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PROFESSIONAL PORTFOLIO 1



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Generative AI Statement

PG Cert tHE – The Use Of Generative Artificial Intelligence (Ai) - Declaration.

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Assessment Component: Portfolio

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Use of Generative AI in Assessment		
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WRITING	For this assessment, you can use Generative AI to create text for submission.	Yes ☐ No ☒
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PROGRAMING	For this assessment, you can use Generative AI to create and check code.	Yes ☐ No ☒
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I acknowledge the use of ChatGPT (<https://openai.com/index/chatgpt/>) on 28/04/2025 to proofread my work and identify improvements to the structure using the following prompt(s):

1. Proofread the following section of text checking for spelling & grammatical errors. Provide me with a list of identified issues without changing my written content.
2. Identify the ways in which the structure of the following section of text could be improved. Provide a list of suggestions without changing my written content.

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1 Teaching & Learning Statement

Having spent the last 23 years in the education system, firstly as a student and, for the past four years, as a lecturer, I have developed a strong appreciation for the wide variety of teaching and learning styles that exist. Reflecting on my own learning experiences, I recognise that the way information is presented has a profound impact on comprehension and synthesis. It wasn't until my undergraduate studies that I fully understood the importance of aligning study methods with individual learning preferences. This realisation now underpins how I plan and deliver teaching sessions. (K1, A1, V1)

Looking back at my academic journey through undergraduate and postgraduate studies, a clear pattern emerges: I consistently performed best in modules that combined theoretical knowledge with practical application. While anecdotal, I observed that many of my fellow engineering students exhibited similar trends. Engaging with theory through practical labs, software-based exercises, and worked examples enabled me to grasp complex technical concepts more effectively than passive note-taking. (K1)

A particularly memorable experience came during the second year of my undergraduate degree, in a module on finite element theory, a complex computational approach to structural dynamics. In the first session of this module, the underpinning theory was delivered in an entirely authoritative, teacher-led style. I vividly remember leaving the lecture feeling somewhat dejected and anxious that I would never truly understand the concepts covered. However, in subsequent sessions, the lecturer provided a series of practical, student-led laboratory activities that developed upon the taught themes in an applied manner, significantly improving my understanding of these complex engineering principles. I have since commenced PhD studies in this very discipline, a concept I would have thought unimaginable during that first lecture session. (K2)

When preparing for assessments, I naturally gravitated towards solving practice problems and working through examples, rather than revisiting lecture slides or notes. Observing my peers employ a range of revision strategies further reinforced my understanding that students absorb information differently. This recognition of varied learning preferences informs my current approach to teaching in my role as a lecturer in the School of Engineering. (K1, K2, A2)

Having undertaken an assessment of my own learning preferences as part of my professional development (A5), I recognise that I am a multimodal learner, with strong tendencies towards

kinaesthetic and visual learning methods (Fleming and Mills, 1992). I appreciate, however, that individuals approach learning at variance, with some tending towards aural or auditory methods, such as in-class discussions, verbal explanations, and the use of lecture recordings, while others favour read/write methods, such as note-taking, and reviewing handouts, lecture materials, and textbooks. Recognising the importance of the teacher's role in facilitating these modalities has led me to implement an integrated, multimodal approach to delivery. (A1, A2, A4, K1, K2, V1)

While it is impractical to cover all lecture content in each of the sensory modalities described within the VARK model, Keen (2024) notes that the aim of effective teaching practice is to embed a range of modalities, such that students are able to focus on materials that align with their individual preferences. Further, Keen explains that the matching hypothesis, which asserts that instruction should be tailored and delivered to learners using their individual preferred learning modalities, is not supported by contemporary research in literature, an assertion that is supported by Clinton-Lisell and Litzinger (2024), who conducted a meta-analysis into the effect of matched and unmatched instruction on student learning outcomes, subsequently concluding, "Teaching with multiple modalities may be preferable to the costly and labour-intensive practice of matching instruction to learning styles given the empirical evidence for benefits across students for multimodal instruction." (K3, V3)

In my role as Programme Manager for the undergraduate Mechanical Engineering provision, I gather and act upon feedback from student surveys. One recurring theme is the diversity of student backgrounds and competencies: while some students excel in analytical subjects like mathematics & physics, others excel in applied, project-based work. Contrary to traditional stereotypes, today's engineering students demonstrate a broad spectrum of learning preferences. (A4, V1, K1, K5)

In response, I aim to design inclusive and varied learning activities that blend theory with interactive workshops, case studies, and practical demonstrations. These are supported by formative assessments and regular feedback loops to help students identify strengths and target areas for improvement. I also include discussion on learning strategies within my modules, encouraging students to explore and reflect on their own study preferences. In doing so, I aim to encourage learners to take ownership over their learning. (A1, A2, A3, A4, K2, V1, V2)

As I continue to develop as an educator, I remain committed to delivering inclusive, high-quality teaching that prepares students not only to succeed academically but also to meet the demands of a dynamic and interdisciplinary engineering profession. (A5, V4)

References

Clinton-Lisell, V. and Litzinger, C. (2024) 'Is it really a neuromyth? A meta-analysis of the learning styles matching hypothesis', *Frontiers in Psychology*, 15. Available at: <https://doi.org/10.3389/fpsyg.2024.1428732>.

Fleming, N.D. and Mills, C. (1992) 'Not Another Inventory, Rather a Catalyst for Reflection', *To Improve the Academy*, 11(1), pp. 137–155. Available at: <https://doi.org/https://doi.org/10.1002/j.2334-4822.1992.tb00213.x>.

Keen, L. (2024) *What does effective teaching look like?* Available at: <https://vark-learn.com/what-does-effective-teaching-look-like/> (Accessed: 26 February 2025).

2 Reflection on Micro Teaching Session

An introductory session on Six Sigma was delivered to colleagues from the automotive engineering department. Aware that most had limited exposure to the methodology, I tailored the session to their specific disciplines and industrial contexts, focusing on bridging the gap by presenting Six Sigma as a structured problem-solving framework relevant to their roles. I designed the session to align closely with their practical experiences, demonstrating how the content applied in context (A1,A2, K1, K2, V1).

The session centred around the DMAIC cycle and was based on a real-world case study involving real-world brake calliper production defect data. This practical case study enabled the attendees to connect new concepts with familiar challenges, thereby enhancing engagement and understanding. The audience responded positively to the case study, participating in discussion and noting that it helped them understand the framework more clearly. To promote active participation, I included a group activity using a simplified fishbone diagram. This task encouraged colleagues to explore potential root causes of a quality issue collaboratively (Neves, Lima and Mesquita, 2021). I feel that this technique was effective in enabling me to assess their understanding quickly. (A2, A3, A4, K2, V3)

Feedback was largely positive, with participants commenting that the session clearly explained key elements of the framework. One constructive feedback point concerned the pace at which statistical content was introduced. Reflecting on this, I recognised the need to adapt supplementary resources for diverse learner needs, such as by providing visual aids or handouts, respecting individual learning approaches (Tomlinson, 2017). (A2, A5, A4, K2, K3)

References

Neves, R.M., Lima, R.M. and Mesquita, D. (2021) ‘Teacher Competences for Active Learning in Engineering Education’, *Sustainability*, 13(16). Available at: <https://doi.org/10.3390/su13169231>.

Tomlinson, C.A. (2017) *How to differentiate instruction in academically diverse classrooms*. 3rd edition. Alexandria, Virginia: ASCD (Gale eBooks).

3 Teaching Intervention Cycle

3.1 Introduction

For this teaching intervention cycle, I have chosen a lecture session from the Quality & Business Improvement (ACMA4004) module, delivered to our Level 4 engineering undergraduates. This module forms part of the School's Degree Apprenticeship (DA) programme and is attended by part-time students from courses in Engineering Management and Advanced Manufacturing Operations. The module introduces industrial continuous improvement frameworks, including lean manufacturing concepts, Six Sigma statistical methods, and the impacts of digitalisation on quality improvement.

The cohort differs from those on our full-time engineering courses, consisting mainly of mature learners who are employed within the manufacturing sector. They typically possess diverse academic and industrial backgrounds, and many have been out of formal education for several years (V1). Having delivered this module in the past academic year, I have observed that the DA delivery format, involving three intensive, three-hour lectures every Friday, poses specific pedagogical challenges, which I aim to address as part of this intervention cycle. (A5)

The focus of this intervention will be a sequence of lectures on the seven basic quality tools, a series of key statistical methods used sequentially to manage machine and process variability in industry. Successful deployment of these tools requires both a strong understanding of the mathematical foundations, but also an appreciation of their practical implementation in real-world problems. An ability to apply these concepts is a fundamental skill requirement for engineering graduates in this sector (Antony and Sony, 2023). (K1, K2, V3, V4)

3.2 Pre-intervention

Initially, the basic quality tools framework was introduced to students by a conventional teacher-led lecture session. The primary teaching material included a PowerPoint presentation which covered the industrial quality context, prompted students to discuss their own views and experiences of manufacturing quality, and provided visual examples of the quality tools and their applications. The notes were uploaded to the module Moodle VLE page and Microsoft Teams group a week prior to the lecture, to ensure that students had access to the materials in advance of the taught session. (A4, K2, K4).

