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Understanding mechanisms of learning: a realist evaluation of the MRes research methods module

Raleigh Anne Mangsat 

Department of Educational Research, Lancaster University, Lancaster, UK

ABSTRACT

This study conducted a realist evaluation of an MRes Research Module to identify what mechanisms enable or hinder learning, for whom, and in what contexts, to inform more effective and equitable postgraduate research training. Research methods training is a cornerstone of postgraduate education supporting students in independent research. However, its effectiveness varies, and there is limited understanding of how teaching strategies produce different outcomes for diverse students. A qualitative, realist evaluation approach was employed, analysing postgraduate student experiences through the Context-Mechanism-Outcome (CMO) framework to explain how and why specific strategies succeeded or failed. Ten MRes Bioengineering students were purposively recruited to ensure representation across a wide range of disciplines. Data were collected through a qualitative survey capturing their perceptions and experiences of the Research Methods Module. Workshops, authentic assessments and field-specific supervision were identified as effective mechanisms for learning. However, generic materials and inconsistent support hindered progress. This study proposes the 'Adaptive Nexus Model for Postgraduate Training', a practice-oriented framework that maps context-sensitive learning pathways across dry-lab, wet-lab, and computational disciplines. It shows that teaching effectiveness depends on disciplinary alignment and supervisory engagement, offering programme leaders actionable guidance to improve equity of learning outcomes across diverse cohorts.

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SUBJECTS

Social Sciences; Education; Higher Education; Social Sciences; Education; Higher Education; Study of Higher Education; Social Sciences; Education; Higher Education; Teaching & Learning

Introduction

Research Methods training is an integral part of postgraduate education, providing students with the skills necessary to conduct and critically engage with research (Azmi & Daud, 2019; Daniel, 2022; Vieno et al., 2022). Within higher education, the relationship between research and teaching has been a subject of debate, evolving from a simple search for statistical correlation to a more advanced understanding of their symbiotic connection. Early meta-analytic work found virtually no statistical association between teaching quality and research productivity (Hattie & Marsh, 1996), prompting a fundamental reconceptualization. Healey (2005) and Brew and Boud (1995) subsequently redefined the 'teaching-research nexus', promoting frameworks that regard learners not as passive users of knowledge, but as active contributors within a 'community of scholars'. This viewpoint underscores the importance of learning through participation in research-focused activities, supporting a vital environment in which educators and students collaboratively co-create knowledge (Brennan et al., 2019; Brew, 2006).

Despite theoretical knowledge, there are still significant gaps in the practical understanding of how to effectively integrate teaching and research, particularly in specialised, high-stakes programmes such as Master of Research (MRes) degree. The current literature endorses strategies such as inquiry-based learning and authentic assessment. However, it only offers a limited understanding of the specific psychological and pedagogical mechanisms that influences their success or failure in practice (Daniel, 2022). Most

CONTACT Raleigh Anne Mangsat  r.mangsat@lancaster.ac.uk; rmangsat@ic.ac.uk  Department of Educational Research, Lancaster University, Lancaster, LA1 4YW, UK

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existing studies depend of skill audits or satisfaction audits that measure outcomes without providing an explanation of the causal pathways that produce them (Gyuris, 2018; Jackson & Li, 2024). Furthermore, student voice is often underemphasised, resulting in limited understanding of whether the module elements function as enablers or barriers from a learner's perspective (Brennan et al., 2019). These gaps are especially pronounced in disciplinary diverse postgraduate contexts, where the applicability of overarching frameworks to contextually specific educational challenges remain insufficiently investigated.

One such context is the MRes Research Methods module embedded within the MRes Bioengineering programme at Imperial College London. This course is a one-year MRes degree that integrates taught research methods training with an extended independent research project. In this course, postgraduate students come from diverse disciplinary backgrounds, including computational modelling, wet-lab biology, and dry-lab engineering. These students have diverse methodological needs, impeding the application of overarching theories to contextually relevant educational enhancements (De Kleijn et al., 2016). Despite its complexity and relevance, this remains an underexplored area in higher education literature.

This study addresses these gaps by conducting a Realist evaluation of an MRes Research Methods module to understand what is effective, for whom, in which settings and the rationale behind it. It makes three distinctive contributions. First, the Realist Method is exceptionally well-suited for this study, as it moves beyond the measurement of uniform effects to explain the causal mechanisms (workshops, supervision, and assessments) that connect educational inputs to observed outcomes. Second, this study identifies a co-dependent, synergistic interplay between student characteristics, authentic assessment, and discipline-specific supervisory support that existing literature treats as independent variables. Third, it proposes the Adaptive Nexus Model for postgraduate training; a practice-oriented framework that directly addresses the equity failures of one-size-fits-all module design. This study aims to evaluate the MRes Research Methods module utilising the Realist Evaluation Framework to understand what works, for whom, in what contexts and why. Specifically, it pursues four objectives: 1) identify the intended learning outcomes and teaching strategies within the module; 2) examine how different student contexts influence outcomes and learning experiences; 3) identify mechanisms within the module that enable or hinder postgraduate student learning; and 4) develop necessary explanatory CMO configurations to inform module improvement.

Research questions (RQ)

The research questions that guided this inquiry:

Primary Research Question: What mechanisms within the Research Methods module enable or hinder student learning, for whom, and in what contexts?

Sub questions:

1. What strategies, assessments, and interactions are perceived as enabling student learning, and how?
2. What module elements are perceived as hindering student learning, and why?
3. How do these mechanisms impact students' confidence, competence, and preparedness for their dissertation project?

To answer these questions, this study adopts a qualitative research methodology, rich experiences and perceptions of MRes students to explain not only what works but why it works across diverse student contexts. This method enables a detailed comprehension that not only distinguishes effective and ineffective strategies but crucially, explains the reasons for their success and failure among diverse students in different circumstances, thereby providing an essential contribution to transforming educational theory into practice.

Literature review

Evaluation and its role in higher education

Evaluation is described as the creation of a credible and systematic formation of merit or worth, and importance of an object (Gullickson, 2020), which is done through systematic inquiry (Vedung, 2010).

Evaluation in higher education (HE) aims to inform decision-making and improve educational practices. It functions as a knowledge resource for academic planning rounds and enhances programme effectiveness (Pattyn, 2019). However, evaluation in higher education provides critical but often conflicting roles. According to Rijcke et al. (2016), it primarily functions as a vehicle for accountability and governance, positioned within the broader 'audit community' trend. It is also utilised to steer academic institutions, assess performance, and allocate resources through indicator systems, and plays a key role in establishing policy and improving institutions. However, evaluation often takes on a representative or legitimising role to fulfil external pressures and maintain a 'good standing' status. Additionally, metric-based evaluation can have an integral impact, steering strategic behaviours such as goal displacement and curtailed task among researchers (Rijcke et al., 2016). In the next section, the process of evaluation in HE will be explored as a lens and practice for investigating the effectiveness of a research module that underpins inquiry in, HE contexts.

