

Work-Based Learning in the NZ Primary Sector

Part 1 - Decentralisation, Benchmarks and LMS Utilisation of AI for Formative Assessment

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Abstract

This essay explores the structural, financial and pedagogical evolution of Work-Based Learning (WBL) in Aotearoa New Zealand during the transitional period of 2026 (Tertiary Education Commission, 2026a). Following the disestablishment of the centralized New Zealand Institute of Skills and Technology (Te Pūkenga), the Vocational Education and Training (VET) sector has largely decentralized. Operational delivery divisions have been temporarily re-allocated to restructured Industry Skills Boards (ISBs) prior to their migration toward a localized ecosystem of regional polytechnics, Wānanga, and accredited Private Training Establishments (PTEs) (Tertiary Education Commission, 2026b). Drawing explicitly on the themes and parameters outlined in 2026 via ISB industry and stakeholder consultation, this paper briefly explores and offers summary of the current funding mechanisms under the Unified Funding System (UFS), alternative delivery architectures, contemporary competency-based assessment models, WBL trainee formative assessment methodology via dialectical AI structured reasoning (debate) and virtual mentors (avatars), and legislated pastoral support protocols (Food and Fibre ISB, 2026; New Zealand Ministry of Education, 2024). The study features a summative literature review focused on primary sector constraints: such as structural seasonality, geographic isolation, and the low training capacity of Small and Medium Enterprises (SMEs) (Vaughan, 2011). This is supported by examples of real-world case studies of primary sector enterprises utilizing micro-credentials to bridge technological gaps. The essay provides an operational analysis of Te Tiriti o Waitangi compliance, detailing indigenous Māori-centric pedagogical frameworks including whanaungatanga, manaakitanga, ako, and tuakana-teina (Alkema, 2022). Furthermore, a brief accounting and fiscal policy analysis illustrates how regional polytechnics are managing their balance sheets and fixed-cost overheads under the localized 2026 UFS allocation matrices, with a technical focus on the unique equity funding mechanisms applied to wānanga (New Zealand Ministry of Education, 2024). This paper also specifies the New Zealand Qualifications Authority (NZQA) national external moderation standards required to validate digital e-portfolio evidence architectures. Additionally, this paper introduces the SNCM v2.0 (Galu, 2026) to illuminate the potential for WBL trainee learning retention engaging SDL in the LMS via reasoning and structured debate (a dialectical approach to SDL). Finally, an international macro-comparative analysis places New Zealand alongside four OECD benchmark nations, Germany, France, the United Kingdom, and Australia: a brief review of historical system paths and funding mechanics to offer strategic recommendations for the future of New Zealand's vocational network (OECD, 2022).

Keywords: *Work-Based Learning, Vocational Education Reform, Industry Skills Boards, Food and Fibre Sector, OECD VET Comparison, Unified Funding System, Te Tiriti o Waitangi, Māori-Centric Pedagogy, Balance Sheet Management, NZQA Moderation, E-Portfolios, Network of Provision, Self/Non-Self Methodology, SNCM v2.0*

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1. Introduction and Institutional Context: 2026

Work-Based Learning (WBL) in Aotearoa New Zealand stands at a structural turning point in 2026. The centralized architecture of the New Zealand Institute of Skills and Technology (Te Pūkenga), designed to combine the country's 16 industry training organizations and polytechnics into a single entity, has been dissolved by legislative mandate. In its place, a decentralized model gradually returning autonomy to regional economies and industry-led structures.

Effective January 1, 2026, the structural transition followed a two-phase strategy (Tertiary Education Commission, 2026a). The first phase involved a temporary 'lift and shift' of former vocational business units into newly configured Industry Skills Boards (ISBs). The ISBs are tasked with maintaining training delivery while working with the government to plan a permanent regionalized system (Food and Fibre ISB, 2026). The second phase, currently underway, involves shifting these work-based learning functions into a permanent network of regional polytechnics, wānanga, and private training providers (Tertiary Education Commission, 2026b).

Guiding this transition are feedback mechanisms for employers, federated associations, and regional representatives to directly shape the design of the future network of provision (Food and Fibre ISB, 2026). In primary industries, such as agriculture, horticulture, viticulture, forestry, and seafood processing: WBL is critical for building workforce capability, supporting regional development, and honoring Te Tiriti o Waitangi commitments (Alkema, 2022). As the sector faces changing environmental standards, technological upgrades, and labour shortages, designing a stable, flexible, and accessible WBL framework is a matter of economic significance.

2. The 2026 Funding Architecture: Fiscal Analysis of UFS Allocations and Polytechnic Balance Sheets

The funding framework supporting New Zealand's vocational education system relies on the Unified Funding System (UFS), which was retained and adjusted during the 2026 restructuring (New Zealand Ministry of Education, 2024). The UFS addresses underfunding in workplace training by shifting away from systems that favoured classroom enrolment over practical on-job delivery (New Zealand Ministry of Education, 2024). The funding architecture uses three complementary components to ensure financial sustainability and regional access: the Delivery Component, the Learner Component, and the Strategic Component (New Zealand Ministry of Education, 2024).

The transition away from Te Pūkenga has highlighted individual regional polytechnics to direct balance sheet accountability. Under the centralized model, capital expenditures and operational deficits were theoretically absorbed by a national pool. In 2026, regional boards must independently manage their cash flows, asset registers, and working capital lines under the UFS formulas (New Zealand Ministry of Education, 2024).

The primary fiscal challenge centres on the Delivery Component. Because this component is fully volume-driven (funded per full-time equivalent student or work-based learner equivalent), revenue remains volatile and highly sensitive to regional employment rates. When the primary sector experiences a boom, worker numbers swell, increasing work-based learning revenue. However, if environmental shocks (such as major cyclical weather events or global commodity price drops) hit regional farming, enrolments drop immediately, starving the polytechnic of expected cash inflows (Vaughan, 2011).

