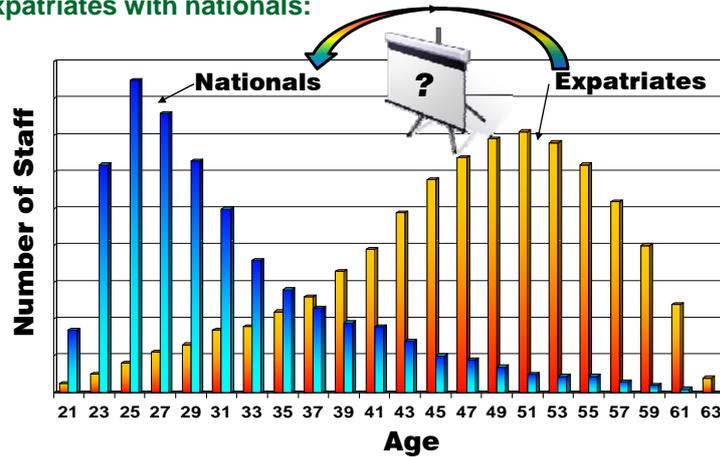
Source: US BLS, SBC Analysis

1 of 6 staff are > 55  
1 in 2 are > 45



## Need for Training: Nationalisation

- This age profile is international. But developing countries have an extra driver.
- The Middle East/Asia will need rapid training to replace retiring expatriates with nationals:



## Need for Training: Safety

- We are experiencing serious and deadly pipeline failures:



- These 'needs' give us a clear conclusion: we need rapid, accessible, international education and training programs.



## Presentation



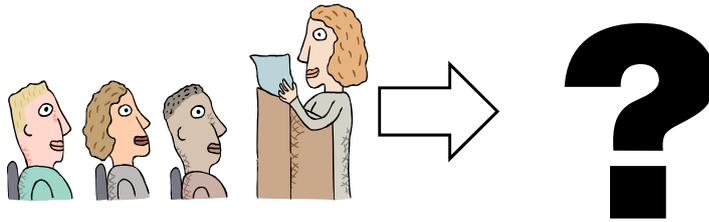
## Training/Teaching in the Future

- Our experience is:
- Staff/companies do not want long residential courses;
  - this is not cost-driven: it is time-driven.
- Staff want to learn at their own pace, and at work/home.
- Companies want courses to be accredited.
- The new (X, Y) generations in work today want to be educated in the same way as they communicate with their friends, book a hotel, and buy a pizza – via the internet.
- On-line distance learning is the future.



## Training/Teaching: The Past?

- Existing residential university courses, and residential industry training courses are both important and essential.
- But these will not supply our needs in the short or long term, nor appeal to many of our younger, newer staff.
- Time to change...



## Training/Teaching: The Future?

- What will our workplace look like in 10 year's time?
- How will we be 'learning' in the future?
- Will we still be...



- attending residential classes...?



## Learning: Today's Learners

- Today's learners are more sophisticated:
  - they carry a 'client attitude';
  - they demand up to date efficient services due to their time-pressed lifestyles and stress-related jobs.



## Learning: The Future?

- Residential, full time training/education courses seem... dated?
- Why not use the internet, social networks, iPads, etc.?
- As everybody under the age of 35 already does...?!
- Education and training needs to fit in with today's modern worker.



## Learning: The Future?

- The future for learning is...
  - Your mobile device will become your office, classroom and organiser.
  - Social media literacy will be a job requirement.
  - The corporate curriculum will use video games, simulations, etc., as delivery modes.
  - Your training and education will be based around your timetable, lifestyle and job.



## The Need for Flexible Learning

- 'Flexible learning' means students learn at their pace,
  - new format of delivery, which will take into account their interests and demands
  - we need to cater more flexibly
  - needs for collaboration between providers of education and training
  - provision of curricula in packaged form
  - large class numbers and new target groups
  - mature and non-traditional entry students



## Online Distance Learning

- Online distance learning is the preferred form of delivery to allow flexible learning.
  - The complete course materials are presented as a series of topics available through different e-learning tools, which are accessible online.
  - This online delivery fits in with today's students and busy workers:
    - it can be incorporated into their personal and work timetables, rather than interrupt and interfere with their timetables, as they increasingly find with residential teaching.



