The RDI-Integrated Knowledge Co-Creation (RDI-IKCC) Framework: From Coursework to Collective Knowledge

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Abstract: Higher education increasingly connects learning with research, development, and innovation (RDI), yet student-generated outputs often remain isolated coursework artefacts rather than contributing to cumulative knowledge. This conceptual paper develops the RDI-Integrated Knowledge Co-Creation (RDI-IKCC) framework to explain how student projects can become a collective evidence base while retaining their primary educational purpose. Drawing on six complementary literature streams, the framework integrates research- and RDI-integrated learning, student partnership and co-research, knowledge co-creation, authentic project-based learning, undergraduate research and distributed student inquiry, and dissemination as a mechanism for knowledge creation. It conceptualises student projects as potentially serving three functions: learning activities, bounded research cases, and sources of evidence. Shared RDI framing aligns distributed projects; feedback and dissemination expose outputs to critical scrutiny and support refinement; and cross-case synthesis integrates sufficiently comparable findings into collective knowledge. Five propositions specify the framework's mechanisms and anticipated outcomes. The framework further distinguishes domain-specific knowledge that can inform RDI activities from pedagogical knowledge that can inform future course design. It does not assume that authentic projects automatically generate research knowledge. Such contributions depend on conceptual alignment, evidential quality, transparent documentation, systematic synthesis, ethical governance, voluntary participation, and appropriate recognition of student contributions. The framework provides a basis for subsequent empirical examination across course implementations and disciplinary contexts.

Keywords: Resilient Learning, Student Co-Researchers, Knowledge Co-Creation, Authentic Assessment

1. Introduction

Higher education institutions (HEIs) are increasingly expected to integrate education with research, development, and innovation (RDI) activities. While research-based and project-based learning approaches engage students with authentic challenges, student-generated outputs often remain fragmented and fail to contribute to cumulative knowledge creation. This limitation is particularly significant in rapidly evolving domains where knowledge is still emerging and multiple perspectives are required. Although prior research has examined students as partners, co-creators, and co-researchers, less attention has been paid to how student outputs can be systematically integrated into collective knowledge. An additional gap concerns the role of academic and professional dissemination, which is typically treated as a means of communicating completed work rather than as a mechanism supporting feedback, refinement, and knowledge creation.

To address these gaps, this conceptual paper develops the RDI-Integrated Knowledge Co-Creation (RDI-IKCC) framework. The framework explains how student projects can be connected with RDI activities, multi-source feedback, dissemination, output refinement, and cross-case synthesis to generate collective knowledge. The study addresses the following research question: *How can student projects be systematically transformed from isolated coursework outputs into a collective evidence base that contributes to both domain-specific and pedagogical knowledge creation within RDI ecosystems?* Rather than empirically evaluating the framework, the paper specifies its conceptual foundations, core components, underlying mechanisms, boundary conditions, and propositions for future empirical research.

2. Pedagogical and Theoretical Foundations of the RDI-IKCC Framework

The RDI-Integrated Knowledge Co-Creation (RDI-IKCC) framework builds on six complementary streams of literature concerning research- and RDI-integrated learning, student partnership, knowledge co-creation, authentic project work, undergraduate research, and dissemination. Together, these perspectives explain students' participation in learning and knowledge production but provide limited guidance on how outputs from multiple student projects can be systematically refined, integrated, and transformed into collective knowledge. The following sections examine these foundations before synthesising the integration gap addressed by the RDI-IKCC framework.

2.1 Research-Based and RDI-Integrated Learning

Research-based learning engages students in inquiry, problem-solving, and knowledge production through authentic research and development activities (Healey and Jenkins, 2009; Visser-Wijnveen, van der Rijst and van Driel, 2016). In professionally oriented higher education, these activities are increasingly integrated with RDI projects involving external stakeholders.

The Learning by Developing (LbD) model emphasises participation in authentic development processes in which students, educators, and stakeholders collaboratively create knowledge and solutions (Raij, 2007). RDI projects can thus support both innovation and collaborative learning (Pirinen, 2013), enabling students to contribute to real-world RDI activities while developing professional and research competences (Rajamäki *et al.*, 2026). This literature establishes the institutional and pedagogical basis for involving students in knowledge-producing activities.

2.2 Students-as-Partners, Co-Researchers, and Knowledge Co-Creators

The Students-as-Partners approach positions students as contributors rather than passive recipients of knowledge by emphasising collaboration between students and staff in learning, teaching, curriculum development, and research (Bovill, Cook-Sather and Felten, 2011; Harrington, Flint and Healey, 2014). Through collaborative inquiry and authentic development tasks, students can contribute perspectives, evidence, and solutions to educational and professional communities (Mercer-Mapstone *et al.*, 2017).

