

Blended Teaching in Introductory Management Courses in Higher Vocational Education: A Mechanism-Oriented Conceptual Framework Linking Digital Literacy Development and Student Engagement

Baoyin Liu¹, Rozaini Binti Rosli^{1*}

¹ School of Business and Management, Lincoln University College, 47301 Petaling Jaya, Selangor, Malaysia. *rozaini@lincoln.edu.my

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ABSTRACT:

Blended teaching is now widely promoted in higher vocational education, yet its value is still often judged by platform use, video completion or general satisfaction rather than by what students learn to do in disciplinary tasks. This paper develops a mechanism-oriented conceptual framework for introductory management courses, a course category commonly referred to as basic management in Chinese higher vocational colleges. The framework explains how blended teaching may become educationally consequential when online preparation, classroom case analysis, digital collaboration, formative feedback and post-class revision are aligned. Drawing on social cognitive theory, the Community of Inquiry perspective, student engagement theory and the DigComp 2.2 framework, the paper conceptualises digital literacy development as a course-level capability pathway and student engagement as a conversion mechanism through which capability is translated into applied management learning effectiveness. The paper also offers a course-level teaching cycle, construct definitions, a measurement blueprint and an empirical validation protocol using time-lagged survey data, learning-management-system traces, rubric evidence and course-performance indicators. Its contribution is to move blended teaching research beyond delivery-mode comparison and toward a more precise explanation of how digital capability and engagement may jointly support management reasoning, case analysis and transfer-oriented learning in vocational settings.

Keywords: blended teaching approaches; digital literacy development; student engagement; introductory management courses; mechanism-oriented framework; higher vocational education.

1. Introduction

1.1 Background and problematisation

Higher vocational education is being reshaped by digitalisation, changing employment

structures and the demand for graduates who can apply knowledge in technology-mediated workplaces. Digital transformation has altered how students access information, collaborate with peers, present solutions and receive

feedback. It has also changed the skills expected of vocational graduates, who are increasingly required to combine disciplinary knowledge with digital communication, information evaluation and problem-solving capabilities (Achtenhagen & Achtenhagen, 2019; Haleem et al., 2022; OECD, 2025; Vuorikari et al., 2022). In this setting, blended teaching is no longer a temporary response to emergency online learning; it has become part of the long-term redesign of vocational teaching.

Introductory management courses, commonly named basic management courses in Chinese higher vocational colleges, are a useful site for examining this redesign. These courses introduce students to planning, organising, leading, motivating, communicating, controlling and decision-making. Their practical value lies not in the memorisation of definitions, but in helping students interpret organisational problems, coordinate group work, justify managerial choices and communicate solutions. Nevertheless, the course is often delivered as a lecture-based foundation subject. When students encounter management mainly through textbook concepts, they may find the course abstract and distant from future employment. This weakens both engagement and transfer.

Blended teaching offers a possible response, but only when it is treated as instructional design rather than as platform operation. A basic management course does not become blended simply because slides, videos and quizzes are uploaded before class. It becomes pedagogically blended when online preparation is explicitly tied to classroom case analysis, when in-class activities require students to use what they prepared, and when post-class digital tasks help them revise, reflect and transfer management reasoning. This distinction is important because recent studies have found that blended learning may improve flexibility, access and participation, but its effects depend on alignment among learning activities, assessment, feedback and teacher facilitation (Hrastinski, 2019; Istenič, 2024; Müller & Mildemberger, 2021; Rasheed et al., 2020; Song & Lai, 2025).

A further issue is that existing studies often ask whether digital technology is used, while paying less attention to how it becomes educationally consequential. Zhang et al. (2024), for example, show that digital technology usage affects Chinese higher vocational students through learning experience and learning engagement rather than through mere exposure to technology. Xianghan Zhang's (2026) study of vocational and applied higher education likewise shows that teaching approaches influence student outcomes through motivational and commitment-related mechanisms. These studies point to a more precise question for blended management teaching: through what mechanisms does blended teaching shape students' learning?

1.2 Research purpose and questions

This paper responds to that issue by developing a mechanism-oriented conceptual framework for introductory management courses in higher vocational education. The framework treats blended teaching as an instructional ecology composed of online preparation, classroom application, digital collaboration, formative feedback and reflective transfer. It treats digital literacy development as a course-level capability outcome and student engagement as the behavioural and psychological process through which students turn that capability into applied management learning.

The paper addresses four research questions. RQ1: How can blended teaching be conceptualised for introductory management courses in higher vocational education? RQ2: How may blended teaching contribute to digital literacy development as a course-level outcome? RQ3: How are digital literacy development and student engagement theorised as linked mechanisms in applied management learning? RQ4: How can the proposed framework be operationalised for future empirical validation without reducing blended teaching to platform use?

1.3 Contribution and article structure

The paper makes three contributions. First, it shifts blended teaching research from a delivery-mode comparison to a mechanism-centred explanation. Rather than asking whether blended teaching is better than traditional teaching, it examines how blended design may develop students' capabilities and activate learning behaviour. Second, it repositions digital literacy as something that can be cultivated, practised and assessed within management tasks rather than as a fixed learner attribute. Third, it specifies how student engagement may convert digital capability into applied management learning effectiveness, especially when students analyse cases, justify decisions, collaborate on proposals and revise their reasoning after feedback.

The remainder of the paper is organised as follows. Section 2 reviews the literature on blended teaching, introductory management courses, digital literacy and student engagement. Section 3 develops the theoretical framework and propositions. Section 4 presents a course-level design and methodological protocol for future empirical validation. Section 5 discusses theoretical, practical and institutional implications. Section 6 concludes the paper.