## Presentation



## The Start: Northumbria University

- Penspen approached Northumbria University and enquired about partnering on a distance learning initiative for Master level courses in pipeline engineering.
- Launched Certificate in Pipeline Integrity Management in September 2011.
- Resides in School of Computing, Engineering and Information Sciences.



## The Certificate: Financial Support

- The initiative is being financially supported by Penspen Ltd., and Northumbria University.
- The reasons for this support are:
  - Penspen Ltd is committed to actively contributing to the pipeline industry.
  - Northumbria University is committed to working with industry to produce learning programmes.



## The Certificate: Content

- The Post-graduate Certificate in Pipeline Integrity Management is delivered by online distance learning.



Module title	'Credits'
Pipeline integrity assessment	20
Onshore pipeline engineering	20
Risk management of pipelines	10
Materials and corrosion	10
<b>TOTAL</b>	<b>60</b>

An MSc is 180 credits



## The Certificate: Masters Level

- The Postgraduate Certificate is a Master level programme within the UK Framework for Higher Education Qualifications.

- The FHEQ describes all the main higher education qualifications.
- It applies to degrees, diplomas, certificates and other academic awards granted by a university or higher education college.



## The Certificate: Masters Level

FHEQ level	Examples of qualifications
4	- certificates of higher education - higher national certificates
5	- diplomas of higher education - Foundation Degrees - higher national diplomas
6	- bachelors degrees - bachelors degrees with honours - graduate certificates and diplomas - Professional Graduate Certificate in Education
7	- masters degrees - integrated masters degrees - postgraduate certificates - postgraduate diplomas
8	- doctoral degrees

**Postgraduate Certificate in Pipeline Integrity Management**

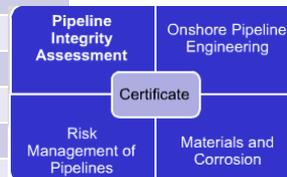


## Module 1: Content

### ■ Module 1: Pipeline Integrity Assessment Module (20 credits)

Class	Title
1	Introduction and Welcome
2, 3	Oil and Gas, Pipelines, and Design
4	Testing Pipelines
5	Why Pipelines Fail
6, 7	Fracture Mechanics and Fatigue
8	Fundamentals of Pipeline Defect Failure
9	How to Assess Corrosion
10, 11	How to Assess Gouges and Dents
12, 13	How to Assess Weld Defects, Cracks
14	Crack Propagation and Arrest in Pipelines
15	Pipeline Inspection using Intelligent (Smart) Pigs
16	Pipeline Repair Methods
17	Risk Management

### Later Modules:



## Module 2: Content

### ■ Module 2: Onshore Pipeline Engineering Module (20 credits)

Class	Title
1	Pipeline Engineering Principles
2	History of Pipelines: Pipeline Material Selection
3	New Materials for Pipeline Design
4	Pipeline Welding
5	Design Exercise Part 1 Pipeline Routing and Construction
6	Internal Pipeline Corrosion
7	Pipeline Testing, Operation, Inspection
8	Management
9	External Corrosion in Soils
10	Internal Inspection
11	Responsibilities, Duties and Ethical Behaviour



## Module 3: Content

### ■ Module 3: Risk Management of Pipelines Module (10 credits)

Class	Title
1	Principles of Hazard and Risk Assessment
2	Risk Assessment Methods
3	Failure Frequency and Consequence Analysis
4	Risk Calculation
5	Risk Acceptability
6	Risk Control
7	Risk Management Systems
8	Risk Management Tutorial