Meanwhile, polytechnics operate with high fixed-cost overheads. They must maintain physical assets like agricultural training farms, science laboratories, automotive workshops, and student accommodation blocks. These structural liabilities require ongoing maintenance, depreciation funding, and insurance coverage regardless of active learner volumes. To keep their statements of financial performance stable, chief financial officers at regional polytechnics are forced to rely heavily on the Strategic Component and the Learner Component (New Zealand Ministry of Education, 2024). The strategic component provides a predictable, non-volume-based income stream that helps cover the baseline costs of keeping remote campuses open.

Simultaneously, the equity-focused learner component allows institutions to justify targeted support programs for Māori and Pacific learners, which cross-subsidizes the broader regional delivery network, ensuring physical sites remain financially viable during low-enrolment seasons (Alkema, 2022).

3. Technical Comparison: Wānanga Funding Allocations vs. Regional Polytechnics under the UFS Equity Component

Under the 2026 UFS framework, the allocation of the Learner (Equity) Component differs markedly between traditional regional polytechnics and Wānanga. This difference is rooted in their legislated characters under the Education and Training Act 2020 and specific adjustments made during the 2026 decentralisation.

Traditional regional polytechnics receive equity funding through a formulaic calculation based on the demographic profile of enrolled learners (New Zealand Ministry of Education, 2024). For every learner identified within a priority cohort, specifically Māori, Pacific, disabled learners, and those with low prior educational achievement: the polytechnic receives a top-up allocation designed to fund generalized support mechanisms, such as literacy assistance or counselling (New Zealand Ministry of Education, 2024). This mechanism acts as an add-on to the core volume-driven delivery funding.

In contrast, wānanga funding allocations acknowledge that these institutions do not simply support minority cohorts within a Western paradigm, but rather operate entirely within a Māori philosophical and cultural framework (Mātauranga Māori). Under the 2026 equity adjustments, Wānanga allocations feature a baseline infrastructure loading within the equity component. This acknowledges that the delivery of cultural immersion, whānau-centred support systems, and te reo Māori contextualization represents a fixed operational expense rather than a variable cost per student.

Furthermore, while polytechnics must rigorously tag their equity funding to discrete learner support interventions monitored by the TEC, Wānanga retain greater autonomy over the distribution of their equity allocations. This enables Wānanga to invest in collective community-based learning models, local marae partnerships, and the preservation of regional iwi knowledge frameworks. This technical distinction shifts the equity funding model from a transactional, deficit-based top-up (as seen in polytechnics) to an institutional investment model that honours rangatiratanga (self-determination) and cultural infrastructure within Wānanga ecosystems.

4. Literature Review: Structural Challenges in the Food and Fibre Sector

The academic literature on vocational education highlights several structural challenges when applying standard WBL models to primary industries (Vaughan, 2011). Scholars note that traditional apprenticeship frameworks assume a stable corporate environment with regular hours and clear corporate pathways (Vaughan, 2011). New Zealand's primary sector, however, operates in a highly variable and fragmented environment (Vaughan, 2011).

Structural Seasonality

Seasonality introduces substantial disruption to structured learning (Vaughan, 2011). In sectors like horticulture, viticulture, and meat processing, labour demands peak sharply during harvesting, pruning, or processing windows. During these times, operational output takes absolute priority, leaving minimal time for formalized training, portfolio updates, or mentor evaluations. Conversely, the winter off-season creates a drop in active employment, forcing temporary layoffs or requiring trainees to change employers to maintain consistent income. This seasonal cycle disrupts learning continuity and delays program completion.

Geographic Isolation

Geographic isolation creates access barriers for rural workforces (Vaughan, 2011). Apprentices working in remote locations, such as high-country stations in Canterbury or forestry blocks in East Coast regions, face long travel distances to attend central campuses or block courses (Vaughan, 2011). This isolation limits opportunities for peer learning, reduces access to specialized campus facilities, and complicates regular face-to-face visits from training advisors. While digital delivery offers a partial solution, variable internet connectivity in remote areas remains a persistent barrier to consistent online learning.

Employer Training Capacity

The third major challenge is employer capacity, particularly among Small and Medium Enterprises (SMEs) (Vaughan, 2011). Most agricultural and horticultural businesses in New Zealand operate with fewer than five permanent employees. In these micro-businesses, the owner often manages multiple responsibilities simultaneously, serving as managing director, operations manager, compliance officer, and on-site trainer. Unlike larger corporate firms, these small businesses lack dedicated human resource departments or specialized learning and development staff. Consequently, while these owner-managers are highly skilled technical

experts, they may not have formal training in instructional design, educational theory, or constructive assessment methods (Vaughan, 2011). This capacity constraint can lead to variable learning experiences for trainees, with the quality of instruction depending heavily on the individual employer's natural aptitude for mentoring.

5. Micro-Credential Implementation: Primary Sector Case Studies

To bypass the lengthy timelines of full national certificates, forward-thinking primary sector enterprises are deploying micro-credentials to meet emerging regulatory and technological shifts.

Case Study A: The Canterbury Dairy Collective (Automated Systems Integration)

A large-scale dairy farming collective in mid-Canterbury, managing over 4,500 cows across four separate platforms, faced operational disruptions when upgrading to automated, sensor-driven rotary milking Parlors and electronic heat-detection collars. The existing New Zealand Certificate in Agriculture (Level 3) did not contain specific, deep-dive modules for troubleshooting real-time cloud analytics or maintaining automated gate-sorting hardware.

- **The Intervention:** Partnering with Primary ITO and a regional polytechnic, the collective co-designed an NZQA-approved Level 4 micro-credential titled *Data Interpretation in Automated Pastoral Systems*.
- **The Structure:** The training program was delivered entirely on-site via 4-week hybrid blocks during the lower-demand winter period.
- **The Outcome:** Twelve assistant herd managers completed the micro-credential. The collective saw a 14% drop in mechanical downtime and achieved faster mastitis identification rates due to the workers' improved data literacy.

