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EISEN

Building the implementation workforce
for health and social care

Project acronym: EISEN
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Intellectual Output 5

WORKSTREAM REPORT October 2021

The aim of this workstream was to develop, refine and critically evaluate our approach to the co-design of our curriculum for implementation. The workstream cut across the entire EISEN project, and provided a focus for reflective and action learning as the curriculum was co-produced, implemented and evaluated.

Based on co-applicants Rycroft Malone and Burton's work on implementation across Universities and health services, our starting point on the co-production of the EISEN project focuses on:

- Engagement with multiple stakeholders, the systems which they inhabit, and their priorities
- Enabling cross-boundary working
- Maximising the proximity of knowledge generation to its use; and the
- attributes and skills of individuals advancing the knowledge base for implementation in health and social care.

This starting point is reflected in the extensive engagement underpinning the development of the Implementation Science curriculum framework (Intellectual Output 1), and our engagement with associated partners and students in designing, developing and pilot testing the curriculum in MSc and PhD programmes (Intellectual Outputs 3 & 4). These ways of working ensured that perspectives from the diversity of partners coming from different contexts, cultures, political structures, educational and health care traditions and systems were taken into account. Hence, by addressing this diversity and finding ways to introduce sufficient flexibility to account for the context varieties, the EISEN project was able to create a curriculum that is transferable across diverse European contexts / countries.

Co-production shares many of the features of action research: it is an activity engaged in the real-world of improvement (in this case the development of improvement science capability within the health and social care workforce), with embedded research that seeks to learn generalizable lessons about 'what works'. We have paid particular attention to reflection and formative evaluation across all project activities, focusing on our project logic model as a prototype methodology for developing curricula in the real world of implementation. This model sets out the expected relationships between project resources, activities, and the generation of outcomes. The model was used throughout project meetings as a framework for critical evaluation on project processes and outcomes. All partners contributed to the development and review of the model, including those students who piloted our courses as the model was reflected in the framing of end of course focus group discussions.

EISEN Logic model

The table below represents the anticipated logic model of the EISEN project, and specifically those key mechanisms expected to drive project success.

Mechanism	Reflection
Implementation as a unifying concept.	Implementation was the major concept in this project, and was intended to service as a boundary object, bringing different stakeholders into the project, and facilitating shared dialogue and understandings.

Our reflection is that for the most part this assumption was correct, certainly from the perspective of external stakeholder engagement across country contexts. Internally however, the overlap between implementation and implementation research was less easy to manage within the project. This was particularly relevant in the development of Level 7 and 8 courses, and the emphasis of completing research into implementation within doctoral degrees. A working position was that research into implementation should still create impact, requiring the development of implementation skills alongside the co-production of doctoral research to increase impact.

It may be that in future and related projects, the concept of impact may have broader appeal, melding the practical and knowledge-based aspects of implementation. |
| Stakeholder engagement | Reflecting the principles of co-production, and our desire to ensure the project products had maximum impact, we engaged widely with stakeholders in the following areas:
The development of our overarching curriculum framework
The identification of learning outcomes and content for our pilot courses
The perspectives of those engaged in the pilot courses (staff and students)

Our assumption that wide stakeholder engagement would ensure project success was correct, as demonstrated by the evaluations of both courses. The Karolinska Institute, Canterbury Christ Church University and the Western Norway University of Applied Sciences are all committed to delivering these courses over the next two academic years. |
| E-learning platform | Our decision to use an e-learning platform to support the delivery of our courses for international groups of students |

| | was of course helpful within the context of the COVID-19 pandemic. It provided us with on-going flexibility to address the challenges of social distancing and the disruption to international travel.