3.2.1 Lesson Plan

Below is a summary of the lesson plan for the introductory session. As with all lectures delivered, it is customary to develop a lesson plan to describe the session's indicative content, aims, and assessment methods. In the School of Engineering, the lesson plans also provide evidence of how Professional, Statutory, and Regulatory Bodies (PSRB) requirements and learning outcomes are embedded within the module delivery. (A1, V4, K5)

Learning Outcomes: this session will build towards demonstration of the following Engineering Council AHEP Learning Outcomes:

- P1: Understanding of contexts in which engineering knowledge can be applied (eg operations and management, application and development of technology).
- P7: Awareness of quality issues and their application to continuous improvement.

Knowledge, Skills & Behaviours: this session will build towards demonstration of the following IfATE Knowledge, Skills & Behaviours:

- K5: Engineering operations & business management
- S6: Monitor and evaluate engineering processes
- B5: Quality Focus Follows quality rules, procedures and principles ensuring work completed is fit for purpose

Learning Objective: The aim of this session is to equip students with a practical understanding of the seven Basic Quality Tools and how to apply them in process improvement initiatives and to support decision-making in quality management.

Indicative Contents: this session will cover:

- Defining the concept of quality – discussing multiple interpretations.
- Recognising the contributions of the quality gurus in shaping contemporary quality.
- Comparing and contrasting traditional and modern approaches to quality assurance and improvement.
- Introduce the 8 dimensions of quality and their relevance in manufacturing.
- Introduce key terminology: Cost of Quality (CoQ), Cost of Poor Quality (CoPQ), 1-10-100 concept.
- Introduce 7 basic tools for quality improvement and their applications.

Learning Materials: Manufacturing quality lecture notes & supplementary reading handout (Quality Gurus & Their Contributions).

3.2.1.1 Reflection on Assessment Methods

While there was no formal formative or summative assessment embedded within this session, the students were routinely encouraged to discuss the concepts covered, both with me, as part of class discussion, and with their peers (A2, V1, V2). The students would also be formally assessed on their knowledge, understanding, and application of these concepts as part of the first summative assessment component for this module in the coming weeks (A3).

The discussion method was made feasible by the small cohort size for this module (11 students) and generally enabled me to gauge individual students' understanding of key concepts. There were instances, however, where students opted not to engage in these discussions, and it remains unclear whether their unease was due to a lack of understanding or a general lack of comfort with vocalising their discussion points in front of me and the rest of their peers (V1, V2).

In reflection, the assessment approach employed during this initial lecture did not consistently provide reliable evidence of comprehension for all students, and as a result, opportunities for timely, targeted feedback were somewhat limited (K3). As Reece and Walker (2007) suggest, it is the teacher's responsibility to design sessions that enable all learners to participate fully. I feel that this lack of structured formative assessment may have hindered the ability of some students in the group to consolidate their understanding effectively (Nicol and Macfarlane-Dick, 2006) (V1,V3, K3).

3.2.2 Pre-intervention Reflection

Revisiting the delivery of the session has prompted me to consider what went well and where there is scope for improvement. I believe the content was appropriately pitched, technically accurate, and aligned well with the intended learning outcomes. I feel that the structure was dominated by teacher-led instruction, and that this may have led to increased passivity of learning. Brookfield (2017) notes that prolonged passive learning is particularly demotivating for adult learners, which as stated above, is particularly pertinent to this cohort. (V1,V3, K3)

I believe that the approach to instruction may have impacted student engagement, which appeared to decline over the duration of the lecture. It was evident during the session that active participation in discussion, both student-to-teacher and student-to-student, steadily declined beyond the first hour. The Biggs and Tang (2011) model of constructive alignment emphasises

the importance of aligning learning activities and assessment modes to the intended learning outcomes to support student learning. It is clear that, on reflection, such a structured approach was lacking during the original delivery. (K3)

The 3-hour session duration, following two earlier 3-hour lectures, likely compounded cognitive fatigue. While longer sessions can enable deeper exploration of content, maintaining focus for such an extended duration proved difficult for the cohort. Bligh (2000) notes that learner attention typically drops after 20 minutes without activity changes, a pattern that became evident as interaction steadily declined, with students appearing increasingly passive and fatigued. This suggests that instructional modes may not have sufficiently re-energised learners or managed cognitive load effectively (Sweller, 2011). Consequently, new concepts were introduced at a time when engagement was already declining. (V1, V2, K3)

The observations outlined above are also reflected in comments retrieved from the Moodle module review conducted at the end of the last semester. A list of student comments related to lecture delivery for the Quality & Business Improvement module are summarised below:

Table 1: Summary of Student Comments from Module Review

Summary of Student Comments
<i>“Some parts of the lecture moved too fast for me.”</i>
<i>“I’d like to see more practical, like the MATLAB activity.”</i>
<i>“After a day of lectures, sometimes its hard to concentrate, especially without a break.”</i>
<i>“Too many slides – boring.”</i>
<i>“Sometimes I found it hard to keep up.”</i>
<i>“Examples from real factories are good, but there could be more of them.”</i>

Reflecting on the observations and student comments presented above, it was clear that restructuring the session design was necessary to incorporate a more structured approach to formative assessment, more opportunities for active learning and differentiation of instruction, and allow students regular cognitive breaks to support comprehension (K1, K2, K3).

3.3 Intervention Strategy

The following intervention strategy has been developed to address the issues identified above. It is informed by best practices identified in research, consultations with my practice managers, and reflection on the unique needs of my students (V3,V5, K3). The cohort primarily consists of mature adult learners who are typically returning to education after a considerable gap. Therefore, the intervention plan considers the role of adult learning theory (Knowles *et al.*,

2020) and curriculum design in promoting a more inclusive, active, and collaborative learning environment (V1, V2, V3, K1, K2).

3.3.1 Differentiation of Instruction

It was noted during the delivery of the pre-intervention lecture that there was an imbalance in the modes of instruction employed, with a reliance on a teacher-centred approach. While teacher-led instruction remains an important element of my lecture plan, I recognised the need to diversify the learning experience to sustain engagement and promote deeper understanding (A2, K1, K2). To address this, a series of discrete, collaborative, student-led exercises could be integrated into the delivery. I feel that this adjustment is particularly appropriate given that students enrolled on our DA provision often bring a wealth of industrial experience and role-specific expertise, providing opportunities for more contextualised, peer-led learning, differentiation, and facilitate greater agency in the learning process (V1, V2, K1, K2).

As part of this initiative, students could be encouraged to work in small groups to apply theoretical knowledge to practical problems, this would involve collaboratively analysing datasets related to process quality issues and interpreting statistical trends to identify root causes (A2, A4). This approach draws inspiration from Kolb's Experiential Learning Cycle, as discussed by Illeris (2007) and Aubrey and Riley (2022), facilitating deeper understanding of technical concepts through the cyclical process of experience, observation, conceptualisation, and active experimentation (K1, V3). Furthermore, the collaborative nature of these tasks addresses learner diversity by providing multiple modes of engagement and promoting a more inclusive learning environment (Petty, 2014) (V1, V2, V3, A4). Group-based, applied learning is thought to be particularly well suited to the needs of this cohort, enabling students to link theoretical constructs to real-world practice, supporting the development of their professional competencies and critical reflection skills (V1, K3).

3.3.2 Segmentation of Delivery (Chunking)

Recognising the risk of cognitive overload on learner engagement, particularly over a three-hour teaching block, I feel that restructuring the session into smaller, more varied learning segments would be beneficial. This approach reflects Sweller's (2011) Cognitive Load Theory, which advocates for structuring information delivery intentionally to prevent overload, limit fatigue, and maximise comprehension (V1, V2, V3, K1, K2).

It is proposed that each learning segment, or chunk, should consist of 20–30 minutes of activity, alternating between short lectures, practical exercises, discussions, case-study analysis, and group problem-solving tasks (K2). It is believed that creating a more active, collaborative working environment early in the session, such as incorporating more paired and small-group work at the beginning before building towards larger group discussions, may also help challenge the perceived barriers to participation, such as low confidence or discomfort with speaking in front of peers. As Davis and Arend (2013) note, facilitating different modes of contribution is essential to allow a wider range of students to engage comfortably (V1, V3).

3.3.3 Structured Formative Assessment

A key element of this intervention cycle is the introduction of a more structured approach to embedding formative assessment throughout my sessions. Formative assessment is a fundamental mechanism for supporting learning, providing timely feedback, and developing learner autonomy (Gray, Griffin and Nasta, 2005; Petty, 2014) (A4, K3, V1). In reviewing the session plan, I recognise the importance of ensuring that formative activities are not treated as peripheral, but are fully integrated into the learning process, in line with the principles of constructive alignment (Biggs and Tang, 2011) (K2, V3). Furthermore, Ashwin et al. (2020) highlight the need to avoid formative assessment becoming merely a ‘summative rehearsal’; instead, it should actively enhance learning through dialogic, rather than unidirectional, feedback (V1, V2).