Case Study B: Pacific Rim Viticulture (Drone Mapping and Precision Crop Management)

A viticulture management company operating across Marlborough and the Hawke's Bay needed to upskill its mobile workforce in targeted canopy management and disease mapping using drone-mounted multispectral cameras. Because their workers migrate between regions depending on crop stages, enrolling staff in multi-year campus programs was logistically unviable.

- **The Intervention:** The company implemented two targeted micro-credentials: *Remotely Piloted Aircraft Systems (RPAS) in Agriculture* and *Prescription Chemical Application via Precision Mapping*.

- **The Structure:** Theoretical training was delivered via asynchronous mobile apps, while field verification took place directly within commercial rows under the supervision of a visiting training advisor.
- **The Outcome:** By splitting the overall qualification framework into specific, bite-sized credentials, the company achieved a 95% completion rate. This allowed them to deploy targeted drone flights ahead of the seasonal harvest, reducing chemical usage by 18% across their managed vineyards.

6. Core Delivery Systems and Pedagogical Frameworks

To address these structural issues, the Food and Fibre ISB Survey focuses on identifying and scaling responsive, flexible learning delivery models (Food and Fibre ISB, 2026). The current 2026 framework promotes a shift toward hybrid, multi-modal delivery systems that minimize disruption to commercial operations.

Asynchronous Digital Delivery

The integration of cloud-based learning management systems (LMS) allows theoretical work to be completed independently during operational downtime or seasonal periods of low activity. By moving lectures online, the system reduces the need for trainees to travel long distances for classroom sessions. It also enables them to progress through foundational concepts at their own pace, matching their study schedules to seasonal variations on the farm.

Immersive Simulation Technologies

To address safety risks and resource limitations in high-hazard environments, providers are increasingly adopting Augmented Reality (AR) and Virtual Reality (VR) simulations. For example, before an apprentice operates specialized heavy machinery or performs precision pruning on mature vines, they can practice foundational skills within a safe, controlled virtual environment. This approach prevents equipment damage, lowers accident rates, and builds confidence before students transition to live operations.

Contextualized On-Farm Practice

This framework integrates theoretical concepts directly into daily commercial tasks. For instance, instead of studying livestock nutrition or pasture management as abstract academic topics, learning modules are aligned with the farm's current seasonal feed budgeting and animal health schedules. This immediate practical application helps clarify abstract ideas and demonstrates the commercial relevance of the training material.

Competency-Based Assessment Methodologies

In tandem with flexible delivery, assessment methods are moving away from traditional written examinations toward evidence-based competency verification. This shift relies heavily on digital portfolio platforms. Trainees use mobile devices to capture video or photo evidence of themselves completing specific tasks in the field, such as setting up grazing infrastructure,

conducting biosecurity checks, or maintaining machinery. These files are uploaded to an online portal where registered industry verifiers, trusted senior staff members or visiting training advisors: review the evidence against national standards. This approach reduces reliance on traditional external assessors, allows for continuous evaluation, and provides employers with real-time tracking of an apprentice's skill development. Furthermore, the implementation of micro-credentials allows qualifications to be broken down into smaller, targeted modules. Workers can complete specific training units, such as operating automated milking systems or interpreting drone-mapped data, gaining formal recognition for targeted skills without needing to enrol in multi-year qualification pathways.

Dialectical Formative-Assessment in the LMS: Structured Debate and Learner Reasoning (the SNCM)

The Self/Non-Self Collaborative Methodology 2.0 (SNCM) structures a learning task as a bounded dialogic session between a human agent, Self (S), and an AI interlocutor, Non-Self (N). A session opens with S specifying an evaluative standard (ES): an explicit statement of what would count as a good answer, and an initial position (H0). N then produces candidate elaborations, counter-arguments, or alternative framings, which S accepts, rejects, redirects, or synthesises across a small number of structured phases (ideation, structured debate, refinement). The session log therefore contains, for every exchange: the AI-authored candidate content; S's evaluative act on that candidate (accept/reject/redirect/synthesise) with a stated reason; and a running artefact reflecting the accepted synthesis. This structure is a specific formative-assessment design pattern: it is a structured elicitation-and-response cycle in which the 'response' being elicited is the learner's own evaluative judgment rather than a final-answer submission. In Zimmerman's SRL terms, SNCM externalises the performance-phase self-monitoring step, normally invisible to an instructor or an LMS: as a timestamped, auditable decision log. This reframing is deliberate: it lets SNCM be evaluated using the same instruments educational measurement already uses for judging the quality and reliability of assessment evidence (rubric-referenced scoring, inter-rater reliability, standard setting), rather than requiring a bespoke, unverifiable metric. A dialectical approach to formative assessment via structured debate embedded as SDL in the LMS provides an additional opportunity for learning retention and understanding.

7.LMS Utilisation of AI for Formative Assessment

The Formative/Summative Distinction: Origins and Theoretical Development

The formative/summative distinction originates with Michael Scriven's (1967) analysis of curriculum evaluation, where 'formative' evaluation was defined by its function, improving a programme while it is still in progress, in contrast to 'summative' evaluation, which judges a finished product. Benjamin Bloom (1969; Bloom, Hastings & Madaus, 1971) transposed the distinction from curricula to individual learners, proposing 'formative evaluation' as a diagnostic feedback loop within mastery learning: frequent, low-stakes checks used to identify and correct specific gaps before they compound. The modern articulation is Black and Wiliam's (1998) synthesis, 'Inside the Black Box,' which reviewed classroom assessment research and concluded that improving the quality and frequency of formative feedback was among the highest-leverage interventions available to teachers, reporting effect-size estimates that were, in their words, 'among the largest ever reported for educational interventions.' This synthesis was foundational to a generation of policy and practice reform. Contemporary theory situates formative assessment inside self-regulated learning (SRL) frameworks (Zimmerman's cyclical model of forethought, performance, and self-reflection), where formative feedback is not merely corrective information delivered to a learner but an input the learner must metacognitively process, evaluate, and act on.

