Sticky Learning

Paul Davison, Founder of PPWD Consulting Ltd explains why 21st-Century Rail Requires 21st-Century Learning

From prescribed training hours to demonstrated competence, the railway has an opportunity to transform not simply how people are trained, but how human capability, safety and performance are developed throughout their careers.

The railway's multi-piece learning problem

The Space Shuttle survived atmospheric re-entry because more than 24,000 individually engineered thermal protection tiles worked together, each designed for its location, accommodating different temperatures, aerodynamic forces and mechanical stresses. Each with its own position, fitment and removal strategy, yet collectively protecting a spacecraft working within an extraordinarily demanding environment.

Although many tiles appeared identical, their operating contexts were not, and NASA's engineers understood that resilience would appear not from making every part the same, but from understanding the variability each would encounter and designing accordingly. Perhaps the railway, and particularly the way we train and develop those working within it, is not so different.

We operate an extraordinarily complex socio-technical system, bringing together thousands of people, hundreds of organisations, sophisticated technologies, ageing and modern infrastructure, operational pressures, customer expectations and countless interactions which change from one moment to another.

Yet, for much of its history, railway training has been designed around something remarkably consistent: the standardised course, delivered over a predetermined period, containing prescribed knowledge, followed by an assessment intended to prove competence. Everybody receives broadly the same programme, irrespective of their earlier experience, learning preferences, rate of development or the challenges they meet.

We readily recognise the importance of accommodating human variability when designing driving cabs, signalling systems, control rooms and workstations, yet often behave as though that variability disappears when people enter a training environment.

'An apparently modest decision to reduce prescribed hours may generate significant additional demands elsewhere within the system'

The recent announcement by the Rail Delivery Group, collaborating with passenger operators, ASLEF and RSSB, of a competency-based approach to practical train driver training therefore represents a potentially significant moment for the industry. However, its greatest opportunity is not simply to replace prescribed driving hours with demonstrated competence. It is to fundamentally reconsider how the railway understands, designs, facilitates, assesses and sustains learning.

One railway, thousands of different learning journeys

Competency-based training is sometimes presented as a relatively straightforward proposition: rather than requiring everybody to complete a prescribed number of training hours, individuals progress once they can demonstrate the knowledge, skills and behaviours necessary to undertake their work safely and effectively. On the surface, the logic appears compelling. Why should somebody who has proven competence continue accumulating hours simply to satisfy an administrative requirement? Equally, why should somebody who has completed those hours be considered ready when their capability remains uncertain? Yet beneath this apparently straightforward change lies a much more profound organisational challenge.

Ladbroke Grove – when training and competence became disconnected

On 5 October 1999, two trains collided at Ladbroke Grove, killing 31 people and injuring hundreds more, a tragedy which exposed not simply weaknesses in signalling, operational arrangements and organisational oversight, but profound shortcomings in how the railway understood and assured the competence of those entrusted to operate within it.

Michael Hodder, the Thames Trains driver, had qualified just thirteen days earlier, having completed approximately 250 hours of practical instruction, exceeding the company's minimum requirement of 200 hours, yet the subsequent Cullen Inquiry revealed significant gaps between the training he had received, the competence he was considered to possess and the operational realities he was expected to manage.

Perhaps one of the most revealing findings concerned the separation of responsibilities between traction knowledge and route learning. His instructor understood his responsibility principally as teaching Hodder how to drive the train, whilst the organisation assumed that route learning was being integrated into that practical instruction. The assessment of his route knowledge did not specifically cover the critical section between Paddington and Ladbroke Grove, and he had not been taught about the particular risks associated with signals previously passed at danger.

The organisational transition following British Rail's privatisation provides an important context, but this was not simply a story of an inexperienced driver receiving inadequate instruction. It was a failure across organisational boundaries, involving the design and management of training, the clarity of instructors' responsibilities, the quality of assessment, the communication of operational risk and the management of known signalling hazards.

The Cullen Inquiry exposed precisely the dangers of assuming that completion of a training programme necessarily demonstrates readiness for the work as actually encountered.

Twenty-seven years later, as the railway moves towards competency-based training, we should perhaps ask ourselves what we have genuinely learnt from that experience.