In RDI-oriented environments, this role may extend to applied research, project implementation, dissemination, and the development of practical solutions (Rajamäki and Pirinen, 2022; Rajamäki *et al.*, 2026). Student partnership therefore shifts attention from individual learning outcomes towards participation in collective knowledge production.

2.3 Knowledge Co-Creation in Higher Education

Knowledge co-creation shifts the focus from individual learning to the collaborative development of shared knowledge and solutions. Paavola and Hakkarainen's (2005) trialogical approach conceptualises learning as the collaborative development of shared objects rather than solely as individual knowledge acquisition or social participation. In RDI-integrated education, knowledge emerges through social interaction, reflection, inquiry, competence sharing, and collaborative problem-solving around shared RDI objects (Pirinen, 2011). By connecting higher education, RDI activities, and external stakeholders, these objects can contribute to broader knowledge-creation and regional development processes (Pirinen, 2013).

Resilient Learning extends this approach by emphasising interdisciplinary collaboration, adaptation, and shared RDI goals under changing conditions (Pirinen, 2017). Student projects can contribute as interconnected cases whose outputs and stakeholder feedback are cross-analysed to develop domain-specific and pedagogical knowledge (Rajamäki and Pirinen, 2022). This perspective provides a foundation for understanding how project-specific contributions may be developed into shared knowledge.

2.4 Authentic and Project-Based Learning in RDI Contexts

Authentic and project-based learning engages students in complex real-world challenges requiring inquiry, collaboration, problem-solving, and the creation of concrete outputs (Thomas, 2000; Bell, 2010). Authenticity connects academic knowledge with its context of application and supports its transfer to professional practice(Herrington, Reeves and Oliver, 2014).

In RDI-integrated education, projects can serve simultaneously as learning environments and vehicles for producing knowledge and practical solutions. The LbD model emphasises collaboration among students, educators, and external stakeholders around authentic development challenges (Raij, 2007), while recent research demonstrates how such projects enable students to contribute to applied research and innovation (Rajamäki *et al.*, 2026). Authentic projects thus provide the practical settings in which student-generated knowledge is produced.

2.5 Undergraduate Research and Distributed Student Inquiry

Undergraduate research positions students as participants in inquiry and knowledge production rather than recipients of established knowledge (Healey and Jenkins, 2009; Walkington, 2015). Its forms vary according to

student independence, research context, and the extent to which inquiry explores existing or produces new knowledge (Brew, 2013).

When multiple student projects examine different aspects or contexts of a shared RDI challenge, the overall arrangement can be understood as distributed student inquiry. Within this arrangement, distributed cases refers to the analytical treatment of individual projects as distinct cases, datasets, artefacts, or interpretations that can be systematically compared. Rajamäki and Pirinen (2022) illustrate this approach by treating student projects as cases within a common research setting and cross-analysing their outputs and stakeholder feedback.

2.6 Dissemination as a Mechanism for Knowledge Creation

Dissemination is commonly treated as the final stage of student research, but it can also function as an intermediate mechanism of knowledge creation. Boyer's (1992) conception of scholarship connects discovery with the integration, application, and communication of knowledge. Conferences, webinars, poster sessions, and peer review can therefore make student-generated knowledge visible and subject it to examination beyond the course context.

Dissemination can advance knowledge creation by exposing project outputs to external perspectives, critique, and feedback. Rajamäki and Pirinen (2022)illustrate how student outputs can progress through webinars, peer feedback, refinement, and conference presentation. RDI-integrated cybersecurity education similarly demonstrates that student projects can produce outputs serving research and development beyond the course itself (Tikanmäki and Rajamäki, 2025). Dissemination can thus connect initial project outputs with iterative review, refinement, and knowledge advancement.

2.7 Synthesis and the Integration Gap

The six perspectives reviewed above provide complementary foundations for understanding student participation in knowledge creation. Research- and RDI-integrated learning connects education with authentic research and development activities, while student partnership positions students as contributors to knowledge production. Knowledge co-creation explains how shared knowledge and solutions emerge through collaboration around common RDI objects, and authentic project-based learning provides the practical setting for this process. Undergraduate research extends students' role to systematic inquiry, while distributed student inquiry enables multiple projects to address different aspects of a shared RDI challenge. Finally, dissemination subjects project outputs to external perspectives, feedback, and iterative refinement.

Together, these perspectives suggest that student projects can contribute beyond individual learning outcomes. However, the existing approaches primarily explain separate elements of the process and provide limited guidance on how they can be systematically connected. In particular, they do not fully specify how multiple projects can be aligned around a shared RDI challenge, treated as distributed cases, refined through multi-source feedback and dissemination, and synthesised into a cumulative evidence base. This integration gap limits the potential of student-generated outputs to contribute systematically to both domain-specific and pedagogical knowledge.

