Research-Teaching Nexus (RTN) Toolkit

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To cite this document:

Ballentine, M., Floyd, S., McChesney, I., Bond, R. and Boyd, K. (2022) Research-Teaching Nexus (RTN) Toolkit. Ulster University. https://ulster.sharepoint.com/sites/ResearchTeachingNexusToolkit

0	Main Menu

- -

1   Introduction to the Toolkit

Ulster University has recognised the importance of a research-teaching nexus (RTN) and has specified the integration of research and teaching as a key principle. Some key benefits of an RTN are listed in Table 1.1. This toolkit has the aim of helping to inspire and guide academics on the use of an RTN in-line with Ulster's Strategy, including as defined within the Student Learning Experience Principles. The toolkit provides practical pedagogic support to academic staff members, across the different faculties.

Table 1.1. Benefits of undergraduate research-teaching nexus adapted from an online article from the University of Oregon's Office for the Vice President of Research and Innovation (accessed via web, Nov 2021).

Benefits of undergraduate research-teaching nexus
• Development of skills such as thinking analytically, question critically, and respond to inquiry
• Strengthens undergraduate education
• Provides additional outlets for teaching, research and to serve
• Fosters a community of scholars that is essential to the intellectual health of the university
• Increased student persistence
• Increased interest and preparedness for postgraduate study
• Higher gains in research skills such as gathering and analysing data, and speaking effectively
• Gains in professional and personal development
• Increasing student retention, and opening career pathways, for minority and underrepresented populations

There is a particular emphasis within the toolkit on the use of more active, inquiry-based approaches to student learning in an RTN. Inquiry-based learning is a student-centred pedagogical approach that enables learners to ask questions, investigate problems and synthesise knowledge, and form evidence-based conclusions, whilst also collaborating with others such as their peers and professional researchers (Attard et al, 2021; Melville, 2015). Such an approach requires the use of specific learning activities to engage students with "profession-specific knowledge and practices" (Spernes and Afdal, 2021).

1   Introduction to the Toolkit

Inquiry-based learning involves students actively gathering information, exploring the ideas of others, evidencing, and developing their own ideas, and making new discoveries, therefore, progressing from a phase of learning to real research, and being able to contribute to new knowledge creation (Spernes and Afdal, 2021; Levy and Petrulis, 2012).

The toolkit extends beyond the theoretical categorisation and modelling of RTN activities as discussed in Section 2 'Research-Teaching Nexus in Practice', (see for example, Clark and Hordosy, 2019; Healey et al., 2010; White and Irons, 2007; Boyer, 2002), by providing more practical information, expanding primarily upon Healey's types of RTN adopted by Ulster, and as informed and customised by studying the literature, survey findings (from Ulster academics), and case studies. For an in-depth discussion of the literature and other research findings, see Section 8 'Scholarship'.

A practical framework is presented in Section 3 'Activities' which provides a gateway to a wide range of potential RTN activities with respect to various student learning and assessment approaches, including a consideration for passive and active learning activities, and teacher-led and student-led activities. Potential competencies that can be developed through an RTN, and embedded within learning outcomes, are discussed in Section 4 'Competencies'. RTN case studies are presented from the perspectives of Ulster staff in Section 5 'Case Studies', that can provide insight into the experiences of RTNs. We hope to add more case studies soon. Checklists are provided in Section 6 'Checklists' to help guide RTN idea generation and decision-making. These can be used as cognitive aids to reflect and identify ways to integrate research into teaching. A series of resources are also provided in Section 7 'Resources'. All references can be found in Section 10 'References'. It is also possible to leave feedback on this toolkit via the methods detailed in Section 9 'Feedback'.

2   Research-Teaching Nexus in Practice

The toolkit is based upon Healey's types of research-teaching nexus (Healey et al., 2010) with the addition of research teaching (Reis, n.d.; White and Irons, 2007). These types are briefly described in Table 2.1. Each type is colour coded as shown, which is consistent across the toolkit.

Table 2.1. Healey's Types of Research-Teaching Nexus (Healey et al., 2010).

Research-Led	Involves modules and curriculum design directly reflecting the research interests of the school and includes lectures that are comparable to research presentations.
Research-Tutored	Involves interactive activities, for example where the lecturer and the students read, and critically discuss research papers.
Research-Orientated	Involves developing students' research skills and techniques, e.g., research methods, processes, and the art of asking research questions and testing hypotheses.
Research-Based	Involves the student being actively engaged in carrying out their own research, e.g., writing papers, using research methods (not just passively learning about them) and completing dissertations based on research topics. Students are encouraged to learn through research and inquiry, becoming 'producers of', rather than 'consumers of' knowledge.
Research-Teaching	Involves students teaching their more junior peers about research and research skills.

2   Research-Teaching Nexus in Practice

The toolkit expands upon Healey's types which are highly theoretical, through eight practical research-teaching nexus student learning and assessment modalities as identified through a study of the recent literature (see for example, Brennan et al., 2019; Limniou and Mansfield, 2019). These modalities are detailed in Table 2.2.

Table 2.2. Research-Teaching Nexus Student Learning Modalities.

Listening about research or researchers	Such as a lecture, guest speaker, attending a conference, meet a researcher, or presentation on research.
Observing research or researchers	Such as shadowing, or via a video recording.
Exploring research alone, with peers or teacher	Such as reading, reviewing, and discussing a paper as a group.
Trying research alone or as part of a group or team	Such as a pre-defined competency development session, task, case study, lab, field work, replication, or research tutorial.
Doing research alone or as part of a group or team	Such as an original and undefined task, lab, field work, replication, project, placement, or a hackathon.
Owning their research, task, or contribution to a partnered project	Such as being recognised as the researcher on for example, a publication, citizen science project, funded project, or stakeholder-linked project.
Projecting their research and identity as a researcher	Such as a publication in a student journal, academic journal, a conference, or giving a presentation on their research.
Teaching others about research or research skills	Such as their peers for example, peer tutoring, or leading a workshop or lesson.

2   Research-Teaching Nexus in Practice

Connecting RTN types with learning and assessment modalities conveys the meaning of each type. These modalities, and associated activities, can be categorised into student learning and assessment identities, highlighting the variation and degree of student passive or active learning and assessment. Thus, the resulting diagram, as shown in Figure 2.1, illustrates how Healey's theoretical types (including expanded models) relate to an RTN in practice, and reveals a multitude of potential options in respect to the student learning experience, including learning and assessment activities, and the level of teacher direction, interaction, control, and ownership.

Connecting RTN Types with Respective Learning and Assessment Modalities and Activities

- **Research-led** can be associated with activities that predominantly involve students listening about, or observing research or researchers, such as a lecture or a presentation.

- **Research-tutored** can be associated with activities that predominantly involve students exploring research, such as reading and reviewing a paper, and discussing it as group.

- **Research-orientated** can be associated with activities that predominantly involve students trying research themselves, such as competency development tasks or pre-defined, unoriginal, tutorial.

- **Research-based** however, predominantly involves activities where students are doing, potentially owning, and projecting original research and their identity as a researcher, such as through publication.

2   Research-Teaching Nexus in Practice

- **Research-teaching** can be associated with activities where students are teaching others about research and research skills, such as their more junior peers, through peer tutoring, or leading a workshop or lesson.

Connecting RTN Learning and Assessment Modalities with Student Identities

- The **research-led** type of the research-teaching nexus is the most passive learning experience for students being teacher-led.

- This is followed by **research-tutored** and **research-orientated** being more teacher-monitored and transitional from being led to leading on research.

- Then **research-based** and **research-teaching** involving the most active learning experience for students being student-led, respectively.

Consequently, students progress from absorbing knowledge and being led during the research-led type as learners in the traditional sense, and developing their knowledge, understanding, and wider competencies, including actively and through inquiry in practice, through the research-tutored and orientated types. Students then progress towards becoming practicing researchers and leading on research during the research-based and teaching types of RTN, producing or contributing to knowledge, and transferring their knowledge and competencies on to others. As a result, forming a complete student research lifecycle.
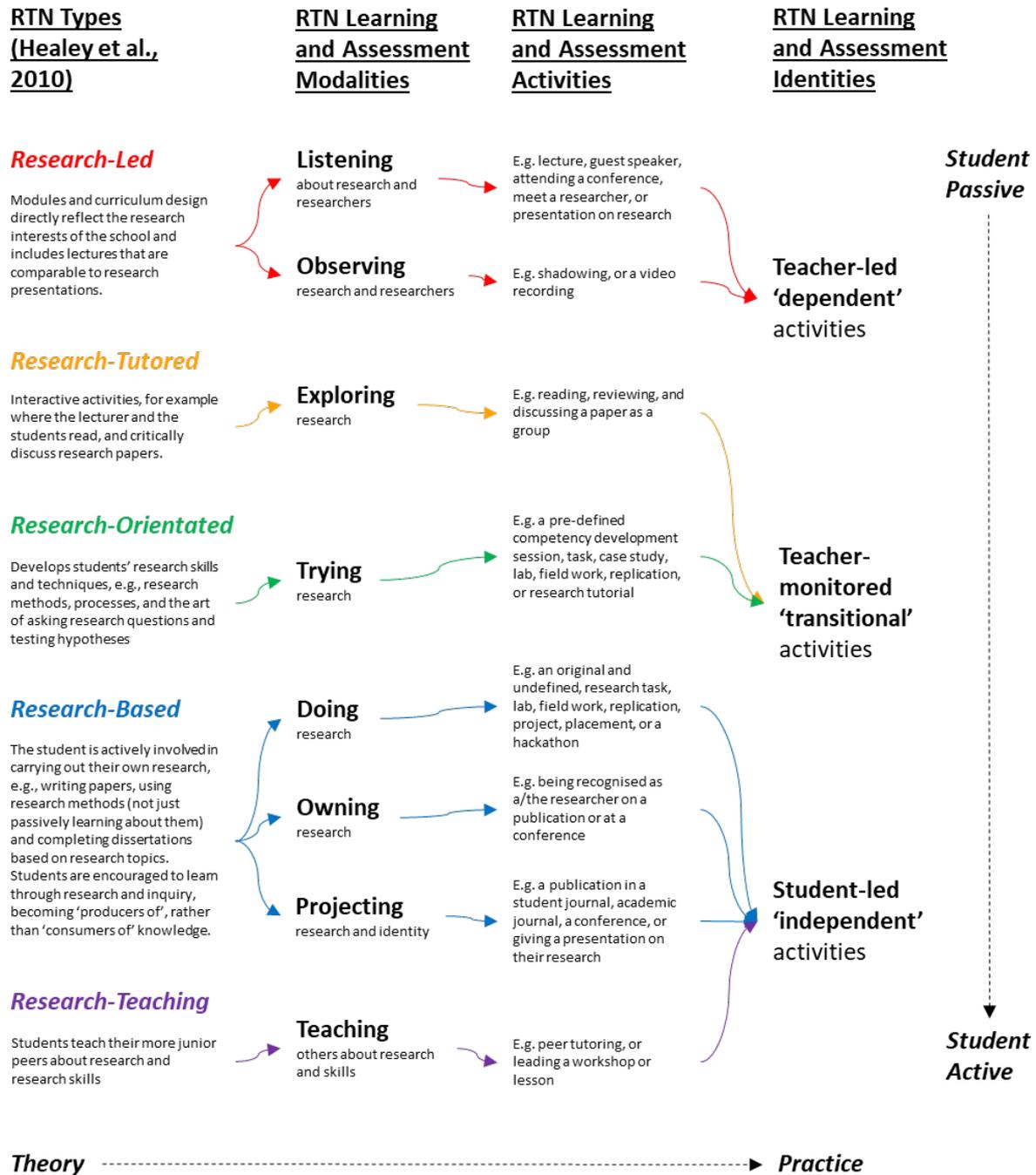
2 | Research-Teaching Nexus in Practice

RTN Types (Healey et al., 2010)	RTN Learning and Assessment Modalities	RTN Learning and Assessment Activities	RTN Learning and Assessment Identities
Research-Led — Modules and curriculum design directly reflect the research interests of the school and includes lectures that are comparable to research presentations.	**Listening** about research and researchers / **Observing** research and researchers	E.g. lecture, guest speaker, attending a conference, meet a researcher, or presentation on research / E.g. shadowing, or a video recording	**Teacher-led 'dependent'** activities — *Student Passive*
Research-Tutored — Interactive activities, for example where the lecturer and the students read, and critically discuss research papers.	**Exploring** research	E.g. reading, reviewing, and discussing a paper as a group	**Teacher-monitored 'transitional'** activities
Research-Orientated — Develops students' research skills and techniques, e.g., research methods, processes, and the art of asking research questions and testing hypotheses	**Trying** research	E.g. a pre-defined competency development session, task, case study, lab, field work, replication, or research tutorial	
Research-Based — The student is actively involved in carrying out their own research, e.g., writing papers, using research methods (not just passively learning about them) and completing dissertations based on research topics. Students are encouraged to learn through research and inquiry, becoming 'producers of', rather than 'consumers of' knowledge.	**Doing** research / **Owning** research / **Projecting** research and identity	E.g. an original and undefined, research task, lab, field work, replication, project, placement, or a hackathon / E.g. being recognised as a/the researcher on a publication or at a conference / E.g. a publication in a student journal, academic journal, a conference, or giving a presentation on their research	**Student-led 'independent'** activities
Research-Teaching — Students teach their more junior peers about research and research skills	**Teaching** others about research and skills	E.g. peer tutoring, or leading a workshop or lesson	— *Student Active*

Theory --------→ *Practice*

Figure 2.1. Research teaching nexus in practice diagram.