For replacing prescribed hours with individual assessments will not, in isolation, resolve the underlying challenge. We must ensure that competence is demonstrated in the appropriate context, that instructors understand their broader responsibilities, that operational risks are incorporated into learning, and that organisational systems

can distinguish between somebody who has completed a programme and somebody who is genuinely prepared for the complexity of the railway.

History does not necessarily repeat itself, but it provides us with opportunities to question the assumptions upon which our future is being designed. We are no longer designing one course for a cohort of trainee drivers. We are potentially designing a different learning journey for every individual within that cohort.

One student may arrive with considerable railway experience, an established understanding of operational relationships and a familiarity with the language, practices and pressures of railway work. Whilst another may have entered from an entirely different industry, possessing strong personal and cognitive capabilities but little knowledge of the railway itself.

Some will develop technical skills quickly whilst struggling with unfamiliar operational situations; others may demonstrate excellent situational awareness and judgement yet require additional opportunities to develop particular handling skills. Their development curves will not necessarily be in any way similar, linear, consistent or predictable.

Consequently, a competency-based system requires much more than flexible assessment dates. It demands sufficiently sophisticated diagnostic processes, individually responsive learning plans, capable instructors, appropriate operational exposure and management systems able to recognise and accommodate these differences.

Even the administrative implications are substantial. Training diagrams, instructor availability, driving opportunities, assessment scheduling, traction and route exposure, training records and competence management systems must increasingly respond to individual development rather than simply processing cohorts through a predetermined timetable.

This is where secondary and tertiary consequences become important. As an apparently modest decision to reduce prescribed hours may generate significant additional demands elsewhere within the system, particularly if individual development requires more varied experiences, greater instructor flexibility or additional assessment opportunities.

The financial benefits of shorter training periods are therefore not necessarily the same as the organisational benefits of more effective learning. We ought to understand those differences before assuming that one will automatically produce the other.

From instructor to facilitator – a different profession?

Perhaps the most significant consequence concerns the people responsible for developing the next generation of railway professionals. Traditionally, the instructor has frequently been regarded as an experienced practitioner whose responsibility is to transfer technical and operational knowledge, demonstrate correct methods, supervise practice and assess performance. These will remain essential capabilities. However, facilitating individual learning requires a substantially broader professional skillset.

The modern learning facilitator must understand not simply the subject being taught. But how adults learn, how confidence and competence develop, how previous experiences shape interpretation, how emotion influences attention and memory, and how to recognise the difference between somebody who can repeat information and somebody who genuinely understands its safe and effective application.

Malcolm Knowles' principles of adult learning, or andragogy, remind us that adults bring existing experiences, expectations, assumptions and motivations into every learning environment. Those experiences can provide powerful foundations for new learning, but equally they can interfere with it, particularly when familiar approaches are applied to unfamiliar circumstances.

Bloom's revised taxonomy offers another useful distinction between remembering, understanding, applying, analysing, evaluating and creating. Knowing the rule is important. Understanding why it exists, recognising when it becomes relevant, applying it under changing conditions and evaluating the consequences of one's actions require progressively deeper capabilities.

The instructor's responsibility therefore extends beyond explaining what somebody must do, towards helping them develop the judgement to understand why, when and how their actions contribute to the wider railway.

I offer that to facilitate a competency-based training system, those facilitators in rail, will be required to hold three complementary responsibilities: Coach, Challenger and Creator.

- To coach is to help people discover and develop their own understanding, rather than simply supplying answers.
- To challenge is to question assumptions, introduce alternative perspectives and create appropriate cognitive difficulty, without humiliation or unnecessary threat.
- To create is to design meaningful learning experiences in which theory informs practice, practice challenges theory, and understanding develops through reflection, experimentation and feedback.

These are not simply alternative presentation techniques; this is a sophisticated multi-disciplinary approach to education. They demand knowledge of human factors, psychology, communication, adult development, group dynamics and the management of learning environments.

