

OUTSTANDING TEACHING, LEARNING AND ASSESSMENT TECHNICAL SKILLS NATIONAL PROGRAMME

**Output 19: Think Piece 3 – Problem-Based Learning and Curriculum Design
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Think Piece 3

Is there a process for designing a technical curriculum around problem-based learning?

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A problem-centered curriculum is very different from a traditional knowledge-based curriculum. In a traditional vocational or technical curriculum, the units are organised into discrete delivery “components” (often determined by qualification units) and a subject-teacher is assigned to deliver the unit. Students will demonstrate they ‘know’, ‘understand’ and can ‘apply’ the learning in assessments, and for the highest grades will be able to offer some ‘evaluation’.

In a problem-centered approach, the curriculum is organized around problems and students are active learners. A problem-based learning curriculum focuses on learning for capability rather than for the sake of acquiring knowledge. Students are developed holistically. Development of knowledge, skills and behaviours are developed simultaneously through working in teams to investigate and solve real-world problems.

Problem-centered curricula are more likely to be found in higher education programmes where “the approach is chosen as the framework for the teaching and learning activities and assessment tasks to ensure alignment with the learning outcomes” (Alwi et al, 2012). The process for designing a curriculum around problem-based learning is a complex process, and it is certainly not linear. An added complexity in designing an FE curriculum (compared to an H.E. curriculum) is that assessment requirements are set by an external awarding body, so not only does the problem-based learning curriculum need to align with industry and the needs of the students, it also needs to yield evidence towards an awarding body qualification. It requires careful attention to creating new modes of delivery and assessment and integration of topics/units, and clearly specified “outputs” from a problem-based episode that can evidence qualification criteria. Careful design and sensible implementation are how best to achieve problem-based learning (Boud & Felletti, 1998).

There are some key principles of problem-based learning curriculum design that are non-negotiable:

- The principle of **authenticity** – the problem-based learning scenarios need to be anchored in meaningful industry-relevant contexts, achieved through collaboration between employers and teachers. “The realistic problem must be contextualized in a scenario that students can be immersed in. Providing context will actually reveal to learners the importance of the knowledge learned as well as the situation in which the knowledge is applied” (Alwi et al, 2012);
- The principle of **assessment extending beyond qualification** outcomes – problem-based learning is designed to develop students’ knowledge, skills and behaviours holistically and to ignore the development, assessment and feedback on skills (such as teamwork, communication, independent research and learning, presentation skills, digital skills and problem-solving) is the antithesis to goals of problem-based learning;
- The principle of **flexibility** – the knowledge learned by students when they work on problems does not unfold typically or coherently and may not evidence what was initially planned when designing the problem-based learning brief. Realistic problems are messy, and this pedagogical feature requires continuous cycles of ‘plan, do, review’ and an acceptance that what the students produce could be different to what was expected when designing the problem.

Just as problem-based learning is “messy”, so is the process of curriculum design. A step by step guide would not be useful. However, the process can be divided into some key “categories” of activity:

1. Is problem-based learning to be a learning activity or a learning *and* assessment activity?

The design of the curriculum will depend on the overall purpose of the problem-based learning activities. A focus on developing skills and behaviours to engage students and support growth in independent learning and develop work-readiness can readily be nested within the delivery of a more “traditional” curriculum. This removes the need to map the problems and outputs to assessment criteria within a qualification. Problem-based learning is used as a learning tool only. Any tension between problem-based learning as a learning activity is removed. However, this approach to technical curriculum delivery is time-consuming and might “squeeze” the limited guided learning hours available for qualification focus. Moreover, the rich evidence of learning that students produce is not recognised and rewarded in terms of their progress towards achievement of the qualification, which may be demoralising for students and teachers. Using problem-based learning episodes as an assessment tool fosters synergy between learning and assessment.

2. Preparing the problem-based learning curriculum

Preparation involves several crucial activities which will not happen in a determined “order”. Teachers will deconstruct the qualification units and reconstruct them around problems. It requires engaging with relevant employers to co-construct the “real-world” situated problems, agreeing the role of the employer, deciding on the focus of these problems, considering natural links between units, agreeing the focus for scenarios, writing problem-based learning briefs and, if the problem-based learning is to be an assessment tool, clarifying expected outputs which align realistically with industry *and* the qualification. Stakeholder engagement includes working with parents and, if used with apprentices, working with employers of those apprentices to communicate and manage expectations. As the problem-based learning briefs emerge, a mapping process to qualification outcomes and assessment criteria is required. Decisions on strategies and methods of assessment of skills and behaviours, such as self and peer ratings, tutor ratings, reflective conversations and tutorials, need to be agreed.