3   Research-Teaching Nexus Activities

The research-teaching nexus in practice framework shown in Figure 3.1 is a simplified interactive version of the previous diagram (Figure 2.1). The framework makes it easier, in a practical sense, to quickly identify at a high level, a research-teaching nexus type and respective student learning modality with consideration for student identity and thus, a degree of passive or active learning.

By following a particular learning modality, appropriate activity cards can be accessed, and easily identified through the colour coding. The activity cards provide a basic list of activities to help guide and inspire activity selection and new idea generation. Blank versions can also be accessed in Section 7 'Resources'. The blank cards can be used to create your own lists of activities appropriate to your teaching responsibilities.

In addition, a full poster version of the research-teaching nexus in practice framework including all example activities is provided in this document, with a link to a digital version provided in Section 7 'Resources'. A simple table listing all activities can be accessed by clicking the link below.

Table of Activities

3	Research-Teaching Nexus Activities

RTN Types

Research-Led	Research-Tutored	Research-Orientated	Research-Based	Research-Teaching
Listening about research and researchers	**Exploring** research	**Trying** research	**Doing** research	**Teaching** others about research and skills
Observing research and researchers			**Owning** research	
			Projecting research and identity	
Teacher-led 'dependent' activities	*Teacher-monitored 'transitional'* activities		**Student-led 'independent'** activities	

(Vertical axis label: RTN Student Learning and Assessment Modalities)

RTN Student Learning and Assessment Identities

Figure 3.1. Research-teaching nexus in practice framework.

4   Research-Teaching Nexus Competencies

Competencies (including skills, behaviours, and knowledge) that can be developed through research-teaching nexus activities are numerous and diverse. Competencies were gathered via a review of recent literature (see for example, Gros et al., 2020; Limniou and Mansfield, 2019; Clark and Hordosy, 2019; Huet, 2018; and Longcroft, 2016), and have been categorised in Figure 4.1 based-upon an adapted and expanded form of the UNESCO transversal skills framework (see for example, UNESCO (Bangkok), 2016). Such competencies are essential for success in the 21st century (Gros et al., 2020; Longcroft, 2016), not only for potential research careers, but in all other aspects of life, work, and society, and in being able to make a positive contribution to the economy (see for example, McKinley et al., 2021; Andersone et al., 2019; Sa and Serpa, 2018; DfE, 2017; CEDEFOP, 2013; Waldock, 2011; White and Irons, 2007). Figure 4.1 is interactive and can be used to help inform the design of learning outcomes, incorporating the development of such competencies, in your research-teaching nexus activities. A full table is also provided in this document.

Intrapersonal Competencies	**Interpersonal Competencies**	**Technical Competencies**
Thinking Competencies	**Communication Competencies**	**Professional Competencies**
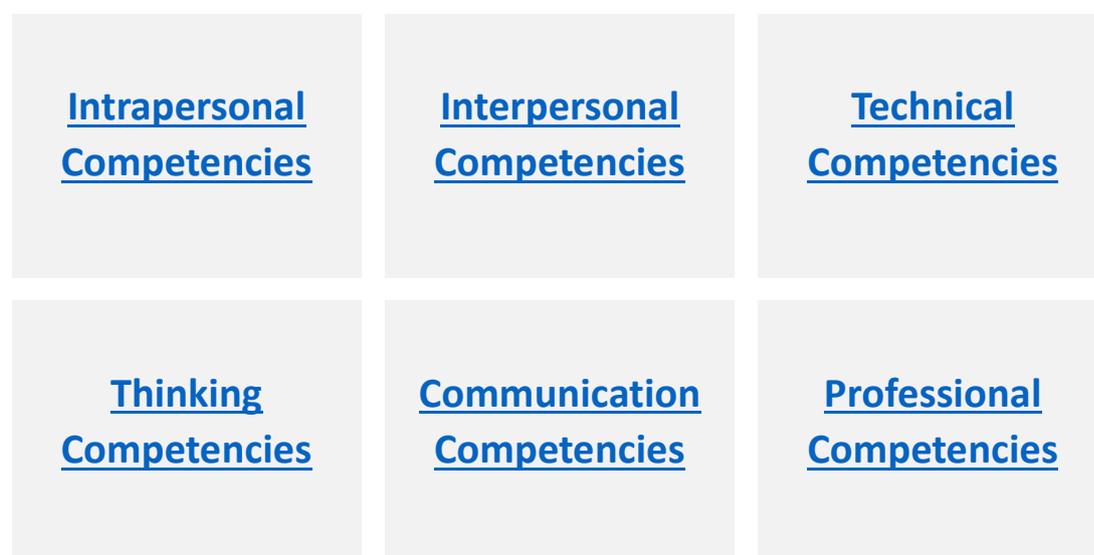
Figure 4.1. Research-teaching nexus competency categories.

5   Research-Teaching Nexus Case Studies

The following case studies (accessed via Figure 5.1) were provided by academic staff involved with an RTN at Ulster University. The case studies were gathered using a standard case study template form that was completed by each academic respondent at Ulster.

Each case study, therefore, provides a practical example of an RTN from the perspective of a practicing academic, a fellow colleague, and can be used to help generate ideas and inform decision-making in respect to your own research-teaching nexus. The case studies can help provide insight on what is best practice.

Should you wish to submit a case study, please contact Sarah Floyd, s.floyd@ulster.ac.uk, Ian McChesney, ir.mcchesney@ulster.ac.uk, Raymond Bond, rb.bond@ulster.ac.uk, Kyle Boyd, ka.boyd@ulster.ac.uk, or Mark Ballentine, me.ballentine@ulster.ac.uk

PLEASE NOTE THAT THIS SECTION IS STILL UNDER DEVELOPMENT.

Case Study 1:	**Case Study 2:**	**Case Study 3:**
Case Study 4:		

Figure 5.1. RTN case studies with academics at Ulster University.

Short RTN insights are also provided.

Insight 1:	**Insight 2:**	**Insight 3:**
Insight 4:	**Insight 5:**	**Insight 6:**

Figure 5.2. Short RTN insights with academics at Ulster University.

| 6 | Research-Teaching Nexus Checklists | 14 |

The following checklists (accessed via Figure 6.1) are designed to help guide and inspire decision-making in respect to, for example, RTN types and learning and assessment modalities, student identities, passive and active engagement, module design, learning outcome design, assessment design, and revalidation.

Each checklist also contains useful links referring to specific useful content within this toolkit.

Modalities Checklist	**Student Identities Checklist**	**Module Design Checklist**
Learning Outcome Design Checklist	**Assessment Design Checklist**	**Revalidation Checklist**
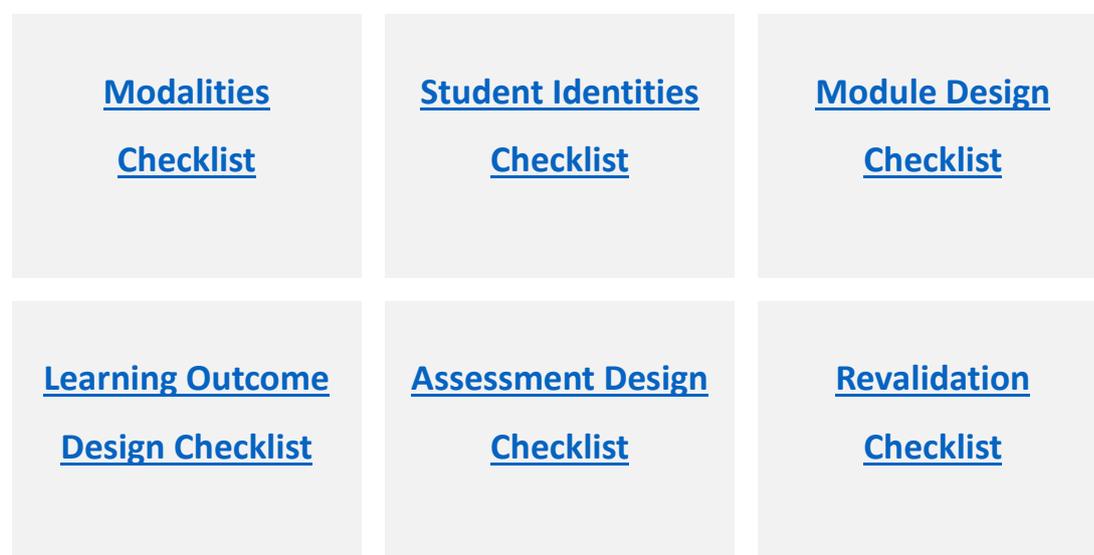
Figure 6.1. Research-teaching nexus checklists.

7   Research-Teaching Nexus Resources

The following links provide access to various RTN electronic resources for your personal use.

The following blank activity cards can be used to create your own lists of activities appropriate to your teaching responsibilities.

[RTN blank activity card: Listening](#)

[RTN blank activity card: Observing](#)

[RTN blank activity card: Exploring](#)

[RTN blank activity card: Trying](#)

[RTN blank activity card: Doing](#)

[RTN blank activity card: Owning](#)

[RTN blank activity card: Projecting](#)

[RTN blank activity card: Teaching](#)

The following link provides access to a digital version of the RTN full activity poster for scaling and printing.

[RTN full activity poster (online)](#)

Other Ulster University resources and toolkits can be accessed via the following link.

[Ulster University resources and toolkits (online)](#)

| 8 | Research-Teaching Nexus Scholarship | |

The following links provide access to RTN Scholarship documents for further reading.

PLEASE NOTE THAT THIS SECTION IS STILL UNDER DEVELOPMENT.

[Literature Review](#)

Ulster RTN survey analysis

RTN conference paper (online)

RTN journal paper (online)

9 Feedback

You can provide feedback on this toolkit via the following options.

[RTN Toolkit](#)

[Evaluation Survey](#)

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The following is a detailed list of all references citied within this document and within resources and scholarship documents.

