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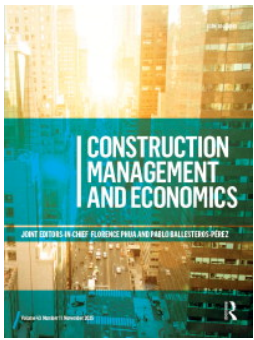
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An investigation of learner types and their unique preferences on the work-based learning (WBL) model: a case of quantity surveying apprenticeship

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ABSTRACT

Degree Apprenticeships (DA) have grown rapidly as a policy-driven response to skills shortages, particularly in Quantity Surveying (QS), where apprentices integrate occupational skills with academic learning through Work-Based Learning (WBL). However, completion rates remain lower than expected, potentially due to challenges in developing apprentices' professional identity. This study examines different apprentice profiles and their impact on identity formation and WBL preferences. A descriptive review of literature was conducted to explore debates on DA and WBL pedagogies, followed by semi-structured interviews and Q-methodology to capture and analyse diverse apprentice perspectives and categorise them based on their characteristics. The findings suggest four distinct apprentice profiles: (i) proactive careerists, (ii) studious workers, (iii) resilient strivers, and (iv) university enthusiasts. Alongside these learner types, the study identified key successes such as employer involvement and professional recognition, as well as challenges linked to workload, delivery models, and identity. This identification provides a foundation for optimising WBL through curriculum adjustments, stronger university–industry collaboration, and diversified assessment methods tailored to different learner strengths. This research contributes to ongoing efforts on enhancing DA programmes to promote social mobility and widen participation. The findings highlight the need for apprentice trailblazer groups to consider various delivery modes for DA, offering a more adaptable approach to target different categories of apprentices, leading to improved completion rates and enhanced graduate outcomes. By adopting adaptable and inclusive WBL frameworks that integrate both structured and adaptable learning pathways, institutions can better align with apprentice needs and support professional identity development, engagement, and long-term success.

Introduction

The ageing workforce in the UK construction sector, coupled with declining attraction and retention of specialist practitioners, has made Degree Apprenticeships (DAs) a policy-driven and strategic approach to recruiting young people for the sector's long-term sustainability (Daniel et al., 2020). Particularly, the UK construction sector faces a severe shortage of Quantity Surveyors (QSs) and a continuous decline in new graduate entrants, with 30% of surveying practitioners aged over 50, threatening the profession's future (RICS 2022). To address the ageing workforce, many countries have implemented skills training programmes as part of government agendas to recruit,

train, and retain specialist practitioners in construction (Daniel et al., 2020, Kamardeen and Hasan 2022, Pan et al. 2020). These programmes are known by various names, such as Degree Apprenticeship (UK), Construction Manpower Training Scheme (Hong Kong), European Alliance for Apprenticeships (Europe), and World Skills Programme (South Africa) (Oloke et al. 2023, Pan et al. 2020). In addition to government-led initiatives like the UK's Degree Apprenticeship model, there are alternative routes where professional bodies themselves take an active role in workforce development. For example, while professional bodies in the UK such as the Royal Institution of Chartered Surveyors (RICS) and the

Construction Industry Training Board (CITB) offer various training and development programmes to address skills shortages in the construction sector (Elliott and Gloeckner 2013), the Netherlands presents an alternative approach where QS-specific higher education pathways are absent. In response, the Dutch trade association NVBK has delivered vocational courses such as Cost Expert Construction and Cost Advisor Construction for more than three decades (Klinken and Aspinall 2011), drawing participants from QS firms, construction companies, and architectural practices. This industry-led route underscores how professional education can be sustained outside universities, though it differs from the UK DA model by lacking formal academic recognition and structured progression.

The UK's DA scheme, launched in 2015-2016, provides young people with an alternative route into training and employment (Ryan and Lőrinc 2018). The DA programme involves a tripartite partnership between the apprentice, employer, and higher education institution (Rothera et al. 2022, Rowe et al. 2017) and requires apprentices to complete a degree alongside their apprenticeship training (IFATE 2021). Apprentices work towards a bachelor's or master's degree while combining study with paid work, with 80% of learning occurring through work-based learning (WBL) (IFATE 2021). This model aims to train the next generation of construction professionals and address skill shortage (Toner 2008). Despite the increasing number of apprenticeship enrolments in Built Environment courses, including QS, challenges remain. Key issues include low completion rates and off-track graduate outcomes (Daniel et al., 2020). The national achievement rate tables (NARTs) for 2020/21 indicate that nearly half of DA programme learners failed to complete the programme, with a retention rate of 53% (Department for Education 2024a), indicating that 47% of enrolled apprentices dropped out before completion of the programme. The causes of aforementioned challenges, including curriculum complexity, insufficient integration of practical and theoretical learning, and diverse learner needs, are further elaborated in the literature review section.

Unlike traditional students, apprentices often have varied backgrounds and learning preferences, due to their complex responsibilities ranging from full-time work and study to family and personal commitments, requiring tailored educational approaches. Research has not fully explored how their diverse characteristics can inform the tailoring of QS Degree Apprenticeship (DA) programmes to better align with learners' preferences and needs, representing a significant gap in

understanding how these factors impact learning and completion outcomes. Thus, this study proposes that understanding the nuanced categories of learners and their characteristics can inform the adaptation of the WBL model, enhancing professional identity development and graduate outcomes. The research aims to (i) uncover the various categories of apprentices and their characteristics in relation to the WBL model, (ii) investigate how these characteristics impact their learning model preferences and professional identity development, and (iii) identify the successes and challenges of WBL in promoting professional identity development. The findings will provide insights into apprenticeship student characteristics and underscore the need for diversified and tailored strategies within apprenticeship programmes.

Literature review

This literature review is structured in two parts. The first section examines empirical studies that contextualise the challenges and problem areas in Quantity Surveying Degree Apprenticeships, including issues of non-completion and learner diversity. This strand of inquiry informed the identification of eight key themes that shape apprentices' learning experiences later used in the Q-sort statements. The second section discusses theoretically grounded research, focusing on Work-Based Learning models, professional identity development, and pedagogical approaches relevant to apprenticeship programmes. This strand of inquiry helped identify the learning styles most commonly adopted by apprentices and their appropriateness within WBL contexts later used in the framework building.

Degree apprenticeship (DA) in quantity surveying (QS) – structure, opportunities and challenges

Quantity Surveyors (QSs) play a critical role throughout a project's lifecycle, far beyond cost estimation, encompassing sustainability assessments, digital technology integration, and regulatory compliance. Unlike other construction professionals, QSs must develop both specialist financial expertise and broad multidisciplinary knowledge, including building regulations, construction technologies, and environmental impacts such as carbon emissions. This enables them to interpret and communicate implications related to quality, cost, and time across various disciplines (Pan et al. 2020). Their "translator" role is especially crucial in the project-based, multidisciplinary construction sector,

where collaboration across evolving teams and specialisms is the norm. However, a systematic literature review of diversity, equity, and inclusion in the AEC industry (Heydari et al. 2024) and a comparative case study examining vocational education and training (Pan et al. 2020) both highlight the multiple challenges faced by quantity surveying professionals, including productivity pressures, economic instability, digital transformation, and regulatory complexities. These challenges are further compounded by recent industry changes, such as the integration of complex design processes, stricter regulatory demands, and heightened focus on energy efficiency, which require QSs to manage whole-life costing, sustainability targets, and digital workflows (Heydari et al. 2024). Additionally, the lack of diversity and inclusion also appears to hinder innovation within their roles (Karakhan et al. 2021). To remain relevant, QSs must develop competencies in digitalisation, sustainability, and inclusivity (Sharma and Cui 2023). Apprenticeships offer an effective pathway for developing these skills, equipping QSs to address multifaceted industry challenges early in their careers (Kamardeen and Hasan 2022).

Despite their potential, degree apprenticeships continue to experience challenges, particularly with low completion rates. As indicated by Department for Education (2024b) in their statistical report, a significant proportion of apprentice do not complete the End-Point Assessment (EPA), which is vital for demonstrating occupational competence and earning the apprenticeship certificate. In 2022/23, the overall Qualification Achievement Rate (QAR) across all sectors was 54.3%, falling below the government's national target of 67%; the construction sector fared slightly worse, at 52.5% (Department for Education 2024b). This may reflect the increasing demands placed on apprentices as the QS role becomes more complex and multifaceted (Kamardeen and Hasan 2022). Nevertheless, given the significant public investment in apprenticeship programmes (Hogarth and Gambin 2014), improving completion rates is essential for demonstrating programme effectiveness and supporting long-term workforce sustainability. **Programme completion** therefore emerges as a critical theme, closely tied to both learner outcomes and sector needs.

Challenges in surveying-related Degree Apprenticeships in general, such as those in Quantity Surveying, Building Surveying, or Land Surveying, share similarities with apprenticeship challenges observed in other sectors such as healthcare and automotive and manufacturing. For Instance, Derbyshire et al. (2024)

drawing on a realist-informed qualitative study of Registered Nurse DA programmes, found that apprentices struggle to reconcile theoretical study with practical demands, largely due to the intensity and fast pace of clinical environments. Such findings underscore the critical need for curriculum alignment, where theoretical content is designed to reflect and complement workplace realities, ensuring that learning is both relevant and immediately applicable. This highlights how sector-specific pressures shape the learning experience and risk undermining progression. However, compared to other surveying disciplines, QS apprentices face unique challenges due to the profession's integrative role in managing cost, quality, and time throughout all project phases. This role requires interdisciplinary knowledge and continuous engagement with various stakeholders. Research on QS apprenticeships, including a longitudinal study by Ó Murchadha and Murphy (2018) and a recent survey-based analysis by Omotayo et al. (2023), shows that these learners face distinctive and compounded demands compared to peers in other surveying pathways, particularly in balancing technical requirements with academic expectations. These complexities demonstrate the importance of WBL relevance, where practical work experience is closely integrated with academic study to support meaningful learning and professional development. As already highlighted, this shift requires broader competencies and presents a more demanding learning curve. Additionally, the fast-paced construction environment often limits opportunities for foundational learning, underscoring the need for pedagogical approaches that explicitly account for the compounded and discipline-specific pressures faced by QS apprentices. This demonstrates the importance of **curriculum alignment** and **WBL relevance** in shaping apprentice success.