One way I could embed this model into my lessons is by incorporating more short, low-stakes practice exercises after each lecture segment. These tasks could alternate between individual, paired, and group-based activities, allowing me to assess students' understanding more reliably while providing more immediate feedback from both their peers and myself. This approach would encourage students to actively reflect on their learning. As Knowles et al. (2020) suggest, giving learners the opportunity to self-diagnose gaps in their understanding is crucial for developing self-directed learning skills in adult learners. (V1, V2, V3, K1, K2)

Following a mini-lecture on the seven basic quality tools, students could work in small groups to diagnose quality failures in hypothetical production scenarios, justifying their selection of appropriate tools. Each group would then share their reasoning, inviting constructive peer critique and allowing for teacher-led clarification (K2). This approach also draws on the students' industrial backgrounds, which I recognise as a valuable learning resource in enabling

students to become co-constructors. I feel that this approach enables deeper discussion and more contextualised application of the technical topics covered. This is a method that is supported by Aubrey and Riley (2022) for effectively engaging diverse adult cohorts (V1, K1). I do recognise however, that the design of these tasks would need to provide differentiation of task complexity (Davis and Arend, 2013) , allowing learners with varying prior knowledge and experience to engage at an appropriate level. For example, from basic recall of key concepts (e.g., definitions of quality dimensions) to higher-order analytical tasks, such as critically appraising quality-related case studies and identifying the most appropriate statistical tools (Armitage *et al.*, 2007) (V1, V2, K2).

3.4 Post-Intervention Lecture

The post-intervention lecture focused on introducing histograms as one of the seven basic quality tools (*see lesson plan in Ch.3.4.2*), specifically within the context of machine capability studies, a tool often used in the manufacturing sector to understand the intrinsic variability of production equipment and processes. This session was selected as an opportunity to implement the changes identified during the earlier reflection and evaluate their impact on student engagement and learning (K3, V3).

3.4.1 Summary of Changes Implemented

1. Low-stakes formative assessments were integrated into the session, with students completing short reflective exercises & quizzes after each block. The session concluded with a self-led capstone activity, where students created histograms from sample data and presented their findings to peers for feedback (see appendix 1) (A1, A2 A3, A4).
2. Students were grouped heterogeneously based on self-reported prior knowledge, with more experienced students encouraged to mentor their peers. Task complexity was tiered: all students created basic histograms, while extension questions challenged them to interpret process capability and consider potential process adjustments (A1, A2, A4, V1, V2, K1)
3. The session was restructured into a series of 25–30-minute segments that alternated between mini-lectures, group activities, and group discussions. It began with an introduction to the theoretical foundations of histograms, covering key terms like frequency distribution, class interval, and shape interpretation. A worked example of a machine capability study using sample production data followed. Students then constructed histograms using Excel, and the session concluded with a class-wide discussion that used the case study data to bridge theory and practice. (K1, K2,K4, A1, A2, A4)

3.4.2 Lesson plan

Module: Quality & Business Improvement Date: 11/04/2025 (Lecture 14) Location: IQ109 (PC Lab)			
Module Learning Outcomes	1. Apply a range of tools and techniques that can be used to investigate problems, assess risk, and analyse areas for improvement 2. Understand the main elements of the six sigma methodology		
AHEP3 Learning Outcomes	P1. Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc) P7. Awareness of quality issues and their application to continuous improvement		
KSB's	K5, S6, B5.		
Lesson Title: Basic Quality Tools – Histograms & Machine Capability Studies			
Resources: Lect. Notes, Sample Dataset, Excel, Moodle Quiz, Capability Case Study.			
1. Apply histogram-based analysis to evaluate production variability. 2. Interpret the results of a machine capability study using histogram data. 3. Assess the application of quality tools in real-world manufacturing contexts			
Activities	Time	Description	Notes
Recap & Session intro	10 mins	Connect previous content (check sheets) to today's focus on histograms. Introduce session aims.	Re-establish relevance to prior learning (continuous improvement)
Teacher-Led Mini-Lecture	20 mins	Introduce histograms: frequency distribution, bin sizes, skewness, normality. Show real-world example from manufacturing data.	Use visual aids. Scaffold for students unfamiliar with stats.
Formative Task 1	10 mins	Paired Task - Students sketch histogram from given data (handout). Discuss distribution shape & implications.	Quick low-stakes task. Encourage peer discussion.
Teacher-Led Mini-Lecture 2	20 mins	Explain machine capability studies (C_p , C_{pk}), link to histogram interpretation. Introduce Excel workflow.	Emphasise application in industrial context.
Formative Task 2	20 mins	Group activity: interpret a new histogram dataset and write a short interpretation with recommendations.	Encourage student-led mentorship using tiered grouping.
Class Debrief	20 mins	Students present findings from histogram task. Provides feedback and invite peer responses.	Structured prompts. Encourage students to challenge peer findings.
Discussion	15 mins	Students critique a flawed machine process using a real case-study. Identify causes of poor capability and suggest improvements.	Create student comment ‘word cloud’. Support critical thinking.
Capstone Task	30 mins	Group Task: build histogram in Excel using production data. More advanced students explore C_p , C_{pk} calculations.	Tiered task: all do basic task; extension for confident students.
Plenary - Q&A	10 mins	Summary of key takeaways: open floor for questions & reflection.	Reinforce relevance, encourage experiential linkage.

Figure 1: Post-Intervention Lecture Plan (Histograms & Machine Capability)

3.4.3 Post-Intervention Reflection

I felt somewhat uncharacteristically nervous immediately before starting the restructured lecture, largely because it was the first time I'd delivered a session without using a PowerPoint presentation as the primary mode of instruction. This represented a significant departure from my usual teaching style, and I was initially unsure how smoothly I'd be able to manage transitions between activities. Instead of relying on slides, I used a combination of handouts, live Excel demonstrations, and whiteboard explanations to guide students through a series of breakout tasks (A1, A2, A4).

Another initial concern was timekeeping. The revised lesson plan involved multiple short activities with brief instructional segments, and without the familiar pacing cues that slides usually provide, I was uncertain about maintaining momentum while also allowing space for discussion, feedback, and group work. At the outset, I found that I was frequently checking the time and adjusting the pacing on the fly. The segmented format did significantly improve student engagement, particularly as they became more comfortable with the structure towards the second half of the session, but, it also highlighted how quickly time can pass when students are engaged in group tasks. On one occasion, I had to abbreviate a debrief in order to stay within the session time, which made it clear to me that I need to build more flexible time buffers into future lesson plans. (K3)

Despite my timekeeping anxieties, the structure ultimately supported a more responsive and collaborative learning environment. Students remained consistently engaged, and transitions between lecture, activity, and discussion began to feel more natural once the rhythm of the session was established. It became evident that the frequent alternation of learning modes acted as a useful refresher, helping to maintain focus and energy levels far more effectively than the extended lecture format I've typically used previously. (K2, A4)

The integration of structured formative assessment throughout the session also proved to be particularly effective. Low-stakes quizzes, peer discussion, and the capstone task gave me real-time insight into student understanding and enabled me to address misconceptions and inaccuracies as they emerged. Students responded well to the opportunity to test their knowledge incrementally, and several noted that receiving immediate feedback helped build their confidence with the technical content.(A1, A2, A3, A4)

By the end of the session, my initial nervousness had given way to a sense of accomplishment. Stepping away from the predictability of presentation slides ultimately gave me more flexibility

to respond to student needs in real-time. I believe that the high levels of participation, especially during the practical exercises, suggest that this restructured approach had a meaningful and positive impact on student learning. (V1, V2, K1, K2, K3)

3.5 Evaluation of Teaching Intervention

The effectiveness of the teaching intervention has been evaluated by comparing student performance in the Knowledge & Understanding Skills element of the Basic Quality Tools assignment across the 2023–24 (pre-intervention) and 2024–25 (post-intervention) cohorts. The results are summarised in Table 2 below:

Table 2: Summary of Marks Achieved Before & After Intervention

	Cohort 1 (2023/24)	Cohort 2 (2024/25)
Average Mark (%)	61	67
Standard Deviation	14.5	13.4
Lowest Mark (%)	38	42
Highest Mark (%)	84	88

As shown in Table 2, In 2023–24, the cohort achieved an average score of 61% with a standard deviation of 14.5. Following the intervention, the 2024–25 cohort achieved an improved average of 67%, with a slightly reduced standard deviation of 13.4%. This represents a modest but meaningful improvement of six percentage points and suggests that students not only performed better on average, but that performance became more consistent across the cohort.