Research methods training in HE

Postgraduate research training is essential for academic progression and for developing the critical skills necessary in both academic and professional disciplines (Azmi & Daud, 2019). These competencies extend beyond technical ability and encompass a set of transferable skills essential for navigating complex work environments successfully. A more general definition of research skills includes seven core competencies: critical appraisal, data synthesis and collection, decision-making, problem-solving, data analysis, and communication (Vieno et al., 2022). The development of these abilities is essential because it enhances students' learning experience, encourages learner autonomy, and opens opportunities for them after graduation (Daniel, 2022; Vieno et al., 2022).

Besides, learners also have a far better experience and are highly likely to successfully progress with their studies when research methods training is integrated into the postgraduate curriculum (Neumann, 1992; Daniel, 2022). Not only that, but strong research abilities are also directly associated with enhanced autonomous learning, empowering learners to take ownership of their work through efficient planning, monitoring, and assessment of their academic progress. This was supported by Azmi and Daud (2019), who conducted a study on the relationship between research-method skills and autonomous learning among postgraduate students. Their findings suggest that developing research methods skills can enhance learners' ability to conduct research. This also reduces reliance on project supervisors and fosters independent scholarship expected at the postgraduate level (Azmi & Daud, 2019).

Furthermore, research skills are highly valued by companies outside of the academic world. Employers often prioritise transferable competencies (Jackson & Li, 2024), and the skills developed during postgraduate studies, such as translating complex information and analysing academic publications, are relevant across various domains, including business and practice. But this development of fundamental skills cannot be left to chance. Assuming that learners will passively acquire research skills simply by participating in research may lead to inefficient skill development and confusion. More often, students expect their project supervisors to be experts not only in their subject fields but also in the specific methods required to conduct research. Thus, this significant relationship can be strained by institutional pressures, such as teaching requirements that limit supervisors' availability and instances where supervisors may lack expertise in diverse methodologies that their students need (Daniel, 2022). There is a definite need for higher education institutions to incorporate explicit skills training into their curricula (Jackson & Li, 2024). This entails evaluating and developing a curriculum to ensure that all students, regardless of background or degree type, have specific targets to improve their research skills.

The teaching-research nexus: evolving from contested correlation to a shared mission to advance learning

In this section, the connection between teaching and research, commonly referred to as the 'teaching-research nexus', will be discussed in more detail. The teaching-research nexus is a fundamental yet

highly debated concept in higher education. For years, university institutions have emphasised that the connection between these two fundamental academic activities is not only essential but also necessary, with institutional mission statements often celebrating the idea of research-active academics delivering innovative teaching (Tight, 2016). However, the nature of this link and its concrete impact on student learning have been the subject of extensive debate, often yielding conflicting results. The preliminary empirical investigations, which were primarily focused on identifying a statistical association between research productivity and teaching quality, were largely unsuccessful in providing definitive evidence. This led to a 'sterile debate' that frequently overlooked the more complex connections at play (Brew & Boud, 1995). In response to this, there has been a significant change in how academics think. The emphasis has shifted from basic correlational metrics to a more advanced conceptualisation of the nexus, centred on the collaborative nature of the learning and inquiry processes that support teaching and research (Tight, 2016; Healey, 2005). This repositioning sees students not as passive learners, but as active members of a 'community of scholars' who work with their educators to build knowledge (Brennan et al., 2019).

This literature will synthesise the main points from recent papers to map the progress of this intellectual journey. Firstly, it will dismantle the correlational paradigm, examining the robust reconceptualisation of the Nexus on learning. Finally, it will examine the practical curriculum and assessment procedures that stem from this perspective. This will help in identifying the critical gaps in the literature that a realist evaluation of a Research Methods module is specifically positioned to address.

Analysing the correlational framework

A persistent variance between commonly held academic beliefs and actual data has been a central feature of the historical search for a measurable context between teaching and research. A plethora of research aimed at correlating faculty research output with student evaluations has yielded inconclusive, weak, or non-existent results. One example is the meta-analysis conducted by Hattie and Marsh (1996), which examined 58 studies and found that the overall correlation was virtually non-existent. This consistent absence of statistical correlation has sparked scepticism and policy discussions about the possibility of splitting teaching and research functions in higher education (Tight, 2016).

Yet Brew and Boud (1995) contended that the entire correlational approach is fundamentally flawed, as it mischaracterises and oversimplifies the behaviours it aims to quantify. The flawed methodology has constructed an unproductive cycle that fails to capture the Nexus's intricate operations. The employed metrics, such as research productivity (publication counts) and teaching effectiveness (as measured by student satisfaction surveys), are inadequate representations, as they do not reflect how teaching and research work in practice. Additionally, the attributes that students highly regard in educators, such as rapport, goodwill, and sensitivity, have been shown in studies to be inversely related to research output (Brew & Boud, 1995).

Reconceptualising the nexus: a common ground in learning and inquiry

The conceptual advancement in understanding the Nexus has been the recognition of learning as the pivotal piece common to both research and teaching. Brew and Boud (1995) assert that research is, in essence, a process of learning and discovery for the academic. On the other hand, teaching helps to accelerate learning and discovery among learners. From this view, the relationship does not lie between two distinct activities, instead within their common objective, which is the construction of meaning. As researchers and academics, they demonstrate the learning approaches they hope to impart to their students, particularly by embracing a deep rather than a surface approach to their subject (Brew & Boud, 1995).

This reconceptualisation emphasises the student's learning processes rather than the teacher's research outcomes. Brew (2006)'s paradigm reimagines institutions as inclusive communities in which all members, both students and programme staff, are regarded as 'learners and knowledge builders'. This breaks down the traditional hierarchy and empowers students to become active collaborators in the academic process. Thus, the key advantage of the Nexus is achieved when students are actively involved and engaged in inquiry-based learning, progressing from passive observers to active participants in the

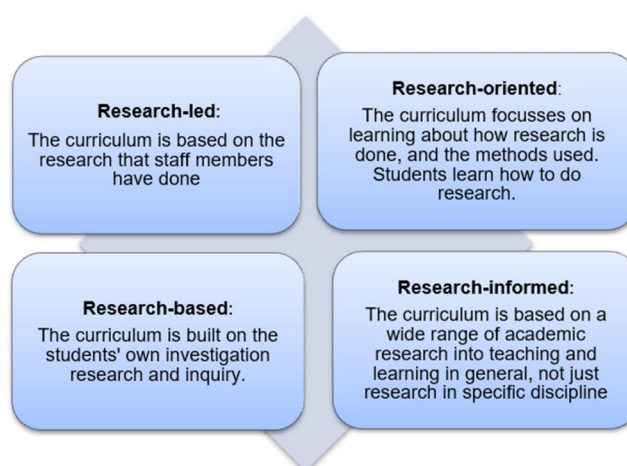


Figure 1. Frameworks as a structured lexicon guiding curriculum design and development.

research process (Healey, 2005). This model was later expanded by Healey (2005), and these frameworks offer a useful lexicon for curriculum development, as shown in Figure 1:

Although the reconceptualisation of the Nexus was focused on learning inquiry (Brew & Boud, 1995), recent literature suggests that research keeps improving its impact and usefulness in postgraduate education. According to Brennan et al. (2019), this active engagement can be understood through a three-phased framework which highlights students' progressive development as good researchers. This also includes adaptive and teaching supervisory strategies that are enhanced by research. Postgraduate students learn research skills and competencies, and they subsequently engage with research practice, in which in turn informs teaching. This model is particularly significant for an MRes Research Module which serves as a preliminary level for developing a vital dissertation research project.