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RTN Type   **RTN Learning and Assessment Modality**

Research-Led	*Listening* about research and researchers

- Lecture
- PhD guest speaker
- Research guest speaker
- Industry research guest speaker
- Guest speaker from university management on research
- Guest speaker from CHERP on research
- Attending a conference
- Meet a researcher (discussion)
- Presentation on research

Teacher-led 'dependent'
activities

RTN Learning and Assessment Identity

RTN Learning and Assessment Activities

→ Main menu

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RTN Type

RTN Learning and Assessment Modality

RTN Learning and Assessment Activities

Research-Led	*Observing* research and researchers

- Meet a researcher (shadowing)
- Video recording of for example, a lab or fieldwork, or a research task or activity
- Live stream of for example, a lab or fieldwork, or a research task or activity

Teacher-led 'dependent'
activities

RTN Learning and Assessment Identity

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RTN Type   **RTN Learning and Assessment Modality**

RTN Learning and Assessment Activities

Research-Tutored	*Exploring* research

- Reading, reviewing, and discussing a paper as a group
- Discussing what it means to be a researcher as a group
- Discussing research careers as a group
- Discussing a conference or presentation as a group
- Discussing research competencies as a group
- Student review club
- Student debates or debate club

Teacher-monitored 'transitional'
activities

RTN Learning and Assessment Identity

RTN Type

RTN Learning and Assessment Modality

RTN Learning and Assessment Activities

Research-Orientated	*Trying* research

- Pre-defined competency development session
- Pre-defined competency development task
- Pre-defined competency development case study
- Pre-defined competency development lab
- Pre-defined competency development fieldwork
- Pre-defined competency development replication
- Pre-defined competency development research tutorial e.g., a famous experiment
- Reviewing a paper, chapter, book or oral presentation and synthesising results and findings
- Analysing a given dataset and information using industry standard software and synthesising results and findings
- Learn research methods and selection
- Learn how to design and deliver a survey, focus groups, and interviews
- Learn how to write proposals, Ethics, and funding applications for given information
- Writing a methodology for given information
- Writing abstracts for given information
- Learning how to search databases, select source material, and reference correctly
- Learning how to write introductions and conclusions for given information
- Simulated research
- Digital design skills and learn how to structure and format a report, paper, and poster

Teacher-monitored 'transitional'
activities

RTN Learning and Assessment Identity

RTN Type　　　　　　　　　　　　　　　　　　**RTN Learning and Assessment Modality**

Research-Based	Doing research

RTN Learning and Assessment Activities

- Original authentic research task within scope of researchers active interests or the departments interests
- Support a researchers active project
- Original authentic case study within scope of researchers active interests or the departments interests
- Original authentic lab within scope of researchers active interests or the departments interests
- Original authentic fieldwork within scope of researchers active interests or the departments interests
- Original authentic replication of a researchers or departments active research
- Original authentic project within scope of researchers active interests or the departments interests
- Original authentic research placement within scope of researchers active interests or the departments interests
- Original authentic citizen science research within scope of researchers active interests or the departments interests
- Original and authentic research using open source data
- Hackathon or datathon
- Timed challenge event
- Multi-disciplinary or cross-disciplinary project involving students from other subjects to solve a problem e.g. project-based learning
- Conducting an evaluation
- Progressive 'cumulative' project-based assessment
- Student-staff research lab

Student-led 'independent'
activities

RTN Learning and Assessment Identity

RTN Type　　　　　　　　　　　　**RTN Learning and Assessment Modality**

RTN Learning and Assessment Activities

Research-Based	**Owning** research

- Being recognised as a/the researcher on a publication
- Being recognised as a/the researcher at a conference
- Developing an identity as a researcher through partnerships

Student-led 'independent'
activities

RTN Learning and Assessment Identity

RTN Type

RTN Learning and Assessment Modality

Research-Based	*Projecting* research and identity

RTN Learning and Assessment Activities

- Publication in an undergraduate/postgraduate student journal
- Publication in an academic journal
- Undergraduate/postgraduate student conference publication and/or presentation
- Academic conference publication and/or presentation
- Giving a presentation on their research
- Presenting their research to stakeholders
- Presenting their research to industry
- Presenting their research to the community
- Student research exhibition or display
- Dramatizing an event based on research findings
- Student blogs and video blogs

Student-led 'independent'
activities

RTN Learning and Assessment Identity

RTN Type　　　　　　　　　　　　　　　**RTN Learning and Assessment Modality**

RTN Learning and Assessment Activities

Research-Teaching	*Teaching* others about research and skills

- Peer tutoring
- Leading a workshop on research and/or research competencies
- Deliver a lesson on research or about research
- Final year project students speaking to junior peers about their research and completing a final year project
- Creating open research educational resources for junior peers
- Mentoring and/or helping to Supervise the research work or skills development of more junior peers

Student-led 'independent'
activities

RTN Learning and Assessment Identity

Research-Led		Research-Tutored	Research-Orientated	Research-Based			Research-Teaching
Listening about research and researchers	*Observing* research and researchers	*Exploring* research	*Trying* research	*Doing* research	*Owning* research	*Projecting* research and identity	*Teaching* others about research and skills
• Lecture • PhD guest speaker • Research guest speaker • Industry research guest speaker • Guest speaker from university management on research • Guest speaker from CHERP on research • Attending a conference • Meet a researcher (discussion) • Presentation on research	• Meet a researcher (shadowing) • Video recording of for example, a lab or fieldwork, or a research task or activity • Live stream of for example, a lab or fieldwork, or a research task or activity	• Reading, reviewing, and discussing a paper as a group • Discussing what it means to be a researcher as a group • Discussing research careers as a group • Discussing a conference or presentation as a group • Discussing research competencies as a group • Student review club • Student debates or debate club	• Pre-defined competency development session, task, case study, lab, fieldwork, replication, or competency development research tutorial e.g., a famous experiment • Reviewing a paper, chapter, book or oral presentation and synthesising results and findings • Analysing a given dataset and information using industry standard software and synthesising results and findings • Learn research methods and selection • Learn how to design and deliver a survey, focus groups, and interviews • Learn how to write proposals, Ethics, and funding applications for given information • Writing a methodology for given information • Writing abstracts for given information • Learning how to search databases, select source material, and reference correctly • Learning how to write introductions and conclusions for given information • Simulated research • Digital design skills and learn how to structure and format a report, paper, and poster	• Original authentic research task within scope of researchers active interests or the departments interests • Support a researchers active project • Original authentic case study within scope of researchers active interests or the departments interests • Original authentic lab within scope of researchers active interests or the departments interests • Original authentic fieldwork within scope of researchers active interests or the departments interests • Original authentic replication of a researchers or departments active research • Original authentic project within scope of researchers active interests or the departments interests • Original authentic research placement within scope of researchers active interests or the departments interests • Original authentic citizen science research within scope of researchers active interests or the departments interests • Original and authentic research using open source data • Hackathon or datathon • Timed challenge event • Multi-disciplinary or cross-disciplinary project involving students from other subjects to solve a problem e.g. project-based learning • Conducting an evaluation • Progressive 'cumulative' project-based assessment • Student-staff research lab	• Being recognised as a/the researcher on a publication • Being recognised as a/the researcher at a conference • Developing an identity as a researcher through partnerships	• Publication in an undergraduate/postgraduate student journal • Publication in an academic journal • Undergraduate/postgraduate student conference publication and/or presentation • Academic conference publication and/or presentation • Giving a presentation on their research • Presenting their research to stakeholders • Presenting their research to industry • Presenting their research to the community • Student research exhibition or display • Dramatizing an event based on research findings • Student blogs and video blogs	• Peer tutoring • Leading a workshop on research and/or research competencies • Deliver a lesson on research or about research • Final year project students speaking to junior peers about their research and completing a final year project • Creating open research educational resources for junior peers • Mentoring and/or helping to Supervise the research work or skills development of more junior peers
Teacher-led 'dependent' activities		*Teacher-monitored 'transitional'* activities		*Student-led 'independent'* activities			

→ Main menu

RTN Type **RTN Learning and Assessment Modality**

Research-Led	*Listening* about research and researchers

RTN Learning and Assessment Activities

Teacher-led 'dependent'
activities

RTN Learning and Assessment Identity

RTN Type

RTN Learning and Assessment Modality

RTN Learning and Assessment Activities

Research-Led	*Observing* research and researchers
	Teacher-led 'dependent' activities

RTN Learning and Assessment Identity

RTN Type　　　　　　　　**RTN Learning and Assessment Modality**

RTN Learning and Assessment Activities

Research-Tutored	*Exploring* research

Teacher-monitored 'transitional'
activities

RTN Learning and Assessment Identity

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RTN Type

RTN Learning and Assessment Modality

RTN Learning and Assessment Activities

Research-Orientated	*Trying* research
	Teacher-monitored 'transitional' activities

RTN Learning and Assessment Identity

RTN Type   **RTN Learning and Assessment Modality**

RTN Learning and Assessment Activities

Research-Based	*Doing* research

Student-led 'independent'
activities

RTN Learning and Assessment Identity

RTN Type

RTN Learning and Assessment Modality

RTN Learning and Assessment Activities

Research-Based	*Owning* research

Student-led 'independent'
activities

RTN Learning and Assessment Identity

RTN Type

RTN Learning and Assessment Modality

RTN Learning and Assessment Activities

Research-Based

Projecting research and identity

Student-led 'independent'
activities

RTN Learning and Assessment Identity

RTN Type   **RTN Learning and Assessment Modality**

Research-Teaching   *Teaching* others about research and skills

Student-led 'independent'
activities

RTN Learning and Assessment Activities

RTN Learning and Assessment Identity

Intrapersonal Competencies

- Ability to Work Independently

- Confidence

- Self-Discipline and Motivation

- Self-Awareness

- Ability to Learn Independently

- Identity and Sense of Belonging

- Integrity and Self-Respect

- Take Risks

- Flexibility and Adapt to Change

- Perseverance

- Identity

- Responsibility

- Respond Positively to Criticism

- Awareness of Own Physical and Mental Health

Interpersonal Competencies
- Teamwork   - Communicating with Others   - Listening to Others   - Considering the Views of Others   - Multi and Cross-Disciplinary Work   - Collaboration   - Networking   - Collegiality   - Sociability   - Empathy   - Compassion   - Dignity and Respect for Others   - Conflict Resolution

Technical Competencies

- Methods, statistics, and Data Analytics

- Specialist ICT

- Information Security, data protection

- E-safety

- Journals and Databases

- Search for Reliable Sources

- Use of Search Engines

- Research Social Networking

- Subject Specific Technical Skills

Thinking Competencies

- Critical Analysis

- Conducting a Review

- Synthesis

- Strategic Thinking

- Systems Thinking

- Innovation and Novel Thinking

- Ability to Debate and Challenge

- Initiative

- Creativity

- Resourcefulness

- Ability to Reflect Independently

- Evidence-Based and Reasoned Decision-Making

- Methodology Design and Application of Theory

- Problem Solving

- Make Key Skills and Knowledge Links from across Programme

Communication Competencies

- Academic Writing
- Referencing
- Writing Abstracts
- Producing Articles
- Producing Conference Papers
- Oral Presentations
- Poster Presentation
- Blogs and social media
- Digital Design and Media
- Teaching/Tutoring Others
- Making Applications for Funding
- Writing Ethics applications

Professional Competencies

- Research Integrity

- Research Ethics

- Intellectual Property

- Cultural Understanding

- Respect for Diversity and Equality

- Equity in Academia

- Awareness of Global Challenges

- Respect for the Environment

- Democratic Participation

- Organisation and Self-Management

- Project Management

- Stakeholder Management

- Financial and Performance Aspects of Research

- Research Entrepreneurship

- Tolerance and Openness

- Research Awareness

- Awareness of Professional Standards and Frameworks

- Awareness of Organisational Policies and Strategies

- Awareness of Professional Societies and Development

- Awareness of Research Bodies

- Awareness of Researchers and Groups within Faculty/Department

- Competencies for Accreditation

Intrapersonal Competencies	Interpersonal Competencies	Technical Competencies
- Ability to Work Independently - Confidence - Self-Discipline and Motivation - Self-Awareness - Ability to Learn Independently - Identity and Sense of Belonging - Integrity and Self-Respect - Take Risks - Flexibility and Adapt to Change - Perseverance - Identity - Responsibility - Respond Positively to Criticism - Awareness of Own Physical and Mental Health	- Teamwork - Communicating with Others - Listening to Others - Considering the Views of Others - Multi and Cross-Disciplinary Work - Collaboration - Networking - Collegiality - Sociability - Empathy - Compassion - Dignity and Respect for Others - Conflict Resolution	- Methods, statistics, and Data Analytics - Specialist ICT - Information Security, data protection - E-safety - Journals and Databases - Search for Reliable Sources - Use of Search Engines - Research Social Networking - Subject Specific Technical Skills
Thinking Competencies	**Communication Competencies**	**Professional Competencies**
- Critical Analysis - Conducting a Review - Synthesis - Strategic Thinking - Systems Thinking - Innovation and Novel Thinking - Ability to Debate and Challenge - Initiative - Creativity - Resourcefulness - Ability to Reflect Independently - Evidence-Based and Reasoned Decision-Making - Methodology Design and Application of Theory - Problem Solving - Make Key Skills and Knowledge Links from across Programme	- Academic Writing - Referencing - Writing Abstracts - Producing Articles - Producing Conference Papers - Oral Presentations - Poster Presentation - Blogs and social media - Digital Design and Media - Teaching/Tutoring Others - Making Applications for Funding - Writing Ethics applications	- Research Integrity - Research Ethics - Intellectual Property - Cultural Understanding - Respect for Diversity and Equality - Equity in Academia - Awareness of Global Challenges - Respect for the Environment - Democratic Participation - Organisation and Self-Management - Project Management - Stakeholder Management - Financial and Performance Aspects of Research - Research Entrepreneurship - Tolerance and Openness - Research Awareness - Awareness of Professional Standards and Frameworks - Awareness of Organisational Policies and Strategies - Awareness of Professional Societies and Development - Awareness of Research Bodies - Awareness of Researchers and Groups within Faculty/Department - Competencies for Accreditation

RTN Student Learning and Assessment Modalities Checklist

Have you considered whether the research activity will involve students:

- Listening about research or a research task such as a guest speaker, attending a conference, or presentation on research?