One particular aspect of the e-learning platform that evaluated positively in both formative and summative discussions were the potential of breakout rooms. These quickly and easily facilitated very different types of networking and therefore learning, which were greatly appreciated. |
| --- | --- |
| International | Our assumption, which held to be correct, was that internal students would benefit from the international nature of the EISEN project. Feedback from students, and their hunger for activities in which they explored implementation issues together across different country, service and policy contexts, indicated this was one of the most appreciated aspects of the courses. |

Workstream leads

The project generated the expected outputs within the lifetime of the project, including:

- Project website
- Presentations at international conferences
- Book chapter on competencies for implementation and research coproduction

A further publication which synthesis all aspects of the

Key Reflections

Implementation, impact and research co-production

Our project has reflected shifts in thinking about implementation beyond effective processes for knowledge translation and utilisation, to the co-production of research evidence with greater implementability. Co-production emphasizes stakeholder engagement through processes which include co-design, which of course was a foundational element of our work to develop our curricula and courses. It means that we have prioritized those aspects of implementation that can be aligned with impact. For example, when selecting those elements of the broader curriculum framework (IO1) to take into the master and doctoral courses (IO 3 and 4), we framed our discussions with internal and external stakeholders around impact. This highlighted the importance of issues such as personal and professional leadership, networking, stakeholder engagement and influence, alongside the more specialist competencies from the established implementation literature.
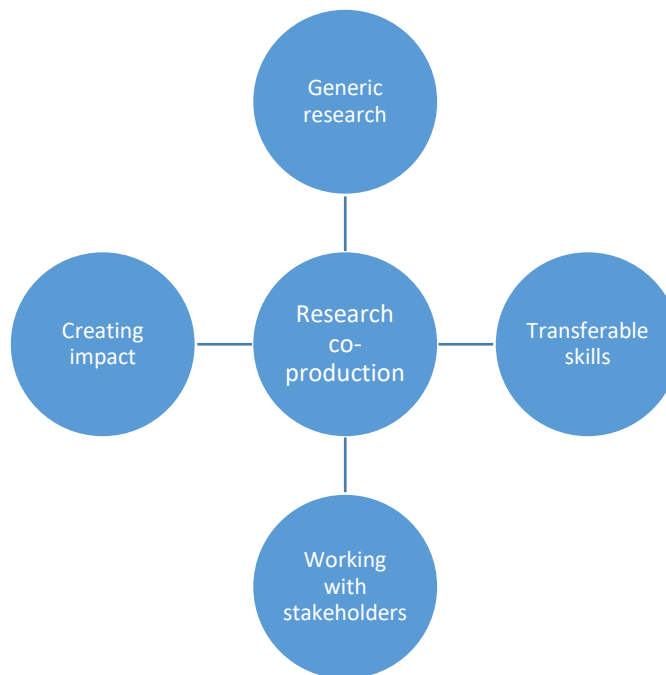
Competencies

Our starting point is that there are particular competencies for implementation, which augment those competencies associated with any disciplinary or methodological tradition. We have developed an overview of what these competencies are, drawing on themes of mastery of research, personal effectiveness, stakeholder involvement, and the generation of impact. These themes point to a broad base of competencies of implementation which have yet to be fully integrated within policies, systems and incentives to drive capability building. Although implementation should not be limited to a healthcare context, we have drawn predominantly on literature, policy and perspectives from this context develop our thinking about what these competencies are, and how they are sustained with career development strategies and frameworks. We focus on the ambitions of implementation as they relate to increasing the impact of investment in research which, particularly in the health and care sectors is consistently framed as a global priority.

Evidence impact is associated with the use of knowledge in practice and policy in different ways, such as professional behaviour-change or policy development, but has been consistently problematized in terms of a gap between knowledge generation and use. This gap has been presumed to result largely from differences between knowledge producers (researchers) and knowledge users (policy makers and practitioners) (Nutley, Walter & Davies, 2003). This position neglects the fact that many medical and health researchers are indeed practising clinicians, and the renewed interest in developing structures, such as researchers-in-residence and clinical academic careers, that support working across service and University settings. More fundamentally it is challenged both through the emergence of a more socially constructed view of the 'knowledge gap' in which knowledge is co-produced with and between stakeholders to maximise its impact (Rycroft Malone *et al.,* 2016). Implementation and co-production provide a new lens on the issue of impact by foregrounding impact throughout the knowledge production cycle through the engagement of stakeholders and the systems in which they live and work. This change may of course be the application of new knowledge in discourse, practice and professional behaviour change, politics and policy as research progresses (Weiss, 1979), and is implicitly linked to the improvement of processes and outcomes.