This synthesis highlights that maximising the full benefits of the Nexus requires student engagement in inquiry-based learning, then later converting them from passive participants into active participants (Healey, 2005). It is important to note that implementing this requires a structured curriculum design to ensure relevance and context, focusing on practical aspects that are often underrepresented in earlier correlational research.

Barnett (1992) stated that these models are applicable but warns that the primary goal of HE should be to expand a student's consciousness and critical thinking skills, not just to prepare them to be 'embryonic researchers'. The objective is to employ research-oriented activities as agents of encouraging intellectual growth, rather than viewing them as ends in themselves. Furthermore, Barnett (1992)'s curriculum framework offers structure; however, the Nexus's effectiveness is dependent on its alignment with disciplinary epistemological traditions. Various disciplines, including wet-lab and computational research, have distinct methodological criteria and epistemologies. Often, general research methods teaching breaks down when the discipline-specific requirements are not incorporated, resulting in reduced relevance. This also hinders the application of specialised contexts, a finding repeatedly acknowledged in the HE training literature.

The adaptive approach to research supervision

The context of postgraduate supervision fundamentally relates to the teaching-research nexus, as students' projects serve the twofold curricular goal of advocating and evaluating student learning. De Kleijn et al. (2016)'s study investigated goal-relatedness in supervision through interviews with supervisors and their students. In their research, the adaptivity approach was implemented to integrate these roles. However, the adaptive approach can lead to conflicts between sustaining academic rigour and delivering necessary student support. Therefore, it is crucial to discuss mutual expectations between the student and the supervisor.

On the other hand, Marnewick (2023) contended that a supervision approach facilitates student learning and improves the quality of postgraduate students' coursework. It also incorporates teaching research skills with supervision, addressing the gap in the literature. The key finding is that it is essential

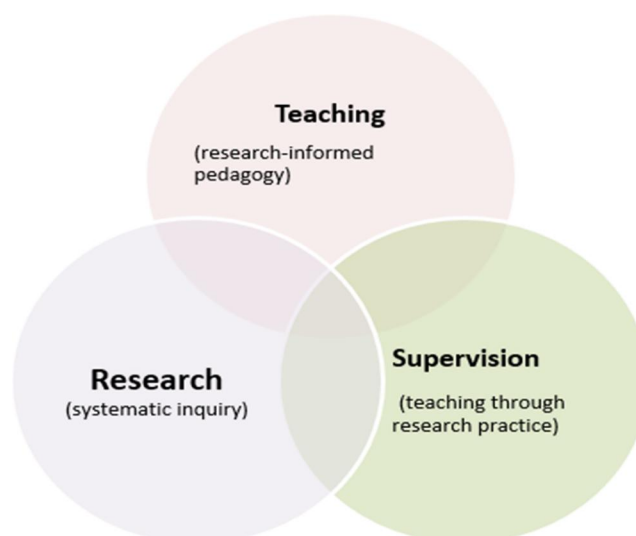


Figure 2. The interconnection between teaching and supervision within the teaching-research nexus at the postgraduate level.

to support students through structured activities, blended learning, and peer feedback to strengthen supervisor capacity and address diverse master student needs. This was supported by De Kleijn et al. (2016), who stated that project supervisors must maintain a balance between their commitment to developing their students' personal development (teaching). Furthermore, ensuring that any learning or supervision does not jeopardise students' capacity to apply their research skills and their responsibility as guardians of academic models (research integrity).

On the whole, supervision serves as a pedagogical channel linking the institutional mission of research with students' progression toward becoming good academic researchers. It is about imparting teaching via research engagement. By involving students directly in inquiry practices, supervision enacts the teaching-research nexus (Jenkins et al., 2007), as shown in Figure 2, generating not just new knowledge but also the next generation of academic researchers (Healey, 2005).

Activating the nexus

The implementation of the conceptual connection between research and teaching necessitates meticulous curriculum design. A study conducted by Brennan et al. (2019) at a research-intensive university unveiled a dynamic three-phase framework that demonstrates the progressive development of students as researchers. This concept is particularly significant for an MRes Research Module, which serves as a preliminary phase for developing a considerable dissertation project. The phases are shown in Figure 3:

Healey (2005) translated this three-phase framework into actionable curriculum approaches that map directly onto each state of the cycle shown in Figure 3. During the Adaptive and Teaching Supervisory phase, incorporating research data into classroom teaching and using academics' own cutting edge work as instructional tools strengthens the connection between pedagogy and research. In the Learning Research Skills and Competencies phase, designing assessments that mirror real research processes (data analysis, literature searches, and research proposals) provides the structured development of skills the framework requires. And during the Student Engagement with Research Practice stage, giving learners opportunities to collaborate with programme organisers on active research projects completes the progression from theoretical knowledge to practical immersion.

This framework emphasises a frequently disregarded feature of the Nexus: the reciprocal benefit of teaching on research, wherein student enquiries and critiques can inspire new ideas and research directions for faculty (Breen & Lindsay, 1999). Within each approach, assessment is critical. Brown and Sambell (2023) promote authentic, learning-oriented assessment approaches that reflect the actual tasks students will encounter in the real world.

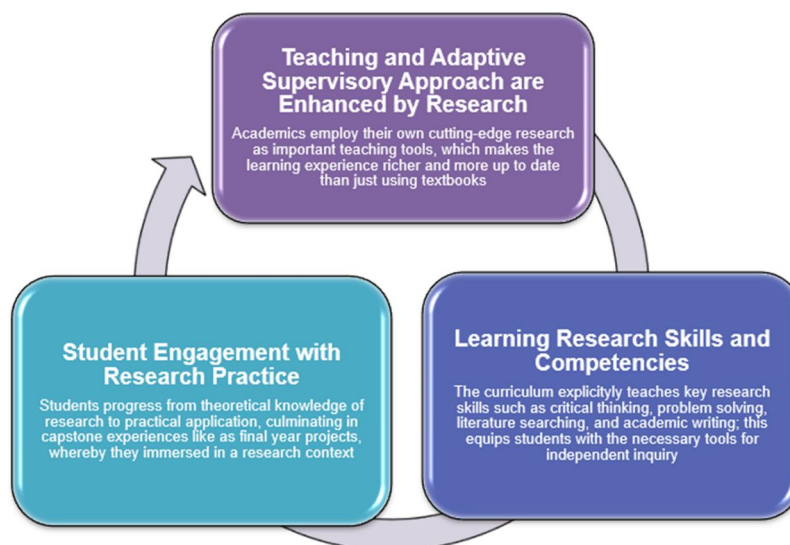


Figure 3. Three-phase frameworks demonstrating the progression of students as researchers.

In the context of the research methods module, this entails transitioning from conventional examinations to assessments that require students to engage as researchers by analysing data, composing research proposals, or evaluating literature. These methods not only improve involvement but also effectively prepare students for the requirements of their projects and future careers (Azmi & Daud, 2019). Lastly, the learner's experience is a significant middle ground. Highly motivated students are more inclined to appreciate and engage in research activities. On the other hand, students with low motivation or those driven by extrinsic factors, such as external pressures, may regard them as irrelevant (Brennan et al., 2019). This emphasises that the effectiveness of any teaching approach is not universal; it is contingent on the student ('for whom') and the context.