- Observing research or a research task such as shadowing, or via a video recording?

- Exploring research or a research task alone, with peers or teacher, such as reading, reviewing, and discussing a paper as a group?

- Trying research alone or as part of a group or team, such as a pre-defined competency development session, task, case study, lab, field work, replication, or research tutorial?

- Doing research alone or as part of a group or team, such as an original and undefined task, lab, field work, replication, project, placement, or a hackathon?

- Owning their research, task, or contribution to a partnered project such as being recognised as the researcher on for example, a publication, citizen science project, funded project, or stakeholder-linked project?

- Projecting their research and identity as a researcher such as a publication in a student journal, academic journal, a conference, or giving a presentation on their research?

- Teaching others about research or research skills such as their peers for example, peer tutoring, or leading a workshop or lesson?

Click here for a full framework of activities.

RTN Student Learning and Assessment Identities Checklist

Have you considered if the research activity will involve students being:

- Teacher-led 'dependent' for example, listening about, or observing research, with a research 'learner-centric' identity?
- Teacher-monitored 'transitional' for example, exploring, or trying research, with a research 'trainee-centric' identity?
- Student-led 'independent' for example, doing research, or teaching peers, with a research 'practitioner-centric' identity?
- In a partnership for example, working together as equals?

Click here for a full framework of activities and respective student identities.

RTN Module Design Checklist

Have you considered in your module design:

- Designing with insight from students and colleagues in respect to their experiences of the research teaching nexus, and using the toolkit?
- Aligning learning outcomes with research competencies?

Click here to see a full table of competencies.

- Involving research learning modalities where students are listening, observing, exploring, trying, doing, owning, projecting, or teaching research and skills?

Click here to see a list of research learning modalities.

- Incorporating research activities into learning, and/or assessment?

Click here to see a full framework of activities.

- Providing content informed by your research interests, or research conducted elsewhere in the department?
- Utilising people and resources such as PhD students, guest researchers, and authentic databases, literature, datasets, software, technologies, and facilities to support learning, and assessment activities?
- Enabling students to reflect, and provide insight in respect to their experiences of the research teaching nexus?
- Coordinating how the research teaching nexus within the module relates to the wider programme?

RTN Learning Outcome Design Checklist

Have you considered aligning learning outcomes with research competencies such as:

- Intrapersonal competencies such as confidence, self-discipline, motivation, perseverance, and ability to respond positively to criticism?
- Interpersonal competencies such as teamwork, communicating with others, listening to others, and considering the views of others?
- Technical competencies such as research methods, statistics and data analytics, data protection, specialist ICT, or research databases and reliable sources?
- Thinking competencies such as conducting a review of literature, critical analysis, synthesis of findings, innovative and novel thinking, or ability to debate?
- Communication competencies such as academic writing, Ethics applications, referencing, writing abstracts, oral and poster presentations, or writing a paper?
- Professional competencies such as research integrity, research Ethics, intellectual property, awareness of global challenges, or project management?

Click here to see a full table of competencies.

RTN Assessment Design Checklist

Have you considered:

- Using research activities as the basis for assessment to enable development of research competencies?

Click here for a full framework of activities.

Click here to see a full table of competencies.

- Using your research, or the departments research interests as the basis for assessment?
- Using authentic research databases, literature, datasets, software, technologies, and facilities in assessment?
- Using a student journal or conference in assessments to enable students to project their research, and identity as a researcher?
- Using team-based research assessments where each student completes a part or specific task on a bigger project?
- Using team-based research assessments that are cross-disciplinary?
- Using a progressive 'cumulative' project-based approach to assessment?

RTN Revalidation Checklist

Have you considered:

- Where and when RTN types will/should be employed and how they inter-relate across the programme?
- Strategically embedding RTN activities within the programme?
- Embedding RTN competencies within the course strategic outcomes?
- How an RTN influences programme entry requirements?
- The rationale for employing an RTN across a programme?
- How the RTN meets local, national, and professional priorities and requirements?
- How an RTN will be structured throughout the programme, fit within the wider curriculum, and how it will be assessed?
- Have you considered who will be involved in the RTN across the programme, their roles, responsibilities, and how they could work together including across modular disciplines?
- What resources are required to enable the embedding of an RTN across the programme?
- How projected student numbers will influence the design of an RTN?
- Have you considered how to provide feedback on an RTN across the programme?

Case study 1:

"MA TESOL students carry out a research-based assessment as part of module EDU712 Language, Learning and Acquisition. This assessment is based on my own research on the effectiveness of teacher talk. They collect data, in the form of their own teacher language or 'talk' and analyse it, up close, using a conversation analysis approach, to evaluate how effective it is for the pedagogical purpose of the different stages of the lesson they are teaching. They write this up in the form of a written elf-reflective case study of their own teacher language."

"EDU517 Multicultural Education students (third year – Education as a Minor degree) carry out a piece of research in which they interview someone form a different ethnic minority background who is living in Northern Ireland to find out about their cultural adaptation and language adaptation. Their findings are presented in the form of a case study and a digital story. Staff and students work together to come up with questions, taking into ethical issues, to ask in the interview."

Case study 2:

"I am part of the current teaching team on a Final Year optional module- Pervasive Computing (COM669). The module has been running in various forms for over 10 years and is closely aligned to the School of Computing's research interests in Digital Health and Internet of Things. The module commonly includes presentations from PhD researchers/ Research Associates from Ulster as well as international researchers and speakers from industry to demonstrate the relevance of these research topics. For Assignment 2 on this module, Students currently undertake an investigation and experimentation into Activity Recognition using Wearable Sensors. This requires the students to research the state of the art in Human Activity Recognition (HAR) and use this understanding to collect and process data for activity recognition. Students collect their own data, which is then pulled and shared among all other students to make a large data set. This large dataset has been collected over the last 4 years and has been used within a number of PhD projects both at Ulster and Internationally."

"MSc Internet of Things and MSc Artificial Intelligence. For the Research project (COM748) which is share across the two MSc courses listed above, we have moved away from a traditional dissertation approach, to one which leads the student to produce a focused 8-page research paper. The authentic assessment consists of an 8 Page research paper, Supplementary material (which includes a wider literature review and other technical details not included in the research paper) and a Conference style presentation. This format allows the student to be actively involved in carrying out their own research and has led to Students publishing 3 conference papers and 1 journal paper in the short time that the module has been running (3 years)."

Case study 3:

"Development of a Level 4 10-credit course for Classroom Assistants (CAs) working with children with visual impairment in collaboration with Flexible Education (UU) and a NI based charity (Angel Eyes). The need for this programme was highlighted in an evaluation conducted following several shorter one-day events for teachers and classroom assistants. It was evident that Classroom Assistants assigned to support children with visual impairment had limited training in this area. In addition, previous vision sciences research suggested limitations in communication between education and healthcare. This course has now been delivered on three occasions to groups of 20 CAs (x3). We hope to continue to run this programme with the support from Flexible Education as it provides much need knowledge and skills to the CAs resulting in improvements for the children and families involved."

Case study 4:

"Masters' students who have no knowledge of research. Integration of academic research papers with the application of case study materials. Students are required to locate articles to provide insights into issues addressed in weekly case studies. Students must write a summary of the academic article, indicating how it is relevant to an issue addressed in the case study materials. The summary is summatively assessed. Students must also prepare a presentation on their chosen academic research article, identifying how it adds insights into the issues covered in the case study. The presentation is also summatively assessed."

Case study 5:

"Supporting and Understanding Speech Sound Disorder (SuSSD) is an online tool (https://www.ulster.ac.uk/research/topic/nursing-and-health/caring-for-people-with-complex-needs/research-themes/neurodevelopmental/ssd) co-produced with speech and language therapists as part of Natalie Hegarty's PhD project (released online 2020). It addresses an identified need to support SLTs with evidence-based practice by providing them with a clinical decision-making flowchart and resources on intervention approaches and target selection for children with speech sound disorder. This resource is used by SLTs in practice but also by myself and other academics to support students with the development of their clinical thinking skills."

Case study 6:

"Working with my PGCE Primary student teachers I evaluated the use of iPads for the purpose of upskilling their mathematical content knowledge. The validity of utilising mobile technologies in the primary classroom to deliver the mathematics curriculum has long since been proven as a successful pedagogical tool (Burden et al., 2012; Beauchamp et al., 2015). Therefore, since student teachers are expected to acquire a high level of technological knowledge during the PGCE, using the TPACK research framework helped to evaluate the integration of iPads synchronously to improving their personal maths content knowledge and heightened their awareness of the most successful pedagogical approaches."

Literature Review

Traditional memorisation-orientated taught courses without active practical activities potentially have negligible effect on learning outcomes (Mohammed, 2017). However, active approaches to learning and skills development helps students to obtain knowledge in different contexts and through different thinking and self-guided learning techniques, thereby strengthening the linkage of new knowledge with personal experience, including application of developed skills in different situations (Skola 2030, 2018). Engaging students to learn in an active research-environment, specifically, undergraduates who generally lack involvement in research, would enable them to develop their construction of knowledge, skills, and attitudes, and to cope with the uncertainty of the knowledge society; traits commonly associated with some, but not all final year and postgraduate students (Clark and Hordosy, 2019; Huet, 2018). Such a research-environment has been coined a research-teaching nexus, whereby both research and teaching are integrated as opposed to being treated as independent pursuits.

A Research-Teaching Nexus in Context

As Huet (2018) discussed, a strongly linked teaching and research-environment and culture leads to more motivated academics who can use their expertise and experience as researchers to add value to their students' education, although this requires a strong institutional commitment. An institutions mission and vision can be a changing agent in respect to where academics and students operate, and their respective identities. Individual departments and their leadership and academic staff also influence the relationship between research and teaching, depending on whether they are believed to be integrated or independent activities, even though undergraduate research is known to have many benefits and to be popular amongst students (Griffiths, 2018). There also exists the complex and competing priorities of teaching, research, enterprise and innovation, performance and excellence frameworks, and funding requirements in most higher education institutions, especially where research is coupled closely to enterprise and innovation as opposed to teaching (McKinley et al., 2021).

Many research-intensive universities, in the face of competing priorities, are moving towards embedding research into teaching, so that research can be used effectively, in producing excellent and innovative higher education, imparting competencies that enable students to respond to the big challenges of the 21st Century (Gros et al., 2020; Longcroft, 2016). The requirement for information literacy, independent learning, Ethical awareness, cultural agility, systems thinking, critical appreciation, and the broad ability to do research, including proficiency in research competencies such as critical thinking, analytical reasoning, interdisciplinary team work, and communication, are crucial to gaining employment, and in being able to navigate everyday networks of knowledge that continue to be made available through digital technologies (Limniou and Mansfield, 2019; Clark and Hordosy, 2019). However, many institutions still lag and persist in favouring academic faculty who prioritise research activities over establishing a research-teaching nexus (Brennan et al., 2019).