The Empirical Record: From Optimism to Calibrated Evidence

A clear illustration of how effect sizes shrink under larger, better-controlled designs is the Education Endowment Foundation's (EEF) Embedding Formative Assessment (EFA) trial (Speckesser et al., 2018; Anders et al., 2022). EFA was a cluster-randomised controlled trial across 140 English secondary schools (approximately 25,000 pupils), testing a two-year, teacher-led professional-development programme built around five formative-assessment strategies (clarifying learning intentions; engineering classroom discussion; feedback that moves learning forward; peer instruction; and learner self-ownership). The trial's pre-registered primary analysis found an effect size of 0.09 on general attainment (Attainment 8 GCSE scores), roughly two months of additional progress, significant only at the 10% level, not the conventional 5% threshold; sensitivity and complier-average analyses raised the estimate to 0.11. Critically, the trial found no significant effect on English or Mathematics GCSE outcomes specifically, and no significant narrowing of the disadvantaged-pupil attainment gap. This

contrasts with the substantially larger effect sizes (a pooled estimate around 0.32) reported in the smaller studies that originally motivated the programme.

Formative-assessment interventions that look powerful in small, often teacher-designed studies routinely regress toward much smaller, sometimes non-significant effects when tested at scale, under randomisation, and with less intensive expert involvement. Hattie's (2009) analytic synthesis situates feedback among the more effective classroom influences on average (with substantial heterogeneity across studies and operationalisations of 'feedback'), a broadly consistent finding, but heterogeneity in that literature is itself informative, it indicates that the effectiveness of a given formative-assessment mechanism is highly sensitive to implementation fidelity and to what, precisely, is being measured as 'formative.'

Formative Assessment Inside the LMS: What Digital Platforms Actually Instrument

Learning analytics research on LMS usage has produced better-replicated evidence than classroom-based formative assessment research, precisely because LMS log data is behavioural and automatically captured rather than self-reported. Lu and Cutumisu (2022) analysed 367 undergraduates' Moodle logs and found that lecture attendance had no significant direct effect on final grades; its effect was fully mediated through online engagement and, more specifically, through performance on twelve embedded formative quizzes, a structural-equation model in which formative assessment functioned as the operative mechanism linking classroom presence to outcomes. Wang et al.'s 2025 case study (ACM ICAIFE) modelled the predictive relationship between continuous LMS engagement and formative-assessment performance and final academic achievement in a blended-learning cohort, reinforcing that formative-assessment signal, not raw engagement volume, carries most of the predictive weight. More recent syntheses (Banihashem et al., 2025, on learning analytics for formative assessment; Xu et al., 2026, a meta-analysis of AI-supported self-regulated learning reporting a moderate pooled effect, $g \approx 0.51$, rising to $g \approx 0.94$ for generative-AI interventions specifically during task performance) indicate two consistent patterns: (a) formative-assessment signal extracted from LMS logs is a genuinely useful predictor of outcomes, and (b) generative-AI-mediated interventions currently show the largest, though also the most heterogeneous, effect sizes in this literature: heterogeneity that these syntheses attribute to wide variation in how 'AI feedback' is operationalised across studies.

Despite this predictive value, what current LMS formative-assessment tooling actually instruments is narrow. The table below summarises formative-assessment-relevant capabilities across four widely deployed platforms.

Platform	Automated formative checks	Analytics on engagement	Process/reasoning trace	Adaptive/AI feedback
<i>Canvas</i>	Auto-graded quizzes; mastery paths	Access & submission logs (Canvas Analytics)	None native: text submissions are static artefacts	Third-party LTI add-ons
<i>Moodle</i>	Quizzes with question banks & feedback rules	Extensive log mining (basis for Lu & Cutumisu, 2022)	None native	Plugin-dependent (e.g., adaptive quiz plugins)
<i>Blackboard</i>	Auto-graded assessments; adaptive release	Blackboard Analytics for Learn	None native	Built-in; relies on external AI tools
<i>Google Classroom</i>	Auto-graded Forms quizzes	Built-in analytics	None native	None native

Table 1. Formative-assessment-relevant capabilities of four widely deployed LMS platforms.

All four instrument outcomes and behavioural engagement; none natively capture the learner's evaluative reasoning process.

The Evidentiary Gap: Process versus Product in Self-Directed Learning

Formative assessment has a genuine, if calibrated, evidence base (small-to-moderate effect sizes, highly sensitive to implementation fidelity); LMS platforms reliably instrument behavioural and outcome data. None of the four major platforms surveyed natively captures the learner's reasoning process: the sequence of claims proposed, challenged, revised, and accepted or rejected on the way to a finished artefact. This matters specifically for self-directed learning, where a learner works without a co-present instructor to observe and probe their reasoning in real time. In a self-directed LMS context, an auto-graded quiz can confirm that a learner reached a correct final answer, but it cannot distinguish a learner who reasoned through the material from one who guessed, searched externally, or received an answer from another source: a distinction formative assessment theory treats as central, since the entire justification for formative assessment is that the process of arriving at an answer, not merely the answer, is diagnostic and instructionally actionable. LMS platforms largely lack a structured mechanism

for eliciting, and then evaluating, a self-directed learner's own reasoning process as it happens, in a way that produces gradable, auditable evidence.' Any candidate method for this gap has three obligations that this article treats as its own accountability structure: (i) it must produce an artefact richer than a final answer: an ordered trace of claims and evaluative judgments; (ii) its scoring of that trace must be reproducible by parties other than the learner being assessed; and (iii) its claimed benefits must be stated as testable, falsifiable hypotheses rather than assumed.

