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Article

Transforming Post-Professional Clinical Skill Education with Digitally Integrated Instructional Design: An Industry-Relevant University-Setting Project Series

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Abstract: Transformative digitally integrated pedagogy can enrich learning experiences, diversify the curriculum and broaden access to industry-relevant advanced clinical education for remote learners in medical education. Clinical skills are characterised as the portfolio of practical and interpersonal skills required by practicing clinicians. The purpose of this project was to design a new wholly online post-professional university subject for clinicians in different healthcare disciplines to advance these skills, which would traditionally be taught and assessed in-person. Our methodology included critically reviewing existing evidence of relevant medical skills which need to be included in the curriculum and approaches to their assessment. We designed a subject which dovetailed learning experiences with continuing clinical practice, and developed a new framework for remote video assessment of practical skills. Our pedagogical approaches included a backwards design coupled with a Four-Component Instructional Design Model (4C-ID) approach, which increased access and contextualised learning opportunities for diverse and practicing clinicians. Our narrative synthesis critically shares our experience and insights of embracing digital-technology opportunities while problem-solving to move past barriers. Our impact evaluation and experiential insights offer a platform to reimagine emerging possibilities for future digitally integrated education in medical education and other clinical-skills professions.

Keywords: medical education; clinical education; instructional design; learning; digital technology; pedagogy



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1. Introduction

1.1. Advancing Clinical Skills in Post-Professional Medical Education

Clinical skills can be characterised as the portfolio of practical and interpersonal skills required by health professionals to engage in and deliver a clinical healthcare service. This entails examination, practical procedures, communication, management skills, articulating rationale for actions and outcome meaning-making [1]. Attitudes, values, self-awareness and trustworthiness embody professional disposition beyond medical knowledge [2,3]. Practicing clinicians across healthcare professions commit to continually developing their clinical skill repertoire through post-professional education [4–6] to cultivate expertise in specialised knowledge fields, advanced competencies and professionalism [1,7].

Beyond foundational proficiency, post-professional clinicians execute integrated rather than fragmented skillsets which translates to autonomous decision-making in challenging

situations [8,9]. This demands higher-order thinking and navigating uncertainty [3]. Well-matched post-professional university education therefore supports clinicians to advance and integrate a complex body of knowledge, independent critical analysis and sophisticated information synthesis in supported learning environments [10]. This includes bridging the gap between knowledge acquisition and translation to clinical practice [11].

The university curriculum, which is reverse-engineered from industry established competency standards, enables teaching practice to be aligned to industry needs and requirements. A portfolio of standardised pathway assessments inclusive of knowledge examinations, written case studies and clinical encounter examinations are typical industry-recognised approaches for specialised clinical qualifications [4,6,12]. These are important for recognising educational impact and certifying work-based practice capability.

1.2. Employing Instructional Design with Digitally Integrated Pedagogy to Advance Industry Skills

Real-world clinical skill growth and advancing practice integration are particularly significant for post-professional learners who are already entrusted at graduate level and currently practicing [9]. In contrast to memory-recall, this commands coordinating knowledge, skills, attitudes, transfer to real-world applications, and a higher cognitive load, which can be conceptualised as “complex learning” [13]. It is well recognised that knowledge and competency acquisition does not guarantee translation to clinical practice, warranting deliberate instructional design approaches to link meaningful skill development with real-world application. Approaches which support this in medical education include effectively designed competency-based and simulation-based learning with high-fidelity clinical assessments [14]. Instructional design refers to employing the processes and modelling of how people learn, to guide sequencing and strategies for critical and relevant learning achievements [15]. The Four-Component Instructional Design Model (4C-ID) systematises the end performance of more complex tasks, for example, an authentic end-to-end clinical consultation, as made up of constituent skill execution, with both automatic and problem-solving cognitive schema [16]. To achieve the desired complex skillset, 4C-ID includes structuring whole-task performance, including the desired qualitative dimension, through specifically designed learning tasks, part-task practice, prerequisite procedural information, and timely supportive information [16]. The 4C-ID model is pedagogically well matched to scaffold clinicians’ capability to organise, integrate and co-ordinate an increasingly complex repertoire of clinical skills, in familiar and unfamiliar problem-task scenarios.