The distinction becomes particularly significant when learners encounter difficulty, because the response of the facilitator can either open or close the opportunity to gain experience. A learner who makes a mistake can be invited to examine their thinking, recognise the influences upon their decision and explore alternative responses, or they can be made to feel embarrassed, inadequate and reluctant to disclose uncertainty again. Both experiences may produce an immediate behavioural response. Only one is likely to nurture the curiosity and confidence required for continuing professional development.

Compassion is an operational capability

This brings us to compassionate learning, a concept which can appear somewhat removed from the apparently hard-edged world of railway operations. Yet compassion, when understood as a practical commitment to being useful, helpful, kind and caring, is neither softness nor an absence of standards. It concerns recognising the circumstances of another person and responding in ways which genuinely support their development.

Sometimes that requires encouragement, reassurance and patience. At other times it requires difficult conversations, clear boundaries, robust challenge and an unwillingness to accept performance which could place people at risk. Compassionate learning does not mean passing somebody who is not competent.

It means taking their development seriously enough to understand why competence has not yet emerged, what assistance may be appropriate and whether the individual can ultimately achieve the required standard.

Psychological and emotional safety become important here because the willingness to disclose uncertainty is fundamental to effective learning. An instructor who approaches a student from a critical or punitive position may unintentionally invite defensiveness, compliance or concealment. Whilst an instructor who communicates from the respectful, curious and responsible position described within Transactional Analysis as the Adult ego state is more likely to encourage reflection and genuine dialogue.

The standards remain unchanged. What changes is the quality of the learning relationship through which those standards are achieved.

Training for the railway that we actually operate

Another danger concerns what we choose to assess. Railway operations are frequently predictable until they are not! Most journeys take place within familiar routines, supported by established procedures, reliable equipment and well-practised interactions between different operational groups.

Safe railway performance cannot depend solely upon somebody being capable of undertaking the normal task under normal circumstances. Learning must deliberately encompass normal, abnormal, out-of-course and emergency situations, recognising that the cognitive demands, social interactions and operational consequences can change dramatically as familiar conditions deteriorate.

A driver approaching a station during routine operations might be required to manage speed, braking, signals, platform conditions and communications through largely familiar patterns. Introduce a signalling irregularity, deteriorating weather, a passenger emergency, a train defect or conflicting operational information, and the situation changes.

The technical requirements remain essential, but so too do situation awareness, workload management, diligence, decision making, communication, cooperation, self-management and the capacity to recognise when an established plan is no longer appropriate.

These are the social, personal and cognitive capabilities which the RSSB describes through its non-technical skills framework. A competent individual must be able not only to perform expected tasks, but also to recognise when circumstances have moved beyond expectation and respond appropriately within their authority and available support.

Tabletop discussions undoubtedly have value, particularly when exploring knowledge, understanding and possible courses of action. However, they cannot adequately reproduce every demand associated with an unfolding operational event.

Where practical and proportionate, learning must also include simulator experiences, realistic scenario exercises, operational rehearsals and coordinated activities involving other railway functions. The opportunity to experience uncertainty, interrupted plans, incomplete information, competing priorities and developing consequences within a supported environment is fundamentally different from explaining how one believes one would respond.

We should be developing capability for the reality of work, rather than simply rehearsing our descriptions of it.

A competent driver is not the same as a competent railway

Another dimension to this discussion which could easily be overlooked, is that rail is a system. A train driver does not operate independently of the signaller, dispatcher, guard, station colleagues, controllers, maintenance teams or the customers whose behaviour can profoundly influence operational conditions.

Consider a developing incident involving a train approaching a congested station. The driver may possess a technically correct understanding of their immediate responsibilities, whilst the platform dispatcher has information about passenger behaviour, the signaller understands the developing train movements, control is managing service recovery, and station colleagues are responding to changing crowd conditions.

Each can be competent within their own role, yet the overall situation may still become unsafe or ineffective if their understandings are incomplete, conflicting or poorly communicated. Individual competence is necessary, but collective capability is what enables the railway to function.

Consequently, training should provide meaningful opportunities to understand the responsibilities, constraints and perspectives of those working across operational boundaries. It should encourage people to examine what others might know, what others might reasonably expect, and how apparently sensible actions within one part of the system can produce unintended consequences elsewhere.

