

Rethinking assessment for interprofessional learning during COVID-19: steering a middle course

McLarnon, Nichola; Hutchings, Maggie; O'Carroll, Veronica; Wetzlmair, Lisa Christin; Blumenthal, Sharron; Boyle, Louise; El-Awaisi, Alla; Greaves, Jane; Park, Vikki; Power, Alison

Published in:
British Journal of Midwifery

DOI:
[10.12968/bjom.2022.30.10.572](https://doi.org/10.12968/bjom.2022.30.10.572)

Publication date:
2022

Document Version
Author accepted manuscript

[Link to publication in ResearchOnline](#)

Citation for published version (Harvard):

McLarnon, N, Hutchings, M, O'Carroll, V, Wetzlmair, LC, Blumenthal, S, Boyle, L, El-Awaisi, A, Greaves, J, Park, V & Power, A 2022, 'Rethinking assessment for interprofessional learning during COVID-19: steering a middle course', *British Journal of Midwifery*, vol. 30, no. 10, pp. 572-581. <https://doi.org/10.12968/bjom.2022.30.10.572>

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please view our takedown policy at <https://edshare.gcu.ac.uk/id/eprint/5179> for details of how to contact us.

Rethinking assessment for interprofessional learning during the COVID-19 era: steering a middle course

Nichola McLarnon, Associate Dean Learning Teaching and Quality¹

Maggie Hutchings, Associate Professor and Visiting Fellow²

Veronica O'Carroll, Senior Lecturer³

Lisa -Christin Wetzlmair, PhD Candidate⁴

Sharron Blumenthal, Senior Lecturer⁵

Louise Boyle, Senior Lecturer⁶

Alla El-Awaisi, Assistant Dean for Student Affairs⁷

Jane Greaves, Senior Lecturer⁸

Vikki Park, Assistant Professor⁹

Alison Power, Associate Professor¹⁰

¹School of Health and Life Sciences, Glasgow Caledonian University

²Faculty of Health and Social Sciences, Bournemouth University

³School of Medicine, University of St Andrews

⁴School of Medicine, University of St Andrews

⁵School of Health and Life Sciences, Glasgow Caledonian University

⁶School of Health and Life Sciences, Glasgow Caledonian University

⁷College of Pharmacy, Qatar University

⁸Department of Nursing, Midwifery and Health, Northumbria University

⁹Department of Nursing, Midwifery and Health, Northumbria University

¹⁰Faculty of Health, Education and Society, The University of Northampton

Corresponding author: N.McLarnon@gcu.ac.uk

Abstract

This, the sixth article in a series exploring interprofessional education during the COVID-19 pandemic, will focus upon the considerations and adaptations aligned to the assessment of interprofessional education, including examples of the alternative assessment strategies employed by faculty, the modality of assessment and the tools utilised, the student and faculty experience of remote/online assessment and the challenges faced by both during the rapid pivot to remote learning and assessment.

Rethinking assessment for interprofessional learning during the COVID-19 era: steering a middle course

Abstract:

This, the sixth article in a series exploring interprofessional education during the COVID-19 pandemic, will focus upon the considerations and adaptations aligned to the assessment of interprofessional education, including examples of the alternative assessment strategies employed by faculty, the modality of assessment and the tools utilised, the student and faculty experience of remote/online assessment and the challenges faced by both during the rapid pivot to remote learning and assessment.

Keywords: Interprofessional Learning, COVID-19 pandemic, online learning, Emergency Remote Teaching, alternative assessment, online assessment, e-assessment

Introduction

As identified in the first article in this series (Power et al, 2021), opportunities for interprofessional education, where different professions can learn with, from and about each other, are key to fostering collaborative practice and improving the quality of care (Centre for the Advancement of Interprofessional Education (CAIPE) 2002). This article, the sixth in the series on interprofessional education, will focus on the experiences and adaptations employed in relation to the assessment of students undertaking interprofessional education during the COVID-19 pandemic.

According to UNESCO (2021), the COVID-19 pandemic affected more than 220 million tertiary level students worldwide. As universities grappled with pivoting to almost entirely online delivery due to physical distancing requirements, remote or online assessment posed a further significant hurdle. However, this challenging period simultaneously presented unprecedented opportunities for re-examining and re-imagining assessment approaches. Examples of the types of student assessment utilised within interprofessional education during this time and the required modifications will be discussed within this paper, drawing on theory and findings from existing literature and illustrated with case study reports and reflections from academics. Consideration will be given to opportunities for innovation and evidence-informed guidance for future and alternative approaches to student assessment of interprofessional education.

What is assessment and why does it matter?

Assessment is an integral component of teaching and learning with diverse functions and purposes. The purposes of assessment can be distinguished between ‘assessment *of* learning’ focused on certification and quality assurance to provide accurate information for making formal decisions about progress and levels of achievement, compared with ‘assessment *for* learning’, focused on guiding learning and providing feedback to students and teachers (Schuwirth and van der Vleuten, 2011; Bloxham, 2014). While these two ways of thinking about assessment are not mutually exclusive, they serve to frame our consideration of the assessment of interprofessional learning during the COVID-19 era.

The assessment of interprofessional learning is complex and multifaceted, creating potential for controversy and tensions between accreditation and compliance with professional and regulatory standards, seeking to assure the reliability of ‘assessment *of* interprofessional learning’ and the pedagogical challenges of ‘assessment *for* interprofessional learning’, seeking to support the motivation and engagement of students and provide learning feedback for students and teachers alike. With regard to ‘assessment *of* learning’ for certification and quality assurance purposes, Rogers et al (2017) reported that despite regulatory frameworks mandating health and social care professional education programmes to produce graduate practitioners with the competence and capability to practice effectively in interprofessional collaborative teams, there remained a lack of

consensus regarding optimal strategies for guiding the assessment of interprofessional learning. Tensions between professional body requirements, service requirements and service user expectations were recognised in addition to limited agreement among stakeholders in the education process about what constituted an adequate curriculum, aligning learning outcomes with learning activities and assessment strategies for interprofessional learning (Rogers et al, 2017).

'Assessment *for* learning', by comparison, represents the possibilities of a radical shift in thinking by focusing on supporting students to learn, rather than on the demands of certification and quality assurance (Boud and Falchikov, 2007). The implications for changes in assessment practice are considerable, emphasising the formative and diagnostic function of engaging students in assessment, helping students to learn through completing their assignments and gaining feedback, but also and more significantly, 'assessment as learning', equipping students for lifelong learning by developing their ability to self-assess and self-regulate beyond graduation (Boud and Falchikov, 2007; Bloxham, 2014).

Why then does it matter how assessment is understood and practised for assuring effective interprofessional learning? Assessment has a major influence on student learning, directing attention to what is important, acting as an incentive for study and influencing what students do and how they do it (Boud and Falchikov, 2007). More specifically, assessment frames learning by creating learning activities which orientate learning behaviour (Gibbs, 2006).