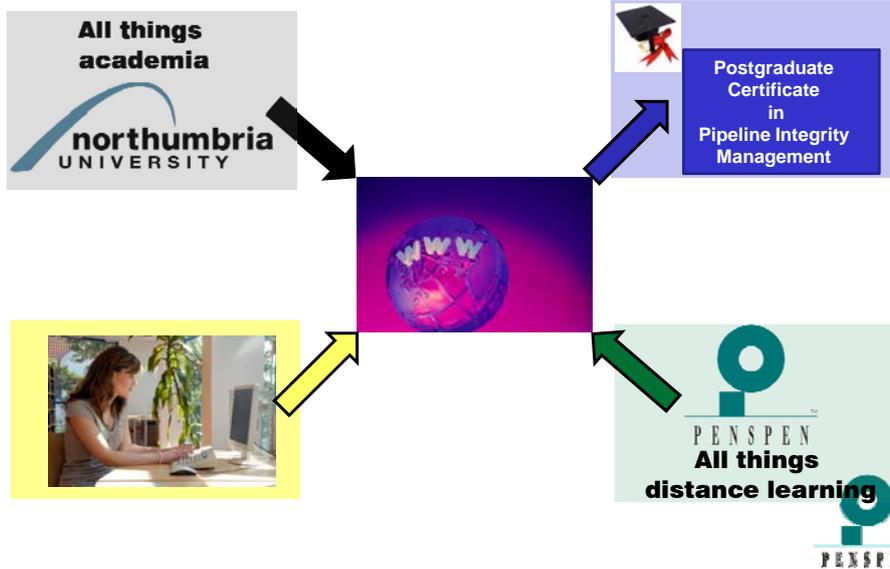
## Module 4: Content

### ■ Module 4: Materials and Corrosion Module (10 credits)

Class	Title
1	Principles of Hazard and Risk Assessment
2	Risk Assessment Methods
3	Failure Frequency and Consequence Analysis
4	Risk Calculation
5	Risk Acceptability
6	Risk Control
7	Risk Management Systems
8	Risk Management Tutorial



## The Certificate: Distance Learning Delivery



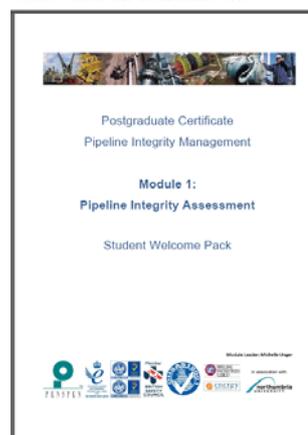
## The Certificate: First Intake

- First Intake (closed): 24 students.
- Around 100 queries in 8 weeks!



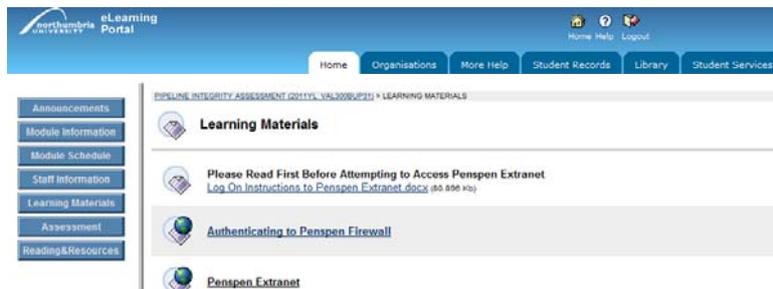
## The Certificate: Registration and afterwards...

- Students register at Northumbria.
- When fees are paid, they will be enrolled, and Penspen will send them a welcome pack, and password to the distance learning website.
- Student will take one Module at a time, and pay a fee for that Module.
  - Student has access to a Module for 13 weeks.
  - A Help Desk will provide technical and IT support.
  - The student will be examined at the end of the Module.
  - Student then moves onto next Module.