Studies ranging from empirical surveys to state-of-the-art reviews of higher-level and degree apprenticeships have consistently shown that non-completion in influenced by a wide set of factors, including loss of interest, prior education, financial motivations, challenges arising from curriculum complexity and the insufficient integration of practical and theoretical learning creating a steep learning curve for apprentices which can contribute to non-completion (Daniel et al., 2020, Daniel et al. 2024, Mulkeen et al. 2019). Such evidence points to the persistence of structural and pedagogical challenges that undermine learner progression. A case study highlighted the growing diversity within the apprenticeship cohort, especially the rise in mature students (aged 21 and above), which adds further complexity (Doss et al. 2021).

These learners often present heterogeneous entry qualifications, varying readiness for higher education, and distinct personal responsibility, which not only shape their engagement but also affect their sense of belonging and overall well-being (Doss et al. 2021). Personal and workplace-related characteristics, such as age, gender, ethnicity, and financial pressures intersect with these dynamics to affect persistence (Doss et al. 2021). Gambin and Hogarth (2016) similarly note that internal workplace conditions, including supervisory support and cultural inclusivity, can either alleviate or exacerbate pressures that influence retention. External influences such as the nature of work, prior experience, and workplace culture further complicate WBL outcomes (Lynch et al. 2006). Fabian et al. (2022) in their exploratory Q methodology study, found that university engagement is frequently disrupted by job demands, highlighting how workload pressures and institutional misalignment can compromise learner well-being. Similarly, Hamilton (2019), in a qualitative case-study, Hamilton (2019) observed, how apprentices navigate multiple and sometimes conflicting identities, demonstrating that learners' own views of their roles and capacities are crucial in shaping their experience and outcomes. Taken together, this body of literature underscores three interrelated themes- **learner views**, **challenges**, and **well-being**, which emerge as crucial to understanding apprenticeship trajectories and the conditions that support or hinder completion.

Dermentzi (2024) in a qualitative case study employing focus groups argues that to be effective, DA programmes must adopt WBL designs that respond to the diverse needs of apprentices. A particularly underexplored factor is professional identity development, which Zhouchen et al. (2024) highlight as crucial for sustaining long-term commitment and successful programme completion. This underscores the importance of understanding the diverse motivations, backgrounds, and learner types of apprentices as a foundation for effective programme design. Within this context, support systems play a pivotal role, encompassing structured mentoring, workplace supervision, academic guidance, and institutional flexibility. Hamilton (2019) shows that apprentices rely heavily on both workplace and university-based mentors to reconcile competing demands, while Hogarth and Gambin (2014) emphasise that employer investment and supervisory practices directly affect completion. At the same time, institutional mechanisms such as accessible academic support, responsive curriculum design, and recognition of prior learning have been shown to reduce attrition (Taylor-Smith et al. 2019). As

such, **support systems** and **perceived benefits** emerge as further essential themes for both learner persistence and programme success.

In summary, the synthesis of this body of literature highlights eight themes that shape the learner experience in QS Degree Apprenticeships: support systems, curriculum alignment and WBL relevance, well-being, programme completion, perceived benefits, challenges, learner views, and suggestions for improvement. These themes were subsequently used to guide the interview framework and inform the development of Q-sort statements.

Contextualising learner identity's role in shaping work-based learning (WBL) approaches

Existing empirical and action research studies suggest that apprentices often hold multiple overlapping identities- personal, social, and professional, which influence how they engage with their learning environments (Quew-Jones 2022). In this context, identity refers to the meaning, value, and sense of self an individual ascribes to the various roles they occupy. Specifically, professional identity is defined as the emotional acceptance and recognition of one's discipline, accompanied by a positive sense of belonging and behaviour aligned with that field (Zhouchen et al. 2024). Empirical evidence-based research on the role of professional identity have shown that professional identity influences engagement and outcomes in DA programmes (Quew-Jones 2022, Zhouchen et al. 2024).

Existing research continues to highlight the centrality of professional identity in DA outcomes (Quew-Jones 2022, Zhouchen et al. 2024). These identities often overlap with personal and social dimensions, shaping learner behaviours and engagement styles (Schreiber and Valle 2013, Smith et al. 2023, Taylor-Smith et al. 2019, Taylor-Smith et al. 2019). Therefore, understanding these intersections is essential for developing WBL models that are robust, particularly within the QS profession, where learners may display divergent learning orientations. For example, some apprentices may favour transformative learning, engaging in critical reflection and personal development, while others may align more with situated learning, gaining knowledge through real-world participation (Lingard et al. 2022). Learners may also exhibit differing mindsets: a fixed mindset may reflect a preference for stability and familiarity, whereas a growth mindset is marked by adaptability and a drive for improvement.

While a comprehensive review of identity theories is beyond this paper's scope, it is essential to consider how identity intersects with learning preferences within the WBL context, especially given the broader diversity of DA learners compared to traditional university cohorts. Pedagogical approaches are central to Work-Based Learning (WBL) because they shape how apprentices develop professional identity, integrate theory with practice, and navigate diverse learning environments (Helyer 2015). Brodie and Irving (2007) in their case study research which examined the development and implementation of a pedagogical approach for assessing WBL within a medium-sized higher education institution proposed a WBL pedagogy, consisting of three fundamental elements: (i) learning – encompassing approaches, theories, applicability, and relating theories with practice in the workplace, (ii) critical reflection – developing students' ability to critique knowledge in both the workplace and academic work, and (iii) capability – involving transferability of skills, subject-specific technical know-how, and interpersonal skills. DAs are thus expected not only subject-specific expertise but also reflective and analytical abilities. Similar requirements have been echoed in other vocational studies (Garnett 2001, Gibbs and Garnett 2011, Lynch et al. 2006). However, the relationship between learning, training, and performance is not always linear, and outcomes may be unpredictable. Some scholars have questioned the empirical validity of rigid learning styles theories, warning that matching instruction too closely to perceived preferences can oversimplify complex educational dynamics and risk reducing equity (Glazzard 2015, Newton and Salvi 2020). More recent studies on apprenticeship education highlight the value of socially oriented pedagogies in WBL (Fabian et al. 2022, Hamilton 2019, Rothera et al. 2022). Social constructivist approaches, underpinning the "communities of practice" model, view learning as inherently social, with knowledge co-constructed through shared experience (Schreiber and Valle 2013). These approaches place the learner at the centre and acknowledge the importance of context and community in shaping learning (Brodie and Irving 2007). Daniel et al. (2020) drawing on a review of apprenticeship practices in the construction sector, purport enhancing learning experiences during training is key to improving completion rates. Building on this, Quew-Jones (2022) conducted an action research study within higher education settings, which emphasised the importance of timely and appropriate teaching interventions. While such interventions also involve the roles and competencies of educators, this lies beyond the current study's scope.

Although multiple pedagogical theories exist, this research focuses on the four learning models identified in case study research Fuller and Unwin (2003) and Lynch et al. (2006) because they provide empirically grounded insights into workplace learning and map closely to the apprenticeship context. These models capture how learners engage with real-world tasks, social interactions, and organisational dynamics, allowing a more precise alignment of learner preferences to effective WBL strategies. These models include: (i) transmission, where experts pass knowledge to novices; (ii) experiential, where learning arises through practical work; (iii) communities of practice, which emphasise the social context of learning; and (iv) competence- or outcome-based, which focus on job-specific skills but may not support broader career development. By applying these four learning models, this study aligns apprentices' diverse characteristics with WBL strategies most suited to their preferences and professional development. Importantly, this study does not prescribe rigid pedagogical alignments to individual learner types; rather, it identifies broad patterns in learner motivations, preferences, and identities to inform more inclusive and adaptive learning environments.

In summary, the literature emphasises the complex, evolving nature of Quantity Surveying Degree Apprenticeships and the critical role of Work-Based Learning (WBL) in shaping learner outcomes. It emphasises how diverse learner identities, motivations, and experiences, particularly among mature and non-traditional students, influence engagement, skill development, and programme completion. While WBL offers substantial benefits, its effectiveness depends on how well it aligns with apprentices' varied needs, learning preferences, and professional identities. Despite the growing recognition of these dynamics, the relationship between different WBL approaches and the development of professional identity remains under-researched, particularly within the context of Quantity Surveying apprenticeships. Existing studies point to the value of empirically grounded WBL pedagogical models, such as those identified by Fuller and Unwin (2003), yet there remains a gap in understanding how specific learner characteristics interact with these models to shape learning engagement and outcomes. This study addresses this gap by identifying distinct learner traits and preferences, providing a foundation for mapping these to appropriate WBL

strategies and informing more responsive and inclusive teaching approaches.

Methodology

This study adopted a three-stage sequential research design to address its objectives. Figure 1 presents the overall research flowchart, outlining the integration of the literature review for theme development (Stage 1), semi-structured interviews (Stage 2), and Q-methodology (Stage 3). This structured approach enabled a comprehensive exploration of learner types and their preferences within the work-based learning model, ensuring both depth and rigour in data collection and analysis.

Literature-informed theme development (Stage 1)

The descriptive review of literature carried out before identified eight key themes shaping the learner experience - support systems, curriculum alignment/WBL relevance, well-being, programme completion, perceived benefits, challenges, learner views, and suggestions for improvement drawn from a range of research conducted within QS WBL contexts (Dermentzi 2024, Doss et al. 2021, Hamilton 2019, Hogarth and Gambin

2014, Taylor-Smith et al. 2019). These themes directly informed the development of the Stage 2 interview questions, ensuring that each topic area was meaningfully explored through participant responses.