Assessment in higher education is predominantly used for summative purposes, to determine whether, and to what extent, the learner has acquired sufficient knowledge, skills and capabilities to meet end of module and programme requirements warranted by means of final marks or grades awarded (Knight, 2007; Schuwirth and van der Vleuten, 2011; Bloxham, 2014). Problems associated with conventional methods for summative assessment, such as high-stakes, end of course examinations, are that they are seen as something that is done to the students. They are separated from the pedagogical process and construct learners as passive subjects with no role other than to subject themselves to the assessment acts of others, to be measured and classified (Boud, 2007; Schuwirth and van der Vleuten, 2011). This approach is incompatible with encouraging students to adopt more active and deeper approaches to their learning.

Assessment for interprofessional learning may be formative, yet it has been argued that students and educators are more likely to value assessment where it is summative and contributes towards professional qualifications (Domac et al, 2016; Barr et al, 2017). This position is reinforced in Rogers et al.'s (2017) analysis of the assessment of interprofessional learning outcomes where it is contended that inclusion of assessment promotes engagement on the part of students who may otherwise tend to pay more attention to their uniprofessional learning. Furthermore, different types of assessment for interprofessional learning in combination are recommended, with those that look to both the individual learners and their performance within a group or team setting (Rogers et al, 2017). Reflective diaries, learning logs, portfolios and objective structured clinical examinations (OSCEs) are some of the assessment methods identified (Barr et al, 2017).

However, for assessment of interprofessional learning to be truly effective, curriculum design needs to go further. It is not simply a matter of appreciating and responding to the equation of assessment *of* learning with summative assessment, and assessment *for* learning with formative assessment. Consideration also needs to be given to developing a smorgasbord of diversified assessment strategies to capture and accumulate the complex range of knowledge, skills and capabilities that a healthcare professional is expected to perform, while building in opportunities for feedback about the assessment task and feedforward to improve performance on similar tasks in the future.

Towards best practice for assessing interprofessional learning

Best practice in the assessment of interprofessional learning is predicated on achieving constructive alignment between the desired learning outcomes, the learning activities undertaken and the means by which they are assessed (Biggs and Tang, 2011). For effective assessment, programme developers need to interrogate the contribution that the assessment is making to desired learning outcomes with the goal of promoting and improving student learning by making it authentic, fit-for-purpose, robust and resilient (Sambell and Brown, 2020). Assessment tasks vary in the types of learning outcome they are capable of assessing and can be mapped against Bloom's (1956) taxonomy of educational objectives - from knowledge-based recall of information by means of factual tests such as short answer and multiple-choice questions; through performance-based application of both professional knowledge, communication and teamwork skills performed in simulation and objective structured clinical examinations (OSCEs); to analysis and evaluation demonstrated in reflective practice-based assignments such as e-portfolios or reflective individual and group blogs (Hutchings et al, 2013; Bloxham, 2014; Anderson and Kinnair, 2016). The challenge for integrating interprofessional education learning outcomes and their assessment within the core curriculum for healthcare programmes is to identify the additional contribution interprofessional learning brings which should not overlap with uniprofessional education learning outcomes, areas, and assessments (Anderson and Kinnair, 2016).

Furthermore, the application of student assessment to programme planning and maintenance is frequently overlooked. Assessment in interprofessional learning can be used to provide information for educators. Pre and post session testing assists programme designers, firstly, for checking the status of the learners prior understanding of the topics. This is of particular interest in interprofessional learning where the extent and nature of knowledge and skills necessarily differs between disciplines. Secondly, it reveals what the learners have drawn from the experience of the course. This is also particularly important in interprofessional learning where students from different disciplines may have different learning objectives (O'Keefe and Ward (2016). Having discussed this heterogeneity of objectives encountered in interprofessional learning, it may be difficult to reconcile the summative, formative and course design dimensions of assessment.

The role of assessment in warranting or certifying student achievement means that being able to verify the validity and reliability of summative assessments is very important (Bloxham, 2014). Achieving best practice in the assessment of interprofessional learning is also dependent on agreement of standards against which performance of learning can be judged and much collaborative work has been undertaken to develop a number of interprofessional competency and capability frameworks for use in learning outcomes-focused curricula in healthcare (Frank et al, 2010; Thistlethwaite et al, 2010, Thistlethwaite et al, 2014; Rogers et al, 2017). Yet it has been argued that it is enormously difficult to warrant complex higher order learning achievements, reliably and validly, let alone attempt to grade them, represented in the kind of soft skills within the psychosocial domain valued by employers, which include self-efficacy, autonomy, interpersonal relationships and leadership skills (Knight and Yorke, 2003; Knight, 2007; Yorke, 2011).

Translating what is important to assess within interprofessional learning, Rogers et al's (2017) panel of interprofessional education leaders recommend including outcomes in the following six domains: role understanding, interprofessional communication, interprofessional values, coordination and collaborative decision-making, reflexivity and teamwork; yet they too identify that the outcomes are 'somewhat nebulous' and difficult to define and warrant for competence to practice (Rogers et al, 2017: 353). Similarly, Domac et al (2016: 532) recognise that despite guidance for the assessment of interprofessional competence and capability, it remains challenging to assess interprofessional learning due to 'diffuse understandings of professionalism', including 'value-based principles for

practice, accountability, human professional behaviours such as empathy, compassion and altruism, how to communicate, boundaries to frame practice with service users and team working.’

What then is the way forward for best practice in the assessment of interprofessional learning? The social nature of the enterprise of assessment has been captured by a number of writers. Yorke (2011: 251) argues that ‘the practice of grading and the cumulation of grades into an overall index of achievement are *socially constructed activities* that fall a long way short of what is expected of scientific measurement.’ Correspondingly, Rogers et al (2017: 350) cite Lurie’s (2012) argument that, because interprofessionalism is, like many others, mainly a *social competence*, it may be more appropriate to abandon reductionist approaches to measurement altogether and rather embrace complexity in relation to “patterns of human performance in the clinical setting (p 56)”.

This understanding of the social nature of assessment gives prominence to professional judgement over measurement, while acknowledging the value of what Yorke (2011) describes as a ‘menu-marking approach’, using marking criteria and rubrics, derived from frameworks and standards against which less experienced markers can develop their expertise as assessors. It recognises and values the professional judgement of programme teams in steering a middle course through the integration of curriculum design and assessment and supports the argument that where ‘well-chosen and contextualized, interprofessional competencies can usefully complement the broader attribute descriptions typical of uni-professional standards and can direct students to the specific areas of learning required’ (Thistlethwaite 2014: 873-874).