2. Literature Review and Research Positioning

2.1 Blended teaching as a designed instructional ecology

Blended learning is often defined as the combination of face-to-face and online instruction, but this operational definition is too thin for course redesign. Hrastinski (2019) argues that blended learning should be understood through the integration of learning experiences rather than through a fixed percentage of online activity. This view is consistent with the Community of Inquiry perspective, in which teaching presence, social presence and cognitive presence jointly support meaningful learning in technology-mediated environments (Garrison et al., 2000). In a

vocational course, the central question is therefore not how much content is online, but how online and offline work are connected to applied learning tasks.

Recent reviews of blended and online learning report benefits such as flexibility, access, student autonomy and resource availability, but they also identify challenges related to workload, feedback quality, interaction, digital readiness and assessment alignment (Akpen et al., 2024; Bond et al., 2020; Hu et al., 2024; Müller & Mildenerberger, 2021; Rasheed et al., 2020; Song & Lai, 2025). These findings caution against assuming that blended teaching is inherently effective. Its value depends on whether course design enables preparation, interaction, feedback and transfer. For an introductory management course, this means that online lectures should prepare students for case-based work, not duplicate textbook reading; online quizzes should diagnose conceptual difficulty, not merely record compliance; and digital collaboration should help students produce management solutions, not just divide assignment labour.

2.2 Introductory management courses in higher vocational education

Introductory management courses are foundational in business administration, accounting, logistics, e-commerce, marketing, tourism, finance and public service programmes. They introduce the language and logic of organisational work, including task allocation, team coordination, communication, leadership, motivation and control. In higher vocational education, these concepts must be connected to applied competence because students are expected to solve practical workplace problems after graduation (Achtenhagen & Achtenhagen, 2019; Ng et al., 2023).

Management education research has shown that online and blended formats require curriculum adaptation rather than simple content migration. Ng et al. (2023) identify online learning in management education as a field shaped by interaction, digital resources and pedagogical

redesign. Ngoasong (2022) further argues that blended learning requires adaptation to institutional resources and learner contexts. These arguments are especially relevant to vocational colleges, where students may have diverse academic preparation, different levels of digital readiness and strong expectations for practice-oriented learning.

In an introductory management course, students can be asked to analyse why a team failed to coordinate, compare alternative leadership responses, evaluate the credibility of information used in a business decision or prepare a digital proposal for improving a workflow. Such tasks connect management theory with occupational situations. They also make blended teaching meaningful because digital resources, classroom discussion and post-class revision become parts of one learning sequence.

2.3 Digital literacy development

Digital literacy is more than technical familiarity with devices. The DigComp 2.2 framework defines digital competence through five areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving (Vuorikari et al., 2022). These areas are directly relevant to vocational management learning. Students need to identify credible business information, compare sources, collaborate through digital platforms, produce digital artefacts and recognise ethical risks in online communication.

Digital literacy research also warns against assuming that younger students are automatically digitally competent. Pangrazio et al. (2020) emphasise that digital literacy is socially and pedagogically constructed. Scale-development studies in higher education further show that digital literacy should be measured as a multidimensional construct rather than as a single attitude toward technology (Amin et al., 2021; Avinç & Doğan, 2024). In blended management teaching, digital literacy should therefore be designed, practised and assessed. It can be developed when students evaluate sources for a management case, co-edit a group

report, create a digital presentation or use platform feedback to revise their reasoning.

This paper uses the term digital literacy development deliberately. Development implies change over time and should not be measured only through an end-of-course self-report. Strong empirical work should combine baseline measurement, post-course measurement and performance-based evidence such as source-evaluation rubrics, digital portfolios and collaborative document histories (El Messaoudi, 2024; Vuorikari et al., 2022).

2.4 Student engagement

Student engagement is a multidimensional construct. Fredricks et al. (2004) distinguish behavioural, emotional and cognitive engagement, while Reeve (2013) adds agentic engagement to capture students' constructive contribution to their learning environment. Wong and Liem (2022) further clarify that engagement should be treated as a refined, multidimensional concept rather than a single indicator of activity. In higher education, validated engagement instruments have been used to capture students' participation, investment, belonging and learning strategies (Assunção et al., 2020; Li et al., 2023).

Educational technology can support engagement when it strengthens interaction, feedback and active learning. Bond et al. (2020), Bedenlier et al. (2020) and Nkomo et al. (2021) show that digital tools can facilitate engagement, but their effects depend on how the tools are embedded in pedagogy. A student who watches videos and clicks through quizzes may still remain cognitively passive. In contrast, a student who uses online preparation to ask better questions, contribute to case discussion and revise a management proposal is more deeply engaged.

Recent engagement research also supports the link between engagement and learning outcomes. Wong et al. (2024) report a positive association between student engagement, academic achievement and subjective well-being.

Jang et al. (2024) show that agentic engagement and autonomy support may have reciprocal relations over time. These findings are relevant to blended management courses because students need both structured support and opportunities to contribute ideas, ask questions and shape group solutions.

2.5 Research gap and positioning

Table 1 positions the present paper against the main literature streams. Existing research has

established the importance of blended learning, digital literacy and engagement, but has not sufficiently explained how these mechanisms operate in introductory management courses in higher vocational education. The unresolved issue is not whether blended teaching is used, but how it becomes educationally consequential in a course where students must translate abstract management concepts into situated organisational reasoning.