Guiding frameworks

An established framework describing the competencies for generating impact from research is lacking. However, we can draw on frameworks that have been developed in research policy areas that are aligned with research co-production (see Figure 1).

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Figure 1. Competencies for Creating Impact

Research competence

Generating implementable knowledge builds on a foundation that melds the methodological and technical aspects of knowledge production, or research more generally. However, thresholds for knowledge and technical competence may resonate differently across a wide range of stakeholders. For example, the peer academic community may have a collective view about threshold knowledge and skills for research; other stakeholders may have different perspectives on this issue. Policy makers and service managers may be willing to draw on more pragmatic investigations, or those which meld different research designs. In these situations, research co-production may be best served by a broader methodological knowledge and skill base. This does not necessarily negate the need for deep expertise as making appropriate trade-offs between methodological purity and pragmatism requires additional insight and understanding.

Transferable skills

Alongside the development of a researcher within a given field, there is an increasing focus on the growth of transferable skills required to sustain a career as a researcher, some of which are relevant to implementation and research co-production.

Concerns have been expressed by a range of stakeholders about the ability of postdoctoral staff to thrive as employees in diverse and dynamic employment contexts which require a combination of technical and transferable skills. Within the United Kingdom for example,

doctoral research students have access to a Researcher Development Framework (RDF) (Vitae, 2010) to support the development of transferable skills within their training and personal development programmes. Creating impact is reflected in the 'engagement, influence and impact' domain of the RDF. This domain spans (i) the communication and dissemination of research, (ii) aspects of working with others (e.g. team working, influence and leadership), and (iii) engagement and impact, framed across teaching, public engagement, enterprise, citizenship and policy work.

Working with stakeholders

An essential element which must be foregrounded within implementation and research co-production is stakeholder engagement. Within, health research policy requires researchers to (i) demonstrate the involvement of patients and the public in many, if not all aspects of their research, and (ii) increase the impact of knowledge through its implementation in practice and policy. Training programmes tend to focus on the appropriateness of involvement of patient and public stakeholders in research as the 'right thing' to do (see for example Hayes *et al.,* 2012), reflecting a range of perspectives including, ethical dimensions, the publicly-funded nature of research, and the potential of generating better quality research with more impact (Wilson, Mathie, Keenan *et al.,* 2015; Boivin *et al.,* 2018).

However, research co-production requires engagement with a much wider group of stakeholders and groups, each of who need consideration in terms of the nature of their engagement with the focus of research. Within healthcare, these may include service users, professionals, managers, commissioners, payers and policy makers, in addition to broader public representatives. Methods such as system mapping can be used to identify stakeholders from across different constituencies, and many applied health research designs focus on the proximity or otherwise between stakeholders and the healthcare practice. Damschroder's (2009) Consolidated Framework for Implementation Research locates stakeholders in either an inner or outer context. Inevitably some stakeholders may only emerge during research co-production as knowledge emerges of the context in which the research is being conducted. In addition to being able to identify important stakeholders, research co-production requires their effective engagement, drawing on the communication and relational skills referred to above, as the basis for partnership working.

Creating impact

The thesis developed here is that meaningful engagement of stakeholders in coproduction generates impact. Increasing the impact of research is at the core of a range of movements which share a common goal within health and care policy and practice: ensuring that knowledge is as close as possible to the points of decision-making. These include evidence-based healthcare, implementation (knowledge translation, knowledge mobilisation), improvement science to name three. The competencies for each movement reflect its particular interests, and provide different perspective on some of the competencies that may be relevant for research co-production.

For example, evidence-based approaches prioritise the use of best available evidence from research alongside service user preferences and other parameters such as cost. Competencies for development generally relate to evidence retrieval, critical appraisal and practical decision-making (Albarqouni *et al.,* 2018).

From the perspective of implementation, there is interest in both the synthesis of evidence from research, and the strategies available to ensure its use within practice and policy. Strategies include the development of knowledge products, for example clinical guidelines and decision aids, which meet different stakeholder needs, dissemination, education and training, the facilitation of change, and system-related incentives. The literature demonstrates both considerable variation in the competencies addressed through education and training, and the lack of an evidence-base to underpin the development and delivery of capability-building programmes (Davis & D'Lima, 2020).