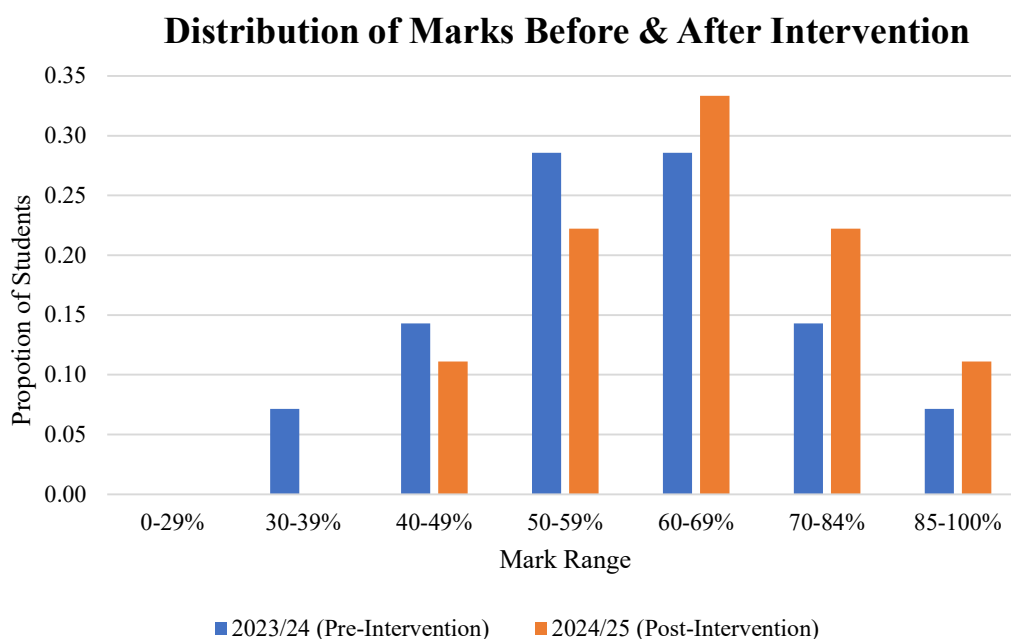


Figure 2: Comparison of Mark Ranges Before & After Intervention

The data presented in Figure 2 has been normalised to account for the variation in cohort sizes between the academic years. By expressing student frequency within each mark range as a proportion of the total cohort, a fair comparison can be made between the two groups. This ensures that observed differences in attainment are reflective of student performance rather than a result of differing cohort sizes.

The distribution of marks before and after the intervention provides further indication of the intervention's positive impact. Notably, the modal mark range shifted from 50–59% in the 2023/24 cohort to 60–69% in 2024/25, indicating a general uplift in attainment. The proportion of students achieving marks below 60% declined, while more students achieved within the higher bands of 70–84% and 85–100%. This redistribution suggests both an increase in average performance and a reduction in attainment gaps within the group. The results support the view that the revised teaching strategy, characterised by more inclusive, active, and differentiated instruction methods, enhanced comprehension and supported improved academic outcomes across a broader range of learners (K3).

Despite the encouraging outcomes, it is important to acknowledge the limitations of this evaluation. Variables such as differences in cohort backgrounds, industrial roles and experience and personal circumstances may also have influenced performance. Furthermore, while this evaluation focused on the Knowledge and Understanding skills component, other assessment criteria such as cognitive and intellectual skills were not separately analysed. These areas should be reviewed in future cycles to gain a fuller understanding of the intervention's broader educational impact.

3.6 Conclusion

Reflecting on this teaching intervention cycle, it is clear that the restructuring had a positive impact on student engagement, understanding, and participation. By diversifying instructional methods, segmenting delivery into more manageable chunks, and embedding a more structured approach to formative assessment, I was able to create a more active and inclusive learning environment that better supported the needs of my degree apprenticeship cohort. (V1, V2, K1)

This process has reinforced the importance of designing sessions that actively involve learners as co-constructors, particularly DA students who benefit from linking theory to their professional experience (V3, K1). It has also highlighted the practical challenges of time management and the need for flexibility when adopting more interactive teaching approaches, as well as the increased planning and preparation required to design coherent, inclusive activities that maintain flow, support differentiation, and align with intended outcomes. However, I truly believe that the advantages of this approach, greatly outweigh the challenges.

Overall, I feel that the intervention has been successful, and has strengthened my understanding of how active learning strategies can significantly enhance the student learning experience (K3, A5). I plan to continue building on this approach, embedding it throughout my teaching practice, and ensuring that future sessions maintain a balance between teacher-led and student-led learning.

3.6.1 Further work

While significant improvements have been made, I believe there are still areas where my delivery can be further refined. Several key areas of continued focus are summarised below:

1. Refine time management in segmented sessions by building in flexible buffers for group activities and debriefs (K3)
2. Explore flipped learning approaches by providing pre-session materials and using session time for applied group work and problem-solving.
3. Develop a more diverse bank of tiered tasks for different ability levels to better differentiate technical content.
4. Incorporate more digital tools (e.g. interactive polls, real-time quizzes) to support formative assessment and engagement.
5. Gather more structured student feedback to evaluate the impact of active learning on confidence and comprehension. (K5)

3.7 References

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3.8 Appendices

Appendix 1 – Example Capstone Worksheet

Machine Capability Worksheet

An electronic components manufacturer uses a high-speed stamping machine to produce pin headers (electrical connector pins) in large quantities. Engineers at the firm believe that the machine is a source of a significant level of process variation and have recently undertaken a kaizen project to address this. A machine operator randomly samples 10 pins per day (for a week) before and after the kaizen project. The specification range for the length of the pin is 13 mm to 25 mm and the target value is 19mm.

You should perform machine capability analysis on the data below to evaluate how well the lengths of the connector pins meet customer requirements before and after the improvement initiative.

Pin Length - Before Kaizen Project										
Day	Operator Measured Values (mm)									
Mon	22.89	15.56	19.66	15.77	18.42	19.09	21.61	18.79	20.24	18.94
Tue	17.61	17.98	20.61	22.20	17.92	21.43	16.66	16.95	18.84	17.16
Wed	18.32	19.32	18.44	18.96	23.31	20.73	19.94	20.38	18.12	22.61
Thu	19.42	21.77	21.62	18.22	15.89	19.13	19.64	20.17	21.19	17.46
Fri	17.46	17.46	17.46	23.78	19.48	20.22	18.33	19.44	21.08	16.17

Pin Length - After Kaizen Project										
Day	Operator Measured Values (mm)									
Mon	19.24	18.86	20.49	17.80	18.63	17.33	18.20	18.25	19.45	19.41
Tue	19.98	17.18	19.73	18.97	19.75	21.13	20.56	20.01	19.43	19.41
Wed	17.80	18.57	19.44	19.62	17.14	19.23	15.68	18.26	17.97	19.36
Thu	19.66	22.17	20.48	19.06	17.71	19.03	20.72	20.81	18.63	18.20
Fri	15.75	18.17	16.57	19.32	20.30	21.86	19.87	17.07	18.49	18.51

Basic Tasks to complete

1. In Excel, use the COUNTIFS function to determine the frequency of occurrence for each class interval starting at 12.5mm and ending at 25.5mm with an interval width of 1mm.
2. Plot a histogram of the frequency data (using a 2-D clustered column plot) for both sets of data to visualise the frequency distribution, make sure the histogram is fully labelled / includes all relevant information.
3. Calculate the max, min, mean and standard deviation (use STDEV function) of each data set using relevant Excel functions.

Intermediate Task: Determine the capability indices (Cm, CML, CMU, Cmk).

Extension task (difficult): add the normal distribution curve and vertical target value, USL and LSL indicator lines to each of the histograms.

Questions to discuss in your groups

1. Describe the central tendency, dispersion (spread) and general shape of each histogram.
2. Compare / contrast the histograms, what has changed and how does this affect the output of the manufacturing process?
3. Using the machine capability indices you have calculated (and the lookup table provided), is the machine capable of producing connector pins that meet customer requirements before and after the improvement initiative?

Equation Sheet & lookup table

$$C_m = \frac{USL - LSL}{6\sigma}$$

Where USL = upper specification limit, LSL = lower specification limit and σ = standard deviation

$$CMU = \frac{(USL - \bar{X})}{3\sigma}$$

Where USL = upper specification limit, $\bar{X}$ = mean average and σ = standard deviation

$$CML = \frac{(\bar{X} - LSL)}{3\sigma}$$

Where LSL = lower specification Limit, $\bar{X}$ = mean average and σ = standard deviation

$$C_{mk} = \text{Min}(CMU, CML)$$

Capable?	Cm	σ level	DPMO
Not	0.33	1	317311
Capable	0.67	2	45500
Capable	1	3	2700
with tight control	1.1	3.3	967
	1.2	3.6	318
	1.3	3.9	96
	1.33	4	63
Capable.	1.4	4.2	27
	1.5	4.5	6.8
	1.6	4.8	1.6
	1.67	5	0.57
	1.8	5.4	0.067
	2	6	0.002

4 Teaching Observations

4.1 Reflection on Observations

Having engaged in two teaching observations and observed a colleague's session as part of the portfolio, I have found the process both affirming and instructive in shaping my ongoing development as an early career academic. Reflecting on the feedback from Dr Marotin and Dr Owen, both of whom I had the privilege to study under during my own academic journey, I was encouraged that they both recognised the planning I gave to the structure, inclusivity, and industrial relevance of the sessions I delivered. Their feedback has prompted me to critically reflect on the importance of embedding more time for post-activity reflection, which aligns with my own observations made during the intervention cycle, particularly during technically dense practical sessions (A2, A3). I have also identified a need to develop more responsive formative assessment strategies to check understanding in real time, something I plan to test in this regard is the introduction of more low-stakes quizzes and peer discussion activities (A3, K2).