The exercise of judgement is not confined to programme planners and assessors. For students to become agents for change, they need assessment which involves cognitive challenge, development of metacognitive capabilities, shaping of identity, building of confidence and growth towards active citizenship (Healey et al, 2016; Brown and Sambell, 2020). Best practice in assessment for interprofessional learning can contribute by nurturing the progression and advancement of formative professional judgement on the part of the learner. Anderson and Kinnair (2016) identified the aspirations of participating professional leads in developing critically reflective students who are capable of thinking differently about rapidly changing modern care design and delivery within an interprofessional education programme for health care professions.

A further welcome steer towards the integral role of practice-based learning in health care programmes and the challenges of incorporating interprofessional practice learning, that contributes to meeting the learning outcomes and competencies required for safe and effective professional practice, reported in Hutchings et al (2022), is reflected in the recent World Health Organisation (WHO) report (2022) which calls for competency-based learning within practice. The Global Competency Framework for Universal Health Care (World Health Organisation, 2022) reaffirms the application of knowledge, skills, attitudes, and behaviours to performance in the practice context as the means for demonstrating and assessing the mastery of learning outcomes by means of a set of defined competencies for education programmes. The WHO competency framework emphasises that knowledge, skills and attitudes are developed interdependently, and the effective behaviours required by the health workforce are not learned in isolation, but in the context of the tasks and situations for real-world practice, hence the need for practice-based authentic integrated assessment capable of assessing multiple aspects of developing competencies.

Such development and valuing of well-designed authentic assessment practices when paired with selected interprofessional learning competencies or capabilities can be transformative with relevance to students’ future lives (Villarroel et al, 2018). This forward agenda for effective interprofessional education assessment aligns with Gordon and Walsh’s (2005) argument for embracing capability rather than competence for assessment of interprofessional learning. While both capability and competence are geared to demonstrating progression over time, capability does not stop at a student

demonstrating that they can undertake a task successfully, but is defined by Fraser and Greenhalgh (2001) as an integrated application of knowledge where the student or practitioner can adapt to change, develop new behaviours, and continue to improve performance in different contexts.

The resonance of Fraser and Greenhalgh's (2001) summary argument continues today, echoing even more strongly for the development of assessment practices in a post-COVID era:

- In today's complex world, we must educate not merely for competence, but for capability (the ability to adapt to change, generate new knowledge, and continuously improve performance)
- Capability is enhanced through feedback on performance and the challenge of unfamiliar contexts
- Education for capability must focus on process (supporting learners to construct their own learning goals, receive feedback, reflect, and consolidate) and avoid goals with rigid and prescriptive content.

In seeking to nurture student learning for the longer term, we argue for an interprofessional learning curriculum, where appropriately designed assessment practices are constructively aligned with interprofessional competencies. The focus of collaborative judgements by programme teams is directed to teaching and assessment for learning, which should contribute to learner judgement underpinned by critical thinking, self-assessment and self-regulation. Programme teams need to acknowledge the influential nature of assessment for learning and the benefits of a balanced and sustainable diet of assessment, taking into account the impacts of local contexts with resource constraints and programme requirements. The desired outcome is to nurture student capabilities and build staff expertise in curriculum design and assessment for effective interprofessional learning.

The idea of integrating and embedding assessment in the learning process is not new, but the impact of COVID-19 triggered the need for changes in assessment to maintain some level of continuity for students and their qualifications while managing assessment processes remotely (Brown and Sambell, 2020). In this way responses and adaptations as a result of COVID-19 provide the impetus for rethinking the discourse of assessment and redressing the balance between assessment *of* learning and assessment *for* learning which contributes towards the formation of the graduate practitioner, "a capable person who can engage in professional work and contribute to society as an informed citizen" (Boud 2007: 19).

Assessment innovations and challenges during COVID-19 pandemic

Where the pandemic has clearly accelerated transitions to online teaching and learning, assessment has been similarly impacted. Various terminologies have been utilised over recent years to describe assessment that is facilitated through the use of technology, including computer based or aided assessment, online assessment, e-assessment, technology enhanced assessment and digital assessment (Timmis et al, 2016). In 2020 JISC suggested that the UK was lagging behind other countries when it came to the use of such assessment, with investment required in data systems, infrastructure and staff development. However, given the rapid pivot to online delivery and assessment and despite the inherent challenges faced by both students and staff, a number of examples are cited within the literature and the case studies within this paper, which demonstrate the breadth of creativity and innovation of approach to alternative online assessment in relation to interprofessional education.

In relation to the assessment of healthcare students in particular, Sahu et al (2022) determine the essential e-assessment modes to be knowledge-based, performance and practice-based assessment, utilising options such as open-ended short answer questions, problem-based questions, viva examinations and recorded objective structured clinical exams (OSCEs). Further examples highlighted within the literature utilised in the assessment of healthcare students in particular, include the use of multiple choice questions, self-assessment, projects, portfolios, peer evaluation, quizzes, online

discussions and open book examinations (Kearns, 2012; Kumar et al, 2013; Kühbeck et al, 2019; Zagury-Orly and Durning, 2021). However, as with any form of assessment, e-assessment options need to be selected carefully, according to what they are capable of assessing and mapped against intended learning outcomes. For example, e-assessment using poorly designed multiple-choice questions has been subjected to criticism, whereby students tend to adopt a surface approach, attempting to recall and reproduce information, rather than adopting a deep approach, seeking to make sense of the learning and to apply to professional practice (Gibbs, 2006; Hutchings et al, 2013). Other examples of assessment, some of which have been successfully used in the assessment of interprofessional learning and facilitated through technology, include the use of blogs, wikis, and include self and peer assessment (Burns et al, 2021). These more discursive and reflective forms of e-assessment, in addition to role plays, simulation and observations are deemed capable of assessing students' higher order thinking and practical skills (Timmis et al, 2016; Appiah and Van Tonder, 2018).

For both staff and students this transition presented a challenge in terms of digital literacy and infrastructure, coupled with, for example, the skills and confidence in the use of online pedagogical approaches for staff and motivation, time management and accessibility issues for students (Rajab et al, 2020; Montenegro-Rueda et al, 2021; Sahu et al, 2022). However, if designed and deployed effectively, as outlined above, with consideration of optimal methods aligned with the nature (whether knowledge-based, performance or practice-based) and level of learning outcomes to be achieved, different forms of e-assessment have the ability to both support and improve student learning. Those e-assessments have shown significant advantages including enhanced flexibility in terms of geographic location and time, enhanced opportunities for collaboration and peer learning, assessment of problem solving skills and the facilitation of meaningful, timely and accessible student feedback (Timmis, 2016; Appiah and Van Tonder, 2018). García-Peñalvo et al (2021) outline a series of recommendations and considerations for the use of online assessment in higher education, with regard to technology, inclusiveness and e-proctoring.

Further consideration will be given to the COVID-19 adaptations and opportunities for innovation in relation to the assessment of interprofessional education through the following case study reports and reflections from academics working with a range of professional groups. The case studies were acquired from members of CAIPE and their affiliated institutions, who were invited to outline how they had responded to the assessment of interprofessional education during the pandemic, identifying changes in approach and the resultant impact for students and staff.