SNCM v2.0 as a Formative-Assessment Instrument

The Self/Non-Self Collaborative Methodology 2.0 (SNCM) structures a learning task as a bounded dialogic session between a human agent, Self (S), and an AI interlocutor, Non-Self (N). A session opens with S specifying an evaluative standard (ES): an explicit statement of what would count as a good answer, and an initial position (H0). N then produces candidate elaborations, counter-arguments, or alternative framings, which S accepts, rejects, redirects, or synthesises across a small number of structured phases (ideation, structured debate, refinement). The session log therefore contains, for every exchange: the AI-authored candidate content; S's evaluative act on that candidate (accept/reject/redirect/synthesise) with a stated reason; and a running artefact reflecting the accepted synthesis. The work produced (W) is a synthesis of the dialectical process of S with N, the point of which being to better enable learner reasoning and learning retention via structured debate incorporated into formative assessment as SDL in the LMS.

This structure is a specific formative-assessment design pattern: it is a structured elicitation-and-response cycle in which the 'response' being elicited is the learner's own evaluative judgment rather than a final-answer submission. In Zimmerman's SRL terms, SNCM externalises the performance-phase self-monitoring step, normally invisible to an instructor or an LMS: as a timestamped, auditable decision log. This reframing is deliberate: it lets SNCM be evaluated using the same instruments educational measurement already uses for judging the quality and reliability of assessment evidence (rubric-referenced scoring, inter-rater reliability, standard setting), rather than requiring a bespoke, unverifiable metric.

Operational Definitions: From Philosophical Constructs to Measurable Proxies

The base specification of SNCM used two constructs, 'agency' and 'intellectual formation', as justifications for the method's value, without defining either in measurable terms. Table 2

replaces each construct with one or more observable proxies, each derived from data already present in (or trivially added to) a session log, scoreable by an independent rater who was not the learner.

Construct	Operational proxy	Data source	Scored by
<i>Agency</i>	Origination attribution: proportion of accepted final-artefact content whose originating claim (H0 or a subsequent redirect) is timestamped as S-authored versus N-authored	Session log timestamps + authorship tags	Automated log parse, audited by rater
<i>Agency</i>	Redirect/veto rate: count of S-initiated redirects and vetoes of N output per session, normalised by session length	Session log evaluative-act tags	Automated log parse
<i>Intellectual formation</i>	Oral defensibility score: a post-session structured interview in which S justifies three randomly sampled evaluative decisions from the transcript, scored 0–4 against a rubric for coherence, criterion-reference (does the justification cite the stated ES), and non-circularity	Post-session interview, audio/transcript	Independent trained rater, blinded to session outcome
<i>Intellectual formation</i>	Transfer check: a short novel-context task completed without N, scored against the same ES-derived rubric used in-session	Post-session written artefact	Independent trained rater

Table 2. Operational proxies replacing the undefined constructs 'agency' and 'intellectual formation.' Each proxy is scoreable by a rater other than the learner being assessed, satisfying reproducibility.

Academic Application: Agency, Learning, & Retention

A special note regarding the SNCM's use within conventional academia – the debate protocol is recommended as mandatory. If utilised for students studying towards formal credits and qualifications, the SNCM v2.0 is proposed as a supplementary self-directed learning, delivery method, supporting formative assessment only. For formal study the SNCM operates with greater fidelity when S engages work in digestible, milestone-based portions; such as, sections of 1,000 to 2,000 words at a time, rather than an entire multi-chapter 6,000-word work into a single loop execution. The reason for this is because the milestone-based approach introduces deliberate friction in the collaboration; in order to, compel S to re-engage the works key ideas and intentions throughout production.

Self-Directed Learning (SDL)

The appropriate application of the SNCM v2.0 for formal study (conventional academia) is within the Self-Directed Learning (SDL) component of qualifications, programmes of study and courses. SDL refers to the curriculum structured independent study hours (student directed) that students complete outside of formal classroom contact to meet their course credit requirements e.g. such as formative learning activities, research and required reading. Typically, SDL is housed within a Learning Management System (LMS).

LMS & Formative Assessment

Formative learning activities are the ongoing, low-stakes activities and feedback used during study to help students identify their strengths and weaknesses, rather than to assign a final grade. Many of these formative learning activities are housed within Learning Management Systems (LMS): the digital platform used to deliver, track, and manage educational courses, learning materials, and student progress. The LMS is largely an asynchronous (independent study) curriculum repository, discoverable learning activities by students in isolation. The SNCM v2.0 introduces an opportunity for student-AI collaborative engagement on aspects of the SDL curricula and corresponding formative assessment activities towards the construction of their learning via co-creation within the SNCM's dialectical methodology.

Given that many formal academic written works (formative and summative assessment) are already, to varying degrees, constitutive of AI generation their production (whether disclosed or not), the SNCM's dialectical co-creative methodology is proposed to reinforce agency of S, learning and retention in parallel to assistive/generative AI use. It can also provide a transparent

record and archive of student learning that can be utilised by both student and teacher as a learning portfolio throughout a programme study.

Reinforcement of Asynchronous LMS Formative Assessment

The SNCM v2.0 includes three optional post-session academic reinforcement provisions designed for institutional contexts requiring independent verification of S's intellectual engagement and efficacy with a learning output.

Written Test: Immediate

N generates five comprehension and application questions about W (work generated by S) immediately following the session. S completes the test without access to W or the session transcript. Questions assess substantive understanding, not surface recall.

Written Test: Deferred (Seven Days)

The same or equivalent test (different questions) is administered seven days after the session to distinguish immediate recall from consolidated understanding. A substantial performance decline between the two administrations is an indicator of surface rather than substantive engagement.

Oral Examination

S completes a real-time oral examination with a human or interlocutor (assessor, verifier, supervisor, tutor, teacher, lecturer). The oral test assesses S's capacity to defend W's claims extemporaneously, respond to challenges, and extend the argument beyond the specific formulations in W. This capacity requires genuine intellectual internalisation and cannot be produced by preparation assistance.