Observing Dr Kerry Tudor's lecture on Automotive Materials offered a great opportunity to reflect on the delivery of complex STEM content from a student-centred perspective. Her use of worked examples, real-world applications, and inclusive pacing reminded me of the importance of providing accessible scaffolding for technical learning (K1, A2). In particular, Kerry's careful integration of sustainability themes and industrial context has driven me to more intentionally embed current industrial developments within my own teaching (V4).

Going forward, I intend to build upon these observations by designing more structured links between learning outcomes and assessment tasks, enhancing content clarity and reinforcing relevance for students (A2, K2). This cycle of feedback and observation has not only strengthened my confidence in my current practice but also renewed my commitment to ongoing reflection and evidence-informed improvement, particularly in facilitation an inclusive and supportive environment that meets the needs of my student (A4, V1, K1).

4.2 Observation 1

PGCertHE OBSERVATION FORM - PSF 2023



Details of the Observation	
Observee	Jordan Jenkins
Practice Advisor / Expert peer observer	Dr A. Marotin
Date of the Observation	11/04/2025
Campus / Location	Swansea Waterfront IQ Building Room IQ-109
Date, Time, Duration	11/04/2025, 1pm, 3 hour
Subject Speciality	Level 4 module ACMA4004 Quality and Business Improvement Quality and Process Improvement Tools & Methodologies: • Structured methodologies (like Six Sigma and Lean) • Risk analysis and prevention techniques (e.g. FMEA, Poka-Yoke) • Customer-focused planning tools (like QFD, Kano Model) • Problem-solving and analytical tools (the Seven Basic Quality Tools) Industry 4.0 - ongoing transformation of manufacturing and industrial practices through: • the integration of digital technologies • automation • data-driven systems
Type of activity	A structured, interactive lecture integrating formative assessment and applied digital modelling using MATLAB, situated within a PC lab environment.
This observation will contribute to the participant's portfolio of evidence to satisfy the assessment of the PGCert tHE and should be undertaken by an experienced academic colleague or professional colleague. Observation by a fellow participant on the programme is not permissible as a means of authenticating practice.	

Teaching/Support preparation [A1: Design and plan learning activities/programmes

i.e. Preparation, selection and organisation of content. Choice of teaching/learning methods.

Comments The lecture demonstrated a high standard of preparation. Both the lesson plan and full scheme of work were shared prior to the session. These documents serve as strong evidence of professionalism, with clear alignment between module learning outcomes, lesson objectives, and teaching strategies. Content was thoughtfully selected and logically sequenced, progressing from theoretical underpinnings of Industry 4.0 to the application of neural networks for predictive maintenance using MATLAB. A balanced mix of teacher-led input, student discussion, formative assessment, and hands-on modelling provided structure while enabling varied engagement with the material. The resources selected – including MATLAB live scripts – were appropriate for the session aims and supported practical, applied learning.
Teaching [A2: Teach and/or support learning through appropriate approaches and environments.] <i>i.e. Beginning class, introduction, continuity with other sessions, students' prior knowledge. Clarity of presentation. Pace. Attitude to the subject matter. Use of appropriate reinforcement. Ending the session – summary, future work etc. Technique and Aids: General apparatus – board, data projector, use of handouts. Was effective communication achieved? Was there good student–teacher rapport? Were the aims/outcomes achieved? Appropriateness of teaching/learning methods.</i>
Comments Jordan began the session with an effective recap, connecting previous content (Lean Six Sigma) to the current topic of digitalisation and AI. This created a strong sense of continuity and purpose. Presentation was clear, well-paced, and conveyed with enthusiasm for the subject matter. Complex concepts (e.g. neural networks) were introduced with clarity, aided by visual materials and real-world case studies. The use of formative questioning ensured the class remained interactive. A significant coding activity reinforced learning and included practical connections (e.g. Fibrax case study), helping students contextualise the topic further. Teaching methods were well matched to the objectives, and effective communication and connection with students were observed throughout.
Effective Learning Environments [A4: support and guide learners /V1 Respect individual learners/diverse groups of learners] <i>i.e General class atmosphere, level of participation, attention, and interest. Student attitude and ability to carry out classwork. Were learning problems identified and overcome? Awareness of individual needs. Attitude to students.</i>
Comments The classroom atmosphere was positive, inclusive, and conducive to learning. Student engagement was high, with learners contributing examples from their workplaces and demonstrating sustained interest during discussion and practical tasks. The lecturer showed awareness of student backgrounds by incorporating workplace relevance and encouraging peer sharing. During the MATLAB task, learners received tailored support, and students were encouraged to experiment and make mistakes as part of their learning journey. The environment promoted mutual respect, active participation, and independent problem-solving.

Assessment [A3: Assess and give feedback for learning]

i.e Formative/summative assessment examples , Question and answer technique. Other evaluation procedures, class management, instructions to students005C.

Comments

Formative assessment was embedded throughout the session via short individual tasks, matching activities, and questioning. These methods allowed the lecturer to gauge understanding and clarify misconceptions in real time. Feedback was immediate and constructive. The design of the practical MATLAB task served both as a learning activity and as an informal diagnostic tool, enabling Jordan to identify and address difficulties students encountered in applying theoretical models. Instructions were clear and expectations were well communicated.

Core Knowledge

- K1 How learners learn, generally and within specific subjects
- K2 approaches to teaching and or/supporting learning appropriate for subjects and levels of study.
- K3 Critical evaluation as a basis for effective practice.
- K4 Appropriate use of digital technologies / resources.
- K5 requirements for quality assurance, enhancement and implications for practice

Comments

- **K1 & K2:** The session reflected a sound understanding of how learners engage with technical content, combining theoretical frameworks with applied, hands-on modelling.
- **K3:** Planning and delivery were clearly informed by reflective practice and pedagogical knowledge, as shown through the structured use of formative assessments and scaffolded progression.
- **K4:** The integration of MATLAB and use of digital live scripts were effective and aligned with the digital capabilities expected in engineering education.
- **K5:** The session directly addressed quality improvement themes and Six Sigma methodologies, aligning content with professional and quality assurance frameworks in engineering.

Professional values

- V1 Respect for individual learners /diverse groups of learners
- V2 Promote engagement and learning and equity of opportunity for all to reach their potential.
- V3 Use scholarship, research or professional learning, or other evidence informed approaches as the basis of effective practise.
- V4 respond to the wider context in which higher education operates, recognising implications for practice.
- V5 Collaborate with others to enhance practice.

Comments

- **V1 & V2:** Jordan created an inclusive learning environment and actively promoted participation from a diverse cohort of learners, many of whom brought workplace experience into the discussion.
- **V3:** The session content was informed by current industrial practices (e.g. predictive maintenance, Industry 4.0) and connected with sector-relevant developments.
- **V4:** The use of examples from real organisations demonstrated awareness of the wider industrial and educational context.
- **V5:** Collaboration with learners through dialogue and mutual knowledge exchange (e.g. workplace examples) was a particular strength, fostering a sense of shared inquiry.

Examples of good practice:

- Comprehensive and professionally presented scheme of work and lesson plan, demonstrating alignment with module outcomes and industry expectations.
- Use of diverse and inclusive teaching methods to cater to different learning preferences and backgrounds.
- Effective integration of digital technologies (e.g. MATLAB) for authentic, industry-relevant tasks.
- Encouragement of student-led input and application of personal experience to deepen learning.
- Strong links to professional practice through case studies and live examples.
- The inclusion of relevant historical context throughout the lecture (e.g. evolution of manufacturing paradigms, progression from traditional quality control to digital approaches) significantly enhanced student understanding of current developments. This approach helped demystify complex concepts by situating them within a clear and relatable timeline.

Action points:

- Consider allowing slightly more time for debriefing practical tasks to consolidate the learning gained during application.

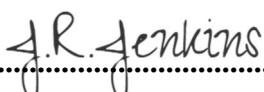
- Explore the option of pre-session reading or videos on foundational AI concepts to support students who may find neural network modelling challenging.
- Continue to develop and integrate sector-relevant case studies to maintain strong contextual links across the module.