In the United Kingdom, Gabbay *et al*. (2014) have written extensively on the types of impact-related knowledge and skills from an improvement science perspective. Impact in this sense is usually associated with the effectiveness, reliability or acceptability of healthcare processes. Drawing together evidence from a number of studies across the United Kingdom, they conclude that effective improvers possess and apply an assortment of knowledge. This ranges from the possession of 'local knowledge' which enables an improver to gauge the context and understand the values, priorities, concerns and practices of a population; to an awareness of the psychological and emotional consequences of change; knowledge of the research process, qualitative and quantitative methods and data analysis; in addition to aspects of sociology including the role of professional identities and organisational structure and hierarchies. Competencies linked to the improvement science literature also concentrate on the use of an array of technical processes and tools designed to deliver improvement-related impact associated with their particular 'brand', including Total Quality Management (Brannan, 1998), Lean (Toussaint & Berry, 2013), Six Sigma (Schroeder *et al,* 2008) and the Model for Improvement (Langley *et al.,* 2009) to name but a few. The 'Habits of Mind' provides a new lens on competencies for improvement work, linked to operating within the contexts of complex systems (Lucas & Nacer, 2015). In addition to a positive approach to learning and influencing others, dimensions of systems thinking, creativity and resilience point to attributes which are linked to dealing with complexity. Lucas & Nacer's model focuses on the capabilities of individual improvers, including tolerating uncertainty, accepting of change, connection-making, and generating ideas.

In summary, competencies for research co-production can be drawn from different conceptual and policy areas, inevitably leading to the development of a comprehensive mix of potential core, general and specific domains.

European Implementation Science Education Network

Improving patient and service user outcomes and increasing citizen participation in the use of knowledge continues to gain momentum across health and social care. The European Implementation Science Education Network (EISEN) was funded by the European Union through its Erasmus+ programme to identify associated competencies, which directed the

development of training programmes to increase capacity and capability in aspects of research co-production and the implementation of research-based knowledge more broadly.

The programme commenced with focused reviews of the literature, research policy evaluation, stakeholder engagement within and across European nations to identify an overarching curriculum framework. As the purpose of the scoping review literature was to inform the development of educational programmes, the review analysis was organised around three major areas, knowledge, skill and attitudinal capabilities. The task of elucidating items which specifically related to what a research student on the EISEN programme needs to know was made more difficult by the way in which many of the subjects naturally overlapped into other domains of skills and attitudes, for example knowledge of research methods, and principles and practice of co-production. Those competencies which relate to implementation and research co-production are summarised below.

Knowledge-related competencies

Alongside collaboration with stakeholders, appreciating and being able to work with different knowledge types, and recognising that these are associated with different rules, processes and potential impacts, is key to research co-production. Hidden knowledge such as stakeholder experience and professional wisdom can emerge from the contexts in which research is co-produced. Different strategies are required to surface different knowledge types, paying attention to their authenticity and credibility, and to synthesise these with other forms of relevant knowledge.

Knowledge-related capabilities identified through our scoping review work related to a wide range of formal, stakeholder-related and context-related knowledge types which emerge within research co-production (Table 1). Although psychology and sociological thinking dominates, the knowledge-base is increasingly influenced by a diverse range of academic disciplines, theories and approaches. The inclusion of perspectives from the design sciences, arts and humanities provides (i) new opportunities to revisit long-standing practical and policy challenges which have otherwise been resistant to change, and (ii) new opportunities to engage stakeholders within the knowledge work. For example, the analysis process in a recent evidence synthesis focusing on the adoption of low-value health interventions drew on the design sciences to explain how information displays can make low-value options difficult to selects. Thinking about cults from religious studies were reflected on to understand the emotional bind that clinicians may have to some ineffective interventions (Burton *et al.,* 2021).