Jens Rasmussen's work on organisational risk boundaries offers an important perspective, showing how everyday work is influenced by pressures associated with economic efficiency, workload and the boundaries of acceptable performance.

Those pressures do not disappear when somebody completes their training. They form part of the operational context in which competence must continually be exercised. Therefore, the learning of any individual should include understanding of how the wider railway functions. Where its operational dependencies reside and how local adaptations may influence the safety and performance of others.

The inner game of railway performance

Timothy Gallwey's The Inner Game provides another useful way of examining this challenge. Gallwey explored the relationship between external performance and the internal interference which can prevent individuals from realising their capabilities.

Within railway training, the outer game might concern rules, procedures, route knowledge, traction handling, operational standards and the observable tasks against which competence is assessed. The inner game concerns attention, confidence, uncertainty, self-talk, motivation, concentration, emotional regulation and the individual's ability to learn from experience.

Of course, both the inner and outer game matter. A trainee may understand the correct action yet struggle to perform it under observation, pressure or unfamiliar conditions. Whilst another may appear highly confident without possessing the depth of understanding necessary for safe performance.

Therefore, we ought to ask whether our training systems genuinely develop both dimensions, or whether they concentrate primarily upon what can be most easily observed, counted and recorded.

This is where reflection becomes essential. David Kolb's experiential learning cycle and Donald Schön's work on reflection-in-action and reflection-on-action help explain how experience can become deeper professional understanding. Yet experience alone is not necessarily a dependable teacher.

Repeated exposure can strengthen effective judgement, but equally it can reinforce assumptions, normalise adaptations and establish habits whose limitations remain unexplored. We therefore need to develop reflective, reviewing and reflexive practitioners. People capable of examining what happened, understanding how their own thinking influenced events, questioning the assumptions underlying their actions and adapting their future practice.

Within Sticky Learning methods, reflection is woven throughout rather than confined to the final evaluation sheet. Delegates continually ask themselves: What surprised me? What challenged my assumptions? How will this change my own practice?

The neuroscience community suggest that memory consolidation continues long after formal teaching has finished. The most memorable learning therefore continues during conversations on the journey home, around the coffee machine or when someone unexpectedly remarks: 'Do you remember that exercise?'. That is learning that sticks. Not because people remember the activity, but because the activity changed how they interpret future experience.

Learning should not cease at the point of qualification. Indeed, qualification ought to represent the very beginning of a more sophisticated and professional learning journey.

Learning, competence management and the rear-view mirror

The railway has developed sophisticated governance, assurance, audit and competence management arrangements, many of which make essential contributions to safe operations.

However, these systems inevitably draw heavily upon evidence of what has already taken place. We review assessments, analyse incidents, monitor compliance, investigate adverse events and examine performance trends to judge whether our operational arrangements remain effective.

These activities are necessary, and they also present the danger that we attempt to drive the railway into the future primarily through its rear-view mirror.

A learning-based organisation retains retrospective assurance whilst investing equally in developing the capacity to anticipate, interpret and respond to changing circumstances.

This distinction is crucial within a competence management system that can record whether an individual has demonstrated a particular skill at a

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particular moment. However, that record alone cannot ensure the same individual will perform effectively when circumstances, equipment, colleagues, workload or organisational pressures change. This requires continuing development supported by meaningful coaching, reflective conversations, operational observation and feedback. Learning conversations should therefore have a purpose beyond explaining what somebody has done correctly or incorrectly.

They should encourage curiosity, moving away from the sometimes-defensive desire to be understood towards a genuine interest in understanding the circumstances, reasoning and relationships which shaped an outcome.

Cognitive psychologists, Robert and Elizabeth Bjork showed that conditions producing the strongest long-term learning often feel more difficult in the moment. Easy presentations create an illusion of learning because familiarity is mistaken for capability. The recognition of something is not recall. The superficial understanding generated during the course is not the same as deeper held performance six months later. This demands a corresponding shift in leadership and followership.

Therefore, the responsibility for learning cannot reside exclusively with the training department, instructor or competence assessor. It must become a shared responsibility extending from the frontline to the boardroom, supported by individuals who recognise their continuing obligation to develop and by leaders who create the time, resources and conditions through which that development becomes possible.