Summary

The academic discourse around the teaching and research nexus has evolved considerably, realigning from a flawed search for correlation to a comprehensive understanding of the relationship as a shared learning and inquiry. Marnewick (2023), Brennan et al. (2019), Gyuris (2018) and De Kleijn et al. (2016), have developed a conceptual model that is highly valuable for designing a curriculum that turns students into effective researchers within a community of academics. However, despite this advancement, substantial gaps remain, which the proposed realist evaluation of an MRes Research Methods module is perfectly positioned to address in this study.

First, while the literature supports broad methods such as authentic assessment and inquiry-based learning, these approaches offer less insight into the unique mechanisms that lead to success in practice. The study clarifies that mechanisms are psychological processes triggered by external pedagogical approaches (e.g. supervision, workshops). Secondly, a vital portion of existing studies, particularly the qualitative work conducted by Brennan et al. (2019), is applicable, but it does not give sufficient attention to students' voices (Brew & Boud, 1995). From the learners' perspective, there is a considerable gap in understanding which module elements pose obstacles and how various techniques influence their confidence, competence, and readiness for their projects.

The utilised IPTs, such as integrating research-led teaching practices, including supervision support and assessments that reflect research processes, are supported by research that recognises them as critical mechanisms for experiential learning and competence development within the teaching-research nexus (as shown in Figure 2). Finally, the literature often speaks in general terminology, whereas the operation of the Nexus is significantly influenced by context. An MRes Research Methods constitutes a distinctive and essential context. A high-stakes postgraduate setting exceptionally engineered to connect taught learning with independent research. The use of adaptive nexus concepts in this context remains underexplored. Consequently, a realist review concentrating on what works, for whom, and in what

contexts within this module will provide a timely and vital contribution. This will transform overarching theory into practical, contextually relevant educational understanding.

Methods and materials

Research design

A Qualitative Research Method was selected in this study. A Realist Evaluation Approach was adopted to address the research questions. This combination allows the study to determine what enables or hinders student learning within the Research Methods Module. Qualitative methods prioritise the exploration of lived experiences and perceptions (Denzin & Lincoln, 2000; Grix, 2018). They are best suited to research problems where variables require contextual exploration rather than measurement (Creswell, 2013). By centering students' own accounts, this approach captures how individuals experience and make sense of the Research Methods Module.

Realist evaluation and the context-mechanism-outcome (CMO) framework

Evaluating research methods training in postgraduate master's programmes is, not a straightforward task. It is a multi-layered process integrated within institutional and individual contexts. To address these issues, Pawson and Tilley (1997) developed a Realist Evaluation. This theory-driven method asks not just whether an intervention is effective, but also for whom, under what circumstances, and why. Research methods training usually consists of several components, including workshops, lectures, project-based learning, supervision and application. Its impact may vary depending on previous student experience, institutional support, disciplinary standards and supervisory support. A Realist evaluation is well-suited to deciphering these dynamics because of its emphasis on context-mechanism-outcome (CMO) configurations. This type of evaluation aims to explain the causal mechanisms (e.g. enhanced self-efficacy, feedback, and peer learning) that link training inputs to observed outcomes, such as improved research competence, completion rates, and learner confidence, rather than assuming a uniform effect. Empirical research on postgraduate training indicates that success often relies on the alignment between learner requirements, supervisory support, curriculum design and practice opportunities (Gyuris, 2018).

The use of CMO analysis will allow the identification of particular and effective mechanisms in postgraduate training, such as scaffolded workshops and authentic assessments aligned with master student projects, particularly when reinforced by subject-specific supervision. This mechanism-focused strategy moves beyond observing correlations to understanding how interventions succeed.

Realist evaluation was employed in this study because of its effectiveness for examining postgraduate research training, its capacity to encapsulate the complexity of educational interventions, and its ability to elucidate the mechanisms that yield learning outcomes and to produce practical, theory-based recommendations (Pawson & Tilley, 1997).

Sampling/participants

The target population was restricted to the total number of registered full-time and part-time postgraduate students in the Bioengineering MRes programmes for the 2024-25 academic year. According to Denzin and Lincoln (2000), in qualitative research, the sample size is determined through purposive sampling, which involves 'handpicking' participants based on their privileged knowledge or experience. For this study, participants were purposely selected because the MRes cohort had more substantial internal perceptions and insights into issues related to their experiences with the Research Methods Module.

Participants were selected based on three inclusion criteria. First, they had to be registered in the Bioengineering MRes programme, either full time or part-time, during the 2024-25 academic year. Second, they must have completed the Research Methods Module, as the research aimed to obtain direct experiential knowledge of its mechanisms and outcomes. Third, they needed to be actively engaged in the dissertation phase of their course, ensuring they could reflect on how the module impacted their research preparedness. These criteria were established to ensure that all study participants possessed the first-hand

knowledge required to provide meaningful insights into the module's enabling and hindering mechanisms. Those students who had not yet taken the module or were enrolled in non-Bioengineering MRes streams were excluded, as their experiences fell outside the scope of this evaluation.

Data collection

Data were collected through online questionnaires between 31-07-2025 and 01-10-2025. All 25 registered MRes Bioengineering students were invited to participate, representing the complete cohort for the 2024-25 academic year. Of these ten completed the survey. The primary reason for non-participation was scheduling constraints, as several students were based at different campuses during the data collection period. As Marshall and Rossman (2007) stated, the success of a qualitative study depends on the researcher's abilities and interpersonal attributes. The recruitment process went effortlessly well as the researcher had a good working relationship with the MRes students.

To assess interactions among CMOs, a qualitative study was conducted using the online survey platform Qualtrics to gather in-depth information on MRes students' experiences and perspectives on the Research Methods Module. The online questionnaire comprised 12 open ended questions and was piloted with two postgraduate researchers to assess clarity and timing before distribution. The online questionnaires included questions on the types of issues encountered in the module, their effectiveness, and the impact of the module on their dissertation construction. The survey was conducted to elucidate aspects of IPT and identify emerging CMOs. Next, responses were read iteratively and coded manually using Initial Programme Theory (IPT) as a deductive framework. Emerging themes were then mapped to context-mechanism-outcome configurations, with each configuration verified against at least two participant accounts to ensure interpretive rigour.

Ethical considerations

This study was conducted in line with the principles of the British Educational Research Association (BERA, 2024). The ethics form was submitted and approved on 31st July 2025. This study was approved by the Ethics Committee of Social Sciences of Lancaster University and Imperial College London. This study was undertaken as part of the PhD in Higher Education Research, Enhancement and Evaluation programme at Lancaster University. The research received ethical approval through the internal review procedures of both Imperial College London and Lancaster University. As the project constituted assessed work within a taught module, approval was granted via each institution's standard internal processes, which do not issue external ethics committee reference or permit numbers; therefore, such numbers are not available for this study. All data collection adhered to the policies of both institutions.