The RDI-IKCC framework addresses this gap by integrating these elements into a coherent knowledge-creation process. It connects shared RDI challenges, distributed student inquiry, authentic project outputs, multi-source feedback, dissemination, iterative refinement, and cross-case synthesis. In doing so, the framework shifts the unit of attention from individual projects to the relationships among projects and the mechanisms through which their outputs can be transformed into collective knowledge. The next section develops the framework's conceptual architecture and specifies its core components, mechanisms, and enabling conditions.

3. Development of the RDI-IKCC Framework

Building on the theoretical synthesis presented in Section 2, this section explains how the RDI-IKCC framework was developed. It first identifies the integration problem emerging from the literature, then introduces the design principles that guided framework development, and finally presents the resulting conceptual architecture.

3.1 Theory-Informed and Practice-Based Framework Development

The development of the RDI-IKCC framework began by synthesising the six complementary foundations reviewed in Section 2, with particular emphasis on distributed student inquiry, dissemination, and cross-case synthesis. At the same time, the framework was informed by practical experiences from project-integrated higher education environments in which student projects were connected with international RDI activities, stakeholder collaboration, conference dissemination, and research-oriented project work. These experiences revealed recurring challenges related to fragmented outputs, inconsistent utilisation of student-generated knowledge, and the absence of systematic mechanisms for integrating findings across projects. The framework emerged from the interaction between conceptual analysis and observed practical needs.

3.2 Design Principles

Four design principles guided the development of the framework:

- Authentic RDI Alignment: Student projects are derived from a shared research, development, or innovation challenge, providing a common foundation for their subsequent comparison and integration.
- Knowledge-Oriented Student Participation: Students are positioned as both learners and potential contributors to collective knowledge, with their projects serving as learning activities, research cases, and sources of evidence.
- Iterative Refinement Through External Scrutiny: Student outputs are progressively refined through feedback from peers, researchers, practitioners, project partners, and external audiences rather than evaluated solely by the lecturer.
- Systematic Cross-Case Integration: Relationships among individual student projects are systematically analysed and synthesised to transform distributed evidence into broader collective insights.

3.3 Cross-Case Synthesis as the Core Integration Mechanism

The theoretical analysis identified a three-stage analytical process connecting individual student projects with collective knowledge creation: *within-case analysis, cross-case analysis, and cross-case synthesis*. Within-case analysis examines each student project as a distinct case in its own context. Cross-case analysis then systematically compares the cases to identify recurring themes, complementary perspectives, contextual differences, and emerging explanations. Finally, cross-case synthesis integrates these comparative findings into a collective interpretation addressing the shared RDI challenge.

Authentic learning environments may generate valuable observations, while feedback and dissemination may improve the quality of individual outputs. However, these processes alone do not produce a cumulative evidence base. Student projects remain isolated unless their findings are analysed in context, systematically compared, and subsequently integrated.

The RDI-IKCC framework therefore positions cross-case synthesis as its core integration mechanism. Individual projects are treated as distributed cases addressing different manifestations or dimensions of a shared phenomenon. Their integration through the three-stage analytical process enables project-specific findings to contribute to broader domain-specific and pedagogical knowledge.

4. RDI-Integrated Knowledge Co-Creation Framework

The RDI-Integrated Knowledge Co-Creation (RDI-IKCC) framework explains how student projects may contribute to collective knowledge creation while retaining their primary educational purpose. The framework operationalises the four design principles identified in Section 3.3 through a three-level structure and an iterative knowledge co-creation cycle.

Its central premise is that a student project may function simultaneously as a learning activity, a research case, and a source of evidence. Figure 1 presents the overall architecture of the RDI-IKCC framework and illustrates the relationships between the three levels of knowledge creation.