Semi-structured interview (Stage 2)

Semi-structured interviews were conducted to gather insights from key stakeholders, including quantity surveying apprentices, apprenticeship managers, lecturers, and employers purposively selected based on their expertise and capacity to provide informed recommendations for the existing curriculum. This approach aligns with Ahn (2022), who, using a typological Q-method study of degree apprentices, demonstrated how structured qualitative approaches can reveal nuanced perceptions and experiences across multiple stakeholder groups. This comprehensive approach ensures a well-rounded understanding of Work-Based Learning (WBL) dynamics and aligns with previous studies on the use of Q methodology in higher educational research (Fabian et al. 2022, Taylor-Smith et al. 2019). Including diverse stakeholders in interviews ensured the statements reflected the full scope of the WBL model, avoiding bias that might arise if only apprentices who may tend to emphasise their personal
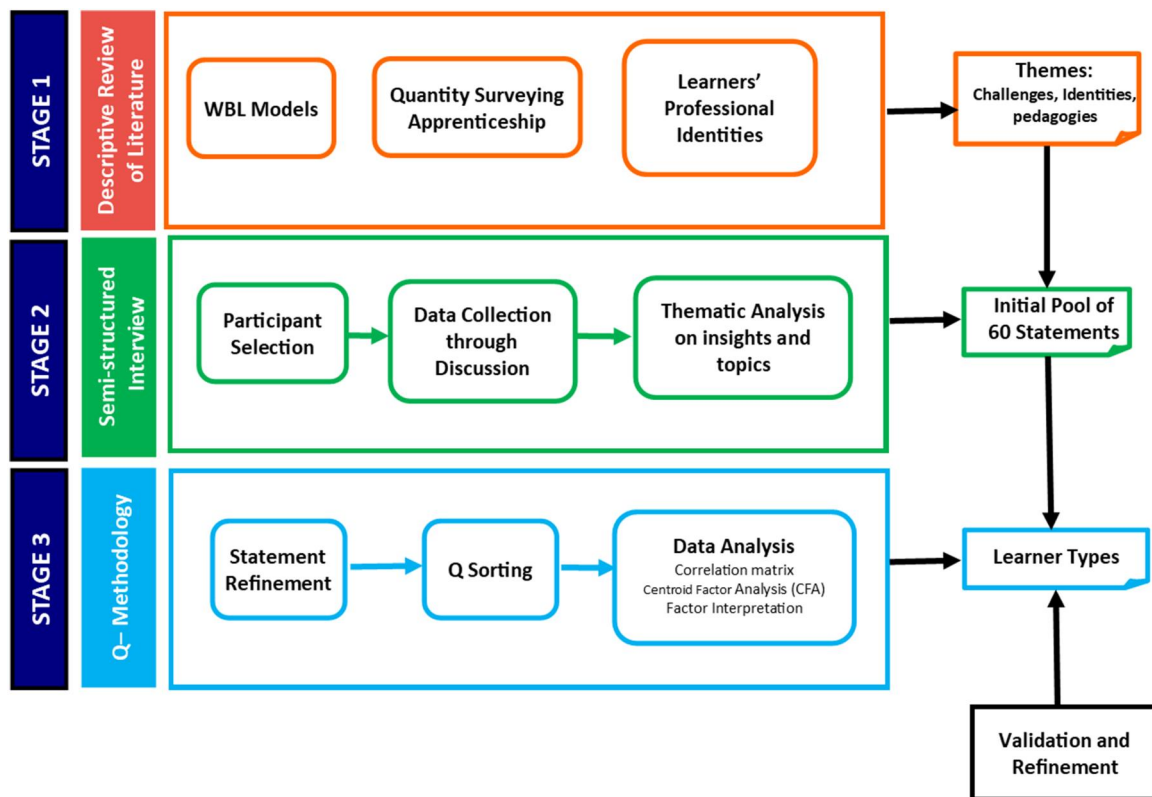

Figure 1. Overview of the three-stage sequential research design.

**Table 1.** Questions explored during semi-structured interviews, aligned with the eight identified themes.

#	Question	Key Theme
	Interview Questions for Apprentices (students)	
1	What is your view on your employer's level of awareness towards DA framework and their level of support towards related tasks that you are currently taking?	Employer's support and level of awareness
2	To what extent do you think that WBL is relevant to the current course that apprentices are taking with 'X' educational institute?	WBL relevance to the current course
3	To what extent do you think that your current course at 'X' is relevant to WBL and further your professional job-role?	Course relevance to the WBL
4	How well do you think that the current DA structure best aligns with your health and wellbeing (i.e. mental health, work-life balance, EDI)	Health and well-being
5	How well do you think you have progressed towards your RICS professional competency and EPA?	Apprenticeship completion
6	How well do you think you have progressed towards completion of your degree at 'X' educational institute?	Degree completion
7	What challenges have you encountered in your journey so far as an apprentice?	Challenges
8	What benefits have you realised in your journey so far as an apprentice?	Benefits
9	In your opinion, what needs to be changed in the current apprenticeship model? And Why?	Suggestions
	Interview Questions for Apprenticeship Managers/ Lecturers/ Employers	
1	What is your view on your employer's level of awareness towards DA framework and their level of support towards apprentices?	Employer's support and level of awareness
2	To what extent do you think that WBL is relevant to the current course that apprentices are taking with 'X' educational institute?	WBL relevance to the current course
3	To what extent do you think that their current course at 'X' is relevant to the WBL they take with 'Y' employer and further their professional job-role?	Course relevance to the WBL
4	How well do you think that the current DA structure best aligns with apprentices' health and wellbeing (i.e. mental health, work-life balance, EDI)	Health and well-being
5	How well apprentices have progressed towards their RICS professional competency and EPA?	Apprenticeship completion
6	How well have apprentices progressed towards completion of their degree at 'X' educational institute?	Degree completion
7	What challenges have you seen apprentices face in their journey so far that other non-apprentices would not face?	Challenges
8	What challenges have you encountered in your journey as an Apprenticeship manager/ lecturer/ employer who work closely with apprentices and their employers/ education institutions?	Challenges
9	What benefits have you seen apprentices realise in their journey so far that other non-apprentices would not realise?	Benefits
10	In your opinion, what needs to be changed in the current apprenticeship model? And Why?	View
11	What changes would you suggest in the current educational curriculum that you're involved in to best match the skill and knowledge demand in the industry? And Why?	Suggestions

experiences were consulted. The tripartite selection of apprentices, employers, and universities provided a foundation for this research. By capturing the perspectives of various stakeholders, the study enriches the overall comprehension of WBL and gathers qualitative insights on the model. Interviews were conducted with 3 Quantity Surveying Apprentices, 2 Apprenticeship Managers (Skill Assessors), 2 Higher Education Lecturers, and 2 Employers. Interviewees were questioned about various aspects, including support systems, curriculum alignment, relevance of WBL, learner well-being, programme completion, perceived benefits/ challenges, overall learner views, and improvement suggestions that align with key themes identified in the descriptive review of literature, as summarised in Table 1. The interview lengths and formats were tailored to each group's availability and role to capture rich and relevant insights. These interviews were pivotal in shaping and compiling key topics of enquiry relating to

WBL, which then informed the development of the statement set used in the subsequent Q-methodology phase. Table 1 presents the three tailored question banks. The same core questions were adapted for each stakeholder group. For example, "What support do you receive?" for students became "What support do you provide?" for lecturers to reflect their differing perspectives.

Q-methodology (Stage 3)

The third stage (as shown in Figure 1) of the research aimed at capturing apprentices' perspectives and experiences of work-based learning (WBL), requiring an exploration of subjectivities using Q-methodology. Figure 2 illustrates the key stages of the Q-methodology process used in this study. These include: (i) the Q-sorting phase, where participants rank statements based on their subjective viewpoints;
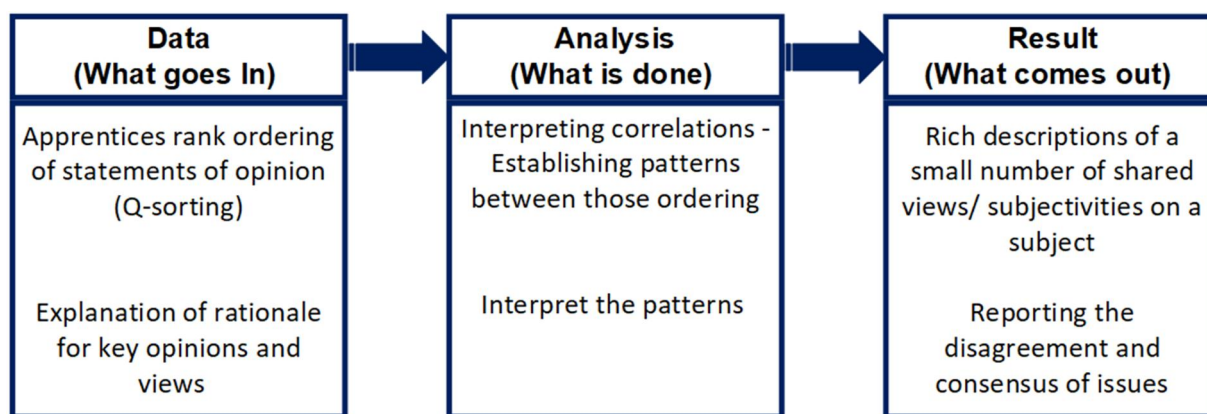
Figure 2. Key stages of the Q-methodology process applied in the study.

(ii) the interpretation of correlations to identify patterns of shared perspectives; and (iii) the reporting of consensus and disagreement across viewpoints. In addition, some illustrative quotations from semi-structured interviews conducted during earlier stages of data collection are included in the 'findings and discussion' section to support and contextualise key points. In the final stage, the analysis addressed three guiding questions: (1) How many categories of apprentices are there? (2) Which individuals belong to each category? and (3) What variables distinguish the different learner types represented by each factor? These questions are answered and discussed further in the 'findings and discussion' section.