Research co-production also extends thinking about context beyond the backdrop to the design and conduct of research, and the mix of barriers and enablers that can shape the implementation of knowledge. Whilst these are important, knowledge creation should also be 'negotiated', influencing, and being influenced by, and influencing the context in which it is situated. Although context is multi-factoral and multi-dimensional, the systems which provide structure and function to health and care services include multiple stakeholder groups with competing interests and varying degrees of power. Being able to work within these complex systems requires at least some insider knowledge, credibility, and the personal skills and reserves to navigate these complex systems successfully.

Knowledge capabilities	Description	Relevance to Research Co-production
Interdisciplinary knowledge	An appreciation of the research paradigms, theories and frameworks from disciplines that can be used within research co-production.	Research co-production requires that threshold indicators of the quality of the research itself are maintained.
Health Services Research	A multidisciplinary field of inquiry that provides a framework to examine health care organisation and delivery and produce new knowledge and improvements for individuals and populations.	Within healthcare, the purpose of research co-production is to generate solutions to problems and to improve health and wellbeing.
Systems knowledge	The configurations of services and activities with a purpose to promote, restore or maintain health, operating within a broader political, social and geographical context.	Research co-production requires insight into the systems which provide a content for the understanding of a research challenge, and the engagement of stakeholders
Public and lay knowledge	Experiential knowledge and expertise that generates different insights for research co-production.	Research co-production generates and values different sources and types of knowledge.
Local knowledge	Contextualised, insider knowledge of organisations and the behaviours and beliefs, cultural values, priorities and norms of stakeholders.	Research co-production generates and values different sources and types of knowledge.
Implementation	Theories, models and frameworks that summarise understandings about how knowledge, usually research-based, can have the greatest impact in policy and practice.	Research co-production draws on knowledge of implementation to shape and enhance impact.

Table 1. Indicative knowledge-based capabilities

Skill-related competencies

There is consensus that those working in co-production require honed interpersonal skills including high-level communication skills, agility across different policy, organisational and professional boundaries, and the ability to engage relevant stakeholders in authentic ways (Table 2) to drive co-production and embedded impacts. Negotiation skills are encompassed in the skill set described as 'soft skills'. The emphasis is that this descriptor is soft in name rather

than nature as working through "*the leadership, structures and political wrangles involved in achieving genuine and lasting improvements can call for real toughness*" (Gabbay et al., 2014) Navigating multiple boundaries can have implications for individuals in terms of encountering conflict, which requires resilience to work towards reconciliation, negotiation, and progress.

Skills capabilities	*Description*	*Relevance to Research Co-production*
Working with multiple communities	The ability to work across disciplinary, organisational, professional and political boundaries to engage relevant stakeholders.	Requires navigating and bridging boundaries, including research and practice, different organisations, professions, groups and other social entities.
Leadership and Political skills	Understanding the system, managing vested interests, navigating and exploiting power bases, shrewd timing of interventions, listening to and taking into account other people's views	Embedded within stakeholder perspectives, research co-production is a political act requiring negotiation and establishing common ground.
Research & analytical skills	Critical thinking, creative thinking, collectively learning how to improve healthcare.	Within any research framework, research co-production requires skills to collect, analyse and interpret data in ways which generate new insights into improvement.
Communication skills	Conveying information to another person or groups effectively to help facilitate the sharing of information and knowledge between people.	Requires the ability the communicate different types of information effectively with multiple audiences.
Facilitation of change	Change agency, knowledge brokerage, championing, influencing, facilitation and mobilising resources for change.	Research co-production should generate different impacts over time, which need supporting as part of the co-production process.

Table 2. Indicative skill-based capabilities

Leadership is key both to the creation of a learning culture and receptive context of organisations and systems in which knowledge is used, and as a deliberate strategy to support the facilitation of research impact. Whilst leadership can be viewed as a set of practices or skill which can be taught, it also infers a characteristic or quality possessed by an individual who leads by example, and develops personal influence to galvanise individuals, communities and resources around partnership working and research co-production.