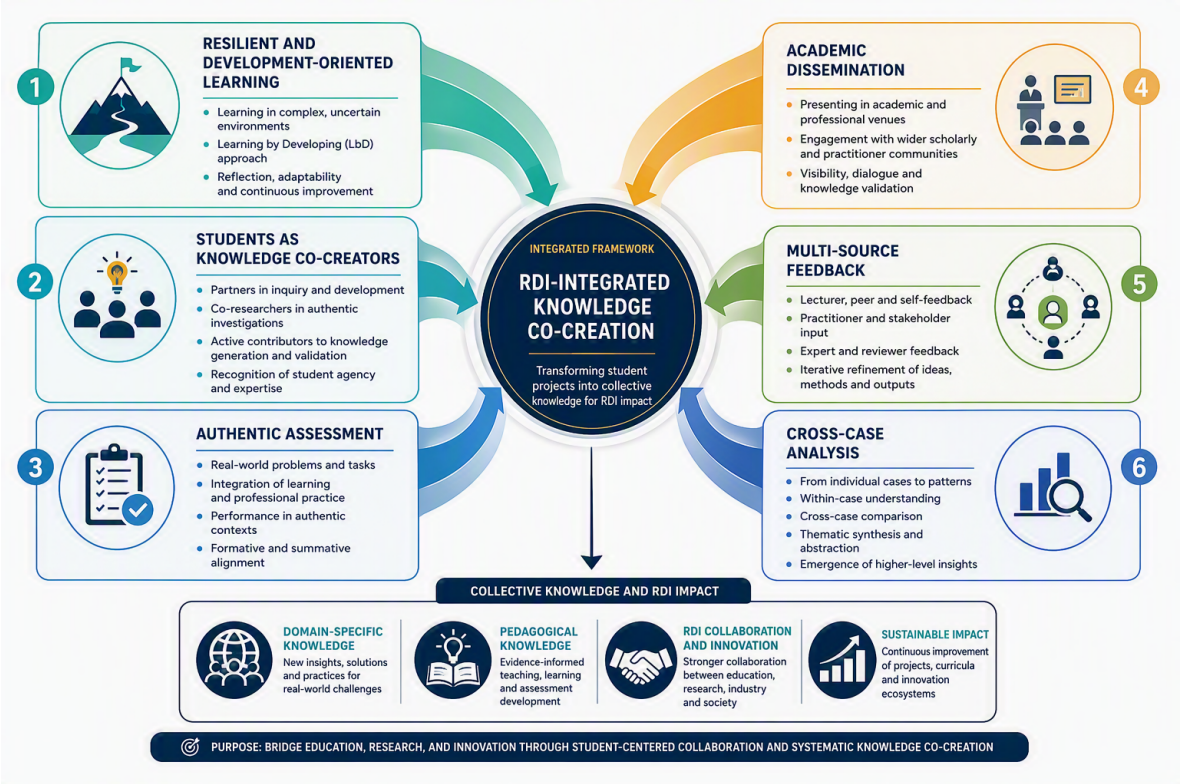


Figure 1: RDI-Integrated Knowledge Co-Creation Framework

4.1 Three-Level Knowledge Creation Structure

4.1.1 RDI Challenge Level

The first level defines the broader research context. Research questions originate from an authentic research, development, and innovation (RDI) project, strategic development initiative, or other real-world collaboration environment. Rather than using predefined classroom exercises, students address a genuine domain-specific challenge that is relevant to project stakeholders and professional practice.

The domain-specific research question varies between implementations of the study module. Examples may include challenges related to digital transformation, healthcare, cybersecurity, artificial intelligence, sustainability, or organisational development.

4.1.2 Student Project Level

The second level consists of the student research process. Individual students or student teams conduct case studies addressing the selected domain-specific research question. Each student project may constitute a separate case within a multiple-case design when its case boundaries, unit of analysis, connection to the shared RDI challenge, evidence base, and analytical procedures are explicitly defined.

The research process typically includes several iterative phases. Students first familiarise themselves with the research context and existing literature. They then formulate their project objectives, prepare research plans, collect and analyse empirical material, and communicate preliminary findings through presentations and interim reports. Throughout the process, students receive feedback from peers, lecturers, and external experts.

4.1.3 Collective Knowledge Level

At the Collective Knowledge Level, sufficiently aligned and documented outputs are compared and synthesised across cases. This enables individual observations to be interpreted in relation to the shared RDI challenge and may generate domain-specific and pedagogical knowledge.

Figure 2 presents the three-level architecture of the RDI-IKCC framework, showing how a shared RDI challenge guides individual student research projects and how their outputs are refined through multi-source feedback, dissemination, and cross-case synthesis to produce collective domain-specific and pedagogical knowledge.