With increasing scenario complexity, there is rarely one singular “correct performance” of an integrated clinical skillset, but multiple examples of capable performance which can be soundly justified according to the contemporary evidence and presenting circumstances. Reciprocally, learning and clinical examination approaches therefore need to frame and diversify problems, choices and solutions. Digitally integrated pedagogy broadens opportunities to purposefully create and expose learners to clinically diverse scenarios with inherent variability and multiple acceptable actions, removing in-person boundaries to accommodate an array of need-based features including time, location and clinical practice context. This aligns with the Universal Design for Learning (UDL) guidelines which advocate optimal participation and meaningful outcomes through diversifying engagement, representation, action and expression opportunities [17].

Traditional in-person clinical apprenticeship models are evolving in favour of situated cognitive apprenticeships, digital technology integration and authentic practice translation [18]. This offers post-professional clinicians the choice to remain in practice alongside engaging education activities according to self-defined needs, which is a significant motivational driver within contemporary decolonial pedagogy perspectives [19].

However, practicing clinicians also need their end-point qualification benchmarked and skills validated according to industry-standardised expectations. Industry endorsement of education is important to demonstrate 'fitness to practice' in qualified positions and aptitude recognition for advancing job roles. Clinical practice examinations with authentic patients are a typical industry process for post-professional clinicians to demonstrate both constituent clinical skills and end-performance competency to meet industry requirements. Clinical encounter video assessments are increasingly replacing traditional in-person clinical examinations in post-professional industry career frameworks, which are conducted according to industry assessment criteria [4,6,12]. Industry approaches vary, and there is not one established best-practice approach to digitally integrated clinical examinations.

1.3. Aims and Intentions of This Project Series

The real-world needs of post-professional clinical learners can be met through education programmes constructively aligned to industry standards, including practical and interpersonal skill integration. Aligning education environments, skill accreditation and practical skill application requires a nuanced balance between process standardisation and clinical encounter authenticity. This calls to action the need for complex learning and high-fidelity assessment approaches that (i) integrate clinical skills; (ii) contextualise advancing clinical expertise; and (iii) authentically translate into real-world clinical practice.

The aim of this clinical learning project was to design, deliver and evaluate online approaches to teach and assess industry-relevant advanced clinical skills (which are traditionally delivered face to face). Our objectives were to advance clinical skills, optimise digital integration opportunities and preserve authentic clinical practice encounters in a supported learning environment. The significance of this project series is to characterise examples of evidence-informed pedagogy; critically share our experience and insights; and to inform future digital integration of skill-based education.

2. Materials and Methods

We designed a new wholly online post-professional university subject for currently practicing clinicians, specifically in sports and exercise medicine (SEM), physiotherapy and podiatry, to advance their clinical skills. Prospective subject specifications were 12.5 credit points, to be engaged part-time over a duration of 8–12 weeks. Instructional design was underpinned by the 4C-ID model, dovetailing learning experiences with continuing clinical practice.

Subject enrolment eligibility included a minimum of two years autonomous post-professional clinical practice experience and the completion of core master's-level subjects within a special-interest field (sports and exercise medicine; pelvic health; paediatrics; and/or clinical rehabilitation). These requirements define the post-professional context, which is designed to grow established skills and integrate them in new and different ways. This is a crucial point of difference with entry-to-practice qualifications, which are designed to develop and apply foundational skills.

The methodology of this work is presented as a three-part project series to represent substantively discrete aims and outcomes necessary to capture an overall perspective, which we present as a narrative synthesis.

2.1. Project 1—Instructional Design of a New Industry-Aligned Online Clinical Education Subject

The aim of this project was to design a new wholly online subject for practicing clinicians to advance clinical skills in their own professional-practice context. Defined contexts were sports and exercise medicine; pelvic health; paediatrics; or clinical rehabilitation. We convened an interprofessional team to leverage the necessary subject-specific clinical, learn-

ing design and digital technology (DT) expertise. This collaboration was key to growing DT capability, with the following evidence-informed intentions:

1. Constructing clinically meaningful intended learning outcomes (ILOs) aligned with industry-validated competencies and standards.
These were underpinned by published clinical career frameworks [5,6] and a scoping review of Entrustable Professional Activities (EPAs) in post-professional clinical education [20], which has been published elsewhere.
2. Employing instructional design with digital integration.
Specifically, we employed the 4C-ID model [16], which included learning activities, part-task practice, supportive information, procedural information, and whole-task integration.
3. Engaging situated cognition and cognitive apprenticeship [18].
This included focal domains of clinical reasoning and decision-making skills; standardised care and routine practice for commonly presenting scenarios; and problem-reasoning towards innovative solutions in more complex scenarios.
4. Cultivating non-cognitive medical skills and behaviours [2].
These included emotional intelligence awareness, embracing a growth mindset and constructive peer review of practice.
5. Replacing traditional in-person clinical examinations with a digital technology (DT) integrated portfolio of clinical skill assessments.

2.1.1. Constructing Clinically Meaningful Curricula

We constructed a set of clinically meaningful ILOs aligned with industry-validated competencies and published industry career frameworks [5,6]. ILO achievement was supported through online learning activities (OLAs) and a portfolio of clinical skill assessments, including authentic clinical encounter examinations to meet industry expectations. This curriculum was endorsed as meeting the requirements for highly developed clinicians with industry accreditation [5,6].

EPAs are well defined units of professional practice which can be entrusted to a professional once they have attained the specific competencies required to complete the end-to-end task [21]. EPAs can capture performance of contextualised work units of clinical skills in preference to a granular competency-based approach [22]. Validated EPAs are therefore well positioned to capture clinically meaningful skillsets and integrated competency proficiency [3]. To optimise discovery and inclusion of meaningful peer-reviewed skillsets in our curriculum, we completed a scoping review of post-professional EPAs in different clinical professions [20]. This led to us incorporating the EPAs for Shared Decision-Making (SDM) in postgraduate medical education [23] in our curriculum. These EPAs scaffold in-practice communication, collaboration and decision-making skills, which align with our situated learning approaches and capture non-medical cognitive skills.

2.1.2. Instructional Design: Transforming Pedagogy and Digital Integration

Positioned at the top quadrant of Bloom's Revised Taxonomy and the Teaching Change Framework (TCF), we engaged higher-order thinking skills, namely student-centred transformation-based pedagogies integrated with digital technologies [24]. Drawing upon van Merriënboer's 4C-ID model [16] we created learning tasks, clinical part-task practice activities, supportive resources (such as explaining how to approach non-routine clinical scenarios) and procedural information (such as step-by-step instructions of how to perform routine aspects of clinical care, e.g., hand washing, and manage digital technologies, e.g., video recording ones' own clinical practice). Clinicians continued to practice remotely in their chosen practice context, engaging with digital learning materials and

weekly peer-review video of their own real-world clinical encounters. This was supported with clinician-educator-facilitated online discussions, fortnightly webinars and a reflective professional skills portfolio. Figure 1 represents this instructional design and digitally integrated pedagogy as a post-professional clinician learner journey. To familiarise process expectations and moderate the cognitive load associated with complex learning, learning tasks were presented in a structured weekly sequence. This included the following: a. attending the fortnightly scheduled webinar; b. working through weekly modularised content; and c. completing a professional portfolio entry. In parallel, students d. self-recorded weekly videos of authentic clinical practice, which were shared with the cohort for self- and peer- review, and e. were expected to assimilate these video examples with contemporary evidence to support and enhance clinical practice approaches.

At Miller’s pyramid peak level of entrustment [25], contextualised clinical skills and end-performance dimensions of more complex tasks are formatively assessed via authentic clinical practice encounters. These are situated in clinicians’ own practice context with incremental f. video assessment submissions, building towards authentic clinical practice performance according to the ILOs by the course end.