Learning should behave more like Blu Tack than glue

Perhaps an unconventional analogy helps explain what the railway needs. Glue is designed to create a lasting attachment, holding components together in a relatively fixed arrangement. Blu Tack performs a different function. It enables things to connect, separate, move, reform and reconnect as circumstances require. In complex organisations, learning ought to behave rather more like Blu Tack.

It should connect people, ideas, experiences and organisational functions, fill spaces between different understandings, and enable those relationships to adapt when circumstances change. This does not imply that operational standards or safety-critical requirements should become negotiable.

Rather, it recognises that the capabilities through which people apply those standards must remain sufficiently flexible to accommodate changing conditions. The railway is continually adapting to innovative technologies, working arrangements, passenger expectations, commercial pressures, environmental demands and workforce demographics. Where our collective context frequently changes faster than our formal training programmes.

A learning system which depends upon relatively static courses and periodic reassessment risks struggling to keep pace. Whereas one which nurtures curiosity, shared understanding and continuing development is better positioned to respond. Learning is not the opposite of performance; any more than safety is the opposite of productivity. Instead, learning is one of the fundamental drivers of both.

The unintended consequences of efficiency

Within my military career, I observed how the initial officer training programme moved between 24 and 32 weeks and subsequently returned back to 24 weeks. This reflected a changing judgement about the time and resources required to develop junior officer capability.

What interested me was never simply the number of weeks, but what those changes meant for the breadth, depth and durability of the capabilities being developed. A shorter programme is not inherently inferior, just as a longer programme is not necessarily better.

The meaningful question concerns what people can actually do, understand, recognise and adapt to after completing it. The same principle applies to rail. If competency-based training produces genuinely more capable drivers through better-designed learning experiences, appropriate assessment and individually responsive development, the benefits could be considerable.

But if the principal measure of success becomes a reduction in training hours, we risk recreating the very problem the reform offers an opportunity to overcome.

The development of a competent railway professional involves much more than progressing efficiently through a syllabus. It requires operational experience, informed judgement, social understanding, technical knowledge, personal capability and the confidence to recognise the limits of one’s own competence. These qualities require investment, and the consequences of failing to invest may become apparent long after the apparent efficiencies have been celebrated.

Twenty-first-century rail requires twenty-first century learning

The railway rightly invests billions of pounds in rolling stock, infrastructure, signalling, digital technologies, control systems and other sophisticated assets intended to improve safety, reliability, capacity and the customer experience. Yet these investments will always operate within the performance boundaries of the humans who design, maintain, manage and use them. If those humans remain undervalued, underdeveloped or deprived of meaningful opportunities to gain experience, the capabilities of the overall system will remain constrained, irrespective of the technological sophistication surrounding them.

The transition towards competency-based training offers something considerably more valuable than a revised mechanism for qualifying train drivers. It offers an opportunity to apply the same human-centred design principles to learning that we increasingly recognise as essential when designing the railway itself.

To move from instruction towards facilitation, from uniform courses towards individual development, from isolated technical competence towards collective operational capability, and from periodic assessment towards professional learning throughout an entire career.

To create environments which are simultaneously compassionate and challenging, psychologically safe and operationally rigorous, responsive to individual needs whilst uncompromising about the standards required for safe performance.

Most importantly, it offers an opportunity to recognise that people are not simply components to be trained before being inserted into an operational system. They are the adaptive, thinking, feeling and learning participants through whom that system continually creates its safety, performance and resilience.

Just as NASA recognised that the Space Shuttle’s protection depended upon accommodating the differing conditions encountered by thousands of individual tiles, the railway must recognise that its collective capability depends upon understanding and developing the different people who contribute to its operation.

Perhaps, then, the question should no longer be how quickly we can train somebody to become competent. It should be how thoughtfully we can design the conditions through which they become capable of learning, adapting and contributing safely throughout their professional lives.

The twenty-first-century rail will not achieve its full potential through twenty-first-century technology supported by twentieth-century assumptions about human learning. The future of railway performance is not simply about what our people know today, but their capacity to learn what tomorrow requires. RP