Table 1. Literature positioning and research gap

Research stream	Recent insight	Remaining limitation	Positioning of this paper
Blended learning in vocational education	Blended learning can improve flexibility, access and participation when online and face-to-face components are aligned.	Many studies remain course-general and platform-centred.	Conceptualises blended teaching as a designed instructional ecology for introductory management courses.
Digital technology in higher vocational education	Digital technology usage can affect student experience, engagement and satisfaction in Chinese higher vocational colleges.	Digital competence is often treated as a prerequisite rather than a developmental course outcome.	Positions digital literacy development as a course-level capability pathway cultivated through management learning tasks.
Management education	Online and blended management education requires curriculum adaptation, interaction and contextualised application.	Introductory management courses in vocational schools receive limited theoretical attention.	Links management concepts to case analysis, digital collaboration and applied reasoning.
Student engagement	Engagement is associated with academic achievement and can be supported by educational technology.	Platform activity is often mistaken for deep engagement.	Defines engagement through behavioural, cognitive, emotional and agentic dimensions and treats it as a conversion mechanism.
Digital literacy frameworks	DigComp 2.2 provides a multidimensional framework for digital competence.	Frameworks are not always translated into course-level pedagogy.	Embeds DigComp areas into management assignments and assessment evidence.

Note. Synthesised from Bond et al. (2020), Fredricks et al. (2004), Hrastinski (2019), Ng et al. (2023), Ngoasong (2022), Nkomo et al. (2021), Song and Lai (2025), Vuorikari et al. (2022), Zhang (2026) and Zhang et al. (2024).

3. Theoretical Development and Propositions

3.1 Complementary theoretical foundations

The framework uses several theoretical perspectives in a complementary rather than decorative manner. Social cognitive theory provides the macro logic of environment-capability-behaviour-outcome relations (Bandura, 1986). In this logic, blended teaching is an environmental condition, digital literacy development is a personal capability, student engagement is behavioural and psychological activation, and applied management learning effectiveness is the course-level outcome. DigComp 2.2 specifies the digital capability domain (Vuorikari et al., 2022). Student engagement theory explains how participation, cognitive investment, emotional relevance and agentic contribution transform instructional opportunities into learning behaviour (Fredricks et al., 2004; Reeve, 2013; Wong & Liem, 2022).

The Community of Inquiry perspective informs the design of the blended learning environment.

Teaching presence is reflected in task sequencing, feedback and assessment alignment; social presence is reflected in peer discussion and collaborative production; and cognitive presence is reflected in inquiry, case analysis and reflective transfer (Garrison et al., 2000). The DigComp 2.2 framework specifies the capability domain of digital literacy (Vuorikari et al., 2022), while engagement theory explains how students transform instructional opportunities into learning through participation, cognitive effort, emotional involvement and agency (Fredricks et al., 2004; Reeve, 2013; Wong & Liem, 2022).

3.2 Conceptual model

Figure 1 presents the mechanism-oriented conceptual framework. The figure is embedded here to clarify the proposed direct, parallel and sequential pathways. Because this paper is a conceptual and methodological article, the relationships are expressed as propositions rather than as empirically tested hypotheses.

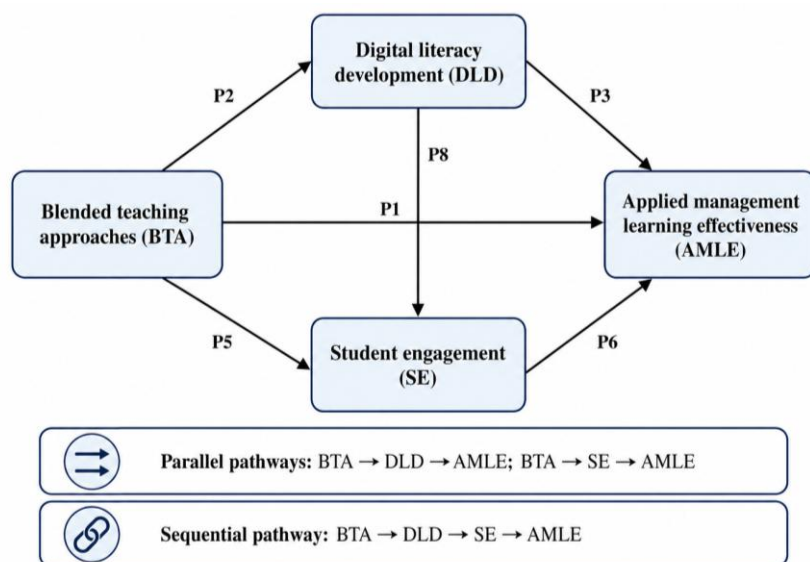


Figure 1. Mechanism-oriented conceptual framework

Note. Developed by the authors based on Bandura (1986), Fredricks et al. (2004), Garrison et al. (2000), Reeve (2013), Vuorikari et al. (2022), Wong and Liem (2022) and Wong et al. (2024).

3.3 Blended teaching and applied management learning effectiveness

Blended teaching is expected to influence applied management learning effectiveness when it links preparation, application, feedback and transfer. Online preparation can introduce

core concepts such as planning, leadership and control before class. Classroom activities can then require students to apply those concepts to organisational cases. Post-class digital tasks can support revision, reflection and presentation. This sequence is more likely to produce learning than a loose combination of uploaded materials and conventional lectures (Hrastinski, 2019; Istenič, 2024; Song & Lai, 2025).

Applied management learning effectiveness refers to students' ability to understand management concepts, analyse organisational cases, collaborate on management problems, communicate solutions and transfer learning to realistic workplace scenarios. It should be distinguished from general satisfaction. A student may be satisfied with convenient online materials but still fail to apply management concepts in a case. Therefore, the proposed outcome is deliberately course-specific and competence-oriented.

P1. Coherent blended teaching is expected to strengthen applied management learning effectiveness in introductory management courses.

3.4 Digital literacy development as a capability pathway

Blended teaching can support digital literacy development when students are required to use digital tools for meaningful management tasks. For example, students may evaluate the reliability of online information before using it in a decision-making case, co-edit a team report on organisational communication, or create a digital presentation justifying a leadership strategy. In these activities, digital literacy is not separated from management learning; it becomes part of how students learn management.