As Gros et al. (2020) stressed, implementing an effective research-teaching nexus "means going beyond the traditional notion of good research guaranteeing good teaching ... and instead exploring more thoroughly a subject that by its very nature is highly complex, and generating suitable institutional policies based on this analysis".

Earlier literature discussed how the structures and systems underpinning higher education course design, implementation, research, and performance are thought to have led to teaching and research becoming non-congruent and generally treated as separate activities. See for example, Hattie and Marsh (2004); Coate et al. (2001); Clark (1997); Hattie and Marsh (1996). There is considerable ongoing debate on the relationship between research and teaching, with early consensus that the quality of research has little-to-no impact on the quality of teaching, and/or that research and teaching are incompatible due to a paradigm shift to mass higher education and increasing complexities in research practice. Such complexities include heavy teaching workload and dense curricula, staff-student ratios or class sizes, and perceived value of research for academic prestige and promotion which impact the motivation of academics in allocating time to prepare research-based pedagogical

activities; the time that could be allocated to these activities is used for teaching administrative work, meetings, and engagement in pure or applied research (Limniou and Mansfield, 2019; Huet, 2018).

Another persistent topic of debate is the level at which research and teaching should be linked and thus, embedded within curriculum design. There are two lines of thought on when students should be engaged within a research-teaching nexus (Healey and Jenkins, 2018). The first line-of-thought alludes to the fact that undergraduates are ill-prepared for such research engagement, with the second opposing line-of-thought, suggesting that students progressively develop the required skills, knowledge and understanding required for research through engagement with teachers and research over time (Clark and Hordosy, 2019; Huet, 2018; White and Irons, 2007). The first argument has generally been associated with the more traditionalist elitist mindset assuming the existence of an educational hierarchy, whereas the second takes into consideration student needs resulting from mass higher education, diverse student populations, and associated educational, social, and economic realities (University of Oregon's Office for the Vice President of Research and Innovation, accessed via web, Nov 2021; Huet, 2018).

However, many authors are now advocates of widespread integration of research into undergraduate education, across all years. Undergraduate research provides opportunities for students to engage in active curricula via meaningful research projects; generate enthusiasm early-on; follow subject advances; become contributors to knowledge; develop appropriate competencies, attitudes, and behaviours; gradually form a research identity; and have a closer relationship with, and better preparation for postgraduate study, especially in situations where research is normally at postgraduate level only. See for example, Griffiths (2018) and White and Irons (2007). Brennan et al. (2019) discuss how a research teaching nexus is beneficial to undergraduate students and staff as it creates a true community of scholars when students become essential partners in research and learning; this is crucial to academic identity and purpose acting as role models for students. Brennan et al. (2019) also

found that a research-teaching nexus and discussions with students stimulate new research directions and/or ideas. However, Brennan et al. (2019) conveyed that there may be a need to consider changing the research balance of academics so that it aligns to teaching needs to improve integration of a research-teaching nexus. Additionally, there is a need to strengthen methodological training mechanisms (Gros et al., 2020). An online article from the University of Oregon's Office for the Vice President of Research and Innovation (accessed via web, November 2021) outlined various benefits of undergraduate research. The benefits have been adapted from the article and summarised in Table 1. The University of Oregon article echoed the previous advocates, identifying how students in fact learn best, through high impact learning opportunities, when close and engaging relationships between students and staff exist, encompassing, "high levels of feedback, classrooms that utilise active learning, opportunities to work with faculty outside of formal classroom settings, and opportunities for students to collaborate with their peers".

Table 1. Benefits of undergraduate research-teaching nexus adapted from an online article from the University of Oregon's Office for the Vice President of Research and Innovation (accessed via web, Nov 2021).

Benefits of undergraduate research-teaching nexus
• Development of skills such as thinking analytically, question critically, and respond to inquiry
• Strengthens undergraduate education
• Provides additional outlets for teaching, research and to serve
• Fosters a community of scholars that is essential to the intellectual health of the university
• Increased student persistence
• Increased interest and preparedness for postgraduate study
• Higher gains in research skills such as gathering and analysing data, and speaking effectively
• Gains in professional and personal development
• Increasing student retention, and opening career pathways, for minority and underrepresented populations

A particular practical challenge of the research-teaching nexus is that the nexus is multidimensional with effectiveness dependent upon wider student, environmental, staff, institutional and situational contextual factors (McKinley et al., 2021; Clark and Hordosy, 2019; Huet, 2018). The research-teaching nexus encompasses active and dynamic student learning and development if applied over years of study, both internal and external to undergraduate degree programmes whereby students react variably to their experiences, either positively or negatively, which can be either inclusive or exclusive as a result; understandings and experiences of the nexus are not necessarily a direct product of pedagogical practice or curriculum design, but are contingent upon personalities, emotions, developing individual interests and experiences, career goals, and wider contexts of higher education policy and practice (Clark and Hordosy, 2019; Huet, 2018).

Griffiths (2018) found that undergraduate students are profoundly affected by decisions regarding research teaching. Thus, there exists a need to problematise the normative presentation of research in terms of its relationship with learning and teaching, and to understand how academics, and students experience research within the context of their programme over time (Clark and Hordosy, 2019). However, a lack of empirical evidence has been a consistent criticism of research on the research-teaching nexus, specifically, on the nature of the research and teaching relationship, and its practical characteristics (McKinley et al., 2020).

A Research-Teaching Nexus in Practice

Huet (2018) argued that "the successful development of a research-based education model needs to be discussed at the level of curriculum design with the course directors, individual academics, students, and when appropriate, with other stakeholders, such as professional bodies, industry, or public sector organisations". The curriculum needs to be flexible when embedding research into all levels of undergraduate education (Huet, 2018). As a result, recommendations from Huet (2018) include, 1) ensure effective institutional policies to reinforce synergies between units, communities, and structures for teaching and research;

2) ensure institutional policies to guarantee effective management of academics' time and staff-student ratios; 3) raise the culture of research and teaching as two integrated activities; and 4) provide pedagogic support to academics to enable research to be embedded not only in the final year, but at all levels of undergraduate study.

There are several commonly used research-teaching nexus models in higher education, for example, Boyer's Four Scholarships Model (White and Irons, 2007; Boyer, 2002; Boyer, 1998), Healey's Curriculum Design (Four Types) Model (and adaptations and expanded versions) which is the most popular model (Limniou and Mansfield, 2019; Clark and Hordosy, 2019), and the Student Research Lifecycle (Clark and Hordosy, 2019). Nevertheless, there is a predominance of models, or applications of models, that continue to fail in informing and motivating academics, engaging students, placing emphasis on the development of competencies, or reorientating from teaching students to students actively learning (Brennan et al., 2019). However, there are initiatives that seek to address these shortcomings, for example, the Connected Curriculum: A Framework for Research-Based Education at University College London (UCL) (UCL website, Nd). The nature of these models and initiatives are summarised below.

Boyer's Four Scholarships Model

Boyer's model assumes that research and teaching are fundamentally linked as they are both forms of scholarship. They can be broken down into four types of scholarship including, 1) discovery through authentic research activities; 2) application through development of new processes and discovered theory; 3) integration in curriculum design, and of prior knowledge into new activities; and 4) learning and teaching, drawing on existing scholarships, peer tutoring, and teaching to more junior peers. Such a theoretical model can be applied at all levels from undergraduate level and above but with differing phases of development. For example, undergraduates are unlikely to conduct high level postgraduate or professional research, but can progressively develop the underpinning skills, knowledge and understanding, through reinforcing the links between research and teaching. 1st year

students for example can start at a basic level (White and Irons, 2007). Thus, supporting the more optimistic and dynamic second line-of-thought that undergraduates learn how to conduct research over time, countering the first line-of-thought that undergraduates are il-prepared for research engagement. See for example, White and Irons (2007), Boyer (2002), and Boyer (1998). Even though Boyer's model recognises and accounts for the dynamics of a research-teaching nexus, and its potential multi-year temporal attributes and variability in student development and activity selection, it is very theoretical and does not explicitly guide academics in-depth, on how to practically differentiate approaches or activities over time, discipline, or student with consideration for the complexities of student, environmental, staff, institutional, or situational contextual factors.

Healey's Curriculum Design (Four Types) Model and the Connecting Research and Teaching in Practice Framework

Healey's model presents four types of research-teaching nexus, namely, 'research-led', 'research-tutored', 'research-orientated', and 'research-based'. Healey's model has also been expanded, for example, the Connecting Research and Teaching in Practice Framework (Reis, N.d.; Healey, 2010). The expanded model makes the addition of 'teaching is research-informed', and 'research is teaching-informed'. A 'research-led' approach is where modules and curriculum design directly reflect the research interests of the school and includes lectures that are comparable to research presentations. A 'research-tutored' approach can include interactive activities, for example where the lecturer and the students read, and critically discuss research papers. A 'research-orientated' approach develops students' research skills and techniques, e.g., teaching and informing students about research methods, processes, and the art of asking research questions and testing hypotheses. A 'research-based' approach is where the student is actively involved in carrying out their own research, e.g., writing papers, using research methods (not just passively learning about them) and completing dissertations based on research topics. Students are encouraged to learn through research and inquiry, becoming 'producers of', rather than 'consumers of' knowledge. See for example, Reis (N.d.); Weller (2016); Visser-Wijnveen et al. (2010); Healey and Jenkins (2009);

Healey (2005); and Griffiths (2004). Healey's model, and the expanded form, are usually accompanied with student development and activity suggestions. However, they do not account for the dynamics of the research teaching nexus, instead focusing on types of research-teaching activities, and as for Boyer's model, are highly theoretical and do not explicitly guide academics in-depth, on how to practically differentiate approaches or activities over time, discipline, or student with consideration for the complexities of student, environmental, staff, institutional, or situational contextual factors.

Student Research Lifecycle

The Student Research Lifecycle was proposed by Clark and Hordosy (2019) as a utility for taking a lifecycle approach in exploring the dynamic nature of the research-teaching nexus over years of study. Such student experiences were argued by Clark and Hordosy (2019) to be characterised by several research-teaching nexus contextual factors, namely, 1) focus of disciplinary knowledge; 2) relationship with researchers; 3) experience of research practice; and 4) developing understanding of the nature of independent learning. Each of these factors can be further broken down into three phases of student development, roughly mapping to years 1, 2 and 3 of UK undergraduate degree programmes, thus, forming a 4 x 3 developmental matrix. Although, emphasis is placed on the fact that not all students progress through all three phases of each of the four factors by year 3. Students place variably within the developmental matrix, with respect to, and as determined by wider student, environmental, staff, institutional, and situational contextual factors such as positive or negative reaction, and resulting inclusion or exclusion bias, highlighting the dynamics of the experience. Interestingly, the addition of research-teaching nexus factor 2) relationship with researchers, adds a separate educational staff dimension that is generally unclear in other models. Thus, staff contextual factors become an intrinsic component alongside wider contextual factors underpinning the strength of the linkages between research and teaching. Furthermore, the generic nature of the matrix implies that approaches and activities can be selected for any discipline, flexibly, in respect to the 12 (4 x 3) points-of development and

relevant contextual factors when making decisions on curriculum design. However, the Student Research Lifecycle is still theoretical in nature.

Connected Curriculum: A Framework for Research-Based Education

The Connected Curriculum is a framework that is designed to be applied flexibly by different departments and faculties to both undergraduate and postgraduate taught programmes at UCL, with a core principle of having students learning through research inquiry. The framework consists of 6 dimensions as summarised in Table 2, which are accompanied by a development guide from beginner to outstanding for each dimension, and a checklist for research in teaching (see UCL website, N.d.). Unlike the models discussed, the Connected Curriculum is practice-based, with in-depth guidance, and usage case examples, in contrast to being theoretical. Even though the dimensions of the Connected Curriculum appear to be transferable to any research-based teaching nexus, the guidance and case examples are heavily tied to activities (e.g., meet the researcher) and contextual factors at UCL (or other universities that have adopted the approach). Therefore, it can be deduced that each university will inherently create its own guidance, and usage case examples for a nexus dependent upon a myriad of student, environmental, staff, institutional and situational contextual factors.