Q-methodology, widely recognised for its ability to systematically identify and cluster shared viewpoints among participants, has been applied across educational and workplace studies (Balch and Brown 1982); capturing diverse and subjective perspectives (Gao and Soranzo 2020); integrate qualitative and quantitative techniques for robust data analysis; reveal consensus and disagreement within participant groups; and provide rich insights into the meaning structures underlying attitudes and beliefs. It is particularly effective for exploratory research (Dijkstra et al. 2025, Lu and Xiong 2023, Morea and Ghanbar 2024, Yang 2023) where the aim is to understand patterns of thought rather than to generalise statistically to a larger population. This method is also well-suited for studying various aspects of education and has been used to investigate tutors' attitudes, student perspectives, and perceptions of educational practices, offering insights into the complex dynamics within educational settings and reshaping the curriculum (Ahn 2022, Fabian et al. 2022). From a total population of 70 final-year QS apprentices, a convenience sampling method was used to recruit participants through

voluntary sign-up, ensuring genuine interest in the study. As Q methodology prioritises capturing diverse subjective viewpoints over statistical representation, this approach is appropriate. Of the 70, 30 expressed interest and completed the Q-sort. Out of 30, 21 completed valid Q-sorts- the remaining were excluded due to incompleteness or null responses, likely influenced by the process's 90-minute duration. While the sample size is modest, it falls within acceptable Q methodology standards, and its limitations are acknowledged. Final-year apprentices provided well-informed perspectives, making them more qualified to offer mature opinions. This approach ensured a consistent level of experience across participants. The effectiveness of a sample size of 21 is well-supported in Q-methodology research, as highlighted by Dieteren et al. (2023) whose systematic literature review synthesises previous studies to show that small samples can still yield reliable results when research questions involve cognitive or subject-specific constraints. As the Q-methodology seeks to identify the different opinions within a group of participants, large numbers of participants are not required for a Q-methodological study, and highly effective Q studies can be carried out with far fewer participants (Márquez-Álvarez et al. 2021, Watts and Stenner 2005). Moreover, the findings yielded in this study are more exploratory, not definitive, which reflects the subjectivity of the participants involved.

Figure 3 illustrates the Q-sorting grid used in the Q-methodology process, where participants were asked to arrange a set of 50 statements reflecting diverse ideas about the topic along a pre-defined ranking distribution, unlike traditional surveys that use Likert scales. They were instructed to start from either end and progress towards the center, distributing the statements according to their perceived significance or
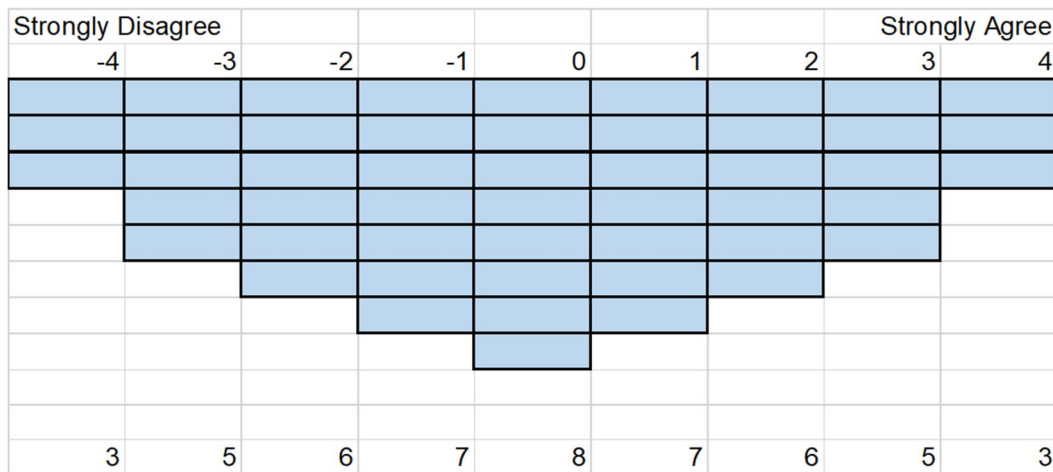
Figure 3. Q- sorting grid.

agreement. As seen in Figure 3, the grid allows fewer slots for extreme (strong) opinions and more for moderate or neutral positions. This forced distribution, resulting in a triangular shape, is a distinctive feature of Q-methodology, designed to encourage participants to express nuanced subjectivity rather than simply endorsing strong positive or negative views. This approach reflects the theoretical rationale articulated by Watts and Stenner (2012), who explain that the forced quasi-normal distribution in Q-sorts reduces response bias and promotes differentiation among statements, thereby enabling a richer understanding of participants' subjective viewpoints rather than a simple measure of agreement intensity. Participants were also asked to explain their selections, particularly the most agreed and most disagreed statements. This process, known as a 'concourse' (Fabian et al. 2022), systematically explores subjective opinions, attitudes, or perspectives (Sorola 2022). To enhance the process, the study focused on the depth of data collection. Follow-up questions in the form of a questionnaire allowed students to provide further thoughts on top of the Q-sorts, helping to gather rich, detailed data to address the research objectives. According to Q methodology guidelines, it is crucial that the number of participants (P-set) does not exceed the number of Q-sort statements to ensure robust factor analysis, which was adhered to in this study. Once all Q-sorts were completed, the ranked grids were statistically analysed to identify patterns and group similar Q-sorts into factors.

Data analysis

Interview

The semi-structured interviews with apprentices, lecturers, apprenticeship managers, and employers resulted in a pool of 60 initial statements. These statements were refined to 50 as listed in Table 2, based on the criteria suggested by Fabian et al. (2022), which includes (i) relevance, (ii) inclusivity, (iii) non-duplication, and (iv) balance. The reduction process involved removing overlapping or repetitive statements, merging similar ideas, and ensuring clarity and distinctiveness of meaning, with quotations from these interviews also informing and illustrating key aspects of the final statements. This helped ensure that the final set was manageable for Q-sorting while still capturing the breadth of perceptions and experiences. The 50 final statements were then categorised into 10 themes to ensure they comprehensively covered perceptions of WBL models.

Q-methodology

Table 3 shows the demographics of the participants in the Q-sorting. The demographic information collected was limited to gender and age, as these are significant variables that could shape the apprentices' perspectives. In line with the ethical approval for the study, other demographic/personal information was not collected.

Analysis was carried out using Banasick's Ken-Q online application/software (Banasick 2019) for Q methodology. Participants ranked the Q-statements based on their level of agreement, creating a structured distribution known as a Q-sort. The Ken-Q software first calculates correlations between each participant's Q-sort. Centroid factor analysis with varimax rotation is then used to identify groups of participants who ranked the statements similarly. These groups, or factors, represent shared viewpoints among participants and help to group people based on how similarly they ranked the statements. These

Table 2. Final set of 50 Q statements used in the study.

#	Statements	Category
S1	My team at the company do all that they can do to support me	Employer's support
S2	My mentor/ counsellor is approachable and is guiding me for my career success	Employer's support
S3	My seniors make sure I don't work overtime when I have university submissions	Employer's support
S4	My company is well aware of my apprenticeship: standards and expectations	Employer's awareness
S5	My company is not too aware of the different tasks that I do at university	Employer's awareness
S6	Things we do at work are completely different to what I do at the University	WBL relevance to the current course
S7	I have been able to self-reflect upon my job role and find the connectivity between theory and practice	WBL relevance to the current course
S8	We learn so much on a daily basis at work that we wouldn't really be able to learn at Uni	WBL relevance to the current course
S9	Meeting and networking with professionals at the workplace have helped me when completing coursework	WBL relevance to the current course
S10	I found my modules very helpful in terms of knowing the knowledge basis behind everything I do at work	Course relevance to the WBL
S11	The things I learn at university are too theoretical. I only absorb information but never put it into practice	Course relevance to the WBL
S12	The course takes into account the digitalisation aspect of construction	Course relevance to the WBL
S13	The amount of group work in class is too much. I prefer working individually	Course relevance to the WBL
S14	I find it very hard to balance my job, university work and life. My weekends are taken up mainly with coursework	Health and well-being
S15	My strengths and weaknesses are better identified and supported in this apprenticeship	Health and well-being
S16	My work-study pressure is created by myself I'm really poor at time management	Health and well-being
S17	I have given with equal opportunities and respect that I deserve at the workplace	Health and well-being
S18	We get to work with different people, of different ages, and different backgrounds both at work and at Uni	Health and well-being
S19	Having gender role models at work has helped me to see myself in the future	Health and well-being
S20	I'm on the right track towards EPA and MRICS. I am progressing well.	Apprenticeship completion
S21	I haven't received proper communication about 20% OTJ, EPA or MRICS. They are all sort of scattered information	Apprenticeship completion
S22	I would expect more input from the skill reviewers and apprenticeship team at Uni for my progress	Apprenticeship completion
S23	I know all the KSBs and I know when they are achieved. I'm on it	Apprenticeship completion
S24	I am totally lost in my lectures, and I have a lot to catch up	Degree completion
S25	I am receiving adequate personal and academic support/ feedback from my tutors	Degree completion
S26	I feel intimidated by other apprentices in class and group work	Challenges
S27	Having a like-minded team of apprentices has helped me in many ways	Challenges
S28	My university personal timetable was either incorrect or not clear	Challenges
S29	I am always called upon for work outside my contracted work hours	Challenges
S30	Sometimes I voluntarily do an extra hour because there's something urgent. I'm okay with it.	Challenges
S31	I take my lunch break, go out and really don't stick to the desk all the time when at work	Challenges
S32	Sometimes my employer forgets my Uni days and assigns tasks, but I remind them- that's not an issue	Challenges
S33	I don't attend to emails and calls in my university days	Challenges
S34	Because of the large number of students, I do not get a personalised learning experience at the University	Challenges
S35	I enrolled quite late on the course, and it was very penalising. I had to go back and look at everything myself on my own time	Challenges
S36	At work, I put what I've learned into practice in real work processes	Benefits
S37	Earning while learning is a massive help to run my family	Benefits
S38	I think I am better at expressing myself because I communicate with a lot of people at work	Benefits
S39	I will automatically receive a position in our company after I graduate	Benefits
S40	When I graduate, I have less stress in finding jobs because I have more work experience for my age compared to non-apprentices	Benefits
S41	I get best practice guidance from my senior colleague who has been in the same position as I was a few years ago	Benefits
S42	I learn a lot through in-company observation and exploration like site visits	Benefits
S43	I don't see myself as an apprentice, I was working anyway, and I know my stuff. I just needed the paper qualification	View
S44	I am aware that my attendance is monitored and engagement with modules is important	View
S45	Module workshop periods should be longer. I prefer the curriculum to be more practical	Suggestions
S46	I like being a student and I like more university time at least 2-days release	Suggestions

(*continued*)

Table 2. Continued.