The Participation Information Sheet and Written consent forms were distributed to all participants. Prior to commencing this research, all participants provided written consent forms after being informed of the study benefits, risks and procedures. All research participants were well-versed about the study process, including their right to withdraw. To protect confidentiality, no respondents were identified by name or other distinguishing details in the analysis and reporting of results. Each respondent was allocated a unique identification number, and all identifying details were removed from the analysed data and reported findings. In accordance with the BERA Guidelines (2024) and the General Data Protection Regulations (GDPR, 2018), all study data were securely and ethically processed. The study data were anonymised to ensure they were not associated with identifiable information for storage and archiving.

Data analysis

A thematic analysis approach was employed, guided by the principles of Realist Evaluation (Braun & Clarke, 2022). This method was selected because it allows patterns in MRes participants accounts of the Research Methods Module to be identified while remaining attentive to the CMO logic of realist inquiry. During the initial phase of analysis, data were systematically organised according to the IPT, categorised by relevance to intervention activities – context, mechanisms, and outcomes (as shown in Table 1 and Table 2). To address potential bias, several approaches were employed. The researcher engaged in

Table 1. Initial programme theory (IPT).

IPT no.	Context (C)	Mechanism (M)	Outcome (O)	Theory explanation
IPT 1	When the module incorporates research-led teaching strategies (e.g. lecturers drawing on their own research)	Students experience enhanced motivation and perceived relevance	Enhanced Understanding and confidence in applying research methods	Exposure to authentic research practices inspires students by demonstrating real-world relevance of methodological knowledge.
IPT 2	When assessments are research-based and require applying methods to authentic or self-directed research questions	Students engage in active knowledge construction	Improved competence in research design, data collection, and analysis	Practical application fosters experiential learning, aligning with research-based learning within the teaching-research nexus.
IPT 3	When the module facilitates research-tutored peer interactions (e.g. group discussions, peer feedback)	Students experience collaborative critique and diverse perspectives	Enhanced critical thinking and methodological reasoning skills	Tutor-guided peer learning scaffolds deeper conceptual understanding and skills integration.

Table 2. Evaluative criteria.

Criterion	Coding indicators	Judgement definition	Graded judgement levels
Knowledge gain	Look for mentions of improved understanding, confidence, ability to apply concepts, clarity in research methods. Compare to confidence/ usefulness ratings.	Improved confidence and assessment performance demonstrate success.	Highly Successful: Reports clear, significant knowledge growth, supported by ratings 4–5. Partially Successful: Some knowledge gained, but gaps remain, or ratings 3–4. Limited Success: Little or no change in knowledge, ratings ≤ 2 , or comments indicate lack of clarity.
Application to dissertation	Evidence of direct link between module learning and dissertation planning/ implementation.	MRes students can apply methods in research dissertation proposals with supervisor approval.	Highly Successful: Explicit statement of applying methods to dissertation tasks, mapping clearly to research proposal; strong rating on relevance (4–5). Partially Successful: Some transfer of skills, but not fully integrated. Limited Success: No application mentioned or possible.
Mechanisms trigger	Look for references to specific teaching strategies, interactions, or assessments that ‘made it work’.	Successful if key mechanisms operate across diverse contexts.	Highly Successful: Mechanisms (e.g. workshops, group discussions, supervisor meetings) clearly enabled learning across situations. Partially Successful: Mechanisms helped but only in certain contexts. Limited Success: No clear mechanism or ineffective methods reported.
Satisfaction and relevance	Use satisfaction and relevance ratings plus open comments on perceived value.	Successful if students perceive relevance and benefit to their learning and researcher development.	Highly Successful: Strongly positive relevance and satisfaction (4–5), enthusiastic comments. Partially Successful: Mixed feedback, relevance only in parts. Limited Success: Low ratings and negative comments.
Equity across contexts	Compare across student type, study mode, prior experience for fairness. Note comments about gaps or inapplicability.	Whether the research module worked across student types (background, study mode, discipline).	Highly Successful: Positive experiences across varying contexts. Partially Successful: Works for some, not all. Limited Success: Strong evidence of inequity or mismatch to context.

reflexive journaling throughout the analysis, documenting how personal assumptions about the Research Methods Module might shape interpretation. Themes were also checked against the existing literature on the teaching-research nexus to ground interpretations in established frameworks rather than subjective judgement. This combination of theoretical grounding and reflexivity strengthened the trustworthiness of the findings.

All coding was conducted manually, as the modest sample size of ten responses did not warrant computer-assisted software. Coding followed a structured three stages process. First an initial open

coding in which raw participant responses were broken down into discrete units of meaning. Second, a focused coding was done, in which recurring patterns were grouped into participant themes. Third, an interpretive mapping where finalised themes were aligned with CMO configurations. To further ensure trustworthiness, the analytical process adhered to Braun and Clarke (2022) criteria of credibility, dependability and transferability. This was implemented through an audit trail of coding decisions, reflexive journaling, and thick description of participants' contexts to support the transparency and rigour of findings. Responses were iteratively reviewed twice to identify recurring themes, which were then mapped to CMO configurations. To analyse the impact and effectiveness of the Research Methods module, the following criteria have guided the judgement based on realist evaluation principles (as shown in Table 2):

Findings and discussion

This research aimed to explore the impact and effectiveness of the research methods module on MRes students. Through a Realist evaluation, the analysis has progressed beyond surface-level student satisfaction to uncover how specific strategies, assessments, and student interactions led to outcomes when used in student contexts. The analysis of MRes student survey responses, guided by a Realist Evaluation Framework, identified recurring patterns (summarised in Table 3). This elucidates how different components of the Research Methods Module functioned across diverse learner contexts and their impact. The results show that these are directly linked to the evaluative criteria (knowledge gain, application to the dissertation, mechanisms, satisfaction, equity), which were qualitatively assessed to determine the module's overall effectiveness.

As stated by Pawson and Tilley (1997) and Wong et al. (2013), realist evaluation emphasises that educational interventions are not uniformly effective. Their impact depends on the interplay between student circumstances, teaching mechanisms, supervision strategies, and the outcomes that MRes students experience. By applying this framework, we were able to explain why some instructional and teaching methods were successful for certain groups, while others encountered limitations. Given the results in CMO configurations and evaluation criteria, we can directly address the research questions and contextualise the discussion within established debates on the teaching-research nexus (Barnett, 1992; Brennan et al., 2019; Brew, 2006). At the end of data collection, ten students submitted their responses via Qualtrics. From these, four themes emerged from the qualitative survey. The presentation of the student data was enhanced by synthesising the qualitative findings into concrete results. The paper used thematic analysis and tables to demonstrate recurring patterns and CMO configurations, as shown below. This includes qualitative statement extracts from the survey data, such as comments on supervisory support and the clarity of module aims.

The findings were organised around the RQs that guided this inquiry. Each subsection directly corresponds to a RQ, structured through CMO configurations developed from the Realist Evaluation framework. This strategy ensures that the discussion moves systematically from identifying enabling and hindering mechanisms. This will help us understand how these mechanisms interact with diverse post-graduate students' contexts, and ultimately explain their impact on their competence, confidence, and dissertation preparedness. The sub RQs is addressed first then the primary RQ as an overarching analytical frame.