Table 2. 6 dimensions of the Connected Curriculum at UCL (UCL website, Nd).

6 dimensions of the Connected Curriculum at UCL
• Students connect with researchers and with the institution's research
• A through line of research activity is built into each programme
• Students make connections across subjects and out to the world
• Students connect academic learning with workplace learning
• Students learn to produce outputs – assessments directed at an audience
• Students connect with each other, across phases and with alumni

Several research-teaching nexus approaches (e.g., active, inquiry-based learning) and activities (e.g., final year projects, meet the researcher at UCL, connecting with the

institutions research and researchers, transdisciplinary, multidisciplinary, and workplace-linked research, dissemination, and connecting with peers) have been discussed. However, Limniou and Mansfield (2019) highlighted significant differences between 1st year students with grand expectations on engaging with research approaches and activities, and 2nd and 3rd year students who are less satisfied with their experiences over the course of their degree programmes indicating a shortcoming in student perceived value returned. This is especially in the areas of designing research; understanding research methodology; interpreting data; discussing data and data analysis; connecting findings with others research; and sharing research findings with others. It was found that 1st year students valued for example, research seminars, placements, listening to external speakers, and attending research conferences, differently than 2nd and 3rd year students who wanted to have more research independence, autonomy, and ownership; such findings are again, reflective of the dynamic nature of the nexus, but start to articulate variation in, and appropriateness of activities at the different points of development, over time as suggested in the Student Research Lifecyle.

Brennan et al. (2019) concluded that teaching quality and student engagement is enhanced (according to academic faculty) by exploiting opportunities to include references to their own research, of faculty colleagues, or international researchers; activities that align with the preferences of 1st year students who can be interpreted as wanting to 'observe', 'listen about', and to 'explore' more in respect to research activities. However, students who partake in more active and authentic research activities as part of a research and learning community, especially those activities which are student-led and connected to key stakeholders, are noted by Limniou and Mansfield (2019) to became empowered, challenged, and familiar and proficient with the process of scientific inquiry. These activities are more aligned with the preferences of 2nd and 3rd year students who can be interpreted as wanting to 'try to do dependently', and 'do independently', their own research, and 'actually own' more of their own research work/contribution. Furthermore, Limniou and Mansfield (2019) presented an evidence-based case for developing appropriate avenues for students to disseminate the findings of the work they do during their study, something that is also found to be severely lacking in an undergraduate research-teaching nexus, for example, student research journals;

student conferences; blogs; posters; and exhibitions. As before, this is more aligned with the preferences of 2nd and 3rd year students and can be interpreted as wanting to again, 'actually own' their research work/contribution, and 'project' their research and identity as researchers.

Limniou and Mansfield (2019) did indicate that the value of such learning activities includes character, identity and confidence building, meaningfulness, and transferability, especially in support of life-long learning; value is inferred to include the myriad of competencies identified through analysis of literature as discussed. If such learning and development approaches and activities are not utilised correctly in curriculum design, do not prepare undergraduate students, including enabling students to engage proactively with relevant assessment processes, as they progress through years of a degree programme, their future career decision-making and employability prospects could be compromised. Employers indeed, make use of research-related competency descriptors in the selection of candidates, due to their universality and importance, to select the most competent workers in respect to advertised positions (Sa and Serpa, 2018; CEDEFOP, 2013). Thus, even though few students will become researchers, research-teaching nexus approaches and activities go beyond preparing students for research-alone, and in fact, if implemented successfully, can contribute to developing highly sought-after competencies required in life, society, for work, and by the economy (McKinley et al., 2021; Andersone et al., 2019; Waldock, 2011; White and Irons, 2007). For example, the Department for the Economy (DfE) NI previously published, 'Economy 2030: A consultation on an Industrial Strategy for Northern Ireland' consisting of five connected pillars, including "accelerating innovation and research", and "enhancing skills, education and employability" (DfE, 2017, p. 9). Consequently, there exists inherent interdependencies between the research-teaching nexus and the research-enterprise nexus prioritised by many research-focused higher education institutions, as the latter is dependent on a workforce with the competencies developed through the former; the importance of getting the research-teaching nexus approaches and activities right are thus, very apparent.

However, learning and teaching strategies and models generally don't mention activities or modalities of learning designed to maximise the benefits of undergraduate research, and by inference, relevance of activities at specific stages of development (White and Irons, 2007; Gibbs, 2002). Furthermore, as Brennan et al. (2019) found, academic faculty express a need and desire for a more formal academic approach to further enable them to link teaching and research, towards successfully embedding research-teaching nexus approaches and activities at all levels and promoting a culture of integration (as per recommendations from Huet (2018)), representing a gap in practical pedagogic support at many higher education institutions.

Activity	RTN Type (Healey et al., 2010)	Learning and Assessment Modality	Learning and Assessment Identities	Student Active or Passive
Lecture	Research-Led	Listening	Teacher-led 'dependent' activities	Most Passive
PhD guest speaker				
Research guest speaker				
Industry research guest speaker				
Guest speaker from university management on research				
Guest speaker from CHERP on research				
Attending a conference				
Meet a researcher (discussion)				
Presentation on research				
Meet a researcher (shadowing)		Observing		
Video recording				
Live stream				
Reading, reviewing, and discussing a paper as a group	Research-Tutored	Exploring	Teacher-monitored 'transitional' activities	Transition from Passive to Active
Discussing what it means to be a researcher as a group				
Discussing research careers as a group				
Discussing a conference or presentation as a group				
Discussing research competencies as a group				
Student review club				
Student debates or debate club				
Pre-defined competency development session	Research-Orientated	Trying		
Pre-defined competency development task				
Pre-defined competency development case study				
Pre-defined competency development lab				
Pre-defined competency development fieldwork				
Pre-defined competency development replication				
Pre-defined competency development research tutorial e.g., a famous experiment				
Reviewing a paper, chapter, book or oral presentation and synthesising results and findings				
Analysing a given dataset and information using industry standard software and synthesising results and findings				
Learn research methods and selection				
Learn how to design and deliver a survey, focus groups, and interviews				
Learn how to write proposals, Ethics, and funding applications for given information				
Writing a methodology for given information				
Writing abstracts for given information				
Learning how to search databases, select source material, and reference correctly				
Learning how to write introductions and conclusions for given information				
Simulated research				
Digital design skills and learn how to structure and format a report, paper, and poster				

Activity				
Original authentic research task within scope of researchers active interests or the departments interests	Research-Based	Doing	Student-led 'independent' activities	Most Active
Support a researchers active project				
Original authentic case study within scope of researchers active interests or the departments interests				
Original authentic lab within scope of researchers active interests or the departments interests				
Original authentic fieldwork within scope of researchers active interests or the departments interests				
Original authentic replication of a researchers or departments active research				
Original authentic project within scope of researchers active interests or the departments interests				
Original authentic research placement within scope of researchers active interests or the departments interests				
Original authentic citizen science research within scope of researchers active interests or the departments interests				
Original and authentic research using open source data				
Hackathon or datathon				
Timed challenge event				
Multi-disciplinary or cross-disciplinary project involving students from other subjects to solve a problem e.g. project-based learning				
Conducting an evaluation				
Progressive 'cumulative' project-based assessment				
Student-staff research lab				
Being recognised as a/the researcher on a publication		Owning		
Being recognised as a/the researcher at a conference				
Developing an identity as a researcher through partnerships				
Publication in an undergraduate/postgraduate student journal		Projecting		
Publication in an academic journal				
Undergraduate/postgraduate student conference publication and/or presentation				
Academic conference publication and/or presentation				
Giving a presentation on their research				
Presenting their research to stakeholders				
Presenting their research to industry				
Presenting their research to the community				
Student research exhibition or display				
Dramatizing an event based on research findings				
Student blogs and video blogs				
Peer tutoring	Research-Teaching	Teaching		
Leading a workshop on research and/or research competencies				
Deliver a lesson on research or about research				
Final year project students speaking to junior peers about their research and completing a final year project				
Creating open research educational resources for junior peers				
Mentoring and/or helping to Supervise the research work or skills development of more junior peers				

RTN case study title:

Hyflex learning: enhancing student access through simultaneous face-to-face and online delivery

Summary of RTN case study:

This research led case study explored how hybrid or hyflex learning could enhance accessibility and pedagogy for one third year undergraduate class over two semesters in 20221/22. In a Hyflex learning environment, all students take part in live sessions, but some of the class learn on campus, that is face-to-face and some learn remotely, at home. To gather data the class completed a questionnaire at the beginning and the end of the first semester and were interviewed in the second semester. The hyflex approach that evolved aimed to ensure accessibility and to engage pupils in a range of interactive tasks and activities to realise the learning outcomes.

Key words:

Hybrid learning, teacher presence, hyflex model, hybrid learning, remote learning, asynchronous learning, synchronous teaching, social engagement, active learning, group work, conative learning,

RTN case study:

This research led case study saw face to face and remote students engage in a range of activities to enhance learning and ensure equitable experiences on their third-year undergraduate study. Several students could not attend university due to COVID-19 linked health reasons and the lessons were taught face to face on campus while using an online classroom to allow remote participation, plus the sessions were recorded to maximise student accessibility. The activities included the use of online discussions to enhance critical writing, virtual whiteboards to share ideas, group marking of sample assignments and gamification through quizzes to engage all students in the classroom and those not on campus. Students were given a choice of attendance over 4 weeks which was cited as a highpoint in this innovative approach. Several times students in groups were expected to interact and engage with materials to develop and present a poster to the group. The student learning outcomes were discussed throughout with interactive ICT activities to enhance assessment approaches. Two written assignments formed the crux of the assessment and evidence of participation in online discussions. The reason for this initiative was that several students could not attend university in person due to COVID-19 health concerns. The benefits were that all students had access to the materials and this flexible approach developed group work with those online and in the classroom. It was important to keep the technology simple and accessible to ensure transferability- the class was set up in Collaborate ultra and all students joined. The students in the room could interact through questions and the online tools and the remote learners also had this opportunity. The faces of those students learning at home were put on a screen in the classroom, meaning that an alternative interaction pattern emerged, remote students asked and responded to face to face students and vice versa to enhance belonging and conative learning.

The timescale was 24 weeks and Rosenberg's learning theories were applied to afford a framework. Bryant's (2021) design principles were also implemented to enhance the project. We feel this is an exemplary practice of innovative and accessible teaching and learning as it challenged us as practitioners to apply our pedagogy to a flexible and multi-dimensional teaching platform to engage pupils. It afforded all students an equitable and

accessible approach to their learning and has ideas and learning to explore and inform teaching and learning across a wider parameter.

RTN successes and best practice:
Initial technical challenges included physical set up, engaging remote learners and teacher confidence. These were overcome through a progressive approach and initial colleague support. The feedback from pupils has been extremely positive and students value the educational risks that are being taken to engage and assist every student during COVID-19 and its limitations and concerns. We reviewed progress and impact through the questionnaires and interviews which were a relatively accurate measure. Not all students responded to the questionnaires which limits data. The approach was well received and valued by the students who particularly enjoyed the group tasks and marking of assessment samples to develop awareness of the assessment criteria.
What did students think about your approach? Include evidence to support your understanding of its effectiveness.
In the second semester we refined the approach and tested a range of approaches to display the materials and the remote students. This led to a simplification of the technical approach and enhancement of the interactivity of the remote learners. This is a work in progress and demands colleagues to work together.
Student comments included:
- 'Very interactive, easy to keep up with what's being taught.'
- 'It's nice to know that everyone can participate whether at home or here in person. It makes for a more interesting class as we have much more input.'
- 'In class interaction was the highlight of the teaching'

Transferability:
This practice is transferable for a motivated educator with an initial technical support colleague. The feedback is hugely positive from both in-class and remote learners and this approach could be replicated across the educational platform where needed. The experience has been shared with colleagues who questioned the equitability of the remote learners and potential demotivation to physically attend class. These are genuine challenges, yet the hyflex model developed proposes that face to face and remote learners can play an equal and active role within classes to realise learning outcomes. This model aims to engage learners through both cognitive and social presence. To develop and implement this practice we recommend that educators are open minded, motivated and consider carefully lesson structure and interactive elements throughout.