For Observee

This observation has provided me with useful feedback on the strengths and development opportunities within my teaching practice (V5). I studied under Arnaud's considered guidance as both an undergraduate and postgraduate student and have long regarded him as one of the most professional academics I have had the good fortune to learn from. Arnaud has always demonstrated a deep-rooted care for students' best interests, which I aim to emulate in my own practice (V1). His feedback affirmed the effectiveness of my approach to lesson planning, student engagement, and the integration of digital tools, while highlighting areas for further improvement, such as allowing additional time for reflection after practical activities (A1, A2, K4). The feedback has also encouraged me to explore strategies to better scaffold complex technical content, such as providing preparatory resources. This experience has reinforced my commitment to reflective practice and to maintaining strong links between academic learning and industrial practice to support my students' development. (A5)

Observer Dr A. Marotin

Date: 11/04/2025

Observee 

Date : 11/04/2025

4.3 Observation 2

PGCertHE OBSERVATION FORM - PSF 2023



Details of the Observation	
Observee	Jordan Jenkins
Practice Advisor / Expert peer observer	Dr Gregory Owen SFHEA
Date of the Observation	31/01/25
Campus / Location	Swansea SA1 – IQ111
Date, Time, Duration	31/01/25, 1pm, 3 Hours
Subject Speciality	Quality & Business Improvement - Manufacturing Systems, Continuous Improvement, Statistical Quality Tools
Type of activity	Lecture & Practical Activity
This observation will contribute to the participant's portfolio of evidence to satisfy the assessment of the PGCert tHE and should be undertaken by an experienced academic colleague or professional colleague. Observation by a fellow participant on the programme is not permissible as a means of authenticating practice.	

Teaching/Support preparation [A1: Design and plan learning activities/programmes] <i>i.e. Preparation, selection and organisation of content. Choice of teaching/learning methods.</i>
Comments - Aims of the session were clearly displayed and described, helping students manage their expectations effectively. - Clear guidance was given for the assignment, with good references to AHEP learning outcomes. - Practical relevance was established through well-selected examples like run charts, Xbar and R charts, linking theory to real-world applications. - Breaks within the session using a mix of teacher delivery, anecdotes, history, questions, and activities made for a well-structured lesson.

- Preparation of high-quality, information-rich slides, complemented by verbal elaboration.
Teaching [A2: Teach and/or support learning through appropriate approaches and environments.] <i>i.e. Beginning class, introduction, continuity with other sessions, students' prior knowledge. Clarity of presentation. Pace. Attitude to the subject matter. Use of appropriate reinforcement. Ending the session – summary, future work etc. Technique and Aids: General apparatus – board, data projector, use of handouts. Was effective communication achieved? Was there good student–teacher rapport? Were the aims/outcomes achieved? Appropriateness of teaching/learning methods.</i>
Comments - Very good start to the lecture; students were engaged from the beginning. - Good use of recalling prior lessons to build continuity. - Demonstrated clear subject knowledge by talking fluently around key assignment issues. - Excellent tone variation to highlight important points. - Effective questioning strategy, balancing open and closed questions, directed at all students. - Encouraged student participation during the introduction of Comparative Pareto. - Excellent use of a "short history lesson" to contextualise the subject matter. - Professional demeanour, open to supporting students, and confident in subject knowledge. - Good use of humour and strong rapport with students maintained throughout.
Effective Learning Environments [A4: support and guide learners /V1 Respect individual learners/diverse groups of learners] <i>i.e General class atmosphere, level of participation, attention, and interest. Student attitude and ability to carry out classwork. Were learning problems identified and overcome? Awareness of individual needs. Attitude to students.</i>
Comments - Created a respectful, supportive learning environment conducive to student success. - Good movement around the class during activities allowed for formative assessment and personal attention. - Clear encouragement for students to seek help when needed, promoting an inclusive and supportive atmosphere.

- Effective use of MS Teams encouraged familiarity with digital platforms for accessing resources.
Assessment [A3: Assess and give feedback for learning] <i>i.e Formative/summative assessment examples , Question and answer technique. Other evaluation procedures, class management, instructions to students005C.</i>
Comments - Referral to the marking rubric was excellent, helping students understand assessment criteria. - Open questions were used effectively to gauge student understanding, though opportunities for further discussion (e.g., "Does anyone else agree?") could have been expanded. - Formative feedback through questioning was strong; suggested development could include more frequent summary sheets or quick formative checks during dense content delivery. - Opportunity noted to adapt teaching dynamically based on mid-session formative assessment results.
Core Knowledge • K1 How learners learn, generally and within specific subjects • K2 approaches to teaching and or/supporting learning appropriate for subjects and levels of study. • K3 Critical evaluation as a basis for effective practice. • K4 Appropriate use of digital technologies / resources. • K5 requirements for quality assurance, enhancement and implications for practice
Comments - K1: Demonstrated strong understanding of how students learn by recalling previous content and layering new material. - K2: Selected teaching approaches appropriate to the students' level, using a mix of storytelling, history, and practical exercises. - K3: Reflected critically on teaching approaches, e.g., recognising opportunity for more student-generated discussion. - K4: Integrated digital tools (Teams) effectively to enhance access to learning materials. - K5: Clear understanding of assessment processes and student needs for quality assurance.

Professional values

- V1 Respect for individual learners /diverse groups of learners
- V2 Promote engagement and learning and equity of opportunity for all to reach their potential.
- V3 Use scholarship, research or professional learning, or other evidence informed approaches as the basis of effective practise.
- V4 respond to the wider context in which higher education operates, recognising implications for practice.
- V5 Collaborate with others to enhance practice.

Comments

- V1: Built a respectful environment, attentive to diverse learner needs.
- V2: Promoted equitable engagement and support opportunities.
- V3: Teaching informed by good practice, possibly influenced by previous examples of best practice / mentoring experiences (Rich Morgan).
- V4: Incorporated broader educational context, like employability skills, in examples.
- V5: Actively Encouraged student-teacher and student-student collaboration and communication.

Examples of good practice:

- Clear and engaging session opening.
- Strong linkage of current content to past learning and future application.
- Effective blend of instructional strategies and active learning.
- Positive class atmosphere maintained through good rapport and humour.
- Use of tone and questioning to deepen student understanding.

Action points:

- Expand formative assessment opportunities within sessions (additional quick checks or mini-summary sheets).
- Encourage peer-to-peer discussion more explicitly when interpreting content.
- Increase real-time adjustment of teaching pace based on formative assessment feedback.

For Observee

Receiving this observation feedback from Greg, whom I respect greatly, having previously studied under his supervision as an undergraduate student, has provided me with valued insights into my teaching practice (V5). The feedback highlighted key strengths, including the effective development of an engaging, supportive learning environment and the ability to connect theoretical concepts to real-world applications. Through critical reflection, I recognise opportunities to further strengthen my use of formative assessment, such as incorporating more frequent quick checks for understanding and encouraging greater peer-to-peer collaboration (K3). Moving forward, I will adopt these techniques to refine my session planning, ensuring that learning remains responsive, interactive, and student-centred. This feedback has reaffirmed my commitment to professional development and to aligning my teaching with evidence-based strategies that improve the student learning experience.

Observer G. Owen.....

Date 31/01/2025

Observee 

Date 31/01/2025

PGCert PARTICIPANTS

On completion of the peer observation reports for each module, compose a short reflective paragraph on your observation experiences for inclusion in your portfolio along with the observation sheets.

4.4 Observation 3

PGCertHE OBSERVATION FORM - PSF 2023



Details of the Observation	
Observee	Dr Kerry Tudor FHEA
observer	Jordan Jenkins
Date of the Observation	06/02/25
Campus / Location	Swansea SA1
Date, Time, Duration	11am, 2 Hours
Subject Speciality	Automotive Materials & Sustainability
Type of activity	Lecture
This observation will contribute to the participant's portfolio of evidence to satisfy the assessment of the PGCert tHE and should be undertaken by an experienced academic colleague or professional colleague. Observation by a fellow participant on the programme is not permissible as a means of authenticating practice.	

Teaching/Support preparation [A1: Design and plan learning activities/programmes] <i>i.e. Preparation, selection and organisation of content. Choice of teaching/learning methods.</i>
Comments Kerry's session appeared thoughtfully planned and well-aligned with the stated learning outcomes. The structure was logical and clear, progressing from foundational concepts to specific material classifications. The teaching materials were well-developed and professionally presented, with slides incorporating both diagrams and equations that seemed appropriate for the technical content. Real-world examples like sintered aluminium powder and concrete composites were embedded within the lecture, which supported contextual understanding. The use of worked examples particularly stood out as an effective way of helping students consolidate learning, and it highlighted the value of combining theory with application when introducing complex STEM content.

Teaching [A2: Teach and/or support learning through appropriate approaches and environments.] <i>i.e. Beginning class, introduction, continuity with other sessions, students' prior knowledge. Clarity of presentation. Pace. Attitude to the subject matter. Use of appropriate reinforcement. Ending the session – summary, future work etc. Technique and Aids: General apparatus – board, data projector, use of handouts. Was effective communication achieved? Was there good student–teacher rapport? Were the aims/outcomes achieved? Appropriateness of teaching/learning methods.</i>
Comments The lecture opened with a clear overview of the session's objectives and how they linked to previous and future content. This helped set a purposeful tone from the outset. The delivery style was confident and engaging, with a visible enthusiasm for the subject that seemed to resonate with the students. The pace of the session was well-balanced, with pauses for clarification and opportunities for reflection embedded at key points, particularly during the more challenging parts of the session such as stress-strain relationships and fibre orientation. There was regular reinforcement of key ideas, and the session concluded with a forward-looking summary that outlined the continuity within the module. The use of visual aids alongside verbal explanations seemed to make the content more accessible, especially for students struggling with technical terminology or mathematical expressions.
Effective Learning Environments [A4: support and guide learners /V1 Respect individual learners/diverse groups of learners] <i>i.e General class atmosphere, level of participation, attention, and interest. Student attitude and ability to carry out classwork. Were learning problems identified and overcome? Awareness of individual needs. Attitude to students.</i>
Comments The classroom environment appeared inclusive and respectful, with students engaged and attentive throughout. The session encouraged active participation, particularly during worked examples, and Kerry used strategies such as direct questioning and walking through the space to maintain student attention and involvement. There was a noticeable effort to connect with students across the room, which seemed to support an inclusive and student-centred approach. Slides and the whiteboard were used effectively to support understanding of key concepts, and the atmosphere encouraged both concentration and interaction. Students responded positively when practical applications were

discussed, suggesting that these moments helped them relate abstract concepts to real-world situations.