Components of programmes which involve mastery over time may be omitted from the problem-based learning curriculum and delivered in a traditional way. Eventually an assessment plan will emerge and decisions about learning spaces, staffing and timetabling will be made. Problem-based learning lends itself to team-teaching in larger spaces (with breakout rooms/space) as this increases the potential for expertise and scaffolding.

The planning stage requires time, deep thinking, extensive collaboration and to be efficient, effective and of high quality, up-front time and space for curriculum teams to undertake these activities.

3. Implementing the problem-based learning curriculum

As teachers develop knowledge of their students’ characteristics and prior learning and experiences, decisions on student groupings will be made. Carrying out a Belbin “style” team analysis can support students to develop effective teamwork and foster metacognition. Promoting inclusion, equality and diversity will require adjustments for some students to meet their individual inclusion needs. Once the problem-based learning episode begins, the curriculum becomes flexible and responsive.

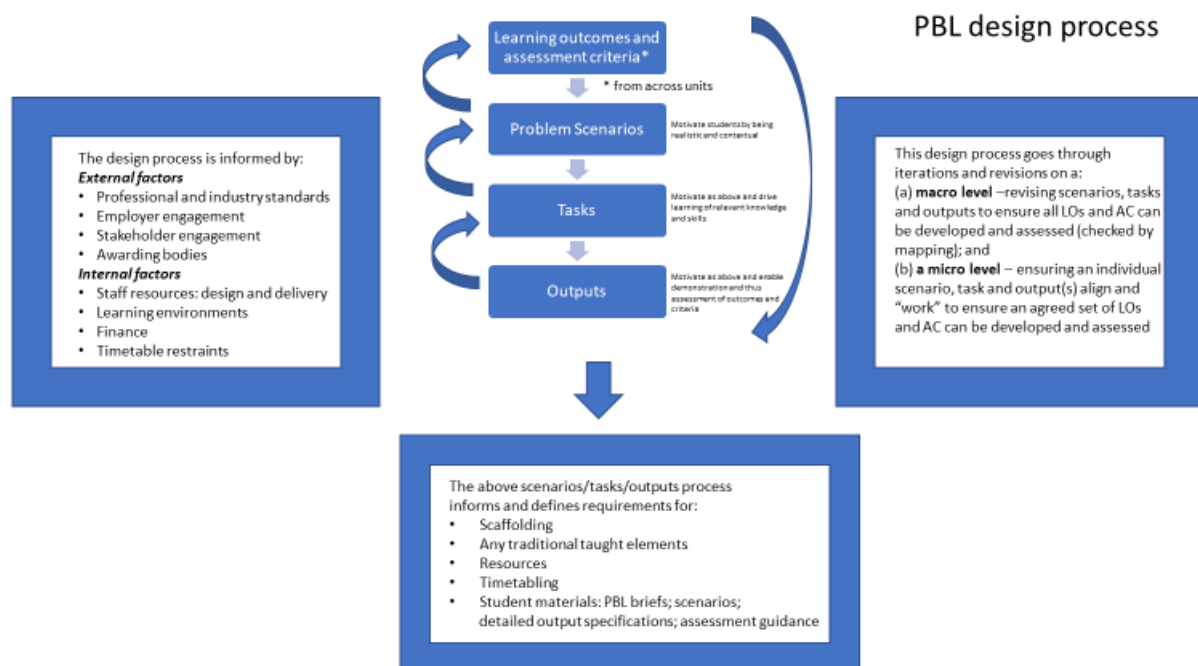
Teachers will make complex decisions on scaffolding activities and resources, reflect after each session, and, based on what has been observed and student feedback this can lead to multiple adjustments. Situated learning requires significant praxis. Assessment of outputs from a problem-based learning episode will then be mapped to the qualification criteria in order to determine gaps and make decisions on future assessment through problem-based learning