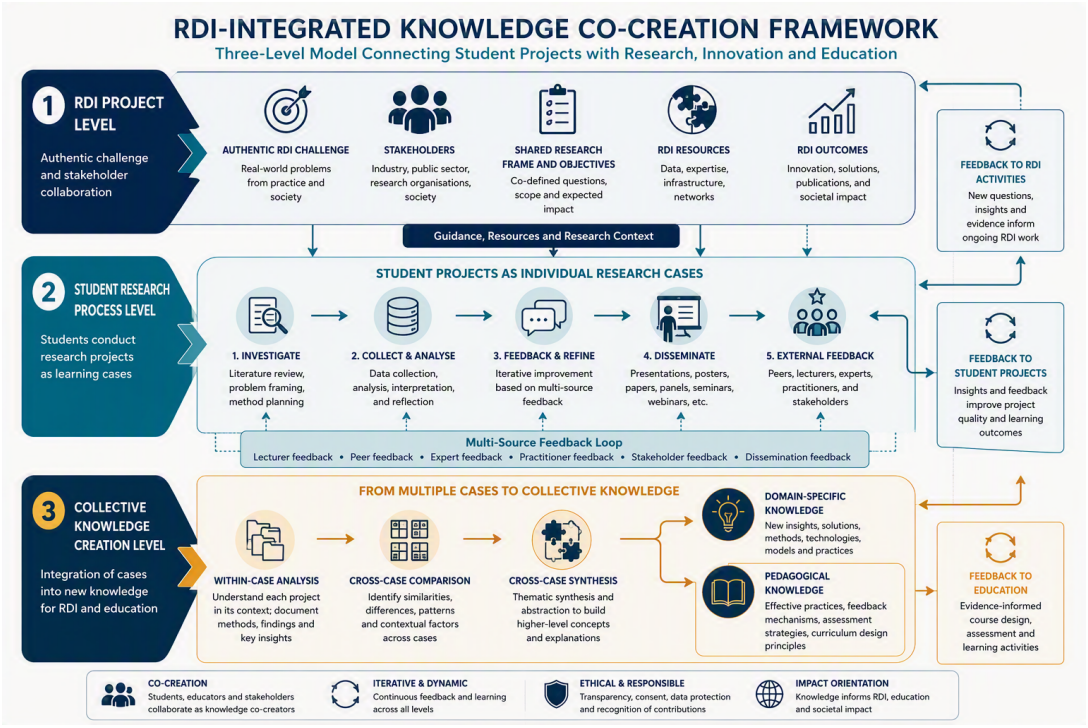


Figure 2: Three-Level RDI-Integrated Knowledge Co-Creation Model.

4.2 Lecturer's Triple Role

The framework relies heavily on the lecturer's three interconnected academic functions as illustrated in Figure 3. In the educator role, the lecturer designs learning activities, supports student inquiry, and assesses learning outcomes. In the pedagogical developer role, the lecturer uses evidence from the implementation to improve course design, feedback, and assessment. In the researcher role, the lecturer evaluates the research suitability of project outputs and coordinates their cross-case synthesis. These functions need not be performed by one individual, particularly when assessment, research consent, and the interpretation of student-generated evidence create potential role conflicts.

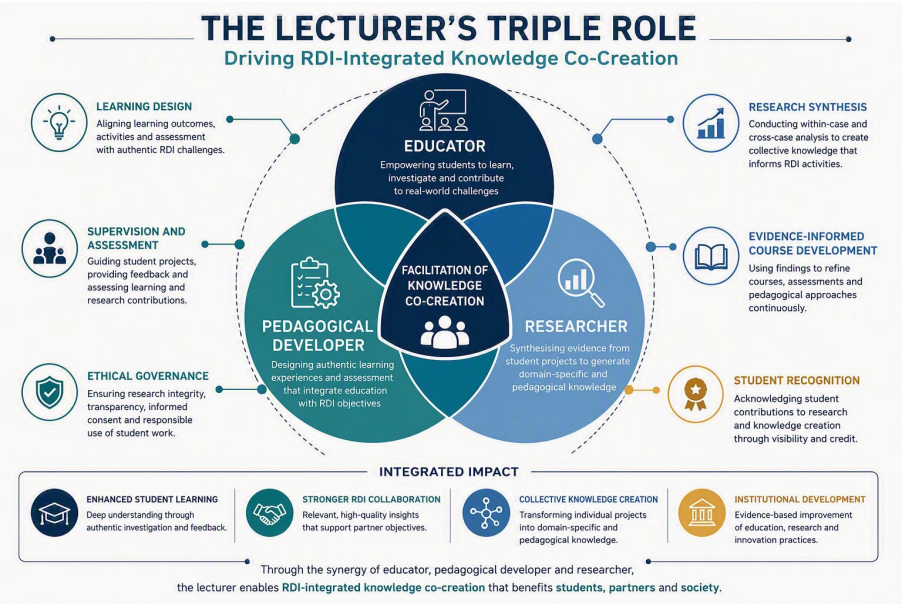


Figure 3: Lecturer's Triple Role in the RDI-IKCC Framework

4.3 Iterative Knowledge Co-Creation Cycle

The three levels of the RDI-IKCC framework are connected through an iterative knowledge co-creation cycle centred on a shared RDI challenge. Drawing on the trialogical view of learning, the challenge and the project outputs developed in response to it can be understood as shared knowledge objects that are collaboratively examined and refined by students, educators, researchers, practitioners, and other stakeholders (Paavola and Hakkarainen, 2005). The cycle begins when the shared challenge is translated into conceptually related but bounded student projects, each addressing a particular aspect, case, or context.