Assessment [A3: Assess and give feedback for learning]

i.e Formative/summative assessment examples , Question and answer technique. Other evaluation procedures, class management, instructions to students005C.

Comments

Kerry used informal questioning throughout the session to gauge student understanding, particularly after key explanations and during the worked examples. These interactions helped maintain momentum while also offering opportunities for students to engage with the material at their own pace. Encouraging students to attempt calculations during the lecture gave the session a formative element and allowed space for active learning. While some students contributed more frequently, there was a clear effort to draw quieter individuals into the discussion without creating pressure. This approach helped to balance engagement across the group. Clarifications were handled supportively, and Kerry appeared responsive to varying levels of prior knowledge within the cohort.

Core Knowledge

- K1 How learners learn, generally and within specific subjects
- K2 approaches to teaching and or/supporting learning appropriate for subjects and levels of study.
- K3 Critical evaluation as a basis for effective practice.
- K4 Appropriate use of digital technologies / resources.
- K5 requirements for quality assurance, enhancement and implications for practice

Comments

The session showed a clear awareness of how learners engage with technical content, particularly through the use of sequential explanation, repetition of key ideas, and step-by-step problem-solving (K1). Kerry's approach to teaching was well-matched to the level of the group and the subject area, with explanations pitched at an appropriate technical depth while remaining accessible to those with varying levels of prior knowledge (K2). Observing how the session unfolded helped me reflect on the importance of critically evaluating how students are responding in real time, and how this evaluation can shape the delivery of content (K3). Digital tools were used appropriately and not excessively, slides were clear and visually supportive without being overloaded (K4). The session

also demonstrated agreement with quality expectations, such as clear alignment between the taught content and the PSRB learning outcomes for the module (K5).

Professional values

- V1 Respect for individual learners /diverse groups of learners
- V2 Promote engagement and learning and equity of opportunity for all to reach their potential.
- V3 Use scholarship, research or professional learning, or other evidence informed approaches as the basis of effective practise.
- V4 respond to the wider context in which higher education operates, recognising implications for practice.
- V5 Collaborate with others to enhance practice.

Comments

Kerry's interactions with students throughout the session modelled an inclusive and respectful approach to teaching. There was a clear effort to involve the whole group, and she showed particular sensitivity to those who were less confident or less vocal in class (V1). I noticed how encouragement was given in a way that supported students' confidence without putting them on the spot. This helped create a classroom environment where participation seemed to come more naturally for many (V2).

The inclusion of recent and relevant examples, particularly around sustainable materials and automotive applications, gave the content a sense of real-world relevance. This made the session more engaging and highlighted how subject knowledge can be kept up to date and applied in meaningful ways (V3). It also helped me reflect on the value of integrating current issues into teaching, not just for relevance but also to encourage critical thinking.

There was a clear emphasis on wider environmental and industrial contexts, particularly in the way Kerry connected material choices to sustainability and recyclability in automotive design. This helped frame the lecture in a broader perspective and showed how subject teaching can link to global concerns and industry developments (V4).

It was also helpful to see how the session was linked to earlier and upcoming parts of the programme. Kerry referred to previous modules students had completed and explained how this content would support future learning. This suggested a strong level of coordination with colleagues and gave students a clearer view of how the curriculum is structured (V5).

Examples of good practice:

- The use of real-world examples from the automotive industry helped bridge theoretical content with practical understanding.
- The pace of delivery felt well-judged, giving students space to take in more complex concepts.
- A range of teaching methods (slides, whiteboard diagrams, verbal explanations) supported different ways of learning.
- Kerry moved around the room and engaged with students in all areas, which helped to build an inclusive classroom dynamic.
- Regular pauses were used to check for understanding, and questions were handled in a way that encouraged further discussion.

Action points:

It might be useful to use live digital tools (e.g. Mentimeter or Poll Everywhere) to increase participation from students who are less likely to respond verbally. This could offer another way to involve quieter learners and provide a quick way to gauge understanding during the session.

Reflection on Observation

Observing Kerry's session offered many useful examples of teaching best practices, particularly in the use of real-world examples to contextualise complex content and the creation of an inclusive, well-paced learning environment (V5). I was particularly intrigued by the way she integrated worked examples and paused for clarification to support understanding across a diverse group of learners. Reflecting on this, I recognise an opportunity to develop my own practice by incorporating more contextual case studies and adopting a more structured, intentional approach to aligning my content and assessment methods with the learning outcomes of each session (V1, V4). Moving forward, I aim to embed these strategies into my planning and delivery to create a more engaging and accessible learning experience. (K3)

Observer *J.R. Jenkins*

Date 06/02/2025

5 CPD Event Evaluation

5.1 Event 1- Embedding Scaffolding

Date: 15/01/2025

This training event was organised internally by senior management within the university prior to the revalidation of the engineering provision in spring 2025. The training explored the principles and application of scaffolding as a pedagogical strategy, and how this can be embedded at an assessment, module, and programme level. As an early-career academic, this session was the first time I had been formally introduced to the concept of scaffolding and provided valuable insights into how targeted, structured support can be used to facilitate independent learning and enhance student learning outcomes (A5).

The session began with an overview of Lev Vygotsky's Zone of Proximal Development (ZPD), which asserts that learners can achieve higher levels of understanding and academic performance when their learning is effectively supported by a more knowledgeable other (Vygotsky, 1978). Reflecting on my teaching practice, I recognised that while I have always offered forms of support to students, I had not consistently approached this in a strategic, planned manner. The distinction made during the session between general support and an intentional scaffolding approach resonated strongly with me, it emphasised the importance of designing supports that are gradually withdrawn to encourage learner autonomy. (A1, A2, V3)

The session identified three key pillars of effective scaffolding:

1. Chunking – breaking complex concepts into smaller, sequential learning steps.
2. Timing – offering timely support when students encounter difficulty.
3. Challenge – creating opportunities for students to operate at the limits (or just beyond) their current level of knowledge or understanding.

I found this framework particularly helpful, as it provided a practical, systematic method for monitoring progression within my lectures, which has in turn led me to review the structure of formative and summative assessments within my modules (K2, K3, A3).

A particularly interesting aspect of the session was the discussion on collective scaffolding, a concept introduced by Donato (1994), which highlights the role of peer collaboration in facilitating learning (van de Pol, Neil and Volman, 2019). I reflected on how, traditionally, I have positioned myself as the primary source of support during lectures. However, by creating

environments in which students are comfortable communicating freely and encouraged to scaffold each other's understanding, I feel that I can facilitate a more interactive and engaging learning experience by increasing the differentiation of instruction (A4, V1, V2, K3).

The training session discussed scaffolding not only at the module level but across the entire engineering provision. In my role as programme manager of the mechanical engineering courses, I appreciated the imperatives of designing curricula where both the acquisition of knowledge and skills development are intentionally scaffolded across academic levels. For instance, expecting third year students to complete substantial group projects without structured development of teamwork skills in earlier years risks disadvantaging students. As such, I plan to work with colleagues to ensure programme-level progression is both coherent and explicitly scaffolded (A1, K1, V4).

As a direct outcome of this CPD activity, I have begun revising my module content and lecture activities to incorporate a clearer scaffolding structure. For example, I have begun to introduced a series of formative tasks that build in technical difficulty towards the final assessments for each of the modules I deliver, allowing students to engage with increasingly complex applications of theoretical, technical concepts. Furthermore, I intend to implement more peer-led activities that encourage students to assume the role of "the more knowledgeable other" within their respective groups (A5, V5)

Attending this training session has prompted me to embed the principles covered within my teaching practice, ensuring that the content I deliver encourages students to communicate more openly with me and their peers as part of a collective scaffolding approach, and to become skilled independent learners who are prepared for the demands of the engineering profession.

References

Donato, R. (1994) 'Collective scaffolding in second language learning', in J.P. Lantolf and G. Appel (eds) *Vygotskian approaches to second language research*. Norwood, NJ: Ablex, pp. 33–56.

van de Pol, J., Neil, M. and Volman, M. (2019) 'Scaffolding Student Understanding in Small-Group Work: Students' Uptake of Teacher Support in Subsequent Small-Group Interaction', *Journal of the Learning Sciences*, 28(2), pp. 206–239. Available at: <https://doi.org/10.1080/10508406.2018.1522258>.