4. Review, reflection and progression of problem-based learning

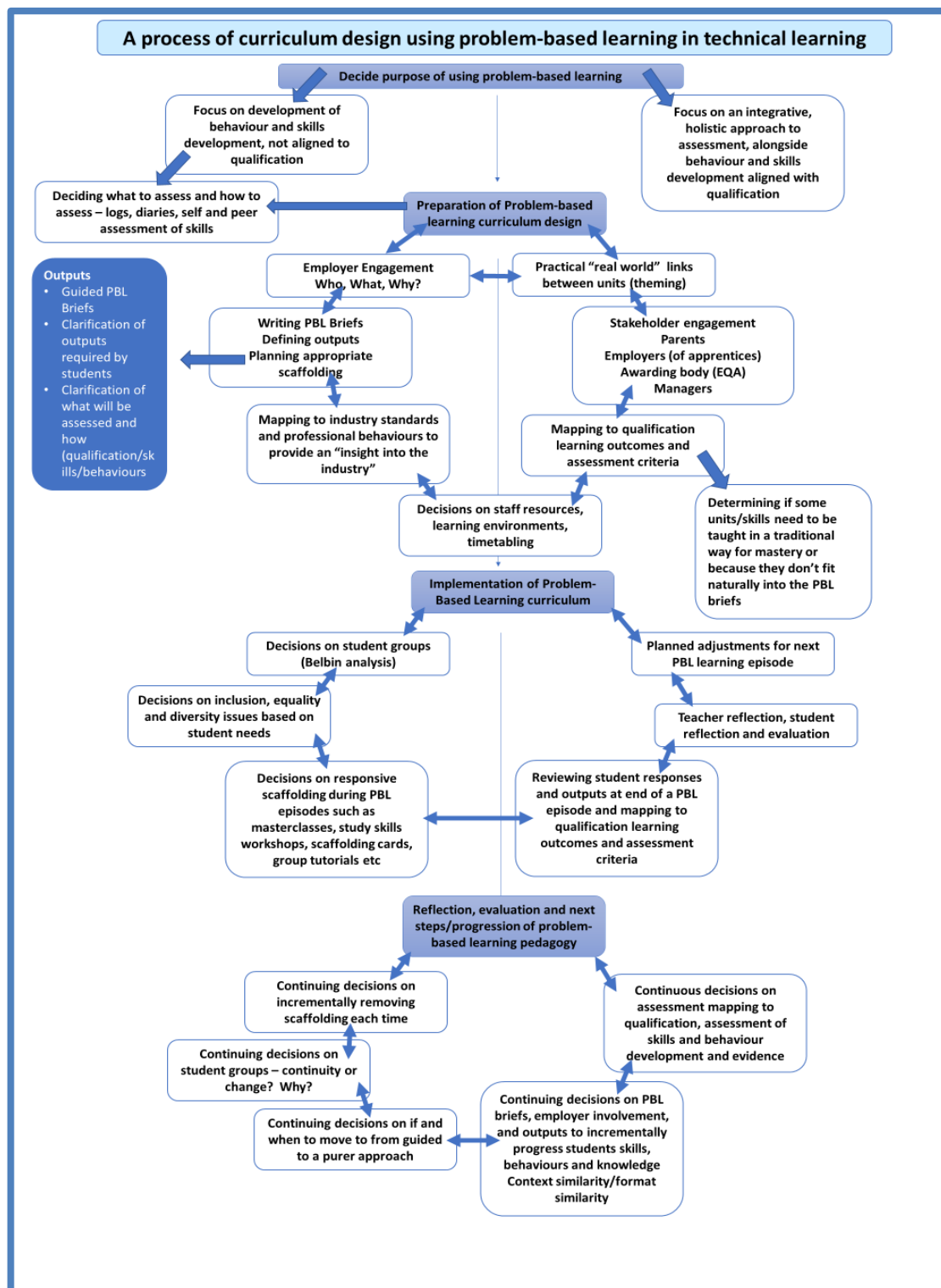
Curriculum design continues after each problem-based learning episode. Teams will review and evaluate impact on learning. Decisions will be made on student groupings. Continuing the same groupings can replicate industry practices and develop skills in working with others. However, to include and meet individual needs, curriculum teams may decide to change groupings. Curriculum teams will reflect on what works best in the teaching, learning and assessment to meet the diverse needs of students.

Teachers will make complex decisions on types of scaffolding and its gradual removal as students make progress with their skills in problem-based learning. Teachers will reflect on assessment mapping to qualification and the assessment of skills and behaviour development.

This can be represented as a process in Figure 2 below (Slorach, 2018).:



A more detailed non-linear process is represented in the diagram on the next page:



The process of curriculum design using problem-based learning is complex. However, the intrinsic value of problem-based learning in preparing students for future job-roles and lifelong learning makes the effort valuable.

The complexity of the process involves trusting teachers to design and develop a responsive and flexible curriculum which continually evolves in response to student's progress. This requires a capacity to innovation which needs to be situated within a culture of controlled and supported risk-taking within an organisation.

It is recommended that technical learning programmes contain intended learning outcomes (ILOs) that go beyond the qualification/knowledge content. Articulating a set of professional behaviours and wider skills provides a useful learning and assessment tool for students and teachers. It is recommended that when developing T-Level content and assessment, Biggs' theory of constructive alignment is used:

Constructive alignment is more than criterion-reference assessment, which aligns assessment to the objectives. Constructive alignment includes that, but it differs (a) in talking not so much about the assessment matching the objectives, but of first expressing the objectives in terms of intended learning outcomes (ILOs), which then in effect define the assessment task; and (b) in aligning the teaching methods, with the intended outcomes as well as aligning just the assessment tasks. (Biggs, 2003)

Applying constructive alignment will reduce the tension between problem-based learning as learning activity and as assessment and will moderate the complexity of a problem-based curriculum design.

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Figure 2: Slorach, S. (2018). Thistle Rose Education Design Limited