Sub RQ1: what strategies, assessments, and interactions are perceived as enabling student learning and how?

CMO 1: workshops/seminars as scaffolds for students

The first configuration involved novice participants with either little or moderate *prior experience*. These individuals frequently emphasised the importance of participating in hands-on practical workshops. Improved confidence, greater ability to choose methodologies, and preparedness to organise dissertation projects were among the impacts induced by the mechanism applied, which involved scaffolded activities in this context. MRes students reported that attending workshops and seminars where 'abstract

Table 3. Overview of realist evaluation findings.

Programme theories	Intervention activities/ events (what did We do?)	Context (who did it work for?)	Mechanisms (how did it work/not work)	outcomes (with What Process Impacts?)	Evaluative judgement/comment (against Evaluative Criteria)
PT1: Practical workshops and rich in feedback module boost students' confidence and research skills for novice learners	Programme team conducted hands on workshops and seminars involving data collection, research analysis and guided review	MRes students with minimal to moderate prior research experience	✓Worked: Formative feedback and activity based learning enabled MRes students to integrate abstract methods to practical application, to support understanding through learning by doing. X Did not work: Few advanced postgraduate students found activities too basic, limiting challenge and collaboration	Enhanced confidence, stronger methodological thinking and dissertation readiness	Knowledge Gain: Highly successful - shown major improvements in competence and confidence Application: Partially to Highly Successful - evident transfer of dissertation project design Mechanism trigger: Highly Successful -workshops and seminars initiated reflection and engagement Satisfaction and relevance: High - participants appreciate collaborative activities Equity: Partially Successful - worked best for novice learners but required less for advanced learners
PT2: Authentic, aligned research module assessment learning tasks encourage transference of learning to dissertation projects	Designed coursework such as planning reports that reflected requirements and integrated project supervisor feedback	Postgraduate students preparing for thesis/ dissertation project	✓Worked: Alignment and authenticity enabled assessments meaningful, and supervisor feedback encouraged deeper reflection and self-awareness X Did not work: Some participants thought there was not enough information related to their field	Cohesive improvement on research proposals and students were able to apply dissertation topics directly; Advanced learners disengaged from other activities	Knowledge Gain: Highly successful due to enhanced clarity on concepts Application: Highly successful - authentic coursework design highlighted relevance. Mechanism trigger: Highly successful - authentic assessment design underpins relevance Satisfaction and relevance: High - coursework assessments were viewed by students as useful Equity: Partially Successful - effective to majority of students but not across all disciplines.
PT3: Engagement of project supervisors and disciplinary fit to improve knowledge application	Embedded mutual student-supervisor expectations in lab meetings, teaching and learning materials and feedback	Master students with engaged project supervisors and subject field aligned with chosen dissertation topic	✓Worked: Project supervisor feedback contextualised research module content, promoting learning reflection and relevance X Did not work: MRes students with limited access to supervisory support were unclear of the expectations	Overall, high research design quality and higher motivation but there was some frustration for some MRes students with minimal access to supervisory support	Knowledge Gain: Partially to Highly Successful - improved understanding of research context Application: Highly successful - authentic coursework design highlighted relevance. Mechanism trigger: Partially successful - dependent on project supervisor guidance and engagement Satisfaction and relevance: High - MRes students valued personalisation Equity: Limited - varied by project supervisory support and engagement

(continued)

Table 3. Continued.

Intervention activities/ events (<i>what did we do?</i>)		Context (<i>who did it work for?</i>)	Mechanisms (<i>how did it work/not work?</i>)	outcomes (<i>with What Process Impacts?</i>)	Evaluative judgement/comment (<i>against Evaluative Criteria</i>)
Programme theories					
PT4: Generic materials and lab/computational desk based students	Delivered learning materials including readings without sufficient lab based relevance	Postgraduate students preparing for thesis/ dissertation project requiring applicable methods	✓Worked: Lab based MRes students X Did not work: Some students were unable to connect content to their dissertation topic	Limited confidence and reduced satisfaction	Knowledge gain: Limited success Application: Limited success Mechanism trigger: Limited success, lack of engagement due to mismatch Satisfaction: Limited due to irrelevance of content Equity: Limited due to misalignment of subject field related to project and diminished inclusivity

ideas became real' and where they could get feedback from their peers and supervisors in the right way helped build their confidence over time.

This finding supports evidence that active, inquiry-based learning is especially beneficial for novice participants, as it connects abstract methodological knowledge with applied practice (Healey & Jenkins, 2009).

However, some participants commented that some workshops and seminars were too generic for them, especially for advanced learners. The students commented:

Some workshops felt too general

Some reading lists were too basic, and not tailored to engineering research contexts.

The online learning materials provided lacked depth compared to in-person teaching.

lectures/content were often repeated I already knew

The qualitative findings directly answer the research question by showing that all the PTs mentioned, such as workshops/seminars, authentic assessments, and supervisory support (as shown in Table 3), consistently aided student learning. However, only under certain contextual conditions. Conversely, other issues, such as equity problems e.g. generic learning materials and inconsistent supervisor support in some areas—hindered the MRes students' learning, especially those in disciplines requiring applied or technical expertise. In realist terms, mechanism is not '*universally causal*', which means that it functions contingently, depending on the relationship between student characteristics, research field expectations, and institutional practices.

In summary, this study sheds a new light on the nexus. It also confirms the arguments by Barnett (1992) and Brew (2006) that teaching and research are deeply linked. Our study supports this idea with real-world examples, demonstrating that the most successful correlations between teaching and research are those tailored to each situation and environment. This also aligns with Brennan et al. (2019)'s framework, which suggests that these relationships are not invariable and are constantly changing.

In realist terms, the *context* of novice students made the scaffolded practice mechanism particularly effective, yielding improved confidence and better preparation for their dissertation projects. This aligns with Brew and Boud (1995) assertion that learning is most effective and meaningful when learners actively participate in research-oriented practices rather than passively absorb knowledge.

CMO 2: authentic assessment as the application tool

In the second configuration, the significance of authentic, dissertation-aligned assessment tasks, especially the planning report coursework, was highlighted for facilitating the transfer of learning. MRes students observed that these assessments served as direct practice for writing dissertation project proposals, leading to more precise research designs and more vigorous methodological justification. The mechanism of authenticity, characterised by tasks that replicate real research processes, led to elevated levels of application and knowledge transfer. This corroborates previous studies indicating that authentic assessment significantly enhances deeper learning and fosters alignment between research and teaching methodologies (Sambell & Brown, 2021). The maintenance or enhancement of assessment structures is essential, as they clarify the relationships between research methods training and the actual conduct of research projects, therefore applying the teaching-research nexus.

The majority of the students commented that they were satisfied with the module:

The assignment itself was very useful to set the tone for the rest of the project.

Grasping a more detailed understanding of the theory and limitations of the current state of my field.

One participant commented on how assessments helped them apply their learning:

The feedback on my report gave me a lot of areas to improve on. This is always super helpful and helps make sure that they are not repeated in the thesis report.