Assessment of Interprofessional Learning: Case Studies

Case studies from Qatar, England and Scotland highlight a number of adaptations that faculties have made in the assessment of interprofessional learning. In some instances, these adaptations raised a number of challenges for both students and faculty. On the other hand, some of the adaptations enabled new opportunities for developing future-facing interprofessional education assessment strategies.

Qatar University, Qatar: developing a cross-Faculty assessment strategy

Previous methods of interprofessional education assessment

In Qatar University, interprofessional education is integrated in the different healthcare curricula, including the College of Pharmacy, College of Health Sciences, College of Medicine and College of Dental Medicine. Usually, the assessment methods vary across the colleges - in the College of Pharmacy and College of Health Science, interprofessional education is usually assessed through written reflective accounts. Assessment by portfolio is used in the College of Medicine and Dental Medicine and the College of Pharmacy assesses their first year students via multiple choice questions and short written answers. For students required to complete reflective accounts and portfolio tasks,

this is undertaken after engagement with an interprofessional education activity within an academic environment, or following an interprofessional education activity within their clinical placement.

What adaptations occurred due to COVID-19 and what were the challenges?

As interprofessional education activities moved to online delivery, several adaptations had to be implemented to ensure continuity of IPE activity (Wetzlmair et al, 2021). Student engagement in online interprofessional education activities also varied as many students were reluctant to utilise their cameras and some faced technical difficulties. This variation in interprofessional education experience and absence of assessment of interprofessional education influenced student engagement for some of the participating professions. It was a particular challenge for those students who were still required to write a reflective written account following their online interprofessional education experience.

What opportunities have occurred for future interprofessional education assessment strategies?

The COVID-19 pandemic was, however, an opportunity to reflect on the assessment strategies employed and work towards unifying assessment across the different health colleges with the aim of ensuring:

- Similar interprofessional education exposure to all Qatar University Health students ensuring equal opportunities for all
- Structured integration and assessment of interprofessional education
- Graduating a capable and competent, collaborative practice ready workforce, who are equipped with the skills to work interprofessionally

To address this, an interprofessional education passport programme was developed. Upon completion and fulfilment of its requirements, the students received a certificate of passport completion, signed by the Vice President for Health and Medical Sciences. Students could then add this to their curriculum vitae or portfolio. The purpose of the passport was to:

- Motivate students to attend, participate and engage in the interprofessional education activities as part of a structured programme
- Provide a tool to enable students to participate in interprofessional education activities as part of their courses in a progressive manner, tailored to their level of study
- Enable students to meet the interprofessional education shared competencies and enhance their understanding of interprofessional education concepts and principles
- Enable students to demonstrate that they have met the interprofessional education requirements.

For the interprofessional education passport programme, the faculty at Qatar University collaboratively designed and implemented a comprehensive assessment strategy to target the goals and educational competencies of interprofessional education. All students are now required to complete a minimum of four interprofessional education activities, with at least one at each level of exposure, immersion and mastery (based on the University of British Columbia interprofessional education model (Charles et al, 2010; El-Awaisi et al, 2017)). For each interprofessional education activity, students are required to submit a reflective assignment, as per their assigned course or module, to add to their passport. These assignments are graded by the respective colleges using an assessment rubric designed for each level of study, with a score assigned to the course or module.

Glasgow Caledonian University, United Kingdom: developing digital literacy for staff and students

Previous methods of interprofessional education assessment

The interprofessional education framework developed by Glasgow Caledonian University, is similarly based on the University of British Columbia's exposure to mastery model (Charles et al, 2010). The framework utilises a varied and cohesive assessment strategy, which is horizontally and vertically aligned, both in terms of the framework and programme specific modules.

What adaptations occurred due to COVID-19 and what were the challenges?

The first year module within the framework focuses on the generation of professional attributes. 395 Allied Health and Social Work pre-registration students (from the disciplines of Diagnostic Imaging, Occupational Therapy, Oral Health Science, Orthoptics, Physiotherapy, Podiatry, Prosthetics and Orthotics, Radiotherapy and Oncology and Social Work) undertook the 11-week module in academic session 2020 to 2021.

Interprofessional groups studied a variety of concepts relating to professional requirements including professional standards and behaviours, communication, conflict management, reflection, organisational context, cultural competence, cardiopulmonary resuscitation, infection control, data protection and personal resilience. The module utilised a flipped classroom approach, whereby students undertook two to four hours of asynchronous activities weekly, followed by a two hour online synchronous session.

Assessment required students to develop an electronic portfolio and enter content on a weekly basis, including evidence of core clinical skills such as cardiopulmonary resuscitation, data protection, and infection control. These core clinical skills were deemed mandatory and non-completion led to an automatic fail. Additional content related to reflection upon aspects such as cultural competence, communication, personal resilience and conflict resolution.

The module team faced challenges in relation to the need to develop and evidence clinical skills such as cardiopulmonary resuscitation and infection control in an online environment. To mitigate these challenges, the team utilised a variety of pre-existing resources available on the TURAS NHS Education for Scotland digital learning platform (designed to support health and care professionals working in the public sector) and resources developed by the British Resuscitation Council. Written instructions were provided to students to enable them to access the external platforms; however, non-completion of mandatory skills led to a large volume of student fails. It became clear non-completion was primarily due to some students being unable to access the relevant external platforms. In an attempt to remedy this situation for future cohorts, these mandatory sections are now delivered earlier within the module to enable difficulties to be detected at an earlier stage. Additionally, video content has also been developed to illustrate access to the external content, which serves to supplement the written instructions.

The digital literacy of both staff and students proved an additional challenge. Staff training was provided and students were provided with both written and video instructions in relation to the functionality of the e-portfolio. Despite this additional support, some students and staff continued to struggle and the video guidance has since been further developed, and appears to be working well.

What opportunities have occurred for future interprofessional education assessment strategies?

COVID has presented interprofessional education teams with many challenges and conversely has enabled teams to reflect and review teaching and assessment practice that optimises the digital capacity of our students and graduates. The preparation for professional practice (PPP) module team at GCU has utilised this experience to amend assessment strategies. The team were used to utilising wikis within interprofessional education modules (Burns et al, 2021) and they have amended practice to enable students to develop an e-portfolio within a wiki platform. The e-portfolio allowed students to demonstrate the completion of mandatory placement materials, reflective practice and collaborative work within an IT platform. This platform also allowed students to utilise the full digital functionality of the platform enabling them to develop and demonstrate their digital capabilities. This aligns our online teaching and learning approach to policy requirements relating to the need to have a digitally skilled workforce (Scottish Government and COSLA, 2021).

In terms of lessons learned the development team did make some assumptions around student and staff digital capabilities, which were found to be limited. This necessitated the development of guidance videos that demonstrated how to make full use of the digital functionality of the wiki.