The practice of research co-production is inherently interdisciplinary. Overall, there is a consensus that embedding an interdisciplinary ethos and fostering the boundary spanning skills of those engaged in facilitating research impact is key (Kislov, 2018). Leadership skills and attitudes are also the hallmark of knowledge champions, knowledge translation brokers, mentors and other change agents who play a crucial role in motivating and sustaining engagement in research co-production activities. The role of leadership as a desirable and beneficial quality of those who succeed in generating change, sustaining improvement and cultivating a culture of knowledge impact is well documented, and is strongly linked to traits including personal influence, supporting the learning of others through mentoring relationships, and the possession of well-developed networks and relationships.

Possessing an understanding of the influence of contextual factors including the ability to identify and assess barriers and enablers to impact is widely recognised as an essential researcher skill for research co-production. Aligned to this is the ability to tailor knowledge to local needs, engaging relevant stakeholders, and working with multiple communities. These skills dovetail with the ability to synthesise and translate knowledge into appropriate appropriate formats, tailored to the needs of specific target audiences, mobilising the necessary resources to initiate and sustain change, and ultimately supporting the impact of knowledge.

Attitude-related competencies

The third dimension of competency relates to the affective domain: the attitudes that should be demonstrated by those engaged in research co-production. This domain determines the way in which an individual should 'be' in terms of behaviour and value (Table 3). The literature is less specific about this domain.

Attitude capabilities	*Description*	*Relevance to Research Co-production*
Values-driven	Being motivated and driven by core social, emotional, psychological or beliefs, qualities and opinions that are important to individual, shared, collective or organisation concerns.	Research co-production can be set within multiple and competing contexts which need reflecting and honouring.
Person-centred	Placing patient and people at the centre of decision-making, planning, designing, delivering, co-producing interventions, ideas, tools, products, services, polices etc.	Research co-production requires a willingness to engage with the concerns of others.
Committed to impact	A spirit of inquiry closely linked with the motivation and desire to change and improve issues for individuals and society, possessing an approach and	Research co-production is concerned primarily with change and the resolution of health-related challenges.

	disposition that motivates and support others to change and achieve.	
Commitment to personal development	Commitment to developing the skills and mechanisms for learning and self-care in stressful or demanding situations.	Research co-production can be messy, requiring a willingness to tolerate uncertainty, learn and persevere.

Table 3. Indicative attitude-based capabilities

Possessing a spirit of inquiry and being willing and able to learn, through reflection, learning from others and by participating in learning communities or communities of practice is also core. Gabbay *et al*. (2014) identified assertiveness as a characteristic of those involved in creating impact from research; similarly, Pereira and Creary (2018) highlight personal resilience as a necessary attribute. Being orientated to service user or stakeholder perspectives and taking a value-driven approach are also recognised as important features of those who undertake implementation and research co-production.

Whilst capturing the knowledge and skills in which proficiency is expected has been comparatively straightforward, defining the qualities for co-production is less clear cut. This is due in part to the way in which those items identified as representing the affective often overlap. For example, the concept of leadership occupies both the skills domain (it can be taught), and the attitudes domain (it is a quality recognised as important in those who lead by example and influence the thinking and behaviour of others). Likewise, being multidisciplinary in one's approach to research co-production could be described as a state of mind, whereas it overlaps with possessing the skills to work across boundaries and professions. As it currently stands there is no definitive set of qualities or traits that have been proposed, and this domain remains under explored and under articulated, and more work is required to develop and define what is the qualitative hallmark of a competent co-productive researcher.

Developing research co-production competencies

Drawing the EISEN curriculum themes together points to some key considerations for the development of competencies for researchers engaging in co-production. Research co-production, through its engagement in the worlds of multiple stakeholders, is messy. It may bring some degree of uncertainty associated with different stakeholder agenda, and the personal demands of affecting change through negotiation, persuasion engagement in policy and practice. From a methodological perspective, it requires a willingness to balance the need for research rigour within the more turbulent and less controlled contexts in which research co-production will occur.

Our thinking points to a generalist profile of research-related competencies and theoretical insights research, but with greater focus on the political and personal skills to create impact. Supporting the development of research co-producers will inevitably challenge the ways in

which research training is organised, how and where it is provided, and the criteria that govern access to that training. In addition to exposure to credible training in research methodology, students will need to develop a sufficient degree of credibility with different stakeholders, probably best obtained through immersion in different aspects of the health system. If this is the case, then there should be the potential for trainees to have refined some of these personal and political skills, or at the very least be able to demonstrate the potential to build these through professional development programmes.