The initial project outputs may include analyses, datasets, artefacts, models, or practical solutions. They should not automatically be treated as research evidence. Their potential contribution to the collective evidence base depends on their relevance to the shared RDI challenge, methodological adequacy, documentation, comparability, and ethical usability. Multi-source feedback and dissemination expose these outputs to alternative perspectives, critique, and external scrutiny. Students may then revise their interpretations, improve their artefacts, strengthen their documentation, or reconsider the relationship between their project and the shared challenge. Feedback and dissemination thus contribute to the collaborative development of the shared knowledge objects rather than serving only assessment or reporting purposes.

After refinement, sufficiently aligned and documented projects may be treated as distributed cases within a shared research setting. Within-case analysis first preserves the context, evidence base, and internal logic of each case. Cross-case analysis subsequently identifies similarities, differences, recurring patterns, complementary findings, and context-dependent variations across the cases. Cross-case synthesis then integrates these comparative findings and interprets their collective meaning in relation to the shared RDI challenge. It is this synthesis, rather than the accumulation of separate project outputs, that enables the transition from project-specific contributions to collective knowledge.

As illustrated in Figure 4, the process is iterative rather than linear. Feedback, dissemination, analysis, and synthesis may reveal limitations, new interpretations, or unresolved questions that require further refinement of individual outputs or reconsideration of the shared framing. The collective knowledge produced in one implementation may also inform subsequent RDI activities and future student projects, allowing the shared knowledge objects to develop across successive course implementations.

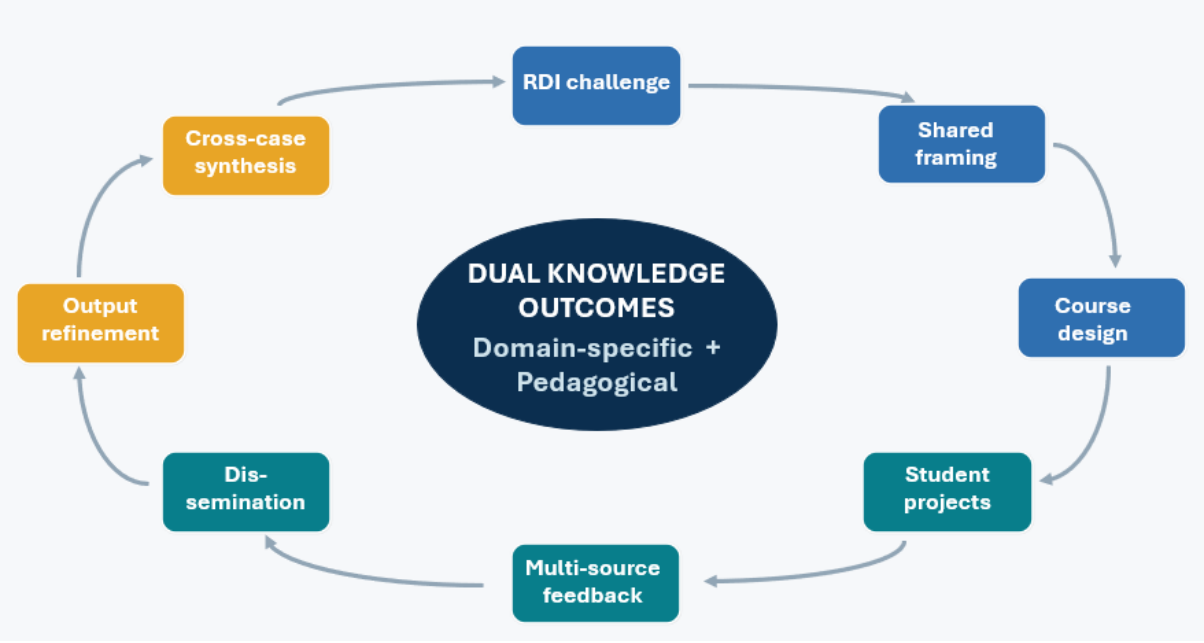


Figure 4: Iterative Knowledge Co-Creation Spiral

The process may generate two analytically distinct outcomes. Domain-specific knowledge concerns the substantive phenomenon addressed by the RDI challenge and may inform ongoing RDI activities, stakeholder practices, and future research. Pedagogical knowledge concerns the design and operation of the learning environment and may inform subsequent course design, supervision, feedback, assessment, and dissemination practices. Although both may arise from the same implementation, each requires distinct research questions,

evidence bases, analytical procedures, and quality criteria. The cycle therefore does not imply that collective knowledge creation occurs automatically.