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RTN case study title: The Research-Teaching Nexus in Practice: Embedding research-based learning in the Master's in History

Summary of RTN case study:
Since 2019-20, the Master's in History has embedded research-based learning into its pedagogical strategies. The course has been redesigned in ways that empower students to become active researchers rather than passive learners. Students design their own research topics, agendas and approaches, proceeding through a suite of practice-based and skills-focused modules with maximum optionality that culminate in a final thesis project and student-led conference.

Key words: research-based learning, history teaching, practice-based assessment.

RTN case study:

Reasons behind the activity/initiative: In 2018-19, Dr Ian Miller was appointed as Course Director for the History Master's programme. In the previous academic year, the History in Master's did not initially proceed through revalidation for reasons including lack of innovative assessment and outdated pedagogical approaches. Enrolment numbers, retention rates and student grades were all lower than desired. In his 2018-19 annual report, the External Examiner regretted that our assessment did not fully integrate critical transferable skills.

Course representative feedback in 2018-19 requested a comprehensive embedding of research skills across the Master's, rather than having original research opportunities confined largely to the final thesis, developed and submitted in semester 3. Students returning from the history undergraduate programme felt that a research-driven approach might provide a natural stepping stone from the 3rd year undergraduate dissertation which was similarly research-based. Rather than returning to writing essays upon commencing the Master's, students sought opportunities to build and develop enhanced research skills acquired towards the end of their undergraduate studies.

Course representative feedback also commented unfavourably on the Master's essay-focused approach and instead wanted to see varied assessment, as recently introduced at undergraduate level. In particular, students queried a 30-credit module entitled 'Special Topic in History' with one core assessment: a scholarly 6000-word secondary source review. Beyond doubt, this module neglected the expansive skillset required for the 21st-century workplace. It was also misaligned with HEA recommendations to embed employability across the curriculum to develop knowledge, skills, experiences, behaviours, attributes, achievements and attitudes that support transition into the workplace (HEA, 2013, 2016).

In advance of 2019-20, I decided to amalgamate our two inter-connected Master's courses: Master's in History & Irish History and Politics. This amalgamation into one Master's provided a crucial opportunity to rethink, reflect upon and restructure the teaching team's learning, teaching and assessment practices.

Approaches adopted and type of RTN: Through planning meetings and one-to-one conversations, and under my lead, the team developed a coherent programme with modules feeding into one

another, shared learning outcomes and a internationalisation and employability focus. Most importantly, it adopted a research-based approach.

As an active researcher, my teaching and learning is naturally driven by scholarly research. I have six book-length publications, one of which has been translated in Japanese, a textbook as well as numerous articles and chapters. In a 2021 mock REF exercise, two books were rated 4*. In 2021, I received the Distinguished Research Fellowship, an institutional award that recognises research innovation and its teaching impacts. I sit on the executive committee of internationally renowned learned societies including Society for the Social History of Medicine. My key pedagogical output is a textbook (Springer, 2018) on the theory and practice of medical history. Review comments from leading medical historians included:

- "An invaluable resource for postgraduate teaching as well as research" [Prof. Pratik Chakrabarti, University of Manchester]
- "*Medical History* will be an important introduction to the field for years to come" [Dr Martin Moore, University of Exeter].

Undergraduate and postgraduate students regularly cite the book, which has been purchased by 59 libraries worldwide (WorldCat), indicating considerable global impact on medical history teaching and learning.

In response to the aforementioned negative feedback, I wanted to go beyond research-led and research-oriented teaching to instead allow the Master's students, who are mostly of high scholarly calibre, to engage in carrying out their own research agendas and methods, rather than passively learning about them. This research-based approach encouraged students to learn through their own research and inquiry to become producers, rather than consumers, of knowledge (Healey, Jordan, Bell and Short, 2010).

The Initiative and its Activities: In semester one, students attend 4 x 6 week research-led mini-modules to obtain a taste of historical sub-disciplines, topics and themes. These are taught by leading experts in areas including medical, Russian, Early modern, international and Irish labour history. During the amalgamation, the teaching team opted to retain these modules which were working well. Hence, Master's students progress naturally throughout the year from an initial research-led focus to one that is increasingly research-based.

From the outset of semester 2, students are expected to have a strong sense of their thesis topic, to be submitted in semester 3. In week 1, students attend an initial session with the thesis convenor, Prof. Ian Thatcher and Course Director, Dr. Ian Miller to develop initial ideas. From here on, students develop their own research approaches and agendas (with guidance of supervisors and module convenors), with their assessment submissions focused on their chosen research topic. This facilitates a full transition from a research-led to research-based (and student-led) approach. Modules are interlinked, and imbued with maximum optionality, to allow students to cumulatively build skills through the development of a programme-wide research portfolio that feeds into, and enhances, the thesis.

Semester 2 modules are as follows:

(i)   *Historian's Craft 1:* This module develops advanced primary source analysis, building upon skills usually acquired at undergraduate level. Students benefit from a team-taught approach involving different lecturers outlining the archives used in their own

research in areas such as Irish, international, early modern or political history. The module convenor runs two theoretical and methodological workshops with the practice-based workshops being scaffolded around these. In practice, rather than just showing students the places (physical and virtual) in which their archival material is stored, one session explores material written by historians on how to methodologically approach, interpret and analyse archival data, oral history interviews, newspapers, etc… in their own research.

(ii) *Historian's Craft 2:* This module develops advanced secondary source analysis, enriching student ability to thoroughly and comprehensively explore and engage with books and articles written by historians and other scholars. Also adopting a team-taught approach, individual teaching staff discuss the development of their scholarly areas over time (e.g. Russian, American and women's history) from international perspectives. Students are introduced students to core, foundational texts, thereby enhancing their potential to contextualise their own research agendas in a broader research picture. Students are also encouraged to reflect upon argumentation and the historiographical purpose of scholarly outputs.

(iii) *History in Practice:* 'History in Practice' replaced the aforementioned 'Special Topic in History' module. It retained a 30-credit weighting to reflect employability's centrality to the revised Master's curricula. The module draws from authentic assessment models which ask students to perform real-world tasks to demonstrate meaningful application of their knowledge and skills relevant to actual situations or problems (Sridharan and Mustard, 2015). Typically, students will develop a practical project based on their thesis topic (e.g. mock museum exhibition, teaching resource, podcast episode, vlog). The core aim is to develop student skills in communicating complex research ideas in accessible, engaging ways and, ideally, in a format suited to their desired career pathway. The module consists of a suite of theoretically-driven public history workshops and practical sessions run by careers and public history experts from UU Careers Service, Ulster Museum, Carlow College and Campbell College.

Learning Outcomes and Assessment: The learning outcome strategies across the Master's in History shifted towards emphasising and learning about the research process, rather than only exploring research outcomes (e.g. book chapters, journal articles) written by scholarly historians. In addition to developing academic skills, learning outcomes were rethought to incorporate and strengthen a diverse range of skills. In that way, students acquired a range of competency developments.

Diverse assessments were put in place across the programme in non-overlapping ways. A new emphasis was placed on providing formative assessments, providing crucial opportunities to constructively help students achieve their best in their final submission. As modules were inter-linked, feedback provided in one module was intended to enhance coursework in other modules. While the traditional scholarly essay still retained its importance in the semester one modules, these were accompanied by innovative, forward-thinking formative assessments (e.g. oral presentation, blog writing, Panopto presentation). In 2021-22, when Prof. Thatcher introduced autobiographical and biographical source analyses in his module, Dr. Miller introduced a new assessment based on finding and analysing the historical patient's voice. In small ways such as emphasising 'voices from below' across modules, the Master's acquired a strong sense of cohesion in its assessment processes.

In the semester two modules Historian's Craft 1 and 2, students now strengthen their personal research skills by completing primary source analyses, writing a professional book review and

writing reports on how historical sub-disciplines developed over time. In that way, students are offered alternatives to writing research-led essays. Instead, through research-based learning they develop a range of competencies that support their research portfolio and complement skills being taught across semester 2's modules.

Whereas Historian's Craft 1 and 2 enhance skills of direct relevant to the thesis, History in Practice assessments encourage students to communicate their ongoing research in non-academic ways, and to a general audience. This is intended to complement, rather than replace, the ongoing development of academic skills. Crucially, the module (and its assessments) emphasise that good public history depends upon solid academic research. It is <u>not</u> about replacing academic rigour or 'dumbing down' information (Sayer, 2019). Accordingly, in week 8, students submit an initial research report of their thesis research, producing work which then supports their primary and secondary source analyses in other semester 2 modules, and semester three thesis writing. Later in this module, students submit a Panopto presentation, followed by their final project and a 2000-word rationale document which outlines the decisions made while developing their project and demonstrating their ability to engage with public history theory (e.g. memory, identity, commemoration).

Working with Prof. Thatcher, in his capacity as Master's thesis convenor, I co-designed and co-implemented an end-of-year student research conference, granting students an opportunity for self-reflection and summative assessment. Members of a student organising committee now acquire event organisation skills (e.g. inviting a keynote speaker, arranging refreshments). Incoming Master's students are invited to acquire an initial course roadmap.

Resources, People and Timescale: As Course Director, I worked in a leadership capacity with core Master's teaching staff including Prof. Ian Thatcher, Dr. Robert McNamara, Dr. Gabriel Guarino and Dr Emmet O'Connor. Following on from unfavourable student feedback, the course (esp. semester 2) was redesigned between April to September 2019, and then implemented from September 2020. From Spring 2020, the course moved online due to COVID. However, the robust design of the new Master's ensured its success, with minimum changes made to assessment, although content delivery was affected. I have since tweaked modules over the years, where required.

Theoretical Underpinning: While amalgamating Master's provision, I drew from Fung's (2017) 'connected curriculum' idea. This maintains that students should reflect upon their learning and assessment as a programme-wide portfolio which they can revisit, develop, curate and comment analytically upon. Thus, I developed a programme that emphasised learning predominantly through research and critical enquiry as an alternative to approaches involving passively absorbing knowledge (Carnell and Fung, 2017). I adopted a spiral sequencing approach to enhance overall programme coherence not easily accomplished using modular approaches (Ireland and Mouthaan, 2020). Assessment strategies aimed to empower students and allow them to become inclusive partners in the shaping of their learning and research (Tong, 2018).

My approach was inspired by Carnell and Fung's (2017) suggestion that HE educators should dismantle divisions between teaching and research. My choice of a research-<u>based</u> approach was deliberate. Healey and Jenkins (2009) observe that this differs from research-led or research-oriented teaching as it encourages students to learn and behave as active researchers. I was convinced that this approach was particularly suitable for an advanced Master's group, as later confirmed in Wanner, Palmer and Palmer's (2021) findings that research-based approaches work

especially well with postgraduates who possess the self-confidence and aptitude needed to assert input, voice and control.

Explain why you feel this activity/initiative fits the RTN type and is a good example of an RTN:
The Master's in History provides a robust example of an entire course designed around research-led and research-based principles, with an emphasis on the latter. Having now run for several years in this format, the team has evidenced considerable success in implementing this approach in uncertain times. Not only does the teaching team impart their own research interests and approaches, but students are urged to think and act like active researchers themselves. Rather than rely upon traditional set essay questions, students are given maximum optionality to allow them to explore their research interests and agendas.

RTN successes and best practice:

Evaluating and understanding impact and effectiveness:.