Northumbria University, United Kingdom: Developing alternative methods where interprofessional practice learning and assessment are disproportionately impacted

Previous methods of interprofessional education assessment

At Northumbria University interprofessional education is assessed both within the practice placement setting and within module learning outcomes throughout the curriculum. In the practice placement setting, students gain experiences of working with other professional colleagues and these core competencies can be formatively and summatively assessed within placement documentation. For example, in line with current European Union regulations for nursing students, this includes completing a 3-year experience log to capture knowledge and skills gained whilst learning about other professions in university, documenting experiences gained during placement and then reflecting on the relationship between theory and practice. Different professional regulatory body requirements for health and social care students affect how interprofessional activity is assessed, however, all share the same goal of requiring students to demonstrate effective and professional collaboration with others to promote safe and holistic care in practice environments.

In university, learning outcomes for modules and programmes include collaborative and interprofessional practice. For example, a second year undergraduate nursing practice module which is assessed by formative and summative assessment includes a learning outcome that requires students to demonstrate collaborative working skills with professionals in addition to service users and carers, whilst demonstrating knowledge and skills of how collaboration improves patient safety. Another skills module at the same level which is assessed by a written assignment requires students to achieve a learning outcome which relates to demonstration of personal and professional attributes needed to enable effective team working as part of a wider interprofessional team.

What adaptations occurred due to COVID-19 and what were the challenges?

At Northumbria University, academic assessments were largely unaffected by the pandemic. Modules were delivered online when face-to-face teaching was not essential. All interprofessional related assessments were submitted online and emergency assessment regulations were applied due to the pandemic.

Practice assessment of interprofessional collaborative practice was detrimentally affected by cancelled placements. Furthermore, students who were medically vulnerable were required to shield following government guidance and were therefore unable to attend placements. When opt-in placements were offered as a result of Nursing and Midwifery Council related changes in the United Kingdom, some students opted out or were unable to opt in, and therefore missed their placement. Some students in placement reported additional challenges gaining experiences and being assessed. Practice assessments therefore had to be achieved in a subsequent placement area.

In March 2020, during the first wave of the COVID-19 pandemic, first year nursing student placements were paused and students were removed from practice environments due to NMC emergency regulation guidelines (Nursing and Midwifery Council, 2020). University staff were also prevented from visiting students and practice partners within placement environments. This had an impact on the assessment of students' interprofessional competence in practice. To achieve practice competencies, including learning about other professions, a range of virtual online Collaborative Technology Enabled Care Services (Co-TECS) learning was established throughout NHS Trusts in the region. Co-TECS provided online educational provision which was practice focused and was delivered by NHS placement practitioners to students who were unable to attend placement. In addition to this

programme, essential teaching could be delivered at university, therefore the students followed a comprehensive simulation teaching programme which was delivered on campus enabling interprofessional competencies to be achieved that would ordinarily have been achieved in practice placement.

The disruption caused by the pandemic affected both students and staff. Staff have been impacted detrimentally due to the additional challenges, stress and pressures imposed by supporting, teaching and finding alternative assessment methods. It was more difficult for staff to assess students' placement achievements and assessments were conducted virtually using digital platforms such as Microsoft Teams or email. Due to time missed from placement, traumatic experiences, shielding, or diminished opportunities for development during the pandemic, many students experienced a reduction in confidence or required longer to achieve competencies, programme extensions were required to complete placement hours for registration and several students required supportive action plans to facilitate their assessment in practice. Student mental health and well-being was often affected; this resulted in increased Occupational Health referrals, signposting to student support services, academic and placement staff spending significant periods of time supporting students, compounded by concern about progression and programme completion. Working at home was problematic for many students as they completed university assessments and the pandemic prevented or inhibited in person collaboration between interprofessional students, creating challenges in developing collaborative practice skills and acquiring the knowledge and experience needed for interprofessional assessments.

The pandemic further reduced opportunities for interprofessional teaching between regional universities. Medical students from another regional university were unable to join Northumbria students virtually for their undergraduate interprofessional educational requirements due to technological constraints with online platforms. 800 Northumbria University health and social care students would ordinarily be joined by several hundred medical students, but the pandemic prevented this activity. Northumbria University has an established interprofessional simulation programme with another regional university whereby third year nursing students and medical students (fourth and fifth year) participate in on campus simulation. These events were not possible; therefore, sessions were adapted to increase simulation using a uniprofessional approach, delivered by a strong clinical and academic teaching team, with an emphasis on interprofessionalism. A virtual simulation ward was also developed to compensate for missed on campus simulation. Part of this resource included a repository of professional roles and responsibilities to facilitate the successful achievement of the learning outcome regarding safe collaborative practice. Student knowledge and understanding was then assessed using a written assignment.

What opportunities have occurred for future interprofessional education assessment strategies?

Despite the inherent challenges of the pandemic, staff have developed a wide range of skills including the use of digital platforms and have demonstrated creativity in relation to teaching delivery and assessment design and deployment.

University of Northampton, United Kingdom: Technology-facilitated adaptations and digital readiness

Previous methods of interprofessional education assessment

The Faculty has an interprofessional education 'collaborative curriculum' meaning it is summatively assessed by a shared/common learning outcome within first, second and third year modules.

- First year: Demonstrate an understanding of the impact of the interprofessional role and the individual's responsibilities within the health, education and social care community
- Second year: Evaluate differences in interprofessional roles and services and their associated impact on practice and the service user experience

- Third year: Critically analyse the different approaches necessary for collaborating effectively in an interprofessional learning context within health, education and social care

Programmes across health, education and social care assess the learning outcome in a variety of ways, including but not limited to reflective accounts (midwifery), portfolios (podiatry, social work), presentations (nursing, OT) and vivas (paramedic science).

What adaptations occurred due to COVID-19 and what were the challenges?

Occupational Therapy includes the learning outcome in their skills modules in first, second and third year and made the following adaptations:

- Skills 4 – reconstructing the group delivery of the assessment, constructing an online element, with delivery of a presentation that covers the delivery of a group activity in theory. Usually the students would have met as a small group, and other students would have participated in the planned activity, but this was not possible, so was adapted to a more theory based online delivery.
- Skills 5 – adapting the poster presentation to be delivered online. Instead of paired delivery in person, the students separately recorded their poster presentations, using Kaltura Capture Software. The students then met with a tutor in a virtual classroom to conduct the questions element of the assessment.

For Social Work, the assessments are written assignments, which were not significantly affected by COVID-19.

The main impact, however, was on teaching delivery - the biggest challenge being a significant 'digital divide' amongst staff and students in relation to the delivery of synchronous sessions. Those who were comfortable with online engagement and learning were minimally affected; for those who struggled with technology, it has proved more difficult. These struggles were not primarily related to student motivation, but to digital readiness, specifically technical challenges, for example reliable internet access and availability of headsets.