#	Statements	Category
S47	There's too much break between my modules at university	Suggestions
S48	I prefer all lectures to be recorded or delivered online	Suggestions
S49	One week of school and then three weeks of work would be ideal for me	Suggestions
S50	I prefer more connection between my employer and academic staff. I sometimes have to email tennis between the two	Suggestions

Table 3. Demographics of the participants in the Q-study.

Demographic information		Count (Nr)	Percentages (%)
Gender	Male	12	57%
	Female	9	43%
	Not Specified	0	0%
Age group	Below 25	8	38%
	25 and above	13	62%

perspectives were further analysed to uncover key themes, enriched by participants' comments for deeper insights.

Correlation matrix

Table 4 was generated using Ken-Q Analysis software, which is designed for Q methodology studies. The software calculates the Pearson correlation coefficient between each pair of participants' Q-sorts. This coefficient measures the degree of similarity in how each pair of participants ranked the 50 statements to identify patterns of similarity in their viewpoints, as shown in Table 4. The Q sorter(s) are treated as variables and statements as observations, with 'US' indicating 'User' or 'participant'. A value close to +100 indicates a very similar ranking (high agreement), while a value close to −100 indicates opposite rankings (disagreement). A positive correlation between two statements indicates that individuals who strongly endorse one statement are also likely to endorse the other. Similarly, the correlation between participants' Q-sorts reflects the similarity in their rankings. A highly positive correlation indicates similar ranking patterns, suggesting agreement in perspectives, while a low or negative correlation implies dissimilarity. For example, if there is a positive correlation between Statement-1 and Statement-2 (listed in Table 2) in this Q-sort study, it implies that participants who strongly identify with Statement-1 are also more likely to strongly identify with Statement-2. For example, referring to Table 4, User 7 and User 8 show a high correlation coefficient of 0.89, suggesting a strong similarity in how they sorted the statements. This indicates that they likely shared similar viewpoints about work-based learning, which is further supported by the fact that they were grouped under the same factor category during the subsequent analysis.

Factor extraction

Factors were then extracted using centroid factor analysis (CFA) as shown in Table 5, to highlight distinct groupings of shared viewpoints among participants. In Q methodology, CFA helps identify patterns by clustering participants (Q-sorts) who rank the statements in similar ways, without assuming strict statistical conditions like in traditional factor analysis. Each factor represents a group of apprentices who share a similar perspective on work-based learning, based on how they arranged the 50 statements. This technique is particularly useful when the study necessitates uncovering commonalities among variables without making strong assumptions about their distribution or correlations (Coogan and Herrington 2011). Factors in this context represent clusters of responses (Q-sorts) that reveal shared perspectives based on ranking statements similarly within the factor and compared to the other factors. This helps in facilitating the identification of apprentices with shared views (Watts and Stenner 2005) and as a result, the categorisation of various types of apprentices was established.

The number of factors to retain was determined by evaluating eigenvalues as presented in Figure 4. Eigenvalues are numbers that show how much of the overall data's variation is explained by each factor identified in the analysis. In Q-methodology, after grouping similar viewpoints (factors), the eigenvalue indicates how important or strong each factor is in representing the participants' shared opinions. A higher eigenvalue means the factor explains more of the differences in how people ranked the statements. The eigenvalues help determine which factors to retain and which ones to discard according to Kaiser's Rule. According to Kaiser's Rule, a factor is retained if its eigenvalue is greater than 1, indicating it accounts for more variance than an individual variable. Factors with eigenvalues above 1 were retained, as illustrated in Figure 4, showing eigenvalues of 5.31, 1.65, 3.13, and 1.29 for Factors 1, 2, 3, and 4, respectively.

All four factors had eigenvalues greater than 1.00 and at least two Q-sorts that loaded significantly on that factor alone, meeting Watts and Stenner (2012) criteria for factor interpretation. These four factors

Table 4. Correlation matrix of participants' Q-sorts.

Respondent	US1	US2	US3	US4	US5	US6	US7	US8	US9	US10	US11	US12	US13	US14	US15	US16	US17	US18	US19	US20	US21
US1	100	68	39	3	−49	0	35	33	27	27	20	50	49	40	42	42	15	16	19	13	44
US2	68	100	30	10	−48	6	24	29	18	40	32	51	48	31	43	37	30	15	7	10	48
US3	39	30	100	−23	−9	−23	96	92	69	22	22	62	54	16	18	38	−9	−9	29	4	27
US4	3	10	−23	100	−11	88	−24	−18	−2	12	8	6	8	−21	−23	18	32	72	−17	−2	38
US5	−49	−48	−9	−11	100	3	−13	−11	0	−23	−18	−27	−20	−8	−23	−17	−8	3	5	6	−37
US6	0	6	−23	88	3	100	−28	−18	−1	7	−2	−2	0	−31	−33	14	40	84	−20	−3	25
US7	35	24	96	−24	−13	−28	100	89	65	21	22	57	48	19	16	32	−11	−16	29	3	22
US8	33	29	92	−18	−11	−18	89	100	70	25	25	65	55	15	16	38	−2	−8	19	4	29
US9	27	18	69	−2	0	−1	65	70	100	18	14	45	42	5	5	36	−16	10	28	13	21
US10	27	40	22	12	−23	7	21	25	18	100	95	23	19	20	19	15	26	17	15	−6	7
US11	20	32	22	8	−18	−2	22	25	14	95	100	23	18	23	22	13	17	8	12	−10	6
US12	50	51	62	6	−27	−2	57	65	45	23	23	100	93	27	33	51	−5	0	3	6	51
US13	49	48	54	8	−20	0	48	55	42	19	18	93	100	33	37	48	−6	−1	7	12	51
US14	40	31	16	−21	−8	−31	19	15	5	20	23	27	33	100	91	23	−1	−31	36	30	17
US15	42	43	18	−23	−12	−33	16	16	5	19	22	33	37	91	100	31	−3	−29	31	26	17
US16	42	37	38	18	−17	14	32	38	36	15	13	51	48	23	31	100	23	24	31	25	48
US17	15	30	−9	32	−8	40	−11	−2	−16	26	17	−5	−6	−1	−3	23	100	35	12	9	25
US18	16	15	−9	72	3	84	−16	−8	10	17	8	0	−1	−31	−29	24	35	100	−5	7	25
US19	19	7	29	−17	5	−20	29	19	28	15	12	3	7	36	31	31	12	−5	100	62	10
US20	13	10	4	−2	6	−3	3	4	13	−6	−10	6	12	30	26	25	9	7	62	100	21
US21	44	48	27	38	−37	25	22	29	21	7	6	51	51	17	17	48	25	25	10	21	100

Table 5. Factor extraction using centroid factor analysis.

Nm	Participant	Factor 1	Factor 2	Factor 3	Factor 4
1	US1	0.7007	−0.2563	−0.0632	−0.2385
2	US2	0.6934	−0.226	−0.01467	−0.1525
3	US3	0.6172	0.3382	0.4854	−0.2638
4	US4	0.186	0.1436	−0.7149	0.2208
5	US5	−0.3119	0.141	0.1668	0.3229
6	US6	0.1031	0.2104	−0.7673	0.2663
7	US7	0.5597	0.3055	0.523	−0.2609
8	US8	0.6263	0.3902	0.4395	−0.2211
9	US9	0.5075	0.3973	0.2945	−0.0336
10	US10	0.4812	0.1329	0.0116	0.3792
11	US11	0.4145	0.1457	0.0991	0.3698
12	US12	0.7435	0.1793	0.1386	−0.3185
13	US13	0.706	0.0884	0.1353	−0.2371
14	US14	0.3726	−0.5184	0.4295	0.1802
15	US15	0.3978	−0.551	0.3934	0.0908
16	US16	0.6669	−0.0715	−0.0495	0.0265
17	US17	0.2302	−0.0722	−0.4019	0.2612
18	US18	0.2215	0.1929	−0.6629	0.2828
19	US19	0.3239	−0.2742	0.3188	0.3275
20	US20	0.2328	−0.3838	0.0917	0.1753
21	US21	0.6268	−0.0822	−0.2957	−0.1673
		Factor 1	**Factor 2**	**Factor 3**	**Factor 4**
Eigenvalues		5.3088	1.6458	3.1296	1.2856
Explained Variance		25	8	15	6
Cumulative Explained Variance		25	33	48	54

accounted for 100% of the Q-sorts and explained 54% of the study variance, within the acceptable value of 40% (Watts and Stenner 2012). A qualitative cross-check analysis was conducted to ensure clustering reliability. Two researchers independently analysed the same Q-sorts and compared their factor solutions to check for Inter-Rater Reliability, ensuring methodological consistency.

Factor loading: Refers to the degree to which each participant's Q-sort correlates with a specific factor, indicating the strength and direction of the relationship between their responses and the identified factors, as previously presented in Table 5.