Digital literacy development is also expected to support learning effectiveness. Students who can locate, compare and organise digital information are better prepared for case analysis. Students who can collaborate digitally are better able to produce group management

solutions. Students who can interpret digital feedback can revise their work more effectively. This argument is consistent with studies showing that digital literacy and digital learning experiences can influence higher education learning outcomes (Amin et al., 2021; Avinç & Doğan, 2024; El Messaoudi, 2024; Vuorikari et al., 2022).

P2. Coherent blended teaching is expected to strengthen students' digital literacy development.

P3. Digital literacy development is expected to strengthen applied management learning effectiveness.

P4. Digital literacy development is expected to function as a capability pathway linking blended teaching and applied management learning effectiveness.

3.5 Student engagement as a conversion mechanism

Student engagement explains how course design becomes learning behaviour. A well-designed blended course invites students to prepare before class, ask questions, participate in case discussion, collaborate on digital artefacts and revise their reasoning after feedback. These activities can strengthen behavioural engagement through participation, cognitive engagement through analytical effort, emotional engagement through perceived relevance and agentic engagement through student contribution (Assunção et al., 2020; Fredricks et al., 2004; Jang et al., 2024; Reeve, 2013).

Engagement is especially important for introductory management courses because management learning requires judgement rather than rote recall. Students must interpret ambiguous situations, compare alternatives, defend choices and learn from peers. Educational technology can support this process when it enables interaction and feedback, but platform use alone is not evidence of engagement (Bedenlier et al., 2020; Bond et al., 2020; Nkomo et al., 2021).

P5. Coherent blended teaching is expected to strengthen student engagement in introductory management courses.

P6. Student engagement is expected to strengthen applied management learning effectiveness.

P7. Student engagement is expected to function as a conversion pathway linking blended teaching and applied management learning effectiveness.

3.6 Digital literacy development and engagement as a sequential pathway

Digital literacy development may also support engagement. Students who can use digital tools with confidence are more likely to participate in online discussion, search for relevant case information, contribute to group documents and interpret teacher feedback. Students with weak digital literacy may avoid digital tasks or participate only superficially because they experience the blended environment as technically burdensome. In this sense, digital literacy development can reduce participation barriers and create the conditions for deeper engagement.

This serial mechanism is consistent with social cognitive theory. A learning environment can develop personal capability; personal capability can then shape learning behaviour; and learning behaviour can influence outcomes (Bandura, 1986). It is also consistent with Zhang et al. (2024), who show that digital technology use in higher vocational education affects student satisfaction through learning experience and engagement, and with Xianghan Zhang's (2026) vocational higher education study, which emphasises motivational and commitment-related mechanisms. The present paper extends this logic to introductory management learning by focusing on digital literacy development and applied learning effectiveness.

P8. Digital literacy development is expected to strengthen student engagement in introductory management courses.

P9. Digital literacy development and student engagement are expected to form a sequential pathway from blended teaching to applied management learning effectiveness.

Table 2 defines the constructs used in Figure 1. Table 3 then summarises the propositions and theoretical justifications so that each path is explicitly connected to the preceding literature.

Table 2. Construct definitions and operational dimensions

Construct	Definition in this paper	Operational dimensions	Course-specific evidence
Blended teaching approaches	A coherent instructional ecology integrating online preparation, classroom application, digital collaboration, formative feedback and assessment alignment.	Online-offline coherence; task sequencing; teaching presence; feedback quality; assessment alignment.	Teaching plan; LMS tasks; classroom activity records; teacher implementation checklist.
Digital literacy development	Students' development in using digital technologies to search, evaluate, collaborate, create, communicate and solve problems in management learning.	Information and data literacy; communication and collaboration; digital content creation; safety and ethics; problem-solving.	Pre-post digital literacy scale; source-evaluation sheet; digital portfolio; collaborative document history.

Construct	Definition in this paper	Operational dimensions	Course-specific evidence
Student engagement	Students' behavioural, cognitive, emotional and agentic involvement in blended management learning.	Participation; cognitive investment; emotional relevance; peer contribution; self-regulation; student questioning.	Engagement scale; discussion quality; peer evaluation; LMS participation; reflective journals.
Applied management learning effectiveness	Students' ability to understand concepts, analyse cases, collaborate on solutions and transfer management reasoning to realistic situations.	Conceptual understanding; case-analysis competence; problem-solving; communication; reflective transfer.	Exam score; case report rubric; group project; presentation score; perceived learning gain.

Note. Construct definitions draw on Bandura (1986), Fredricks et al. (2004), Garrison et al. (2000), Li et al. (2023), Vuorikari et al. (2022), Wong et al. (2024) and Zhang et al. (2024).

Table 3. Propositions and theoretical justifications

Proposition	Relationship	Core theoretical logic	Key support
P1	BTA -> AMLE	Aligned online, classroom and post-class activities create repeated opportunities for applied management reasoning.	Hrastinski (2019); Ng et al. (2023); Song and Lai (2025)
P2	BTA -> DLD	Blended tasks require students to search, evaluate, collaborate and create through digital tools.	Vuorikari et al. (2022); El Messaoudi (2024)
P3	DLD -> AMLE	Digital capability helps students handle management information and produce better case-based solutions.	Amin et al. (2021); Avinç and Doğan (2024)
P4	BTA -> DLD -> AMLE	Digital literacy is a capability pathway between blended design and learning effectiveness.	Bandura (1986); Zhang et al. (2024)
P5	BTA -> SE	Coherent blended design creates participation, interaction, feedback and relevance.	Bond et al. (2020); Nkomo et al. (2021)
P6	SE -> AMLE	Engaged students invest effort, participate in case work and revise managerial reasoning.	Wong et al. (2024); Jang et al. (2024)
P7	BTA -> SE -> AMLE	Engagement converts instructional opportunities into learning behaviours and applied reasoning.	Fredricks et al. (2004); Reeve (2013)
P8	DLD -> SE	Digital capability reduces participation barriers and supports confident online collaboration.	Pangrazio et al. (2020); Vuorikari et al. (2022)

Note. Developed by the authors based on Hrastinski (2019), Ngoasong (2022), Hu et al. (2024), Jiang (2024) and Song and Lai (2025).