What opportunities have occurred for future interprofessional education assessment strategies?

Since COVID-19 restrictions have been lifted and staff and students have returned to campus, in the main, assessment strategies have reverted to their original formats in line with how programmes had been originally validated. That said, COVID-19 did provide opportunities for innovation and creativity in design and facilitation of assessments that had traditionally been conducted face to face, such as group/individual presentations. Some forced adaptations have delivered additional rewards such as students developing their digital capabilities through using Kaltura Capture software to record presentations and consolidating their digital confidence and competence through becoming accustomed to interacting online using virtual learning environments (VLEs) such as Blackboard Collaborate.

Discussion and Considerations

Assessment is a fundamental part of the education process, which brings together the entire teaching and learning journey of the student (Montenegro-Rueda et al, 2021). The case studies in this paper provide the opportunity to explore how assessment of interprofessional education was adapted during the COVID-19 pandemic. Reflecting on these experiences, it is possible to stand back and consider the key factors which enabled educators to continue to assess interprofessional learning during this challenging time.

As outlined above, assessment can be utilised either as a means to provide students and teachers with an indication of progress and a vehicle through which to provide feedback to enhance performance (formative assessment), or as a means to grade final student performance and determine the extent

of the student's learning (summative assessment) (Dixson and Worrell, 2016; Montenegro-Rueda et al, 2021). El-Awaisi et al (2022) identify a need for valid and reliable formative and summative assessment of interprofessional learning. The case studies presented within this paper illustrate combinations of both approaches, with the impact of COVID-19 primarily affecting the mode of assessment (knowledge-based, performance and practice-based assessment) and a shift in assessment methods from in-person to online assessment.

Although each profession has different regulatory bodies and standards for education, the same drivers for interprofessional collaborative practice such as patient safety and quality delivery of care are inherent to all and can therefore guide common learning outcomes relevant to all health and social care programmes of education. El-Awaisi et al (2022) identify the need for assessment of interprofessional education to be explicitly mapped to interprofessional education shared competencies in line with Rogers et al. (2017) expert panel consensus recommendations for learning outcomes, including competencies around teamwork and effective communication in an interprofessional team, the reflection on those concepts and decision-making based on patients' needs (Anderson & Kinnair, 2016). An additional common key factor in the case studies was the focus on the importance of the role of learning outcomes in constructive alignment (Biggs and Tang, 2011) – whereby the desired learning outcomes, the learning activities undertaken and the means by which they were assessed were carefully aligned. In these case studies, the interprofessional education initiatives employed utilised common learning outcomes within their interprofessional learning activities, but flexibility was employed when it came to each professional programme of study and how they assessed these learning outcomes. The COVID-19 pandemic has thus enabled more flexible adaptations to be made where required but still, however, enabled students to meet learning outcomes.

A thoughtful use of assessment enables programme teams to assess students' performance with regard to specific interprofessional competencies and skills (Kahaleh et al, 2015) grounded in an appreciation of the social nature of assessment and giving prominence to professional judgement (Yorke 2011). Common assessments include written reflections, portfolios, and objective structured clinical examinations (OSCEs) (Anderson & Kinnair, 2016; Barr et al, 2017), which have been demonstrated through the various case studies to be feasible during emergency remote teaching. Furthermore, mixed-methods approaches also appear appropriate for assessing interprofessional education interventions (Kahaleh et al, 2015; Shrader et al, 2017), utilising combinations of carefully designed multiple choice questions, written reflections and presentations. Assessing the roles of health professional students within an interprofessional team, however, remains challenging even with standardised assessment tools (Kahaleh et al, 2015). The assessments often fail to address the top two of Kirkpatrick's outcomes levels: change in organisational practice and benefits to patients and/or clients (Shrader et al, 2017), a finding also reflected by Domac et al (2016) and Rogers et al (2017).

Some students may be required to demonstrate interprofessional outcomes when completing profession-specific assessments; however, procedures, criteria and credits should be consistent across professions and across courses (Wagner & Reeves, 2015). Consideration should also be given to the avoidance of over-assessment of students (Shrader et al, 2017), through for example introducing no more than two standardised forms of assessment (Kahaleh et al, 2015). Additionally, for assessment to be successful it must also be authentic in nature, whether delivered online or face to face (Appiah and Van Tonder, 2018; JISC, 2020; Sutadji et al, 2021) - in other words, ensuring that the knowledge, skills and capabilities gained are applicable in the practice or work setting. Ensuring that the learning outcomes continue to be robustly assessed, while simultaneously creating an authentic learning experience are essential; however, the shift from in-person to online assessment, as reported by Wetzlmair et al (2021) and within the case studies presented here, can prove challenging. As for

online delivery, effective replication of face-to-face assessment to a remote learning environment should entail much more than a 'lift and shift approach', and should ideally entail a redesign of the entire learning and teaching process.

Adaptations to assessment also need to be cognisant of the 'digital divide' that can occur among staff and students. Availability and reliability of IT equipment and confidence in their use are important enablers of sustainable online interprofessional education assessment; on the other hand the challenges acknowledged within the case studies, including lack of confidence in using equipment, varied availability, reliability or usage of functions such as cameras, can all present as significant barriers. This impacted for some on the ability to provide equitable, impactful interprofessional learning experiences for students, where interaction and authentic experiences are key to actual interprofessional collaborative practice within health and social care settings (Barr and Low, 2013; Webb et al, 2019). These challenges also extended to assessment, where challenges with technology impacted for some higher education institutions on the ability to assess students' interprofessional learning. Further considerations for e-assessment should also include the issues of consistency, transparency, practicability, accessibility and the emerging challenge of integrity, through the prevention of student academic misconduct and dishonesty (Appiah and Van Tonder, 2018).

Amongst the challenges, however, there are promising signs of new opportunities for re-examining and reimagining the assessment of interprofessional learning in the future, including opportunities for assessing higher order thinking and practical skills, alongside increased flexibility over time and location. Nonetheless as we transition from the acute phase of the COVID-19 pandemic, educators need to continue steering a middle course, cognisant of best practice for assessing interprofessional learning and the impact of the aforementioned considerations on both educators and students.

CPD reflective questions

- How did the COVID-19 pandemic influence the assessment of students undertaking interprofessional education?
- What opportunities and challenges do IPE assessments face post-pandemic?
- What are the key aspects that can be transferred to post-pandemic assessment of interprofessional education?

Upcoming article: Article 7 will focus upon the theory behind service user and carer involvement in teaching and learning, as well as providing real-life examples and focusing on some of the lessons learned to ensure this involvement can be successfully achieved.

Acknowledgements: Thanks to all members of the CAIPE Experience Research Subgroup for contributing to this series of articles.

Declaration of interest: The authors declare that there are no conflicts of interest.