Table 6 presents the factor loadings after Varimax rotation, which means that the data has been statistically adjusted to clarify and separate the distinct learner viewpoints more effectively- making it easier to interpret which participants align most strongly with each factor. Varimax rotation further sharpens these clusters, making the differences between them clearer and easier to interpret. The factors were initially flagged (with a tick '√') to identify which participants strongly represented each viewpoint. These flagged Q-sorts were then used to create factor arrays for interpretation as presented in Table 6.
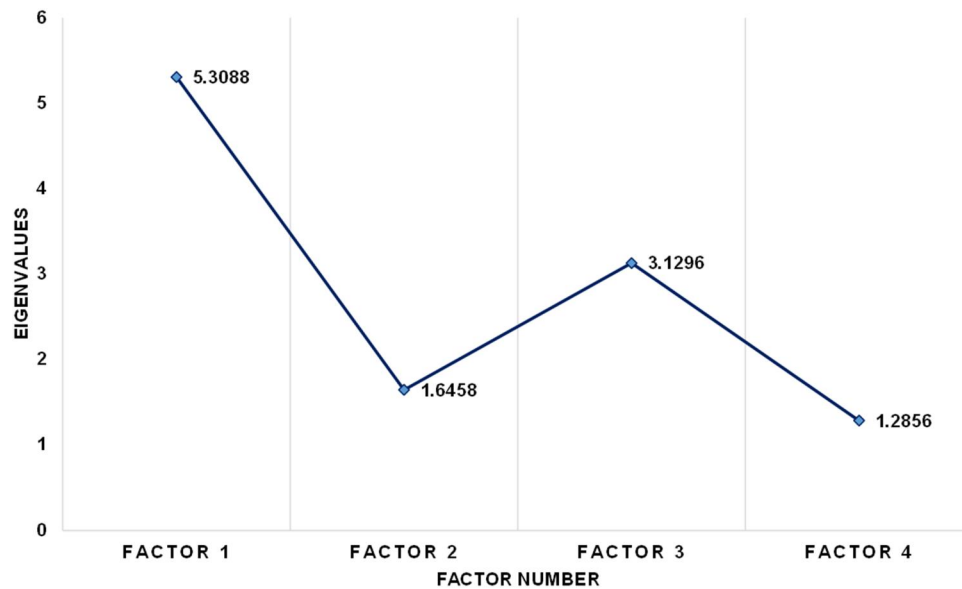
Figure 4. Eigenvalues used to determine factor retention.

Table 6. Factor loading after varimax rotation.

Number	Participant	FG	Factor 1		Factor 2		Factor 3		Factor 4	
3	US3	F1-1	0.9269	√	−0.1703		0.0616		0.1129	
8	US8	F1-2	0.9123	√	−0.1208		0.0236		0.1476	
7	US7	F1-3	0.8913	√	−0.2318		0.0425		0.1137	
9	US9	F1-4	0.8019	√	0.0307		0.0254		−0.0507	
12	US12	F1-5	0.7375	√	0.1155		0.2514		0.3026	
13	US13	F1-6	0.6623	√	0.1297		0.3344		0.2523	
6	US6	F2-1	−0.0925		0.9116	√	−0.1781		−0.0224	
4	US4	F2-2	−0.0796		0.8759	√	−0.1079		0.0827	
18	US18	F2-3	0.0146		0.8646	√	−0.121		0.0204	
21	US21	F2-4	0.3668		0.5095	√	0.3947		0.1604	
17	US17	F2-5	−0.1512		0.4998	√	0.1357		0.2724	
15	US15	F3-1	0.0375		−0.2967		0.7498	√	0.3761	
14	US14	F3-2	0.0164		−0.3098		0.7425	√	0.3442	
20	US20	F3-3	0.031		0.1104		0.7023	√	−0.2579	
19	US19	F3-4	0.1761		−0.1005		0.5987	√	−0.0862	
16	US16	F3-5	0.4545		0.3525		0.4652	√	0.1112	
10	US10	F4-1	0.1249		0.0519		−0.0943		0.8492	√
11	US11	F4-2	0.1181		−0.0399		−0.1151		0.8351	√
2	US2	F4-3	0.2642		0.236		0.3771		0.6148	√
5	US5	F4-4	−0.096		−0.1227		−0.1176		−0.4985	√
1	US1	F4-5	0.3595		0.1761		0.4569		0.4609	√

Factor interpretation

As described in the Factor extraction section, four factors were retained following centroid factor analysis with varimax rotation. Q-sorts with shared perspectives were grouped into four factors, each encompassing 5-6 participants. Smaller, focused samples are acceptable in Q methodology studies, as the quality of insights often outweighs the need for large numbers (McKeown and Thomas 2013). An extensive desk study was undertaken to discern the characteristics of Q-sorts associated with each factor. For example, participants grouped under Factor 1 strongly concurred with Statement-1 (My team at the company does everything possible to support me), suggesting they appreciate workplace support. This process helped identify consistent traits within each factor and label the four factors: (i) Proactive Careerists, (ii) University Enthusiasts, (iii) Studious Workers, and (iv) Resilient Strivers. The results and findings section describes the characteristics of these factors and their implications for the study.

Validation: Lastly, the categorisation was validated through a workshop presentation at the Council of the Heads of the Built Environment (CHOBE). The participants, subject leaders in the built environment with experience in managing DA programmes, provided feedback that was used to refine the categorisation and improve the description.

Findings and discussion

Understanding apprentices based on their perceptions and preferences

This section presents the categorisation of apprentices into four distinct factors, each reflecting unique characteristics and learning preferences. Each factor has been given a descriptive title to capture its defining traits. The analysis addresses three guiding questions: (i) how many categories of apprentices exist, (ii) which individuals belong to each category, and (iii) what variables differentiate these groups. Figure 5 illustrates the categorisation, derived from the Q-methodology analysis. The four factors and their associated learning styles are described in detail below. Within the narrative, statements are referenced with their number and

rank (e.g. S4:+4 indicates strong agreement with Statement 4).

Factor 1 – proactive careerists

Factor 1 accounted for 25% of the study variance, with six Q-sorts loading on it, predominantly representing individuals aged 25 and above, with equal representation of three male and three female apprentices. These apprentices demonstrate a strong preference for workplace learning over traditional university study (S1:+4). Evidence from semi-structured interviews and additional Q-sort comments reinforces this observation. For instance, views regarding university learning include: "I honestly love working, so I feel like we learn so much on a daily basis that we wouldn't
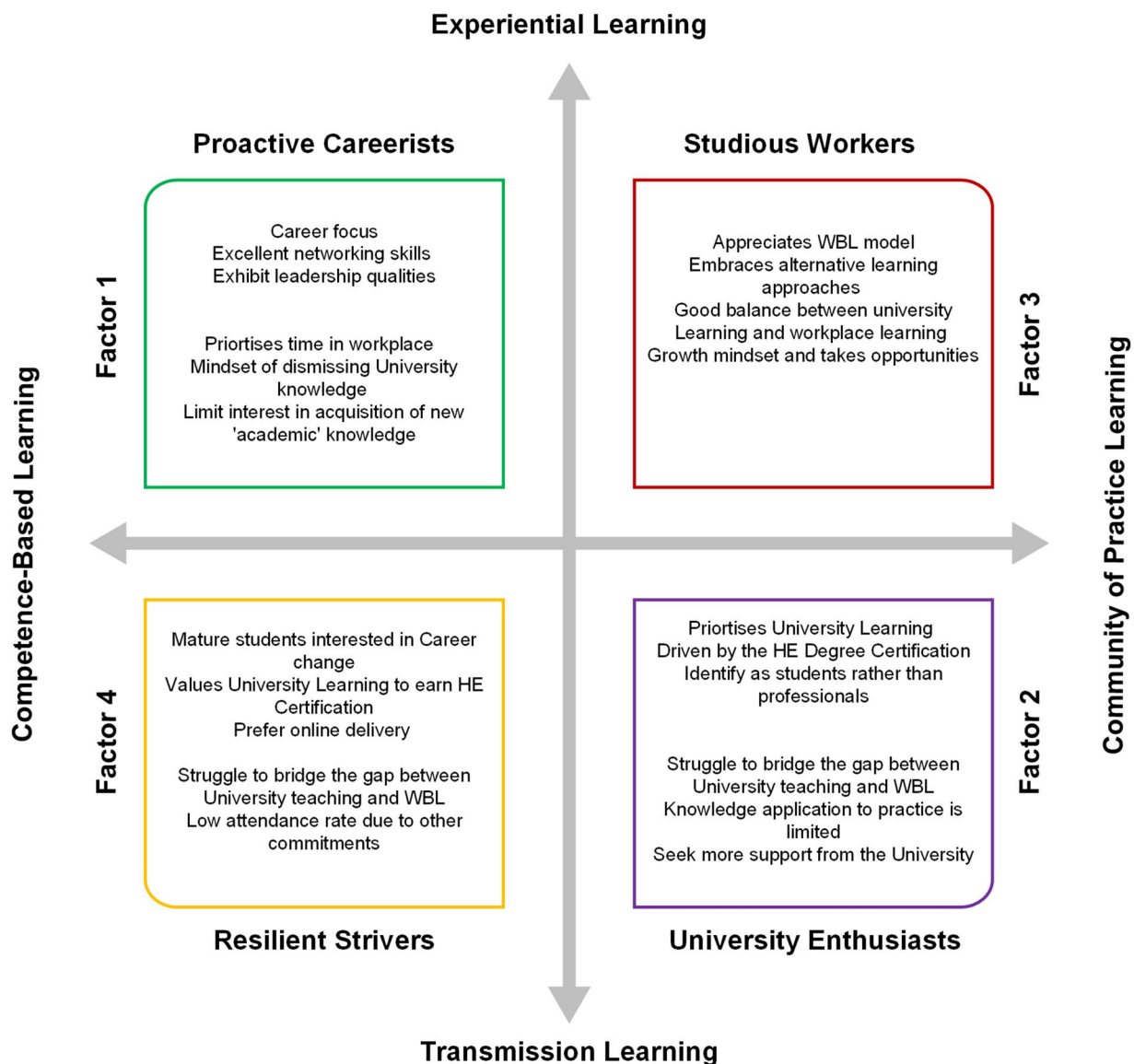

Experiential Learning

Proactive Careerists

Factor 1

Career focus
Excellent networking skills
Exhibit leadership qualities

Priortises time in workplace
Mindset of dismissing University knowledge
Limit interest in acquisition of new 'academic' knowledge

Studious Workers

Factor 3

Appreciates WBL model
Embraces alternative learning approaches
Good balance between university Learning and workplace learning
Growth mindset and takes opportunities

Competence-Based Learning

Community of Practice Learning

Factor 4

Mature students interested in Career change
Values University Learning to earn HE Certification
Prefer online delivery

Struggle to bridge the gap between University teaching and WBL
Low attendance rate due to other commitments

Factor 2

Priortises University Learning
Driven by the HE Degree Certification
Identify as students rather than professionals

Struggle to bridge the gap between University teaching and WBL
Knowledge application to practice is limited
Seek more support from the University

Resilient Strivers

University Enthusiasts

Transmission Learning

Figure 5. Framework for four learner types and their suggested learning strategies.