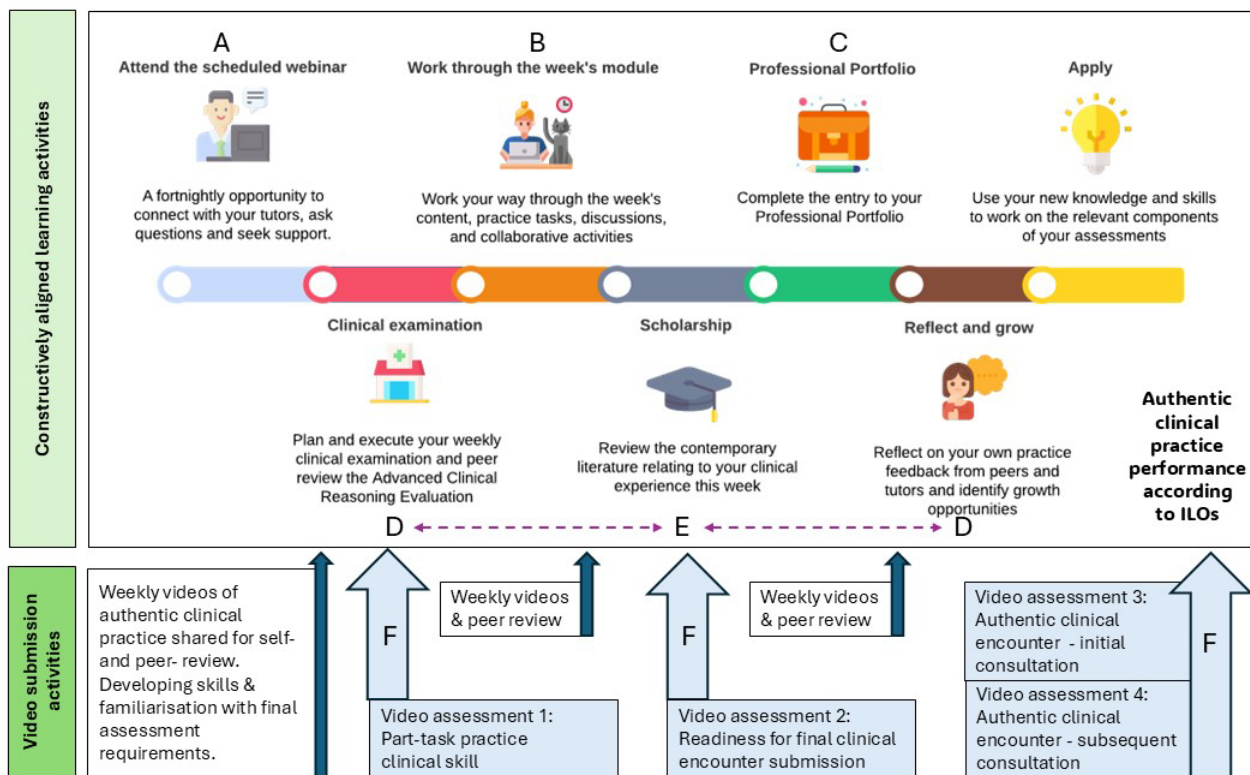


Figure 1. Instructional design and digitally integrated pedagogy represented as post-professional clinician learner journey. Clinicians continued to practice remotely in their chosen practice context, engaging with digital learning materials and weekly peer-review video of their own real-world clinical encounters. This was supported with clinician-educator-facilitated online discussions, fortnightly webinars and reflective professional skills portfolio. Large arrows represent submission points for summative assessment of authentic clinical practice. Small arrows represent the weekly process of uploading authentic clinical practice examples for peer review.

2.1.3. Situating Online Clinical Skill Apprenticeship in Vygotsky’s ZPD

We drew on Vygotsky’s pedagogical model [26] to create an inclusive learning environment situating clinical learners in their zone of proximal development (ZPD). This recognised and leveraged existing knowledge and skills as a platform to facilitating engagement in the forward-trajectory learning space beyond what was already known. Vygot-

sky's ZPD refers to an interactive space where learners engage with more knowledgeable others—including clinician-educators, and digital and other resources—to extend knowledge and skill capability beyond what they can achieve independently [19].

Recognising and leveraging existing knowledge and skills entailed conscious appreciation of previous qualifications and clinical experiences through quizzes and small-stake clinical skill assessments (formative and summative) early in the subject. This was important to identify strengths and learning needs which enabled nuanced ZPD engagement and informed the learning journey roadmap to achieving subject ILOs. Clinician-learners constructed a 'Professional Growth Envelope' using Stephenson's 'Capability envelope' model of exploration, learning activity engagement, progress review and demonstration of broadened skills [27]. We invited participants to adopt a strength-based growth mindset to imagine advancing their clinical practice future, with integrated knowledge, skills and personal qualities applied effectively in familiar, specialist and changing circumstances [28]. This contextualised approach respects learners' identity and connections which are important within culturally responsive practice frameworks [29].