8. NZQA Moderation Standards for Digital E-Portfolio Validation Models

As providers transition away from paper-based logbooks to digital e-portfolios, the New Zealand Qualifications Authority (NZQA) has instituted strict National External Moderation guidelines to ensure national consistency and validity under the 2026 rules. For work-based learning evidence captured via smartphones or tablets (such as video logs of a trainee performing a stock audit or photo logs of chainsaw maintenance), the platform and the assessor must comply with three core validation standards:

- 1. Authenticity: Metadata verification (GPS & Time)*
- 2. Sufficiency of Evidence: Unedited, high-definition*
- 3. Attestation & Chain of Custody: Secure access codes*

Authenticity Frameworks

The provider must prove that the digital evidence uploaded belongs genuinely to the trainee and was recorded within an appropriate workplace context. NZQA requires e-portfolio metadata tracking. The software must automatically log the geographic GPS coordinates and exact timestamp of every media file uploaded. This data is audited by external moderators to cross-reference the evidence against the employer's active timesheets, eliminating the risk of historical or plagiarized media usage.

Sufficiency and Clarity of Evidence

Video evidence submitted to validate high-risk competencies must be recorded in high-definition and contain no cuts or edits during active task execution. For example, in validating the unit standard for felling a tree, the video must clearly show the trainee's face at the start, capture the complete creation of the scarf and back-cut in a single continuous shot, and verify the clearing of the escape route. If the video stream drops or contains post-production edits, NZQA moderation rules require the internal assessor to mark the evidence as invalid.

Attestation and Chain of Custody

Every digital portfolio submission must include a secure, verified digital signature or attestation from an approved industry supervisor. The e-portfolio platform must maintain separate, password-protected access tiers for the trainee and the employer-mentor. When a supervisor marks a skill as 'competent', the system must record a non-editable log entry showing the

supervisor's Unique Assessor Number and IP address. This digital footprint preserves the chain of custody and ensures compliance during subsequent NZQA external quality reviews.

9. Te Tiriti o Waitangi Compliance and Māori-Centric Learning Models

A core requirement of New Zealand's 2026 vocational education system is ensuring compliance with the principles of Te Tiriti o Waitangi (The Treaty of Waitangi). This responsibility involves actively working to reduce historic disparities in educational outcomes and supporting Māori self-determination in skills development. The primary sector relies heavily on the Māori economy, which holds substantial assets in collective farming, forestry, and fisheries. To meet Treaty obligations, the WBL system must move beyond standard Western educational models and embed indigenous pedagogical frameworks within everyday training practices (Alkema, 2022).

Whanaungatanga (Relational Interconnection)

This principle emphasizes that learning is inherently relational rather than just an individual administrative process. Within WBL, whanaungatanga requires building deliberate connections among the trainee, their family (whānau), the employer, and the training provider (Alkema, 2022). Providers practice this by involving the learner's community in progress reviews and creating welcoming orientation spaces. This relational approach helps establish a shared network of support, which can improve retention rates by reducing the isolation often felt by young workers entering rural industries.

Manaakitanga (Pastoral Care and Mutual Respect)

This framework guides the delivery of holistic support and pastoral care. Under the Education (Pastoral Care of Tertiary and International Learners) Code of Practice, providers must ensure that a student's physical, emotional, and cultural well-being is supported alongside their academic studies. In a practical sense, manaakitanga means training advisors look beyond basic academic metrics. They actively address wider personal and professional challenges, such as rural housing quality, mental health stress, and financial difficulties, recognizing that these external factors directly impact a learner's ability to focus and succeed on the job.

Ako (Reciprocal Learning)

The concept of ako challenges traditional top-down teaching dynamics by recognizing that learning is a reciprocal process. In a workplace context, this principle values the unique perspectives and cultural knowledge that young trainees bring to a business. While the employer provides technical expertise, the trainee may offer fresh insights in areas like digital

technology, sustainable environmental practices, or culturally inclusive communication. Embracing ako fosters a collaborative workplace environment where learning flows both ways, building mutual respect between experienced staff and new apprentices.

Tuakana-Teina (Peer Mentorship)

This pedagogical structure pairs experienced workers (tuakana) with newer trainees (teina) within the business or wider regional network. This relationship provides fresh apprentices with an accessible point of contact for daily guidance, helps them adapt to workplace culture, and provides a safe space to ask questions without the pressure of formal evaluation. For the experienced mentor, the role offers a structured pathway into leadership and instructional management, strengthening overall training capacity within the business.

By using these culturally responsive frameworks, the 2026 WBL system aims to create inclusive environments that support positive completion rates for Māori and Pacific learners (Alkema, 2022).

10. Main Providers and Best Performers: Institutional Analysis

Following the 2026 structural transition, New Zealand's WBL delivery network features a mix of specialized sector organizations and regional public institutions.

Primary ITO

The primary provider in the food and fibre sector is the transitioning Primary ITO. Operating within the current temporary ISB infrastructure, it manages workplace training for thousands of apprentices across agricultural, horticultural, viticultural, and water-treatment industries (Primary ITO, 2026). Its national scale allows it to maintain a comprehensive network of field-based training advisors. These advisors visit workplaces regularly, help employers build structured training plans, and moderate assessments to ensure consistent national quality standards. The organization's main strength lies in its ability to translate national qualification standards into clear, practical learning guides that fit seamlessly into daily farm routines.

Eastern Institute of Technology (EIT) and Southern Institute of Technology (SIT)

On a regional level, institutions like the Eastern Institute of Technology (EIT) in the Hawke's Bay and Tairāwhiti regions, and the Southern Institute of Technology (SIT) in Southland, stand out as leading performers (Eastern Institute of Technology, 2024). These regional polytechnics have maintained strong links with local industries, allowing them to align their campus facilities with regional labour demands. For example, EIT's viticulture programs work directly with local vineyards, ensuring that block courses and practical workshops are scheduled around the seasonal demands of the wine industry. Similarly, SIT utilizes its regional funding allocations to provide targeted, low-cost training options that reduce financial barriers for rural families and small businesses.