Table 4 operationalises Figure 2 by linking teaching stages to student actions, evidence

sources and mechanisms. It also provides an implementation-fidelity tool that future researchers can use when comparing classes or institutions.

Table 4. Blended teaching implementation matrix

Teaching stage	Teacher design	Student action	Evidence and expected mechanism
Pre-class preparation	Provide micro-lectures, reading guide, diagnostic quiz and case prompts.	Watch, read, quiz, record questions and identify difficult concepts.	Video completion and quiz results indicate readiness; questions reveal cognitive obstacles.
Digital information inquiry	Set criteria for source credibility and link search tasks to a management problem.	Search, compare and evaluate organisational or business information.	Source-evaluation sheets provide evidence of information and data literacy.
Classroom case application	Organise group analysis, role-play, debate and teacher feedback.	Apply concepts to cases, justify choices and respond to peer questions.	Observation and rubrics capture behavioural and cognitive engagement.
Collaborative production	Assign group report, shared document or digital presentation.	Co-edit, divide responsibilities, revise arguments and present solutions.	Version history and peer evaluation capture collaboration and content creation.
Post-class reflection	Provide feedback, reflective prompts and revision requirements.	Revise case analysis, submit reflection and update portfolio.	Reflection logs show metacognition and transfer-oriented engagement.
Course assessment	Use rubrics for exams, case reports, projects and presentations.	Demonstrate conceptual understanding and applied management reasoning.	Scores and rubrics provide outcome evidence beyond self-report.

Note. The matrix integrates blended learning design principles with digital literacy areas from Vuorikari et al. (2022) and engagement indicators from Fredricks et al. (2004), Reeve (2013), Li et al. (2023) and Wong et al. (2024).

4.2 Measurement strategy

A major risk in blended teaching research is over-reliance on end-of-course self-report. To avoid this problem, empirical applications of the framework should combine perception measures, behavioural traces and performance evidence. Table 5 presents a measurement blueprint. The listed items are examples only; researchers should adapt validated instruments, conduct expert review, pilot the questionnaire

and align rubric indicators with the actual course syllabus.

Digital literacy development should be measured as change rather than as a static perception whenever possible. A stronger design is to measure baseline digital literacy at the beginning of the course and post-course digital literacy after students have completed blended learning tasks. The analysis can then control baseline digital literacy or estimate change. Student engagement should also be measured through

more than platform frequency, because click data do not necessarily indicate meaningful participation.

Table 5. Measurement blueprint for empirical validation

Construct	Suggested dimensions, evidence, timing and item/rubric scope	Example item or rubric indicator	Indicative sources
Blended teaching approaches	T2 student survey (about 12-15 adapted items) plus teaching-plan evidence: online-offline coherence, teaching presence, task sequencing, feedback quality and assessment alignment.	“Online preparation helped me participate in classroom management case analysis.”	Hrastinski (2019); Garrison et al. (2000); Ngoasong (2022)
Digital literacy development	T1-T2 pre-post scale (about 18-20 items) plus performance evidence: source-evaluation sheet, collaborative document history and digital portfolio.	“I can evaluate the credibility of online business information before using it in a management assignment.”	Vuorikari et al. (2022); Amin et al. (2021); Avinç and Doğan (2024)
Student engagement	T3 survey (about 16 items), classroom observation and LMS evidence: behavioural participation, cognitive investment, emotional relevance and agentic contribution.	“I actively connected management theories with realistic organisational situations.”	Fredricks et al. (2004); Assunção et al. (2020); Li et al. (2023); Wong et al. (2024)
Applied management learning effectiveness	T4 performance and rubric evidence: examination, case report, group proposal, presentation and reflective-transfer task.	Rubric: identifies problem, applies concept, justifies solution and reflects on transfer.	Ng et al. (2023); Ngoasong (2022)
Control variables	T1 institutional records and student background evidence: gender, major, prior GPA, baseline digital literacy, device access, internet quality, class size and teacher experience.	Institutional records and student background questionnaire.	Podsakoff et al. (2012); Hair et al. (2022); Kline (2023)

Note. The blueprint is designed to guide future empirical validation. It should be adapted to the target institution and pilot-tested before formal data collection.

Figure 3 shows the evidence-triangulation logic. The central purpose is to reduce common-method bias and to strengthen the evidential link between blended teaching, explanatory mechanisms and learning outcomes.

The use of multiple data sources is also necessary for reducing common-method bias, especially when students evaluate teaching design, engagement and perceived learning effectiveness in the same questionnaire (Podsakoff et al., 2012).