Pedagogical mediating tools included text-based knowledge content, embedded multimedia, high-quality video, authentic in-practice clinical video examples, asynchronous online discussions and synchronous tutorials. All learning materials and assessments were fully integrated on a Canvas™, Melbourne, Australia, learning platform [30]. Digitally integrated tools included Feedback Fruits™, Amsterdam, Netherlands [31] for peer review of clinical practice videos; H5P™, Tromsø, Norway [32] to create richer content such as interactive clinical decision trees; and Zoom, CA, United States [33] hosted in-person tutorials.

Cultivating online communities of practice and learning extended breadth of experience beyond the learner's own practice context. This included (i) benchmarking of end-goal practice expectations, as demonstrated in specialist video clinical encounters; (ii) own-practice evaluation, as a way of reinforcing student-led learning; (iii) colleague peer review of practice, as a way of cultivating communities of practice and learning, and to cultivate approaches to practice and learning which align to benchmark standards of quality and safety of care; and (iv) expert guidance, using methods of exposure to expert opinion and self-reflexive comparison within one's own practice. Timely and constructive clinician-educator feedback scaffolded clinical skill advancement. This approach commits to supporting cultural safety through shared respect, shared meaning, shared knowledge and shared experience [29].

Authentic clinical encounter assessment represented an industry-valued representation of clinical practice capability according to quality expectations. Catering to the real-world needs of diverse and remotely located clinician-learners meant employing mobile-device-accessible video integration.

2.2. Project 2—Clinical Encounter Video Assessment Inquiry

This project aimed to capture the defining features of clinical-skill examinations conducted in authentic practice contexts. Our objective was to construct a valid and equitable clinical encounter video assessment approach in a university setting.

We attained ethics approval for a project aiming to describing the extent and profile of Australian universities offering video clinical examinations in post-professional sports and exercise medicine (University of Melbourne, ref: 2023-27404-46029-3). Post-professional programmes were defined as those offering education to already-qualified clinicians who are registered to practice. Online searches conducted between 10th May and 10th June 2023 identified any/all discoverable post-professional programmes in sports and exercise medicine, sports and exercise physiotherapy and/or sports and exercise podiatry at Australian universities (n = 9). A representative from each of these programmes was invited to

participate in an online survey designed using Qualtrics skip-logic [34] to discover (i) if video clinical examinations are offered within the programme of study and (ii), if so, how these are designed and conducted.

Our inquiry did not discover any peer-reviewed guidelines, or any other Australian universities offering video clinical examinations. Our scoping review of post-graduate EPAs did not discover guidelines for the online assessment of EPAs [20].

We therefore aligned our clinical encounter video assessment approach with (i). current industry criteria for video assessment; (ii) instructional design models; (iii) readily accessible DT capability; and (iv) academic quality assurance standards. We generated a model of relevant considerations for conducting clinical examinations according to Kane's framework of assessment [35], incorporating well-established pedagogical approaches to scaffolded teaching, facilitating and assessing clinical skills in practice. Figure 2 represents this outcome model, presented within Kane's Framework. Our approach included clearly defined outcome criteria, procedural instructions for video recording at the education-workplace interface, and a transparent marking rubric to minimise judgement-based assessment [36].