Table 7. WBL model of learning in the workplace mapped with the 4 factors.

WBL model	Mapped statements	Factors	Traits/Characteristics
Transmission Learning	S2, S8, S42, S19, S21, S22	Factor 4 - Resilient Strivers Factor 2, University Enthusiasts	• Rely on seniors to shadow work and guide the process • Prefers more structured and detailed information on tasks • Rely on more support from other parties • Identify as students more than professionals • Struggle to see the connection between theory and practice Believes in mentorship and role model
Experiential Learning	S7, S26, S15, S30	Factor-3 Studious Workers Factor-1 Proactive Careerists	• Learn from their own experience • Reflect on their own practice • Volunteer for extra work happily because they like to learn by applying • Take ownership of their time in managing university days and off-the-job days • At work, they put what they've learned into practice in real work processes • Identify their strengths and weaknesses Prefer the practical side of learning and a practical curriculum
Communities of Practice Learning	S18, S13 S9, S2, S31, S17, S1	Factor 2, University Enthusiasts Factor-3 Studious Workers	• Acknowledges the group dynamics, diversity in groups and is open to learning from them • Takes opportunities for networking • Acknowledges peer learning from like-minded apprentices • Self-aware that they are better at expressing themselves because they communicate with lots of people at work They get the respect they deserve so, in return, they give that respect back to their peers at work
Competence(outcome) based Learning	S39, S40,	Factor 4 - Resilient Strivers Factor-1 Proactive Careerists	• Confident and future-focused mindset that believes they have already secured a job upon graduating. • Self-assured and pragmatically prepared for the job market

really be able to learn in the university course". Another apprentice remarked: "…The university side of getting up in the morning, listening to long lectures, and doing assignments is what I don't like". While these comments may reflect individual preferences or lifestyle choices, they highlight perceptions that influence learner engagement. Such views do not necessarily indicate systemic shortcomings in university education but reveal mismatches between traditional pedagogical approaches and the learning preferences of some apprentices. Recognising these perspectives is essential for informing inclusive and responsive teaching practices in degree apprenticeship programmes. This preference for workplace learning aligns with the experiential WBL pedagogy (Figure 5 and Table 7), where individuals build knowledge from work experience (Fuller and Unwin 2003, Lynch et al. 2006). These apprentices exhibit constructivist learning characteristics, constructing knowledge through workplace interactions (Lingard et al. 2022). Employer support, such as mentorship, is a key success factor (Table 8), consistent with prior research on the importance of guidance in WBL programs (Taylor-Smith et al. 2019). Apprentices in this category are self-reliant learners, taking ownership of their learning process, actively pursuing career goals, and developing networking skills. One apprentice stated, "… You start working and you learn things on the go, and you talk to different people. I know for myself people are helpful. They really take the time to teach me how to do things…"

Some apprentices in this group perceive university knowledge as outdated: "… What we need is hands-on experience, not more theory…" This aligns with existing literature noting apprentices' preference for experiential over theoretical learning (Fuller and Unwin 2003). They expect less support from the university and view WBL as a continuation of work, demonstrating traits of competence-based learning (Fuller and Unwin 2003) which do not see themselves as typical 'students' (S43:+4). These perceptions are influenced by structural and philosophical constraints of universities which prioritise foundational knowledge, critical thinking and transferable skills over rapidly changing industry needs (Omotayo et al. 2023). Apprentices in this category also prefer individual work in university settings (S13:+4), as they already have extensive teamwork experience at work (Jiang et al. 2024). One apprentice stated, "I already work in teams when at work, I do not want my performance to be assessed based on lots of group work". Nonetheless, they exhibit leadership skills and take ownership in group tasks. In terms of professional identity, these apprentices identify primarily as professionals rather than students, reflecting a mature and well-developed sense of professional identity

(Klinken and Aspinall 2011, Jiang et al. 2024, Hamilton 2019).

Suggestions for support: Maintain strong employer mentorship, provide flexible university engagement, and tailor WBL activities to reinforce experiential and competence-based learning approaches.

Factor 2 – university enthusiasts

Factor 2 accounted for 8% of the study variance, with five Q-sorts loading on it (3 female, 2 male), equally representing apprentices below and above 25 years of age. These apprentices enjoy their university experience, structured learning and seek more support from tutors and demonstrate a preference for community of practice learning (Table 7) (Fuller and Unwin 2003, Lynch et al. 2006). They appreciate the breadth of university knowledge relative to workplace learning and make minimum complaints about their learning and administration in general at university (S10:+4) ".the module itself really helped in terms of breaking down the different aspects because at work we mostly focus on Section 4, due to the requirements of payments while the university module covers more sections".

These apprentices display constructivist learning characteristics, engaging meaningfully with peers, mentors and work experience (Lingard et al. 2022). They highly value their degree for career progression, emphasising that "If I want to be promoted, I know they will ask me for my degree". This opinion is supported by literature, which recognises that acquiring a degree qualification is seen as an accomplishment (Smith et al. 2021).

However, they may struggle to connect workplace experiences with university learning and prefer one-on-one tutor support, aligning with transmission learning approaches (Fuller and Unwin 2003). Some noted workplace approaches were outdated: "…my senior managers are very old-fashioned. We still take-off in books and we still have SMM books in our office…". This supports findings from (Gambin and Hogarth 2016, Nafilyan and Speckesser 2019) regarding the duties undertaken by apprentices sometimes differing from their university learning.

University Enthusiasts identify more as students than professionals, reflecting a less developed professional identity and weaker sense of belonging. This category resonates with Fabian et al. (2022)

Table 8. Findings on WBL successes factors and challenges in the QS DA programme.

WBL	Themes	Instances from participants
Successes	Employer's Involvement	Employer collaboration and contribution to the curriculum design through industry advisory boards and guest lectures improve the quality of the training.
		Mentorship from employment organisations and their involvement in progress monitoring encourages apprentices to remain focused.
	Learning and Training	The flexibility of the WBL structure which differs from the traditional education route encourages engagement and wider participation.
		WBL structure bridges the gap between theory and practice using signature pedagogies to improve the learning experience.
	Recognition	Recognition from leading professional bodies working in the construction industry i.e. RICS, CIOB
		Acquiring the degree qualification – Bachelors or Masters
	Benefits	Earnings from apprenticeship placements while
		The employers provide an assurance for the apprentices for their Job security post-degree completion
		Apprentices are presented with opportunities for networking and building professional contacts.
		Structured pathway for career progression following apprenticeship training completion.
Challenges	Health and well-being	Workload imbalance creates stress among students which directly impacts their health and wellbeing. Work and study pressure could cause poor academic and workplace performance
		Unhealthy work-life balance could create burn-out among students
	Alignment of Learning and Practice	Some of the job roles taken by apprentices do not align with their university education and apprentices find it challenging to transfer theoretical and practical knowledge as a result.
	University delivery models	Joint delivery including apprentices and full-time students creates a gap/divide and allows less flexibility in targeting the various audiences.
	Sense of belonging	Some apprentices struggle with the sense of belonging and need more support in balancing academic and professional responsibilities/roles.
	Identity	Inadequate acknowledgement of the dual identity of various categories of apprentices creates less flexibility in teaching and learning design.

classification of "aligned student-workers" where their group indicates a less developed professional identity and a weaker sense of belonging in their profession (Fabian et al. 2022). One reason for their preference for university life is workplace pressure, aligning with Gambin and Hogarth (2016) findings on apprenticeship challenges. Students expressed concern about insufficient time for off-the-job training due to heavy workloads, a widely documented issue affecting well-being (Taylor-Smith et al. 2019), (Yng and Michelle 2024) (Table 8). One apprentice noted, "…I have been working full-time hours whilst studying as well; this causes a lot of stress. I sometimes wish I had the normal university experience in terms of living in university accommodation and joining student societies". This underscores the need for workplace learning tailored in partnership with universities, supported through structured guidance, handbooks, or training workshops that align tasks with learning outcomes and provide feedback.

Their learning style aligns well with transmission learning, which focuses on structured knowledge delivery, and community of practice (Figure 5), which fosters collaboration and shared learning with peers and professionals.

Suggestions for support: Strengthen university-employer collaboration, provide structured guidance for workplace mentors, align tasks with academic outcomes, and maintain consistent feedback to enhance engagement and well-being.

Factor 3 – studious workers

Factor 3 accounted for 15% of the study variance, with five Q-sorts loading on it (1 female, 4 male). Apprentices in this group balance university and workplace learning, appreciating WBL benefits while remaining open to alternative learning approaches. (S36:+4). One apprentice noted: "…The fact that I am continually learning and developing as a person both in the industry and academic world is the most rewarding thing".

These learners demonstrate community of practice and experiential learning characteristics (Fuller and Unwin 2003, Schreiber and Valle 2013). They connect university theory with practical workplace applications and show advanced reflective skills in experiential learning (Brodie and Irving 2007). This category resonates with Fabian et al. (2022) classification of "cast adrift" where they see work as secondary to their studies, feel bored at work and generally prefer university learning over the tasks they do at workplace

(Fabian et al. 2022). Integrating theoretical knowledge gained at the university with practical skills acquired in the workplace leads to a more holistic understanding of their field (Table 7). This nuanced understanding is revealed through the Q-sorts and is identified as a success factor (Table 8) that bridges the gap between theory and practice. One apprentice noted, "…this week in class, I picked up a new thing called 'time value of money,' and I've been chatting about it with my senior coworker. He shared a story about how discounting is used in our company". Another comment highlights their commitment to the WBL model and their ability in critical reflection: "…I really enjoy it when lecturers ask us to watch a video before class so we can come prepared. Also, those extended workshops where we get to practice measurements are great". These learners are receptive, well-prepared, and demonstrate a growth mindset, ready to embrace new learning approaches, including both synchronous and asynchronous learning techniques like the flipped classroom technique (S48:+4; S45:+3). Additionally, they create more networking opportunities, seeing the learning potential in every interaction. They treat meeting new people and gaining new experiences as part of the success of their apprenticeship, as expressed by one apprentice: "…these weird and wonderful opportunities I've had like talking to our chairman and building these relationships…". In terms of identity, these apprentices balance their multiple identities as both students and professionals, developing a sense of belonging in the profession and readiness to explore opportunities.