5. Conceptual Propositions

The RDI-Integrated Knowledge Co-Creation (RDI-IKCC) framework proposes that collective knowledge creation emerges through the interaction of shared RDI framing, distributed student inquiry, multi-source feedback, dissemination, and cross-case synthesis. Based on the framework, five conceptual propositions specify its principal mechanisms and expected outcomes. They are intended to guide future empirical research rather than establish causal relationships.

5.1 Distributed Cases as a Collective Evidence Base

Individual student projects can function as distributed cases when they investigate different aspects or contexts of a shared RDI challenge. Their outputs form a potential collective evidence base when the projects are conceptually aligned and sufficiently documented to enable comparison.

> *P1. Distributed Cases Proposition:* Conceptually aligned student projects addressing a shared RDI challenge are more likely to form a collective evidence base than projects conducted as independent coursework activities.

5.2 Multi-Source Feedback as a Refinement Mechanism

Feedback from lecturers, peers, researchers, practitioners, stakeholders, and other relevant actors can introduce alternative interpretations, identify weaknesses, challenge assumptions, and reveal practical constraints. The framework therefore treats feedback as an iterative knowledge-refinement mechanism rather than solely as an assessment activity.

> *P2. Feedback Refinement Proposition:* Student project outputs refined through feedback from multiple relevant sources are more likely to become robust and usable knowledge contributions than outputs refined through feedback from a single source.

5.3 Dissemination as an External Scrutiny Mechanism

Conferences, seminars, webinars, workshops, stakeholder events, and poster sessions expose student outputs to audiences beyond the immediate course context. The questions, critiques, and alternative interpretations arising from these environments can inform further refinement before the outputs are included in cross-case synthesis.

> *P3. Dissemination Scrutiny Proposition:* Student project outputs exposed to external scrutiny through academic or professional dissemination are more likely to be critically refined than outputs communicated only within the course environment.

5.4 Cross-Case Synthesis as a Knowledge Integration Mechanism

Feedback and dissemination may improve individual project outputs, but they do not alone transform distributed evidence into collective knowledge. Cross-case synthesis enables recurring themes, complementary findings, contextual differences, and theoretically relevant contrasts to be identified across projects.

> *P4. Cross-Case Integration Proposition*: Systematic cross-case synthesis of aligned student project outputs is more likely to generate collective knowledge than the separate interpretation of individual project findings.

5.5 Dual Knowledge Creation

The RDI-IKCC process can produce two related knowledge outcomes. Domain-specific knowledge concerns the substantive RDI challenge, whereas pedagogical knowledge concerns the educational arrangements through which the challenge is investigated, including course design, supervision, feedback, dissemination, and synthesis.

> *P5. Dual Knowledge Creation Proposition*: When supported by distinct research questions, evidence bases, and analytical procedures, the systematic study of the RDI-IKCC process can generate both domain-specific and pedagogical knowledge.

6. Discussion and Conclusions

This conceptual paper developed the RDI-Integrated Knowledge Co-Creation (RDI-IKCC) framework to explain how student projects can contribute to collective knowledge creation within research, development, and innovation ecosystems. The framework responds to a gap between approaches that involve students in authentic research and development activities and the mechanisms required to transform their separate outputs into a cumulative evidence base. Its central contribution is therefore not another model for organising individual student projects, but an integrative structure connecting shared RDI challenges, distributed student inquiry, multi-source feedback, dissemination, iterative refinement, and cross-case synthesis.

6.1 Theoretical Contribution

The framework's main theoretical contribution is to distinguish participation in knowledge-producing activities from collective knowledge creation. Students may engage actively in authentic inquiry, produce relevant artefacts, and present their findings without those contributions becoming part of a broader evidence base. Collective knowledge creation occurs only when project-specific evidence is systematically related to evidence from other projects and interpreted in relation to a shared RDI challenge. The framework consequently shifts the unit of analysis from individual student projects to the relationships among projects. It conceptualises student projects as **distributed cases** whose collective value depends on conceptual alignment, evidential quality, and systematic comparison. Cross-case synthesis is therefore not an additional reporting stage but the principal mechanism through which fragmented outputs may become cumulative knowledge. A second contribution concerns the role of dissemination. Conferences, webinars, poster sessions, workshops, and stakeholder events are commonly treated as endpoints at which completed work is communicated. In the RDI-IKCC framework, they function as intermediate arenas of external scrutiny. Questions, critique, and alternative interpretations arising from dissemination can reveal limitations and support further refinement before outputs are included in cross-case synthesis. Dissemination contributes to knowledge creation only when the resulting feedback is documented, evaluated, and incorporated into subsequent analysis. The framework also clarifies the meaning of student knowledge co-creation. The use of student work as research material does not automatically make students co-researchers or knowledge co-creators. These roles require meaningful agency, traceable intellectual contributions, and appropriate recognition. Students may therefore occupy different roles across the process, including learner, investigator, evidence contributor, co-researcher, and knowledge co-creator. This differentiated view avoids overstating participation while recognising contributions that extend beyond individual learning. Finally, the framework distinguishes two potential knowledge outcomes. Domain-specific knowledge concerns the substantive RDI challenge, whereas pedagogical knowledge concerns the design and operation of the learning environment. Although both may emerge from the same implementation, they require separate research questions, evidence, analyses, and quality criteria.