## The Certificate: Online Distance Materials

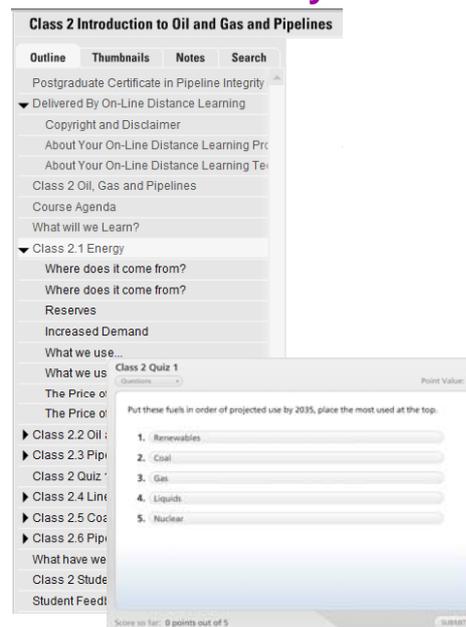
- Penspen supply all e-learning materials and academic tutors. <http://www.penspen.com/PCPIM>
- Students are Northumbria University students with full access to all University facilities, including their Virtual Learning Environment, 'Blackboard'. <https://elp.northumbria.ac.uk>
- All materials will be accessed through Blackboard:



## The Certificate: Online Distance Delivery

- Classes are presented in 'bite size' mini-lectures allowing students to plan their learning over the duration of the module
- Guidelines and study plans are provided based on standard distance learning recommendations
  - 2-3 hours study per day

Student support



## The Certificate: Online Distance Delivery

- Online materials include interactive quizzes giving the opportunity to students to self-assess their progress.
- Students are encouraged to create virtual communities and take part in discussion boards as part of their learning experience.

Class 2 Quiz 1 Point Value: 5

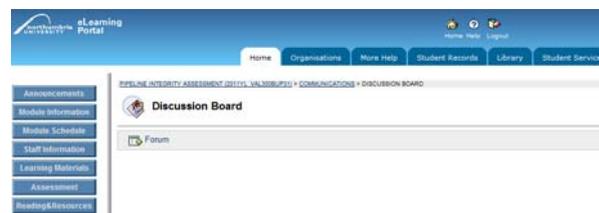
Questions

Put these fuels in order of projected use by 2035, place the most used at the top.

1. Renewables
2. Coal
3. Gas
4. Liquids
5. Nuclear

Score so far: 0 points out of 5 SUBMIT

The student learning experience!



## The Certificate: Online Distance Delivery +

- Penspen will organise Master Classes led by industry experts to complement online material.
  - Residential Master Classes
  - Webcast format (example)
- Standard training courses presented by Penspen worldwide will present an opportunity to meet the tutors.

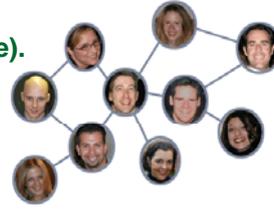


<http://collab.northumbria.ac.uk/qdldemo/>



## The Certificate: The Student Journey

- Students will find an e-learning partner (usually living in the same time zone).
  - First point of contact for discussions points set by module tutors.
  - Oversee each other's progress.
- Virtual communities give students the opportunity to interact with peers working in the same industry.
  - Social and professional global networking



No isolation as in traditional distance learning delivery



## The Certificate: The Assessment

- The PgC PIM is a postgraduate level course
  - Assessment must reflect this level
- Standard training materials enhanced to meet academic requirements set by the UK accreditation agency
- Assessment as recommended by the Higher Education Academy via
  - Formative Methods
  - Summative Methods

All students will be examined under University regulations and scrutiny.



## The Certificate: The Assessment

### ■ Current Summative Assessment Method:

- Closed-book examination paper at the end of the module
- Students can present the exam at Northumbria University or through the British Council in their own country.

### ■ Future Assessment:

- Online based examination

After successful completion of exam, students will be awarded a PgC PIM



## The Certificate: What after the Certificate?

- Penspen will continue to develop modules to build up an MSc, **with industry support**
  - Students can apply for admission in the 'Professional Engineering' MSc, delivered by the same School at Northumbria.
    - This Masters degree takes place in the workplace, and it is directly relevant to what students are working on.