To support studious workers effectively, it is essential to strengthen curriculum-employer alignment so that academic modules clearly reflect workplace realities. Facilitating reflective practice encourages apprentices to connect theory with real-world applications, while structured feedback loops between academic mentors and workplace supervisors help maintain consistent learning (Fuller and Unwin 2003). Therefore, experiential learning and community of practice approaches are particularly beneficial for this group (Figure 5). These methods allow Studious Workers to contextualise their academic learning through hands-on experiences, collaboration with peers and professionals, and reflective practice.

Suggestions for support: Facilitate reflective practice, strengthen curriculum-employer alignment, and maintain structured feedback loops between mentors and tutors. Experiential and community of practice approaches enable this group to contextualise learning effectively.

Factor 4 – resilient strivers

Factor 4 accounted for 6% of the study variance, with five Q-sorts loading on it (2 female, 3 male). These apprentices prioritise earning a degree for financial or practical reasons rather than engagement with learning outcomes, deviating from the typical student approach to higher education. While their primary motivation often stems from the financial aspect (S37:+4) of earning while learning ". it is great being paid and not having to think about being in debt after graduating".

Apprentices of this type exhibit characteristics of behaviourism (Lingard et al. 2022) as their learning is shaped through external reinforcement and conditioning, which is influenced by the rewards, feedback, and structures they encounter in their training environments. This category of apprentices also faces challenges in bridging the gap between university education and WBL, leaning towards the competence-based learning approach (Fuller and Unwin 2003). It is worth noting that most apprentices in this category are mature students (above 25) who have moved into Construction and Built Environment to obtain the degree for better pay. This aspect confirms claims that some apprentices join the scheme for the 'wrong reasons' (Daniel et al., 2020) and are at risk of struggling to balance work-study life (Fabian et al. 2022). Apprentices in this category may struggle with attendance for scheduled on-campus lectures due to personal commitments, although they value university learning – "…as I have a young family, it works for me that I can have this sort of balanced work life". They tend to prefer lectures delivered online (S48:+4), where they have the flexibility to attend to caring responsibilities during off-the-job days, while also needing more one-on-one support and guidance through the course. This indicates traits of the transmission learning model (Table 7) (Fuller and Unwin 2003). In terms of their sense of belonging, these apprentices tend to view themselves more as professionals than university students. However, they somewhat lack the right competencies and motivation to pursue advancement in the profession. As such, they are less likely to be committed to the profession and further pursuing chartered surveyor status due to overlaps and challenges with other identities.

Resilient Strivers are learners who prioritise tangible and practical outcomes, such as financial gain and earning while studying, over deep engagement with the learning process. Their motivation is often driven by the immediate benefits of income and qualification, which helps maintain their commitment but may limit their full academic and professional growth. Their learning style aligns best with competency-based learning and transmission learning (Figure 5), where structured content and real-world relevance are emphasised. Supporting this group requires connecting learning to real-world applications, providing mentorship to foster deeper involvement with their development, and balancing their short-term financial goals with long-term career progression.

The analysis highlighted that while participants' characteristics may overlap across factors, the categorisation identifies dominant traits that help to explain distinct learner types. The four factors discerned through Q-methodology, along with their associated learning styles, provide a structured understanding of the diversity within Quantity Surveying apprenticeships and offer a foundation for tailoring pedagogical approaches to better meet apprentices' needs.

Suggestions for support: Link learning to real-world applications, provide mentorship, balance short-term financial goals with long-term career progression, and tailor learning flexibility for personal circumstances.

Significance and implications of factor identification

Apprentices exhibit overlapping characteristics across the four factors, highlighting shared patterns in learning preferences and professional development. For instance, Factor 1 apprentices view employers as supportive educators, whereas Factor 2 apprentices prefer structured, university-style teaching and perceive less formal guidance from employers. Studious Workers and University Enthusiasts both prioritise structured academic learning as a foundation for professional growth. Similarly, Resilient Strivers share traits with both Studious Workers and Proactive Careerists, particularly in demonstrating commitment to personal development and a strong work ethic. These overlaps underscore the importance of tailoring learning approaches to accommodate diverse learner types and the varying ways apprentices engage with both workplace and academic environments. Initiatives such as the NVBK model in the Netherlands illustrate how professional bodies can support alignment between higher education and occupational practice (Klinken and Aspinall 2011).

As illustrated in Figure 5, this study offers new theoretical insights by identifying distinct learner types within the construction apprenticeship context, thereby enriching existing models of work-based

learning and apprentice identity. These findings advance academic debates by providing empirical evidence of how varying learner preferences shape engagement with WBL and what type of teaching and learning strategies best suit these typologies. Drawing on Fuller and Unwin (2003) and Lynch et al. (2006), the study highlights four WBL learning styles- experiential learning, community of practice learning, competence-based learning, and transmission learning demonstrating how each aligns with the characteristics and preferences of specific learner types, as reviewed in the literature.

Furthermore, in seeking ways to enhance existing WBL, successes and challenges were identified and individually explained within the factor explanations, supported by relevant literature. Table 8 summarises the findings and highlights the factors that stand out from the investigation. The identified themes provide opportunities to initiate changes to existing WBL and/ or the curriculum, ensuring that it remains relevant and effective for all types of apprentices.

While this study identifies four distinct learner types based on apprentices' perceptions, it is important to acknowledge that apprentices may transition between these profiles throughout their training. Fuller and Unwin (2003) also agree that apprentices' identity traits are subject to boundary crossing. For example, a 'Resilient Striver' might develop stronger academic confidence over time and begin to exhibit traits of a 'Studious Worker'. Although this study does not investigate the dynamics of such changes or the factors influencing them, existing learning theories such as peripheral learning (Lynch et al. 2006) suggest that learners' profiles remain within these broad categories despite evolution. Therefore, even with potential shifts, the categories identified here remain relevant and applicable.

Practically, the findings suggest optimising the QS apprenticeship WBL model through curriculum adjustments that incorporate both structured and adaptable learning pathways. Assessment methods should be diversified to reflect different learner strengths, and stronger university-industry collaboration is recommended to better integrate theoretical and practical learning. This includes blending structured, transmission-style learning for those who prefer clear guidance (e.g. University Enthusiasts) with experiential, community-based approaches for more autonomous learners (e.g. Proactive Careerists). Incorporating digital tools that support both collaborative learning and self-directed exploration can enhance engagement across all learner types. Moreover, adaptive learning pathways that allow apprentices to shift between learning modes as their needs evolve will improve the overall effectiveness and inclusivity of WBL in digital environments.

Conclusions and emerging opportunities

In addressing the three research aims, this study (i) identified four distinct apprentice categories within the WBL model: Proactive Careerists, University Enthusiasts, Studious Workers, and Resilient Strivers- each showing unique yet sometimes overlapping traits in learning preferences, engagement, belonging, and WBL experiences. Notably, no strong age-related patterns emerged, suggesting that individual motivations, identities, and learning styles play a greater role than age alone.

The study then (ii) examined how the four learner types influence learning preferences and shape professional identity development. Traits such as reflective thinking led some learners to prefer structured environments, while others thrived in exploratory, experiential settings. Attributes like technical competence, learning agility, communication, and problem-solving aligned with different learner types and influenced their engagement with professional development. The framework in Figure 5 builds on these insights by linking learner traits to appropriate teaching and learning pedagogies, contributing to the theoretical discourse and supporting more targeted WBL practices. The findings suggest that curriculum and assessment could benefit from both structured and flexible pathways. While some apprentices complemented the existing WBL approach, others critiqued it in favour of more structured, university-style learning. Moreover, apprentices with more academic experience preferred theoretical learning, whereas those from practical backgrounds favoured hands-on approaches, preferences often shaped by their environments and support systems. The study therefore recommends inclusive, adaptable approaches that reflect diverse learning needs.

Finally, the study (iii) explored the successes and challenges of WBL in promoting continuous improvement. It highlights that successful completion of a DA programme empowers apprentices to take ownership of their roles and address skills gaps in the construction sector. While the study does not critique any specific stakeholder within the tripartite DA arrangement, it centers on apprentices' subjective experiences of the WBL model, as capturing these perspectives is essential, as effective pedagogical design must be grounded in learner needs. The findings identify key influences on professional identity and graduate outcomes, including employer support, curriculum

relevance, dual identity challenges, workload, and well-being. These insights underscore the importance of flexible, learner-centered approaches that accommodate diverse characteristics, enhance engagement, and support identity development.

Practically, the results inform the design of more responsive apprenticeship programmes by industry stakeholders, emphasising tailored mentorship and adaptable learning environments to improve retention and skills development. Educators are encouraged to implement personalised strategies that align with apprentices' interests and strengths, while universities can use these insights to create more inclusive and effective WBL experiences. Policy-wise, the study highlights the need for adaptive apprenticeship standards and funding mechanisms that recognise diverse learner needs. The findings contribute to broader efforts to enhance the DA pathway, offering a foundation for more diversified training models that support professional identity and retention in quantity surveying. However, further research, particularly longitudinal and cross-sectoral, is recommended to test and extend these insights. Future studies should also explore the evolving roles of educators and training needs within QS and beyond, to ensure DAs remain relevant and impactful across industries.

Limitations of the study

While the sample size of 21 could limit the generalisability of the findings across the Quantity surveying apprenticeship population, the depth of data and robust methodology provide valuable insights into learner types within the context of work-based learning. Also, Q methodology focuses on capturing the diversity of perspectives rather than generalising to a larger population. Working with smaller, focused samples renders quality insights that outweigh the need for large numbers. Consequently, this study can only achieve an analytical generalisation based on the likely transferability of findings to other construction and built environment DA programmes based on the similarity of the context.

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Data availability statement

Some or all data, models, or code generated or used during the study are available from the corresponding author by request. The following data, models that support the findings of this study, are available from the corresponding author upon reasonable request:

- The Q sorts for the 21 participants
- Transcripts for the semi-structured interviews
- Data analysis conducted by using Banasick's Ken-Q online application/software for Q methodology.

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