6.2 Relationship to Existing Approaches

The RDI-IKCC framework complements rather than replaces research-based learning, Learning by Developing, Resilient Learning, Students-as-Partners, authentic project-based learning, and undergraduate research. These approaches explain how students can participate in authentic inquiry, collaborate with stakeholders, and contribute to shared development activities. However, they provide less explicit guidance on how outputs from multiple projects can be aligned, refined, compared, and synthesised into a collective evidence base. The framework adds an integrative layer by connecting these established approaches with multiple-case reasoning. Its novelty therefore lies not in any individual component but in their configuration around a shared knowledge-creation logic: common RDI framing establishes the basis for comparison; distributed projects generate complementary evidence; feedback and dissemination support refinement; and cross-case synthesis produces collective interpretations. This configuration extends the pedagogical focus from the quality of individual learning experiences to the cumulative knowledge potential of a project portfolio.

6.3 Practical and Ethical Implications

Implementation must begin before individual project topics are selected. Academic staff, RDI actors, and external partners should define the shared challenge, core concepts, possible units of analysis, expected forms of evidence, and minimum documentation requirements. Without this common framing, projects may remain educationally valuable but analytically incompatible. The framework also requires a clear distinction between educational assessment and research-quality evaluation. A project may fulfil course requirements without

providing evidence suitable for synthesis. Decisions about inclusion in the collective evidence base should therefore be transparent and based on criteria such as relevance, methodological adequacy, documentation, comparability, and ethical usability. The lecturer's roles as educator, assessor, pedagogical developer, and researcher create potential conflicts of interest. Students should be informed about any intended use of their work beyond course assessment, and refusal to participate in research must not affect grades or access to learning opportunities. Consent, attribution, authorship, data protection, and the ownership of artefacts should be addressed before dissemination or synthesis. Where possible, assessment, consent procedures, and research decisions should be distributed among different actors.

6.4 Boundary Conditions and Future Research

The framework is most applicable when multiple projects investigate related aspects of a complex and context-sensitive phenomenon. It is less suitable when project questions are unrelated, concepts and units of analysis are incompatible, evidence is insufficiently documented, or outputs cannot be ethically reused. External dissemination is also not inherently beneficial: its value depends on the relevance of the audience, the quality of feedback, and whether that feedback informs refinement. The framework is conceptual and its propositions therefore require empirical examination. Future studies should investigate whether shared RDI framing actually improves comparability across student projects, how feedback from different sources affects output quality, and whether dissemination produces identifiable changes in subsequent versions. Research should also examine how alternative cross-case synthesis methods influence resulting knowledge claims and under what conditions collective domain-specific or pedagogical knowledge can be produced reliably. Longitudinal studies across successive course implementations would be particularly valuable because cumulative knowledge creation may require continuity beyond a single cohort. Comparative studies across disciplines, institutional settings, and dissemination formats could further clarify the framework's transferability, resource requirements, and limitations. Particular attention should be given to the experiences and agency of students, including whether they recognise themselves as contributors to the resulting knowledge and regard the associated responsibilities and recognition as equitable.

6.5 Conclusion

The RDI-IKCC framework explains how student projects can move from isolated coursework outputs towards a collective evidence base through alignment around shared RDI challenges, distributed inquiry, multi-source feedback, dissemination, iterative refinement, and cross-case synthesis. Its principal contribution is to connect student participation with both domain-specific and pedagogical knowledge creation. As a conceptual rather than empirically validated framework, it provides propositions and a structure for future research on the conditions under which distributed student projects can generate credible, reusable, and collectively meaningful knowledge.

AI Declaration

Artificial intelligence tools, including Keenious and Microsoft Copilot, were used to support literature discovery, language editing, translation, and structural refinement. Figures 1–3 were produced with AI assistance from concepts, content, and instructions defined by the author. All sources were verified by the author, who remains fully responsible for the conceptual development, accuracy of the visual representations, interpretations, and final content of the manuscript.

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