The authentic assessment, particularly the planning report correlated with the dissertation tasks, was recognised by the MRes students as a mechanism for applying knowledge in practice. They reported that the assessment structure '*directly informed*' their practice and dissertation design, showing that authentic tasks produced both application value and relevance. This supports Breen and Lindsay's (1999) statement that assessment design is central to learners' motivation, especially when they view

assessments as integral to their academic progression; their engagement intensifies. This also aligns with Barnett's (1992) study, which suggests that teaching is directly related to research strategies, making the curriculum a driver in inducting students into learning and enhancing their research skills.

Beyond distinguishing discrete mechanisms, this research's key novel contribution lies in framing the synergistic relationship between teaching and supervision. The analysis demonstrates that the effectiveness of enabling mechanisms, such as authentic assessments (Brew & Boud, 1995), is not an isolated case but is considerably amplified or, conversely, invalidated by the quality of discipline-specific supervisory engagement. For example, while the dissertation planning report provided a valuable scaffold for all postgraduate students (Healey & Jenkins, 2009), its intention as a tool for genuine learning transfer relied on supervisory guidance to translate generic principles into subject-specific contexts.

CMO 3: supervisory support and disciplinary fit

In the third configuration highlighted the importance of supervisor engagement and disciplinary fit. MRes students who had access to supervisors who were actively involved in their field reported higher levels of satisfaction and a more precise application of the learning materials covered in the module to their dissertation projects. This supports Marnewick's (2023) study, which suggests that supervision approaches enhance the quality of students' coursework. The personalised, discipline-specific discussion mechanism produced stronger outcomes in the application of the methodological alignment and reported increased confidence. This led to increased learner satisfaction and an impactful alignment between research methods training and students prepared for their dissertation projects. This also underscores Brennan et al. (2019) study, which found that the relationship between teaching and research is quite dynamic and has some bearing on disciplinary norms.

On the other hand, students who did not have enough support reported that it was hard for them to connect module materials to their projects.

A few participants commented on the importance of supervisory support and their engagement:

...different supervisors have different levels of commitment and engagement, and including external feedback on the report possibly from module leads can give more even playing field for everyone
This module specified my aims and objectives in a way that makes it clear for both myself and supervisor.

Project supervisors must maintain a balance in ensuring their commitment to meet diverse learners' needs (De Kleijn et al., 2016; Marnewick, 2023). This includes an adaptive approach incorporating planned activities, blended learning, and peer feedback, which must be maintained, along with a discussion of mutual expectations between students and supervisors (De Kleijn et al., 2016).

Sub RQ2: what module elements are perceived as hindering student learning, and why?

CMO 4: generic learning materials as a barrier

Finally, the fourth configuration indicated equity issues for MRes students in dry laboratory-based or computational fields who attended generic lectures and reported limited opportunities for practical participation/application. In this scenario, the absence of tailored mechanisms diminishes the perceived significance of the Research Methods Module, resulting in decreased confidence and a weaker application to the dissertation project.

The findings showed that MRes students had an issue with the generic nature of the teaching materials, which was explicitly raised by students whose projects were dry-lab-based and in computational disciplines. For these students, the module content and reading lists were often broad and insufficiently specific, rendering them irrelevant to their projects. This also made them unsure about how to apply these ideas to their projects. This created contexts in which mechanisms did not work for them. Some students learned well from lectures, while others did not, emphasising the uneven equity of learning application. This resonates with Barnetts' (1992) and Brew's (2006) studies, which suggest that the Nexus cannot be perceived as a singular, universal process, but must be adapted to the epistemological traditions of specific fields. This means that when instructional materials failed to incorporate disciplinary epistemologies, learners experienced lower learning satisfaction and weaker application to research

project work. A few students highlighted that the module 'did not feel like a module' but rather a disconnected set of teaching materials.

Participants described that the learning materials were a barrier:

I could not see the link between the module content and my lab based project
There was lack of tailored student support for computational research

MRes students reported a lack of opportunities to utilise what they have learned in their field. A few students commented that relying on generic lectures and reading lists, with no parallel discipline-tailored workshops, was not relevant to their projects. Mechanisms that showed effectiveness in some contexts but did not work well in others. This supported Barnett's (1992) argument that institutions often struggle to strike the right balance between generalised training and authentic instruction in specific disciplines.

Another barrier was the inconsistency in how project supervisors were involved. Some MRes students received tailored feedback that connected the research module content. On the other hand, a few students reported a lack of engagement. This aligns with Brennan et al. (2019) findings that institutional and interpersonal variability influence student viewpoints of the teaching-research link. From a realist perspective, the mechanism of project supervisor support was not consistently available across contexts, resulting in varied outcomes.

On the other hand, learners exposed to generic learning materials without disciplinary contextualisation exhibited lower confidence. They limited their application to dissertation projects, leading to frustration and dissatisfaction with their studies. These findings were consistent with Breen and Lindsay's (1999) research on student motivation, indicating that when learners fail to acknowledge a connection between instruction and their research objectives, both confidence and engagement diminish. This means that outcomes vary from one environment to another, which is a significant sign of equity issues. Whilst the research methods module worked well for the majority of the MRes students, with supervisory support and prior methods experience, it was less impactful for those with minimal experience in lab or technical disciplines. The inconsistencies indicate that, although conceptually strong, the module's design did not fully implement the inclusivity needed to achieve equity across diverse student backgrounds.

In sum, these findings highlight a co-dependent pedagogical connection in which the structural element (the assessment) and the relational element (supervision) mutually reinforce one another. Without tailored supervisory input, the authentic assessment risked becoming another 'generic learning material', an obstacle for some postgraduate learners. This exposes a more complex reality than the literature often presents, moving beyond simply advocating for specific techniques to understanding the precise, context-dependent environments required for their effectiveness and success. This analysis, which converges on the interaction between mechanisms, establishes an original and rigorous advancement of the CMO framework in this educational context.

Sub RQ3: how do these mechanisms impact MRes students' confidence, competence, and preparedness for their dissertation project?

The analysis illustrates that confidence gains were inconsistent across the MRes cohorts, which significantly impacted by practice, feedback, and disciplinary fit. Learners who attended workshops/seminars and received feedback immediately from their allocated supervisors reported that they were more confident in using what they have learned from the research methods module into their dissertation projects. In the same manner, authentic assessments provided learners with a systematic approach to practising tasks aligned with their dissertation projects, which helped students become more competent and ready. These outcomes align with Brew's (2006) study that competence develops when teaching and research are openly connected through active and applied tasks. As the CMO 4 analysis showed, this pattern was particularly evident for MRes students in computational and dry-lab disciplines (see above).

Primary question: what mechanisms within the research Methods module enable or hinder learning, for whom and in what contexts?

The evidence (as shown in Table 2) illustrates that mechanisms such as workshops/seminars, authentic assessments, and supervisory support consistently aided student learning however only under certain

contextual conditions. Conversely, mechanisms like equity issues such as generic learning materials and inconsistencies in supervisor support in some areas hindered the MRes students' learning, especially those students in disciplines requiring applied or technical expertise. In realist terms, mechanism is not '*universally causal*' which means that it functions contingently, depending on the relationship between student characteristics, research field expectations, and institutional practices.