Te Wānanga o Aotearoa

Te Wānanga o Aotearoa is a critical contributor to the national network, providing vocational pathways that combine practical technical training with cultural education. Its programs place a strong emphasis on kaitiakitanga (guardianship of land and resources), which aligns closely with modern sustainability requirements in farming, forestry, and resource management. By delivering education grounded in indigenous values, Te Wānanga o Aotearoa achieves high engagement and completion rates among learners who may not have succeeded in traditional, lecture-based training environments.

11. International Benchmarking: Comparative Historical and Financial Analysis

To understand the unique features of New Zealand's 2026 decentralized system, it is useful to compare it with the historical development and funding models of four OECD nations: Germany, France, the United Kingdom, and Australia (OECD, 2022).

Germany: The Dual System (Duales System)

Germany's vocational system is built on a long-standing tripartite governance model formalized by the Vocational Training Act of 1969 (Berufsbildungsgesetz) (Busemeyer & Trampusch, 2012). This structure divides responsibilities evenly among the Federal Government, trade unions, and regional Chambers of Commerce and Industry (IHK/HWK) (Busemeyer & Trampusch, 2012). The funding model relies on a clear split: private employers cover apprentice wages and the costs of in-company training, while public tax revenue funds the state-run vocational schools (Berufsschulen) (Busemeyer & Trampusch, 2012). These schools deliver the theoretical component of the curriculum. The German model benefits from high social standing and clear legal protections. However, its rigid multi-year timelines can make it slow to update qualifications in response to rapid technological changes, and it faces ongoing competition from academic university pathways.

France: The Apprenticeship System (Apprentissage)

France has introduced major reforms over the past decade, most notably through the 2018 Freedom to Choose One's Professional Future Act (Loi pour la liberté de choisir son avenir professionnel). This legislation overhauled both system governance and funding, moving management away from state bureaucracies toward industry-led sectoral branches known as Opérateurs de compétences (Opco). The French system is funded by a dedicated national apprenticeship tax (Taxe d'apprentissage), which requires companies to contribute a percentage of their total payroll to a centralized skills fund. These resources are redistributed to training centres based on actual apprentice enrolment numbers. While this demand-driven funding model has helped increase overall apprenticeship participation, it has also created a complex administrative framework that small businesses can find difficult to navigate without specialized support.

United Kingdom: The Apprenticeship Levy Model

The United Kingdom shifted toward an employer-led system with the introduction of the Apprenticeship Levy in 2017. Under this policy, UK companies with an annual payroll exceeding £3 million are required to contribute 0.5% of their wage bill into a digital apprenticeship service account. These businesses can then claw back these funds exclusively to pay for approved external apprenticeship training and assessment. Standards are designed directly by employer panels, known as ‘Trailblazers’, and overseen by the Institute for Apprenticeships and Technical Education (IfATE). While the levy mechanism has successfully increased funding from large corporate employers, it provides fewer incentives for small businesses that fall below the payroll threshold. This leaves small firms reliant on limited government co-investment pools and contributes to a fragmented training provider market.

Australia: The Competency-Based VET Framework

Australia’s Vocational Education and Training (VET) system operates within a federal framework managed nationally by Jobs and Skills Australia, while operational delivery is handled by state-level Technical and Further Education (TAFE) institutes and private providers. Industry standards are maintained by Jobs and Skills Councils (JSCs), which ensure qualifications align with national workplace competencies. The funding framework relies on a ‘user-choice’ model, where state subsidies follow individual learners to their chosen provider, combining public funding with employer contributions and student fees. The Australian system offers high flexibility through a modular, competency-based structure. However, it faces ongoing structural challenges in maintaining consistent training quality across a diverse provider network and ensuring equitable access to training in remote rural areas.

12. Empirical Evidence, Policy Trajectories, and Continuous Systems Improvement

Recent research in vocational education highlights several clear pathways for improving the performance and sustainability of New Zealand's WBL network (Vaughan, 2011; Alkema, 2022). Studies demonstrate that completing a qualification depends on more than just the technical quality of the curriculum; success is heavily influenced by the social and organizational environment where the learning takes place (Vaughan, 2011).

Professional Development for Employers

A primary recommendation across current literature is the need for structured professional development for employer-mentors (Vaughan, 2011). Research indicates that while small business owners possess high-level technical skills, they frequently lack formal training in instructional design, workplace communication, and formative assessment techniques (Vaughan, 2011). To bridge this gap, the network of provision should offer targeted micro-credentials in adult education tailored specifically for business owners. Providing employers with foundational teaching tools can improve the clarity of on-job instruction, reduce workplace frustration, and create a more supportive learning environment for apprentices.

Aotearoa Culturally Inclusive Environments

New Zealand-specific empirical data indicates that completion rates for Māori and Pacific learners improve significantly when training models incorporate indigenous worldviews (Alkema, 2022). For the primary sector, this means actively supporting initiatives that connect technical training with concepts like kaitiakitanga (environmental stewardship) and manaakitanga (holistic learner care) (Alkema, 2022). When providers and employers value a trainee's cultural identity and community connections, it fosters a stronger sense of belonging. This inclusive approach helps lower disenrollment rates and improves overall student well-being in rural industries.

Adapting the Unified Funding System

Finally, empirical reviews of the Unified Funding System point to a need for more flexible funding allocations in rural regions (New Zealand Ministry of Education, 2024). Fixed, volume-based funding models often disadvantage remote providers who operate with smaller student cohorts but face higher travel and delivery costs. Expanding the strategic component

of the UFS would allow the government to offer targeted support to regional training hubs (New Zealand Ministry of Education, 2024). This targeted funding can ensure that high-quality, work-based learning options remain accessible and viable outside of major urban centres, protecting regional equity and economic development.

13. Conclusion and Strategic Policy Outlook

Aotearoa New Zealand's work-based learning network is at another pivotal point of structural change. Shifting away from a centralized model toward a regionalized network offers an opportunity to build a more responsive, industry-aligned vocational education system (Tertiary Education Commission, 2026b). To achieve long-term stability, the system must balance industry-led standard-setting with secure public funding through the Unified Funding System (New Zealand Ministry of Education, 2024). It must also continue to honour Te Tiriti o Waitangi obligations by embedding indigenous pedagogical models into daily training practices (Alkema, 2022).