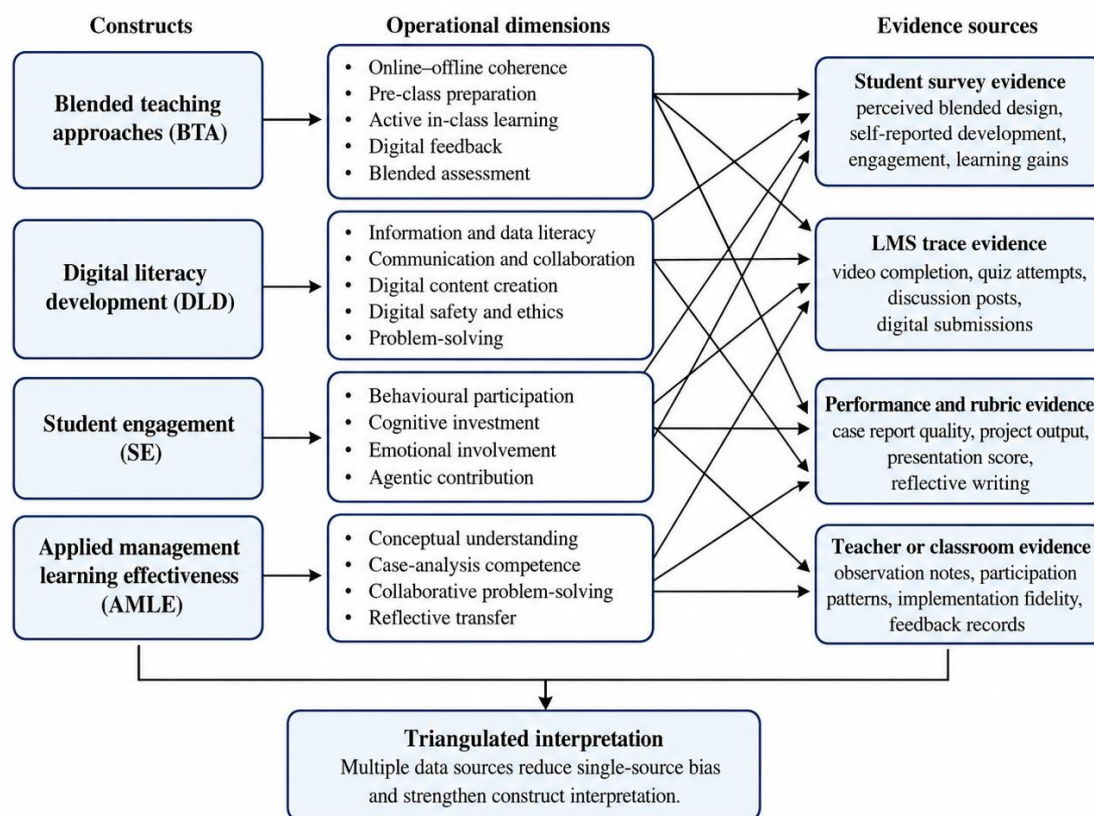


Figure 3. Construct operationalisation and evidence triangulation

Note. Developed by the authors based on Podsakoff et al. (2012), Hair et al. (2022), Hayes (2022), Kline (2023) and Vuorikari et al. (2022).

4.3 Empirical validation protocol

Although the present paper is conceptual, the framework is designed for empirical testing. Figure 4 outlines a recommended time-lagged validation pathway. At Time 1, researchers collect baseline digital literacy, prior GPA, device access and background variables. At Time 2, after several weeks of blended teaching, students evaluate blended teaching quality and complete digital literacy development measures. At Time 3, students report engagement and provide behavioural evidence through LMS traces, classroom observations and peer evaluation. At Time 4, researchers collect

examination scores, case-report rubrics, group-project scores, presentation evidence and reflective-transfer evidence.

This temporal ordering matters because the model concerns developmental and explanatory processes. If all variables are measured in one end-of-course survey, indirect paths may reflect common-method covariance rather than a plausible teaching process. A multi-site design is preferable. For structural equation modelling, a sample of at least 400 valid responses is recommended when indirect paths, control variables and alternative models are examined. When students are nested in classes or teachers, researchers should check intraclass correlations and use cluster-robust or multilevel approaches where necessary.