Typically, entry to research training programmes has been dependent on the student's curiosity towards their topic; indeed this would seem to be key to helping students deal with inevitable problems they will encounter along the way. A more co-productive context for research training will inevitably mean some degree of flexibility in students' underpinning research programmes, as these will need to be responsive to different stakeholder perspectives and interests. Those supporting capability building will need to draw on different strategies to support students' perseverance. The preparation for our EISEN programmes indicates that research co-production is rarely the guiding framework in which research training programmes are organised; there are of course some that have potential, and which have been aligned with integrated knowledge translation in Canada (Sim *et al.,* 2019). Less use of didactic teaching methods and opportunities for students to work together to explore the different contexts in which their research co-production is located seem to be key through, for example the use of problem-based learning and reflection, with facilitation of interprofessional and interdisciplinarv solutions (Carlfjord, Roback & Nilsen, 2017).

Although there is renewed interest in interdisciplinary health research, research methodology, methods and practices are generally set within a broader disciplinary tradition. Research capability building approaches have essentially consisted of a doctoral apprenticeship in which students are immersed within the tradition in a supervisory relationship with a more experienced academic. Although knowledge and technical competencies will have an element of specificity, the aim of an apprenticeship is a sufficient degree of independence on which a career within the discipline can be built.

Universities have traditionally held research at the core of frameworks and processes for academic promotion. The degree to which these frameworks value particular types of research will be dependent on national research policy, and the weighting attached to different factors such as journal rankings and / or methodological quality. More recently, some national funders have raised the visibility of impact as an indicator of research quality. It is inevitable then, that Universities may pay less attention to academic or professional scholarship, enterprise or knowledge exchange activities as vehicles for academic promotion. Some academic staff of course have dual roles in services, for example as a Clinical Academic. Here, it can be more complicated to navigate the pathways to financial rewards and academic promotion, as service organisations may place greater value on the generation of more specific and local knowledge and impact.

The clinical academic role is well established in some professional disciplines, most notably medicine. However, policy efforts to focus attention on maximising the return on investment

in applied research have generated a wide range of roles and opportunities which support working across practice and research boundaries. Examples include Fellowship and similar programmes that provide specific boundary spanning opportunities, often linked to defined and time-limited projects, and 'in-residence' roles (Marshall *et al.,* 2016). Here, an individual with typically very different worldviews and skills spends time within a host organisation to challenge thinking and practices, and to support change. Although additional benefits for researchers appear less clear, evaluations of programmes to bridge research and practice through shared organisational architectures have indicated the potential for positive emotional rewards and opportunities for career progression (Rycroft Malone *et al,* 2016).

Conclusion

Knowledge co-production provides a new lens on the issue of impact by foregrounding this throughout the knowledge production cycle through the engagement of stakeholders and the systems in which they live and work. This change may of course be the application of new knowledge in discourse, practice and professional behaviour change, politics and policy as research progresses (Weiss, 1979), and is implicitly linked to the improvement of processes and outcomes.

There is a distinct set of competencies for research co-production which cover a range of core, common and specific issues relating to knowledge work. Co-production should not be associated with any one particular research methodology, but competence within the methodologies used is core. Other competencies reflect two key dimensions of co-production, including engagement with stakeholders in their systems, and building impact from research. These competencies are broader than common transferable skills which are often aligned with traditional research training programmes, and which seek to ensure that research postgraduates have a sufficient degree of 'rounding' to thrive in the workplace and broader economy. Specific competencies are associated with the ability to effect change and impact in the contexts of research implementation; we argue that these competencies can also be useful for research co-production efforts. Implementation research is generating an evidence-base for some of these competencies, for example facilitation. However, the wider change management literature points towards inter-disciplinarity, cross-boundary working, creativity, systems thinking, and political and emotional intelligence as essential competencies for research co-production. Embedding co-production within the systems that sustain training and careers in research requires a refreshed suite of curricula, and the development of incentive systems which prioritise real-world impact.

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