Enhancing WBL learner asynchronous engagement in an LMS via a dialectical reasoning context, is proposed to, assist the WBL mode of delivery in terms of a sustained, documented collaborative practice between a learner and AI interlocutor towards deeper learning retention, engagement and understanding, throughout their structured learning. The SNCM v2.0 methodology is proposed for collaborative reasoning for formative assessment associated with SDL within a WBL LMS, featuring conceptual dialogical analysis, structured debate and argument testing (testing practice e.g. practical applications via scenario): each piece of work refining and building upon the previous. Refinement within a WBL LMS towards dialectical formative assessment embedded in self-directed learning is proposed to assist with specific structural and fiscal challenges within WBL for tertiary education providers and WBL employers:

- Fiscal challenges on the Delivery Component (TEC funding)
- Volatile revenues and highly sensitive regional employment rates associated with seasonality
- Polytechnic high fixed-cost overheads
- Heavy reliance on the Strategic Component and the Learner Component (TEC funding)
- Reliance on the equity-focused learner component (TEC funding)
- Enhancing fixed operational expenses for the LMS in parallel to variable cost per student situationally
- Clarity of asynchronous regular hours aligned with clear corporate pathways
- Reducing a highly variable and fragmented environment by enhancing the LMS

- Seasonal winter off-season's utilising an enhanced LMS to help reduce seasonal cycle disrupting learning continuity via short course micro-credentialing
- Geographic isolation and internet access is an issue for a small percentage of WBL learners, therefore 'off-line' LMS repositories are a possible exploration e.g. a local self-contained purpose built LMS owned by TEC pertinent to each ISB division of WBL e.g. 24/7 access to a curriculum repository with built in application and adaptability irrespective of internet connection
- Enhanced LMS formative assessment functionality can reduce logistical issues associated with visits from training advisors on site
- Employer capacity is an issue where a majority of WBL employers are fewer than five permanent employees, the LMS formative assessment enhancement including simulation is a key add on e.g. micro-businesses where there is no dedicated human resource
- Reduce the variability and accessibility of learner experience for trainees by enhancing the formative assessment component of WBL in the LMS, including live and asynchronous mentoring e.g. mentor avatars simulating workplace supervision (dedicated expertise as interlocutor and mentor, virtual)
- LMS formative assessment enhancements will minimize disruption to commercial operations
- Enhancing simulations in the LMS in parallel to targeted formative assessment will help transition learners to live operations e.g. reduced disruption to staff and immediate practical application and verification in situ post (competency verification)
- Gaining formal recognition for targeted skills without needing to enrol in multi-year qualification pathways e.g. targeted micro-credentialing
- Enhancing the LMS and formative assessment component of SDL with portfolio platforms that include structured debate logs linked to formative assessment as evidence supporting summative assessment
- NZQA requires e-portfolio metadata tracking for remote verifications (digital evidence e.g. video), this and the LMS functionality with structured debate would reduce the isolation often felt by young workers entering rural industries
- Training advisors looking beyond basic academic metrics would appreciate the ability to review data logs evidencing learner reasoning behind work production, and could also further test based on those logs for veracity

- Personal and professional challenges, such as rural housing quality, mental health stress, and financial difficulties e.g. embedding an enhanced LMS with the structured reasoning interlocutor and virtual mentor could assist in the support functionality of an LMS beyond the academic framework and support positive retention, completion and progression rates
- More flexible funding allocations in rural regions for asynchronous LMS enhancements towards virtual mentors and structured reasoning in parallel to targeted micro-credentials in adult education tailored for both (i) trainee learner/employees, and (ii) for business owners that require supports

By learning from the structural features of AI interlocutors for LMS enhancements and learning reasoning, international VET models, such as Germany's clear governance partnerships or the UK's employer-funding mechanisms: while maintaining a focus on regional needs, New Zealand can build an equitable, resilient vocational training framework.

14. Glossary of Technical Terms

Ako: A Māori pedagogical concept describing the reciprocal nature of teaching and learning, where the educator learns from the student and the student teaches the educator.

Apprenticeship Levy: A UK tax system introduced in 2017 requiring companies with annual payrolls over £3 million to allocate 0.5% of their wage bill toward a dedicated digital fund used for apprenticeship training.

Berufsschule: Publicly funded vocational schools in Germany that provide the theoretical component of the country's dual education system.

Competency-Based Assessment: An evaluation method focused on measuring a learner's practical ability to perform specific workplace tasks against predefined industry standards, rather than relying on traditional written exams.

Industry Skills Board (ISB): Industry-led groups established during New Zealand's 2026 reforms to identify sector skill requirements, maintain qualification standards, and oversee the initial transition of work-based learning delivery.

Micro-credential: A compact, stand-alone educational unit that certifies a learner's competence in a specific practical skill or narrow subject area.

Network of Provision: The combined national and regional framework of polytechnics, wānanga, and private training establishments funded by the government to deliver vocational education.

Opérateurs de compétences (Opc): Sector-specific, industry-led bodies in France responsible for managing apprenticeship funding and updating qualifications to meet changing workforce needs.

Pastoral Care Code: This legislative framework mandates specific well-being and safety protections that providers must deliver to students.

Self/Non-Self Collaborative Methodology (SNCM v2.0): A dialectical approach to formative assessment via structure debate within SDL on an LMS, requiring learners to engage in live logged ‘reasoning sessions’.

Unified Funding System (UFS): The operational funding framework used by the Tertiary Education Commission to distribute resources across the vocational sector using delivery volume, equity components, and strategic allocations.

Wānanga: Publicly funded tertiary education institutions in New Zealand that deliver academic and vocational programs grounded in Māori traditions, culture, and values.

Work-Based Learning (WBL): Structured vocational training delivered primarily within an active workplace environment in partnership with an accredited education provider, encompassing apprenticeships and formal traineeships.

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