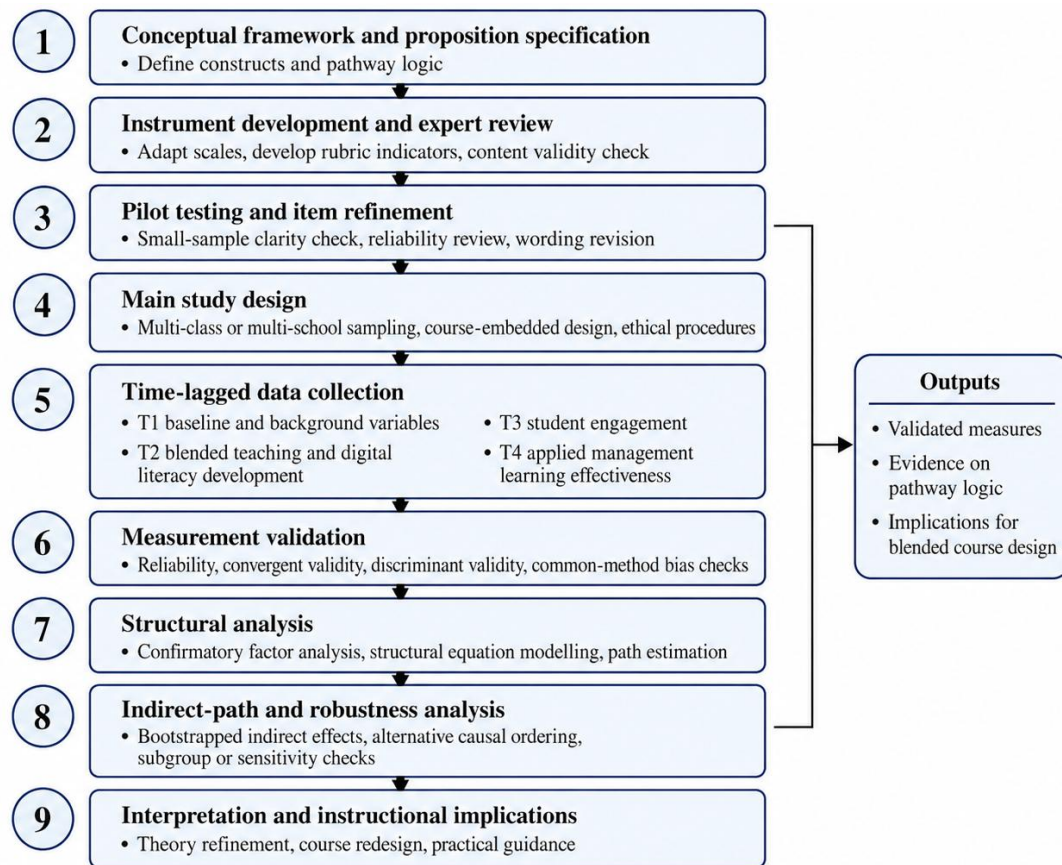


Figure 4. Empirical validation pathway

Note. Developed by the authors based on Hair et al. (2022), Hayes (2022), Kline (2023) and Podsakoff et al. (2012).

The structural model can be represented through the following equations, where C denotes control variables such as prior achievement, major, gender, device access, baseline digital literacy, class size and teacher experience:

Indirect paths should be tested through bootstrapping procedures, because confidence intervals provide a more appropriate basis for interpretation than reliance on the significance of separate path coefficients alone (Hayes, 2022).

$$DLD_i = \alpha_0 + \alpha_1 BTA_i + \Gamma C_i + \varepsilon_i \quad (1)$$

$$SE_i = \beta_0 + \beta_1 BTA_i + \beta_2 DLD_i + \Gamma C_i + \varepsilon_i \quad (2)$$

$$AMLE_i = \gamma_0 + \gamma_1 BTA_i + \gamma_2 DLD_i + \gamma_3 SE_i + \Gamma C_i + \varepsilon_i \quad (3)$$

Table 6 summarises the empirical analysis and robustness strategy. The table is embedded here because a transparent connection between conceptual development, measurement strategy and analytic procedure strengthens the framework's empirical credibility.

Table 6. Empirical analysis and robustness strategy

Analytical step	Purpose	Recommended procedure	Reporting requirement
Data screening	Check missing values, outliers, normality and response quality.	Report missing-data treatment, descriptive statistics and attrition across waves.	Sample profile and data-cleaning decisions.
Measurement validation	Assess reliability and construct validity.	Cronbach's alpha, composite reliability, AVE, HTMT and confirmatory factor analysis.	Factor loadings, CR, AVE, HTMT and model fit.
Structural model	Test direct and indirect explanatory paths.	SEM or PLS-SEM depending on theory-testing or prediction orientation.	Standardised coefficients, standard errors, confidence intervals and R^2 .
Indirect-path testing	Estimate specific indirect paths.	Bootstrapping with at least 5,000 resamples.	Specific indirect effects and 95% confidence intervals.
Common-method control	Reduce same-source bias.	Time separation, multi-source data, anonymity and statistical sensitivity checks.	Procedural controls and statistical diagnostics.
Robustness checks	Test stability of the framework.	Control prior GPA, baseline digital literacy, teacher/class effects and compare alternative causal ordering.	Alternative model fit and subgroup results.
Nested data	Account for students clustered in classes or teachers.	ICC check, cluster-robust standard errors or multilevel SEM where appropriate.	Justification of independence or multilevel treatment.

Note. Guidance draws on Podsakoff et al. (2012), Hair et al. (2022), Hayes (2022) and Kline (2023).

4.4 Ethical and implementation-fidelity considerations

Future empirical research should obtain institutional ethical approval before collecting student data. Participation should be voluntary, and students should be informed that non-participation will not affect course grades. LMS trace data, rubric scores and survey responses should be linked only through anonymised codes. If teacher-level data are collected, teachers should also provide informed consent.

Implementation fidelity should be documented because blended teaching effects are difficult to

interpret if different classes receive substantially different designs. Teachers should use a shared weekly teaching template, common case prompts, common rubrics and a brief implementation checklist covering pre-class resources, in-class activities, feedback timing, digital collaboration tasks and post-class revision. If multiple teachers are involved, researchers should record teacher experience, digital pedagogical competence and deviations from the planned sequence. Short classroom observations or teaching logs can provide a further check on whether blended teaching was implemented as designed.

5. Discussion

5.1 Theoretical implications

First, the framework shifts blended teaching research from a delivery-mode comparison to a mechanism question. A course does not improve because it is labelled blended; it improves when online preparation, classroom application and post-class revision create a coherent learning process. The theoretical value of the framework lies in explaining how course design creates capability conditions, how digital literacy enables participation and how engagement converts instructional opportunities into applied management learning.

Second, the framework repositions digital literacy from a learner prerequisite to a course-level developmental outcome. Higher vocational students may enter college with unequal digital resources and uneven experience in using digital tools for professional problem-solving. A blended introductory management course can address this inequality when it teaches students how to evaluate digital information, collaborate in shared documents, create management artefacts and interpret feedback. This argument extends digital literacy research by locating capability development inside disciplinary teaching rather than outside it.

Third, the framework treats engagement as a conversion mechanism rather than as a simple participation indicator. Platform log-ins and quiz attempts are useful traces, but they do not show whether students are interpreting management concepts, defending solutions or revising arguments. By linking behavioural, cognitive, emotional and agentic engagement to applied management learning, the framework explains why digital capability must be enacted through meaningful participation before it can influence learning outcomes.

Fourth, the paper extends recent mechanism-oriented studies in vocational and applied higher education. Zhang et al. (2024) explain digital technology use in relation to learning experience, engagement and satisfaction.

Xianghan Zhang (2026) explains vocational teaching effects through motivation, perceived programme relevance and commitment to learning. The present framework builds on this line of work but focuses more narrowly on introductory management courses and on the sequence from blended design to digital capability, engagement and applied management reasoning.