Vygotsky, L.S. (1978) *Development of Higher Psychological Processes*. Edited by M. Cole et al. Harvard University Press. Available at: <https://doi.org/10.2307/>

5.2 Event 2 - WISA AI Staff Development Symposium

Date: 19/03/2025

This event was organised by the Wales Institute of Science & Arts (WISA) and involved presentations by senior members of academic staff centred around discussing the impact of artificial intelligence (AI) on higher education. The session was framed within the Institute's curriculum review process as well as the department's Innovation and Enterprise (I&E) strategy. The session provided a thought-provoking examination of the influence of generative AI technologies on curriculum design, delivery, and assessment practices, as well as the broader ethical and cultural implications of AI adoption for higher education institutions (A5).

The introductory session outlined the key objectives of the institutes curriculum review, namely to ensure that programmes remain fit for purpose under the increasing influence of digital technologies. It was highlighted that the Institute's strategy seeks to leverage AI-driven innovation whilst maintaining academic integrity, a theme that resonated throughout the event (V4).

The first part of the session focused on a series of presentations examining the immediate and long-term challenges posed by generative AI. Boon's (2025) presentation, *"Is this the end of business as usual?"*, promoted reflection on the need for both staff and students to adapt to rapid technological change. I found the discussion around AI's potential to disrupt traditional assessment models particularly pertinent, especially in terms of maintaining robust academic standards while embracing the opportunities AI can offer for creating more personalised learning experiences (A1, K2).

Dr Bashford's (2025) discussion on policy development examined the importance of clear, ethical frameworks to guide the adoption of AI in teaching and learning. It became clear that institutions must move quickly to establish policies that are both enabling and protective, ensuring equitable student experiences and safeguarding academic integrity (V1, V4). This theme was echoed in Dr Whitehead's (2025) discussion on AI and ethics, which brought into focus the significant moral considerations associated with integrating AI into educational contexts. The discussion prompted me to reflect upon how factors such as bias in AI systems, data privacy, and the implications of algorithmic decision-making require careful navigation. This has influenced my thinking around the responsible use of AI tools within my modules, ensuring that student welfare and fairness remain central (V3).

The second half of the session explored practical applications of AI in higher education. Dr Williams (2025) provided a practical demonstration of how custom AI models can be trained, using the lecturer's own module content and materials, to offer a supplementary mode of technical support to students. Dr Williams noted that students who had already used this facility reported that they found it useful in increasing their access to support, noting that the system could be used flexibly, outside of lecture contact time, to support their learning. I recognised that the potential for AI to act as an additional support mechanism for students, providing immediate, anonymous, and personalised guidance, presents an exciting opportunity. However, I also feel that it requires very careful integration to ensure that human academic judgement and pastoral care elements are not inadvertently diminished (A2, A4).

This CPD event has encouraged me to approach the design and delivery of teaching materials with greater awareness of the opportunities and challenges posed by generative AI technologies. It reinforced the importance of engaging with this technology to ensure that it is ethically and effectively integrated into my teaching practice, grounded in principles of equity, ethics, and educational value. Through this approach, I aim to contribute to developing a culture of responsible AI use within my modules (A1, A4, K3, K4, V4).

References

- Bashford, T. (2025) 'Policy development within HE'. UWTSD.
- Boon, K. (2025) 'Is this the end of business as usual, are we ready for genAI? '. UWTSD.
- Whitehead, N. (2025) 'AI & Ethics for learning and teaching '. UWTSD
- Williams, O. (2025) 'Custom GPTs as module support tutors '. UWTSD.

5.3 Event 3- Festo Didactic Training Event

Date: 06/12/2024

In December 2024, I attended a CPD workshop focusing on Industrial Automation Skills. This event was targeted towards lecturers and technical demonstrators working with concurrent automation technologies, including pneumatics, electro-pneumatics, programmable logic controller (PLC) programming, and emerging Industry 4.0 (digitalisation) concepts. The topics covered during this session are of particular interest to the School of Engineering, as we are currently in the process of developing new module content aligned with these technologies in response to consultation on emerging graduate skills requirements with our industrial liaison panel. As such, the opportunity to participate in this training was invaluable in supporting the development of my subject knowledge, expertise, and how to embed this within my teaching practice (V4, A5).

The session commenced with an introduction to the relevance of industrial automation skills within international WorldSkills competitions, highlighting the high standards of technical proficiency and problem-solving expected of engineering graduates internationally. It was beneficial to reflect on how such standards could be used as examples to benchmark our own student development and drive curriculum improvements within our engineering programmes (K1, V4).

The morning sessions on pneumatics and electro-pneumatics provided both theoretical insights and practical hands-on experience. Revisiting the fundamentals of pneumatic systems served to refresh my knowledge of core technical principles, while the transition to electro-pneumatics demonstrated the sectors move towards more advanced automated control systems. Engaging directly with component assembly and troubleshooting exercises reinforced my understanding of these technologies, and reminded me of the importance of practical application alongside theoretical instruction in facilitating deeper understanding among my own engineering students (A1, A2, K2).

The subsequent sessions focusing on PLC programming were particularly valuable. Working with Siemens controllers and the TIA Portal development environment, I gained practical exposure to configuring, programming, and testing these systems. While I have prior experience of programming different types of logic controllers, this was the first time I had had the opportunity to apply my knowledge to a Siemens system. Given the prevalence of Siemens hardware in industry, it is critical that students develop familiarity with these platforms.

Observing how Callum, Festo Didactic's Lead Training & Support Manager, provided structured walkthroughs during the session offered a useful model for how to introduce students progressively to increasingly complex programming environments (V5, A2, K1).

In the afternoon, the training explored more complex programming tasks, utilising Modular Production System (MPS) stations to simulate real-world manufacturing processes. This practical activity prompted me to reflect on the importance of ensuring that my students develop not only the underpinning theoretical knowledge required, but also competence and confidence to apply within real-world industrial contexts (A2, V1).

The final session provided an introduction to Industry 4.0 concepts, offering insights into how technologies such as the industrial internet of things, Artificial Intelligence, and cyber-physical systems are transforming contemporary manufacturing systems. I reflected on the fact that, while my module content is closely aligned with current industrial skills requirements, as identified in consultation with the School's industrial advisory panel, there is a pressing need to incorporate further discussion on future skill sets, such as Industry 4.0 concepts, into relevant modules, particularly to prepare students for the rapidly shifting technological landscape they will enter upon graduation (Rikala *et al.*, 2024). Continuously updating my own knowledge and understanding of these advanced concepts will be essential in providing our engineering students with the skill sets they will require in their future job roles (K1, V4, A5).

This event has prompted me to review my learning materials and reinforced the importance of maintaining strong industry relevance within the curriculum and ensuring that students are equipped with theoretical knowledge, technical skills, and the future-facing competencies required to succeed in a rapidly evolving engineering sector (Amorim and Azevedo, 2021) (V3, V4).

References

- Amorim, J. and Azevedo, A. (2021) 'Engineering Education: Towards the Fourth Industrial Revolution', in, pp. 29–46. Available at: <https://doi.org/10.4018/978-1-7998-3499-1.ch003>.
- Rikala, P. *et al.* (2024) 'Understanding and measuring skill gaps in Industry 4.0 — A review', *Technological Forecasting and Social Change*, 201, p. 123206. Available at: <https://doi.org/https://doi.org/10.1016/j.techfore.2024.123206>.

6 Evidence of 40 Hours Teaching at HE Level

Post Graduate Certificate in Teaching in Higher Education (PG Cert tHE) Evidence of teaching hours log

Candidate: Jordan R. Jenkins		Campus: Swansea IQ	
Date	Session Details	No of Hours	Practice Advisor's Signature
31/01/2025	Quality & Business Improvement (ACMA4004)	3	G Owen
05/02/2025	Manufacturing Design & Technology (ACMA5002)	2	G Owen
06/02/2025	Engineering Design (ACM4008)	2	G Owen
06/02/2025	Design for Manufacture (ACEA7004)	3	G Owen
07/02/2025	Quality & Business Improvement (ACMA4004)	3	G Owen
12/02/2025	Manufacturing Design & Technology (ACMA5002)	2	G Owen
13/02/2025	Engineering Design (ACM4008)	2	G Owen
13/02/2025	Design for Manufacture (ACEA7004)	3	G Owen
14/02/2025	Quality & Business Improvement (ACMA4004)	3	G Owen
19/02/2025	Manufacturing Design & Technology (ACMA5002)	2	G Owen
20/02/2025	Engineering Design (ACM4008)	2	G Owen
20/02/2025	Design for Manufacture (ACEA7004)	3	G Owen
21/02/2025	Quality & Business Improvement (ACMA4004)	3	G Owen
26/02/2025	Manufacturing Design & Technology (ACMA5002)	2	G Owen
27/02/2025	Engineering Design (ACM4008)	2	G Owen
27/02/2025	Design for Manufacture (ACEA7004)	3	G Owen

28/02/2025	Quality & Business Improvement (ACMA4004)	3	G Owen
			Total Hours =40

Participant's signature 

Practice Advisor's signature: G Owen.....