In summary, the CMO analysis further consolidates the teaching-research nexus by grounding it in empirical evidence. The findings affirm the claim by Barnett (1992) and Brew (2006) that teaching and research are deeply linked, while extending this into a context-sensitive model for postgraduate training. This is where Healey's (2005) four mode typology categorises curriculum types without specifying how to activate them differently across diverse cohort. At the same time, Barnett (1992) argues for epistemological alignment without operationalising it for heterogeneous cohort. Unlike prior work, this study demonstrates that the most effective teaching-research integration is contingent on student characteristics and disciplinary contexts. This describes what an integrated curriculum should achieve without specifying how to deliver it differently across a heterogeneous cohort.

In addition, key contribution to this study is therefore an 'Adaptive Nexus Model', which reveals that mechanisms such as authentic assessments are not independently effective but require development through discipline-specific supervision. This moves beyond from evaluating what works to fundamentally challenge the 'one-size-fits-all' concept rife in HE. The limitations identified for computational and dry lab-based students signifies a systematic flaw in the standardised curricula, demanding an institutional shift toward dynamically adaptive educational structures to ensure equitable outcomes for all postgraduate researchers.

Limitations

This study's primary limitation is the small sample size, as 10 out of 25 contacted postgraduate students returned the qualitative survey questionnaires. The scope was also limited to a specific context. Although purposive sampling was utilised to compile in-depth insights into the Research Methods Module, this limitation means that the CMO findings may not be broadly generalisable across different disciplines and institutional settings.

The findings revealed substantial context-specific inequities in the '*one-size-fits-all*' module design, particularly for students with computational and dry-lab projects. Consequently, 'the Adaptive Nexus Model' for postgraduate training is proposed as an actionable, theory-based framework, stemming directly from the CMO configurations, to address systematic flaws and strengthen equity across diverse cohorts.

Further, as a qualitative study, the findings relied on participants' views and the researcher's knowledge and skills. However, support from the literature and interpretation, grounded in academic frameworks, and the utilisation of reflexivity, heightened trustworthiness.

Future studies should include a larger sample size of student participants to validate whether this research's findings can be generalised to other contexts, such as including other departments and wider institutions.

Recommendations

As per the evaluation findings, this paper proposes the 'Adaptive Nexus Model for Postgraduate Training'. Figure 4 presents the Adaptive Nexus Model as a three-component framework developed to address the inequities identified through the CMO analysis. The first component, Diagnostic Onboarding, proposes that learner needs and disciplinary backgrounds be assessed at the start of the module. This ensures that the diversity of the MRes cohort from wet-lab to computational researchers is acknowledged before curriculum delivery starts. The second component, Discipline-Specific Pathways, calls for tailored curricula and expanded scaffolded workshops that align with the methodological requirements of each discipline or field. This directly addressing the gap identified in CMO 4 where generic module materials failed postgraduate students in computational and dry-lab disciplines.

The third component, Integrated Supervision, mandates that project supervisors actively connect module content to each student's dissertation project. This responds to the finding from CMO 3 that supervisory engagement was highly variable and that its absence diminished the impact of otherwise effective



Figure 4. Outline of the adaptive nexus model.

mechanisms. The three components function as a sequence. Onboarding informs the design of tailored pathways, which are then reinforced through structured supervisory input. Together, they replace the one-size-fits-all model with a context-sensitive structure that aims to make enabling mechanisms equitably available across all student contexts (De Kleijn et al., 2016; Marnewick, 2023).

1. Development of Field-Specific Learning Pathways

Students enrolled in dry-lab-based and computational disciplines faced a barrier due to the generic nature of the teaching. It is strongly recommended that the module incorporate individualised material, reading lists, and hands-on workshops that align with the methodological requirements of the various research topics. This will ensure that the topics that postgraduate students have learned are relevant to their dissertation projects and will increase their ability to apply those concepts. Barnett (1992) highlighted that the curriculum framework provides structure but will require alignment with disciplinary epistemological traditions. Different disciplines, including computational research, have specific methodological criteria and epistemologies, and therefore should be structured appropriately.

2. Standardisation and Enhancement of Supervisory Engagement

Although supervisor assistance was an essential enabling element, its deployment was not always consistent. To ensure equitable student support, supervisors are encouraged to provide clear guidelines for connecting module content to the projects their students are working on. Formalising this engagement would ensure that all learners receive contextualised feedback and reinforcement of their learning, thereby reducing the variability that currently hinders some learners. As Marnewick (2023) stated, the effectiveness and success of adaptive supervision depend on consistency and the clarification of mutual expectations between the supervisor and students. Along with balancing the incorporation of structured activities and peer feedback, it is crucial for enforcing capacity and addressing learners' needs (De Kleijn et al., 2016; Marnewick, 2023).

3. Expansion of Scaffolded, Hands-On Workshops for all levels

To improve confidence and skills, hands-on workshops and seminars proved highly beneficial, particularly for those just starting in research. These offerings should be expanded to ensure they are accessible and relevant to learners from diverse backgrounds and project types. It is possible to accommodate students with varied levels of prior expertise by designing sessions that are either tiered or parallel. This will help students feel secure and competent in their research. These outcomes align with Brew's (2006) study, which found that competence develops when teaching and research are openly connected through active, applied tasks.

Conclusion

In conclusion, this Realist Evaluation of the MRes Research Methods module aimed to move beyond a surface-level assessment of student satisfaction to reveal the fundamental mechanisms that facilitate or impede learning for diverse postgraduate students in various contexts. The results showed a complex, context-dependent reality. While the Research Methods module can help students learn and support their dissertations, its impact is inconsistent across the cohort. The module's success and effectiveness are not universal. The evaluation demonstrates that the module is 'partially successful' overall. Its performance depends on how well the teaching methods, student needs, and disciplinary practices work together.

Additionally, the analysis of the CMO configurations revealed several key patterns. Enabling mechanisms, such as hands-on and scaffolded workshops, helped novice learners translate abstract ideas into practical skills, boosting their confidence and readiness. Authentic assessments that mirrored dissertation project tasks also worked well, making it easier to transfer knowledge. Moreover, active, field-specific support from project supervisors was an effective method, reinforcing module content and situating it within the context of research projects. These findings validate the principles of the teaching-research nexus, which promotes learning through active engagement in research practices. This study provides a crucial, contextually sensitive perspective on the literature of postgraduate training. Pinpointing the specific variables that determine the success or failure of teaching practices offers practical guidance for developing a more equitable, effective, and inclusive learning environment that truly prepares learners for their path as independent researchers.

Finally, this research reveals a simple yet impactful truth: research training must be in tune with learners. This principle moves beyond a plain inventory of best practices to wholly challenge the efficacy of a 'one-size fits all' module design, which proved inequitable for postgraduate students in computational and dry-lab fields. The most significant outcome of this study is that the teaching strategy is only as good as its relevance to learners' own world. An authentic assessment and a hands-on seminar or workshop are beneficial only when a supervisor helps the student connect the dots back to their research project. Therefore, to achieve equitable and positive outcomes, institutions are encouraged to prioritise the creation of effective educational structures. The 'Adaptive Nexus Model' proposed in this research offers a clear framework for accomplishing this and is dynamically adaptive, ensuring that all postgraduate students are equally equipped for success.

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ORCID

Raleigh Anne Mangsat  <http://orcid.org/0009-0009-1333-6180>

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