5.2 Practical implications for teachers

For teachers of introductory management courses, the first implication is to design backwards from applied management outcomes. If the outcome is case-analysis competence, pre-class videos should introduce the concepts needed for the case, classroom tasks should require students to apply those concepts and post-class assignments should require revision after feedback. When teaching planning, students may use a digital board to design an operational plan for a campus service project. When teaching leadership, they may compare online examples of service-failure responses and justify a preferred managerial response. When teaching control, they may design basic performance indicators and feedback procedures for a simulated team.

Second, digital literacy should be embedded in management assignments instead of being treated as a separate technical skill. Teachers can require students to justify the credibility of online sources, compare organisational cases, co-edit a management proposal, prepare a digital presentation and reflect on ethical issues in digital communication. These tasks make students use digital tools to produce management reasoning, not merely to submit assignments.

Third, engagement should be assessed through multiple forms of evidence. Attendance and platform activity should be combined with discussion quality, peer contribution, reflective journals, case-report revision and student-generated questions. This broader assessment can help teachers identify students who appear active online but remain cognitively passive, and

it gives quieter students more than one route to demonstrate engagement.

5.3 Institutional and policy implications

At the institutional level, the framework suggests that higher vocational schools should move beyond platform-centred digital transformation. Investment in digital infrastructure is necessary, but it does not by itself improve teaching. Schools should evaluate whether blended courses develop students' digital literacy, strengthen engagement and improve applied learning evidence. Teacher professional development should therefore include instructional design, digital assessment, feedback literacy, learning analytics and case-based teaching. Zhang and Li's (2025b) discussion of digital capacity building is used here only as a broader governance reference: digital capacity depends on resource

coordination and inclusive support, not on technology provision alone.

At the policy level, blended teaching reform should be connected to vocational education quality rather than administrative compliance. Policies that count online resources, videos or platform visits without examining learning design may produce surface-level reform. A more meaningful evaluation should ask whether students can use digital resources to understand, analyse and solve professional problems. Zhang and Li's (2025a) work on digital transformation and organisational resilience is similarly relevant only at the level of broad digital-change logic, because it emphasises the interaction of technology, management and organisational culture. Table 7 converts these implications into an action framework for course teachers, departments and institutions.

Table 7. Practical implications and action framework

Level	Key problem to address	Recommended action	Expected improvement
Course teacher	Online and offline tasks are disconnected.	Design a weekly sequence linking micro-lecture, case analysis, feedback and revision.	Stronger coherence between preparation, interaction and transfer.
Course team	Digital literacy is assumed rather than taught.	Embed source evaluation, collaborative writing and digital presentation into assignments.	Digital literacy becomes visible and assessable.
Department	Engagement is measured through attendance or platform logs only.	Use rubrics for discussion quality, peer contribution and reflective revision.	Engagement evidence becomes multidimensional.
Institution	Blended teaching is evaluated as platform construction.	Evaluate course redesign, teacher support, learning analytics and outcome evidence.	Digital transformation becomes learning-quality oriented.
Policy maker	Reform indicators may reward resource quantity rather than teaching quality.	Connect blended teaching evaluation to vocational competence, digital literacy and employability.	Policy shifts from compliance to capability formation.

Note. The action framework is informed by Achtenhagen and Achtenhagen (2019), Haleem et al. (2022), OECD (2025), Vuorikari et al. (2022), Zhang (2026), Zhang and Li (2025a, 2025b), Zhang et al. (2024) and Zou et al. (2025).

5.4 Boundary conditions and future research

The framework has several boundary conditions. First, students' prior digital experience and device access may influence how they respond to blended teaching. A course that assumes stable internet access and high digital confidence may widen inequalities. Second, teacher digital pedagogical competence may moderate the effect of blended teaching. A platform-rich course can still fail if teachers do not connect online activities to classroom application. Third, class size and institutional support may affect interaction quality, feedback timeliness and implementation fidelity. Fourth, the framework is especially suited to concept-case-application courses such as introductory management; it may require adaptation for laboratory, procedural or highly technical skills courses where learning evidence is organised differently.

Future research should test the proposed framework with multi-site, time-lagged and multi-source data. It should also compare alternative causal orderings. For example, engagement may also promote digital literacy development because engaged students practise digital tasks more actively. Comparing the proposed DLD → SE pathway with an alternative SE → DLD pathway would strengthen causal reasoning. Future studies may further examine generative AI and adaptive learning systems, because these tools are beginning to influence case search, writing feedback, data interpretation and decision-making practice in management education (Zou et al., 2025).

6. Conclusion

This paper developed a mechanism-oriented conceptual framework for blended teaching in introductory management courses in higher vocational education. The core argument is that blended teaching becomes educationally meaningful when it develops students' digital literacy and activates their engagement. Digital literacy enables students to search, evaluate,

collaborate, create and communicate through digital tools. Engagement transforms this capability into participation, cognitive effort, emotional relevance and agentic contribution. Together, these mechanisms explain how blended teaching may strengthen applied management learning effectiveness.

The framework is not a claim that blended teaching automatically improves learning. It is a theory-informed explanation of the conditions under which blended teaching is likely to matter. For higher vocational schools, the practical message is clear: digital transformation should be evaluated by the quality of learning design, capability formation and evidence of applied learning, not by platform use alone. Future empirical studies can use the proposed course design, measurement blueprint and validation protocol to test the framework across schools, majors and teaching contexts.

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Ethical approval: Ethical approval is not required for the present conceptual manuscript. Future empirical research involving students should obtain institutional ethical approval and informed consent.

Data availability: No empirical dataset was generated or analysed in this manuscript. Future empirical studies should provide anonymised data or a transparent data-availability statement according to the requirements of the target journal.

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