References

Anderson ES, Kinnair D. Integrating the assessment of interprofessional education into the health care curriculum. *Journal of Taibah University Medical Sciences*. 2016;11(6):552-558.
<https://doi.org/10.1016/j.itumed.2016.10.005>

Appiah M, Van Tonder F. E-Assessment in Higher Education: A review. *International Journal of Business Management and Economic Research*. 2018;9(6);1454-1460.

Barr H, Ford J, Gray R, Helme M, Hutchings M, Low H, Machin A, Reeves S. Interprofessional education guidelines. Centre for the Advancement of Interprofessional Education. 2017. <https://www.caipe.org/resources/publications/caipe-publications/caipe-2017-interprofessional-education-guidelines-barr-h-ford-j-gray-r-helme-m-hutchings-m-low-h-machin-reeves-s> (accessed 1 June 2022)

Barr H, Low, H. Introducing interprofessional education. CAIPE: London. 2013. <https://www.caipe.org/resources/publications/caipe-publications/barr-h-low-h-2013-introducing-interprofessional-education-13th-november-2016> (Accessed 9 June 2022)

Biggs J, Tang C. Teaching for quality learning at university. New York: McGraw Hill. 2011.

Bloom B. Taxonomy of educational objectives. Handbook 1: Cognitive domain. New York: McGraw Hill. 1956.

Bloxham S. Assessing assessment: new developments in assessment design, feedback practices and marking in higher education. In: Fry H, Ketteridge S, Marshall S. (eds) A handbook for learning and teaching in higher education: enhancing academic practice. (4th ed.). London: Routledge. pp.107-122. 2014.

Boud D. Reframing assessment as if learning were important. In: Boud D, Falchikov N. (eds) Rethinking assessment in higher education: learning for the longer term. London: Routledge. pp.14-25. 2007

Boud D, Falchikov N. Rethinking assessment in higher education: learning for the longer term. London: Routledge. 2007.

Brown S, Sambell K. Changing assessment for good: a major opportunity for educational developers. Staff and Education Development Association. <https://www.seda.ac.uk/covid-19-assessment-collection/>. 2020. (accessed 1 June 2022)

Burns L, McDermott J, Mulholland R, Blumenthal S, McLarnon N. An online module evaluation of the role and effectiveness of wikis in fostering collaborative practice. Journal of Interprofessional Care. 2021;35(5):791-793. <https://doi.org/10.1080/13561820.2020.1806217>

Centre for the Advancement of Interprofessional Education. Interprofessional education – a definition. 2002. <https://www.caipe.org/about-us> (accessed 1 June 2022)

Charles G, Bainbridge L, Gilbert J. The University of British Columbia model of interprofessional education. Journal of Interprofessional Care. 2010;24(1):9-18. <https://doi.org/10.3109/13561820903294549>

Dixson DD, Worrell FC. Formative and summative assessment in the classroom. Theory into Practice. 2016;55(2):153-159. <https://doi.org/10.1080/00405841.2016.1148989>

Domac S, Anderson ES, Smith R. Learning to be interprofessional through the use of reflective portfolios? Social Work Education. 2016;35(5):530-546. <https://doi.org/10.1080/02615479.2016.1178717>

El-Awaisi A, Wilby KJ, Wilbur K, El Hajj MS, Awaisu A, Paravattil B. A Middle Eastern journey of integrating Interprofessional Education into the healthcare curriculum: a SWOC analysis. BMC medical education. 2017;17(1):1-10. <https://doi.org/10.1186/s12909-016-0852-5>

El-Awaisi A, Jaam M, Wilby KJ, Wilbur K. A systematic review of the use of simulation and reflection as summative assessment tools to evaluate student outcomes following interprofessional education activities, *Journal of Interprofessional Care*. 2022-02-06:1-9.

<https://doi.org/10.1080/13561820.2022.2026899>

Frank JR, Mungroo R, Ahmad Y, Wang M, De Rossi S, Horsley T. Toward a definition of competency-based education in medicine: a systematic review of published definitions. *Medical Teacher*.

2010;32(8):631–637. <https://doi.org/10.3109/0142159x.2010.500898>

Fraser SW, Greenhalgh T. Coping with complexity: educating for capability. *British Medical Journal*.

2001;323(7316):799-803. <https://doi.org/10.1136/bmj.323.7316.799>

García-Peñalvo FJ, Corell A, Abella-García V, Grande-de-Prado M. Recommendations for mandatory online assessment in higher education during the COVID-19 pandemic. In: Burgos D, Tlili A, Tabacco A. (eds) *Radical solutions for education in a crisis context: COVID-19 as an opportunity for global learning*. Lecture Notes in Educational Technology. Springer Singapore. pp.85-98. 2021.

<https://doi.org/10.1007/978-981-15-7869-4>

Gibbs G. How Assessment Frames Student Learning. In: Bryan C, Clegg K. *Innovative Assessment in Higher Education*. London: Routledge. pp.23-36. 2006.

Gordon F, Walsh C. A Framework for Interprofessional Capability: Developing Students of Health and Social Care as collaborative workers. *Journal of Integrated Care*. 2005;13(3):26-33.

<http://dx.doi.org/10.1108/14769018200500023>

Healey M, Flint A, Harrington K. Students as partners: Reflections on a conceptual model. *Teaching & Learning Inquiry*. 2016;4(2):1-13. <http://dx.doi.org/10.20343/teachlearning.4.2.3>

Hutchings M, McLarnon N, McDermott J, Watson, A., Power A, Anderson E S, Owens M. Practice-based-learning and the impacts of COVID-19: doing it for real? *British Journal of Midwifery*. 2022;

30(6):333-344. <https://doi.org/10.12968/bjom.2022.30.6.333>

Hutchings M, Quinney A, Galvin K, Clark V. The yin/yang of innovative technology enhanced assessment for promoting student learning. In: Greener S. (ed) *Case studies in e-learning research for researchers, teachers and students*. Reading: Academic Publishing International. pp.66-79. 2013.

JISC (Joint Information Systems Committee). The future of assessment: Five principles, five targets for 2025. 2020. <https://www.jisc.ac.uk/reports/the-future-of-assessment> (accessed 1 June 2022)

Kahaleh AA, Danielson J, Franson KL., Nuffer WA, Umland E.M. An interprofessional education panel on development, implementation, and assessment strategies. *American Journal of Pharmaceutical Education*. 2015;79(6). <https://doi.org/10.5688/ajpe79678>

Kearns LR. Student Assessment in Online Learning: Challenges and Effective Practices. *MERLOT Journal of Online Learning and Teaching*. 2012;8(3).198-208.

Knight P. Grading, classifying and future learning. In Boud, D. and Falchikov, N. (eds) *Rethinking assessment in higher education: learning for the longer term*. London: Routledge. pp.72-86. 2007.

Knight P, Yorke M. *Assessment, learning and employability*. Maidenhead: Open University Press. 2003.