## Postgraduate Certificate: Support

- The success or failure of this initiative will depend on the support of the oil and gas industry.
- Industry is asked to support this initiative on one of three levels:
  - **STUDENT SUPPORT:** Register staff on the modules, or provide funding for students on the modules.
  - **COURSE SPONSORSHIP:** Companies can support the modules by direct sponsorship, and finance each module for a year, or specified period.
  - **FINANCIAL SUPPORT:** New modules and Certificates will require substantial investment in both materials, and staff. Direct financial support will allow these modules and Certificates to be developed.



## The Certificate: Fees

- The fee for the full Certificate is £6,200.
- The fee for the first module (20 credits) is £2,067.



Module title	'Credits'	Cost (£)	Available
Pipeline integrity assessment	20	2067	2011
Onshore pipeline engineering	20	2067	2012
Risk management of pipelines	10	1037	2013
Materials and corrosion	10	1037	2013
<b>TOTAL</b>	<b>60</b>	<b>6200</b>	



## The Certificate: Benefits

- The modules on this Certificate program have been developed and produced by professional engineers at Penspen, with extensive experience of pipeline engineering.
  - The modules are both up-to-date, and relevant to the pipeline industry today.
- Most of the classes are delivered by practising pipeline engineers:
  - this allows the students to share past and contemporary experiences with the lecturers.



## The Certificate: Benefits

- Flexible education programmes offer the opportunity to attend short courses, which in the long term will lead to a formal degree.
- Students will be able to study from their workplace, or home, anywhere in the world, without having to leave their full time jobs.
- There is no long term economic commitment, as students do not need to enroll for a full time degree course.
- International students can gain a qualification from a university in the UK, even when they are not able to come to the UK to attend a formal course.



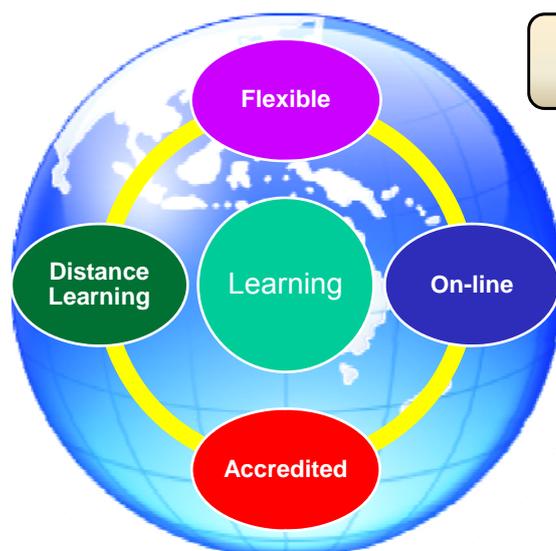
Distance learning



## Presentation



## Training/Teaching: The Future



Product



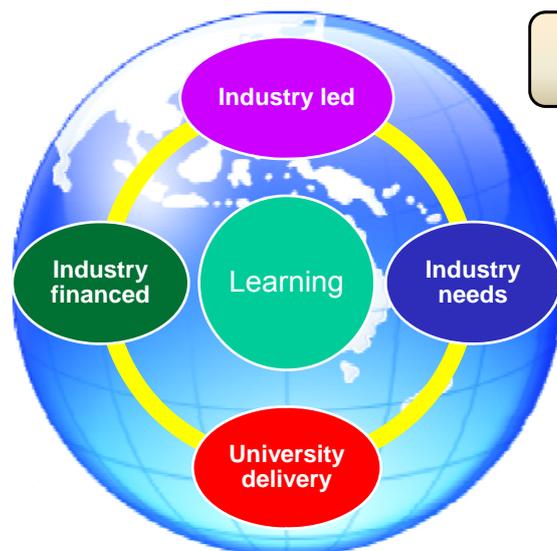
## Training/Teaching: The Future



**Environment**



## Training/Teaching: The Future



**Delivery**



## The Vision

- Our 10 year vision is to supply a complete suite of learning programmes for the industry.
- This Certificate is a pilot study.
- Its success depends on our industry's response to this pilot study.
- Over to you....



## Thank You for Your Attention: Close



Contact Points:

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