The Master's has a number of ways of assessing quality assurance and the impacts and effectiveness of changes made. One key indicator is the greatly improved tone of our external examiner reports. In 2019-20, the external examiner singled out 'a critical awareness of trends in the relevant literatures and historiography' as a 'standout feature' of the programme, adding that the Master's had 'been substantially revised and improved'. The external examiner report described the new emphasis on core research skills as 'especially effective' and 'arguably more comprehensive' than in the Universities of Aberdeen, Dundee, Glasgow and the Highlands and Islands. In his report, the external examiner added:

The range of assessment methods in these UU programmes are one of its key strengths. The diversity, use of reflective think pieces and more formal question-driven essay style assessments is excellent and reflects best practice. The use of critical thinking, ability to marshal complex data and argument – as per QAA key benchmarks in History – are consistently part of the curricular requirements and assessments". The external examiner added that he 'was struck at the quality and consistency (both within and across modules) of detailed feedback…across all the programme.

Each module has a moderation form which involves other teaching staff checking and evaluating the quality of assessments and modules. Since 2019-20, no major issues have arisen during this internal evaluation process, a testimony to the strengths of the revised programme.

As further indicators of the appeal of our research-based approach, enrolments have increased from less than ten per annum to over 20 in 2020-21. Retention rates improved significantly and it would be highly unusual nowadays for a student to leave without completing. The Master's now offers the £750 Birley Prize for the strongest thesis in social history, further increasing the attractiveness of our provision. My course design success has been noticed externally and led to an external examiner appointment for MA in Gastronomy and Food Studies (TÚ Dublin Grangegorman) from 2021-22 and Liverpool Hope University's curriculum redesign meeting (2022).

Student Perspectives: Module evaluations have been overwhelmingly positive, indicating that students welcome the opportunity to develop research-based skills alongside more traditional essays and assessment formats. The course representative feedback is a crucial mechanism for

assessing student views. Since the amalgamation and revamp of our Master's provision, this feedback has been highly positive, with no negative comments regarding our approaches.

Indeed, the research-based approach has had demonstrable successes. Most importantly, students excel when given opportunities to develop coursework that interests them. Students have moved away from exploring fairly dry topics such as politics and war by being encouraged to develop research agendas based on topics that personally interest them. To provide a few examples of how we have strengthened the students' inquisitiveness, we currently have research portfolios being developed on topics including the history of judo in Ireland, the Beatles and Victorian death photography. Many students develop a public history format suited to their proposed career paths. To provide an example, in 2019-20, a student whose research focused on the exclusion of women from Victorian medical education developed a learning resource for primary school students, having thought carefully about how to develop this potentially overly-academic topic in a suitable way for that age group. This student successfully proceeded to the competitive PGCE programme in Liverpool.

Two students who work at Museum of Free Derry are currently developing museum-based projects which they hope to turn into a real-life exhibition. A further student is currently working on a research-based history club project at St. Cecelia's School, Derry, bringing to life his Master's research on Irish history and using it in meaningful, practical ways. A former student, Rebecca Watterson, played an active role in developing the popular www.epidemic-belfast.com project upon taking up a PhD position, based on her development of a research-based podcast episode in History in Practice.

Challenges faced and planned changes: While the overwhelming majority of students engaged enthusiastically with the diverse assessments, some resistance was met from a mature student who would have preferred to continue with the familiar traditional essay format and who saw little personal need for skills development as he was not actively seeking employment following the Master's. This did challenge my initial presumption that employment was high on the list of my student cohort. I would consider it unfeasible to develop teaching options for students aspiring towards being unemployable.

A small number of students with specific learning needs required extra guidance on the varied types of assessment, given how radically many of these differed from the traditional essay format. However, this group ultimately approached the assignment with enthusiasm, after acquainting themselves with the new format.

The module order outlined above relates to the full-time Master's programme. We also run a part-time Master's in History. At present, 1st-year part-timers study 2 semester one modules and the Historian's Craft modules. They return in 2nd year to study 2 semester one modules, and History in Practice. This does disrupt the connected curriculum model in that the processes of formative feedback provision stretches across two years of study, undermining the interconnectedness of the modules. As a revalidation is forthcoming, we intend to work on this for 2023-24.

Transferability:
I would consider the history teaching team's success at course design to be highly transferable and to provide an exemplar model for colleagues across Ulster University and elsewhere. In 2022,

I have submitted a peer reviewed support document, with Prof. Ian Thatcher, to share my experiences with colleagues. My own colleagues greeted my suggestions with much enthusiasm and adopted my approach. I am now in the process of disseminating my achievements further afield. My advice would be to pay attention to the needs of some students who might not initially cope well with alternative assessments based on research-based approaches.

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RTN case study title:

Module title: Creativity
Module co-ordinator: Dr Mike Brennan Ulster University Business School.
Course: MSc Business Development and Innovation

Summary of RTN case study:

The aim of the module is to develop an understanding of creativity and how this concept relates to innovation, entrepreneurship, and development. A particular emphasis is on the identification of a challenge at an individual, group, organisational, or societal level. The teaching draws on international research networks and projects supported by the UK Research Council's Global Challenges Research Fund. Teaching practice is based on research that addresses the United Nations Sustainable Development Goals (SDGs). (www.safewater-research.com) (Brennan et al., 2019).

Key words:

Creativity, Innovation, Entrepreneurship, Problematization, Transdisciplinary.

RTN case study:

The Creativity module draws on SDG research undertaken on two multinational projects (SAFEWATER and TRANSLATE) with partners in Brazil, Colombia, Malawi, Mexico, and Nepal (Brennan et al., 2021, Rondon-Sulbaran et al., 2021). The teaching-research nexus is informed in three ways.
- Research-led: the outcomes of research relating to SDGs is presented to students as a case study on innovation and entrepreneurship.
- Research-oriented: a transdisciplinary approach to research and problem solving is emphasised with a particular focus on development and change.
- Research-based: students can undertake small scale collaborative coursework based on engagement with researchers from different disciplines.

Students are expected to draw on knowledge of the SDGs and methodologies associated with transdisciplinary research and relate these to their coursework.

Competency development is linked to key competencies for sustainability through the completion of problem-based coursework (Rieckmann, 2017) and in particular:
- systems thinking and the ability to recognise and understand complex systems.
- strategic competency and the ability to develop innovative actions.
- critical thinking and the ability to questions norms, practices, and opinions.

Assessment is based on a generic framework that asks students to investigate a particular context, draw on discipline theory, and propose a development strategy. This research is undertaken during a single semester and can be used as the basis for a subsequent dissertation.

→ Main menu

The theory informing teaching is transdisciplinary research. The emphasis is on problematization, challenging assumptions, and transformation knowledge. The benefit of such an approach is that it can be related to any level of analysis (from societal to individual challenges) and different discipline backgrounds.

RTN successes and best practice:

The strength of the research-teaching approach is the relevance and applicability of such ideas to all students - irrespective of background or previous education. This can raise challenges in that student paradigms and assumptions about change can be contested. The impact of the approach is evidenced by the number of students that use the work completed for this module as the basis for their final dissertations.

Transferability:

This research-teaching approach has also been successfully adopted for a complementary module (Innovation & Entrepreneurship) on the Executive MBA programme at Ulster University. In addition, researchers and teachers from different disciplines have adopted some of the key tools used in both modules e.g., the multi-level business model framework, as evidenced by the exemplar Environmental Engineering (MEC501) module presented by the School of Engineering at Ulster (Fernandez & McMichael 2022).

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RTN case study title: Environmental Engineering (MEC 501)

Summary of RTN case study: This TRN module-based case study outlines a research-led approach to learning, teaching and assessment within an engineering module focused on innovation and sustainability underpinned by state-of-the-art technologies and research. Learning is based on current 'real world' environmental issues and real life scenarios in relation to issues of energy, waste, and environment.

Key words: Innovation technologies, sustainability, live-cycle assessment

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RTN case study:
General information
School: School of Engineering
Programme: Engineering (Level 6)
Module title: Environmental Engineering (MEC501)
Cohort Size: 25-40 per year
Academics: Dr Pilar Fernandez and Dr Stuart McMichael

Aims and objectives: This module aims at learning competency in environmental engineering aspects to expand the knowledge and change the approach about the main elements of the environment (water, air, energy) and our relationship with it via natural and man-made processes and out productive system. The module provides a solid underpinning and revision in mass and energy transfer, environmental chemistry, water pollution, water quality control, air pollution, global climate change, life cycle analysis, legislation and standards, energy and sustainability, and renewable energy. This module objectives reflects directly several research interests of the school and includes lectures that follow a structure and content dimension comparable to research presentations. The specific objectives are:

- To promote awareness and to develop an understanding of the environmental damage in line with the recent Climate Action and Sustainability principles established by the United Nations.
- To understand and get the knowledge of the state-of-the-art technologies and methodologies to limit and control environmental pollution and its national and international regulations.
- To develop an understanding of innovative, environmentally friendly design and technology to produce sustainable energy.

Motivation: The module is research-led taught because the lecturer is an active researcher in the module area and I am very aware of the key role of research in innovative engineering. Therefore, in my lectures I am including the research of the curriculum topics.

Teaching method: The students are expected to work on a project for 8 weeks where they do their own research on a clean technology of their choice. The lecturer guide the students along this period by conducting an introductory lecture for briefing on what is expected from the students and also by further short lectures on the basics and fundamentals of several novel technologies and innovations existing in the field today. The lecturer facilitates the students some research papers related to the selected topics and explains what is the expected level of the research that they must carry out. The students actively do their research activities using scientific databases (e-Library) and (if possible) in local busines/facilities. They work in teams to facilitate the research work and promote the cohesive work for a deeper understanding required when research is involved.

→ Main menu

Assessment: After their research work is done, following the advice of the lecturer, they elaborate a <u>technical-research report</u> (assessed by the lecturer) on their research and present it as a team as an <u>oral presentation</u> (WK9) in class, to their peers and the module teaching team followed by a short session of questions and answers, assessment (by their peers and moderated by the lecturer) and an <u>open debate</u> between the presenting students, the academic team and the rest of the students about the topic of their research. This initiative benefits the students because is an <u>active way of learning</u>, where <u>the students direct their own learning path</u> with the supervision of the lecturer, the students find it <u>more engaging and exciting</u> as they are the key part of the learning process.

RTN successes and best practice:

Benefit to students: With this approach, the students strongly develop <u>key competences</u> including, research skills, leadership, initiative, deep understanding on engineering processes and sustainability, critical analysis, perception of the global context of the clean technologies, and how to work as a team.

Students' feedback: was in general positive. Some examples of their comments are, 'the team project permitted to learn in a different way, being more independent and having a more open attitude.', or 'This is more fun and engaging than going to class and just listen.' and 'I like to give feedback to my peers and that my comments are considered for the assessment'. From my point of view, the outcomes were clear, very high students' engagement, with a range of 95-97% students' participation (for the 4 years I have used this method) in class with very good questions, their answers, comments, suggestions, etc. during the debates originated during the oral presentations and good average marks for this piece of assessment.

Future changes: For coming years, I aim to design and deliver a few lectures on research methods at a general level, so the students understand better research articles reading. I also aim to improve the briefing information, so the students are more clear on the expectations of their research work.

Transferability:

Can this approach be transferable: This practice can be implemented in any level 6 module, as students' level of knowledge and skills like critical thinking, mature basic foundations of engineering, professional experience for around one year after their placement in a company in the third year of their degree. The students at this stage know what teamwork means in practical terms, and what real jobs will ask them to do. Research is one of the main skills and resources of information they will need for their further jobs. Regarding the topic, this method is transferable to other disciplines other than engineering, i.e. architecture, politics, humanities, health, etc. See below that this method has been implemented for a module on criminology.

Influence on other colleagues: Some lecturers in my school know about this approach and they showed interest.

Advice to other colleagues: This approach needs initially more work for planning for preparing information for the students in your lectures, briefing and select resources. It also needs some time every week to follow up the progress of the work of the students during the 8 weeks of the

main research project the students must carry out. For this, I would advise to dedicate few minutes after your lectures to supervise or give advice to the students on their research assignment.

Evidence on other colleagues using this method: Dr Elena Mancuso (lecturer on Biomedical Engineering at the School of Engineering) adopted this method for one of her modules (masters level).   Dr Dawid Stanczak (lecturer on Criminology and Criminal Justice at the School of Applied Social and Policy Sciences) adopted the teamwork project with research approach for in Criminology and Criminal justice (3rd to 4th year).

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