Kühbeck F, Berberat PO, Engelhardt S, Sarikas A. Correlation of online assessment parameters with summative exam performance in undergraduate medical education of pharmacology: a prospective cohort study. *BMC Med Educ.* 2019;19(1):412. <https://doi.org/10.1186/s12909-019-1814-5>

Kumar LR, Bedra A, Karkera R. Perception of medical students on e-assessment conducted through Yengage portal. *Arch Med Health.* 2013;1(1):61-6. <https://doi.org/10.4103/2321-4848.113577>

Lurie SJ. 2012. History and practice of competency-based assessment. *Medical Education.* 2012;46(1):49–57. <https://doi.org/10.1111/j.1365-2923.2011.04142.x>

Montenegro-Rueda M, Luque-de la Rosa A, Sarasola Sánchez-Serrano JL, Fernández-Cerero J. Assessment in Higher Education during the COVID-19 Pandemic: A Systematic Review. *Sustainability.* 2021;13(19):10509. <https://doi.org/10.3390/su131910509>

O’Keefe M, Ward H. Implementing interprofessional learning curriculum: how problems might also be answers. *BMC Medical Education.* 2018;18:1-9. <https://doi.org/10.1186/s12909-018-1231-1>

Nursing and Midwifery Council. Emergency standards for nursing and midwifery education. London: Nursing and Midwifery Council. 2020

Power A, Sy MP, Hutchings M, Coleman T, El-Awaisi A, Kitema GF, Gallagher J, Herath C, McLarnon N, Nagraj S, O’Carroll V, Owens M, Park V, Pope E, Wetzlmair L-C, Greaves PJ, Anderson E S. Learning in lockdown: exploring the impact of COVID-19 on interprofessional education. *British Journal of Midwifery.* 2021;29(11):648– 652. <https://doi.org/10.12968/bjom.2021.29.11.648>

Rajab MH, Gazal AM, Alkattan K. Challenges to Online Medical Education During the COVID-19 Pandemic. *Cureus.* 2020;12(7):e8966. <https://doi.org/10.7759%2Fcureus.8966>

Rogers GD, Thistlethwaite J, Anderson ES, Dahlgren MA, Grymonpre RE, Moran M, Samarasekera DD. International consensus statement on the assessment of interprofessional learning outcomes. *Medical Teacher.* 2017;39(4):347-359. <https://doi.org/10.1080/0142159x.2017.1270441>

Sahu PK, Dalcik H, Dalcik C, Gupta MM, Chattu VK, Umakanthan S. Best practices for effective implementation of online teaching and learning in medical and health professions education: during COVID-19 and beyond. *AIMS public health.* 2022;9(2):278–292. <https://doi.org/10.3934%2Fpublichealth.2022019>

Sambell K, Brown, S. The changing landscape of assessment: some possible replacements for unseen time-constrained face-to-face invigilated exams. Staff and Education Development Association. <https://www.seda.ac.uk/covid-19-assessment-collection> 2020. (accessed 1 June 2022)

Schuwirth LWT, van der Vleuten CPM. Programmatic assessment: From assessment of learning to assessment for learning. *Medical Teacher.* 2011;33(6):478–485. <https://doi.org/10.3109/0142159x.2011.565828>

Scottish Government and COSLA. Enabling, connecting and empowering: Care in the digital Age. <https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2021/10/scotlands-digital-health-care-strategy/documents/enabling-connecting-empowering-care-digital-age/enabling-connecting-empowering-care-digital-age/govscot%3Adocument/enabling-connecting-empowering-care-digital-age.pdf> 2021. (accessed 1 June 2022)

Shrader S, Farland MZ, Danielson J, Sicut B, Umland EM. A systematic review of assessment tools measuring interprofessional education outcomes relevant to pharmacy education. *American Journal of Pharmaceutical Education*. 2017;81(6):119. <https://doi.org/10.5688/ajpe816119>

Sutadji E, Susilo H, Wibawa AP, Jabari NAM, Rohmad SN. Adaptation strategy of authentic assessment in online learning during the covid-19 pandemic. *Journal of Physics: Conference Series*. 2021. <https://doi.org/10.1088/1742-6596/1810/1/012059>

Thistlethwaite JE, Forman D, Matthews LR, Rogers GD, Stekettee C, Yassine T. Competencies and frameworks in interprofessional education: a comparative analysis. *Academic Medicine*, 2014;89(6):869–875. <https://doi.org/10.1097/acm.0000000000000249>

Thistlethwaite J. Moran M. and on behalf of the World Health Organization Study Group on Interprofessional Education and Collaborative Practice. Learning outcomes for interprofessional education (IPE): Literature review and synthesis. *Journal of Interprofessional Care*, 2010;24(5):503-513. <https://doi.org/10.3109/13561820.2010.483366>

Timmis S, Broadfoot P, Sutherland R, Oldfield A. Rethinking assessment in a digital age: opportunities, challenges and risks. *British Education Research Journal*. 2016;42(3):454-476. <https://doi.org/10.1002/berj.3215>

UNESCO. COVID-19: reopening and reimagining universities, survey on higher education through the UNESCO National Commissions. 2021. <https://en.unesco.org/covid19/educationresponse> (accessed 1 June 2022)

Villarreal V, Bloxham S, Bruna D, Bruna C, Herrera-Seda C. Authentic assessment: creating a blueprint for course design. *Assessment & Evaluation in Higher Education*. 2018;43(5):840-854. <https://doi.org/10.1080/02602938.2017.1412396>

Wagner SJ, Reeves S. Milestones and entrustable professional activities: The key to practically translating competencies for interprofessional education? *Journal of Interprofessional Care*. 2015;29(5):507-8. <https://doi.org/10.3109/13561820.2014.1003636>

Webb LA, Lindqvist SM, Bowker L, Leinster S. (2019). Clinical skills as a vehicle for interprofessional learning. *Clinical Teacher*. 2019; 16(5): 448-453. <https://doi.org/10.1111/tct.12809>

Wetzlmair L-C, Kitema GF, O'Carroll V, El-Awaisi A, Power A, Owens M, Park V, McKinley M, Anderson ES, Loder-Fink B. The impact of COVID-19 on the delivery of interprofessional education: It's not all bad news. *British Journal of Midwifery*. 2021;29(12):699-705. <https://doi.org/10.12968/bjom.2021.29.12.699>

World Health Organisation. Global Competency Framework for Universal Health Coverage. 2022. Geneva. Licence: CC BYNC-SA 3.0 IGO. <https://www.who.int/publications/i/item/9789240034686> (Accessed 4 July 2022)

Yorke M. Summative assessment: dealing with the 'measurement fallacy'. *Studies in Higher Education*. 2011;36(3):251–273. <https://doi.org/10.1080/03075070903545082>

Zagury-Orly I, Durning SJ. Assessing open-book examination in medical education: The time is now. *Medical Teacher*. 2021;43(8): 972-973. <https://doi.org/10.1080/0142159X.2020.1811214>