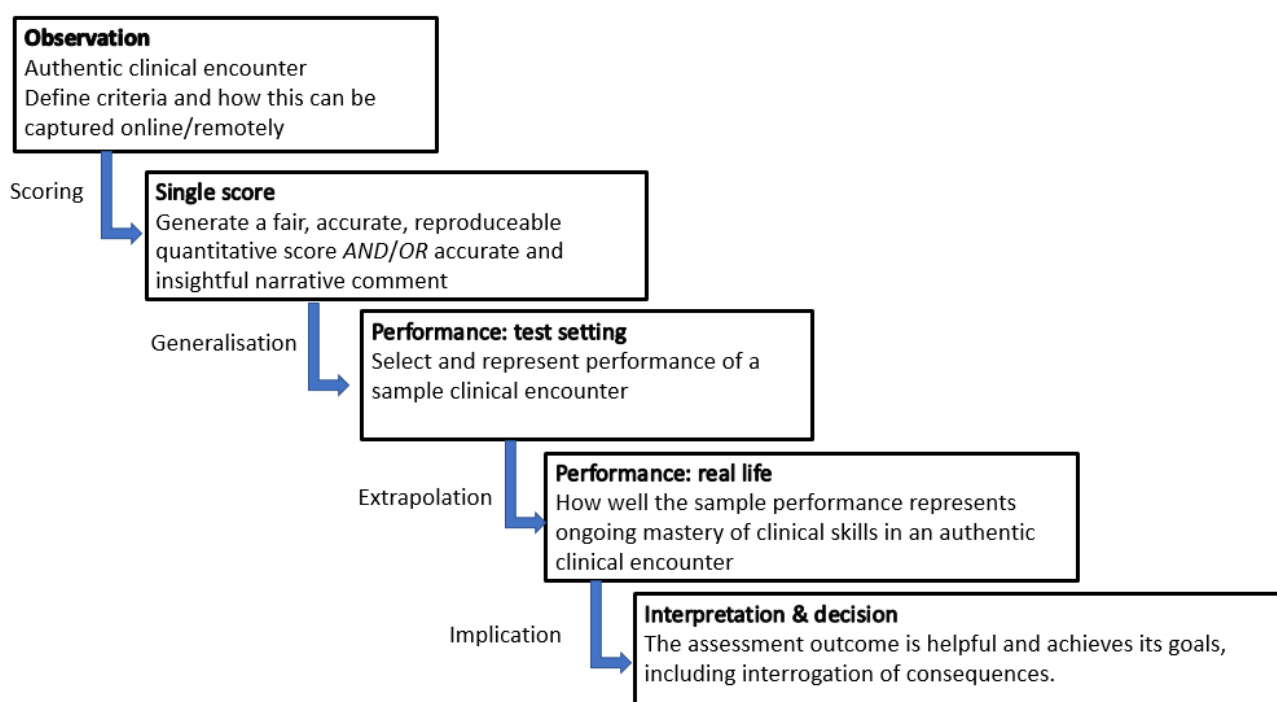


Figure 2. A model for authentic clinical encounter video assessment using Kane's framework of assessment. This figure represents a model of defining features for conducting authentic clinical video assessments according to Kane's framework of assessment [35], which incorporates well-established pedagogical approaches to scaffolded teaching, facilitating and assessing clinical skills in practice.

2.3. Project 3—Evaluation of Impact and Student Experience

We aimed to evaluate the impacts of this pedagogical approach on student learning and ILO achievement. Ethics approval was attained to evaluate cohort assessment grade performance and student experience (University of Melbourne, ref:2023-23744-42190-1).

All students in the inaugural three-student cohorts ($n = 22$) were invited to complete two online surveys designed using Qualtrics [34]. Participation in each survey was voluntary, informed consent was obtained and anonymised data were managed by researchers independent of the subject. One subject-specific survey sought student perspectives relating to how specific online curricula, teaching activities and mediating tools supported

assessment preparation and ILO achievement. The second survey was based on the validated National Student Survey (NSS) [37,38] and sought a standardised student experience perspective. (Survey questions are available as Supplementary File—Subject Survey; Supplementary File—NSS). Cohort grade performance (GP) on scaffolded assessment tasks was collated to evaluate student demonstration of LOs in constructively aligned assessment tasks throughout the subject (n = 22).

3. Results

3.1. A New Online Subject Was Designed to Advance Clinical Skills

We designed and delivered a wholly online subject to advance clinical skills for qualified practicing clinicians. Our constructively aligned curriculum was endorsed on specific industry-accredited post-professional career pathways [6,12]. Our scoping review of EPAs [20] led to the inclusion of SDM EPAs in medical education [23]. We duplicated the subject specification to facilitate dedicated content streaming for physiotherapists and podiatrists. (The full subject descriptions are available in the Supplementary File ACP Handbook and available at <https://handbook.unimelb.edu.au/subjects/phty90114> accessed on 2 May 2025; and at <https://handbook.unimelb.edu.au/subjects/phty90126> accessed on 2 May 2025).

3.2. ILOs Were Achieved and Demonstrated via Authentic Clinical Practice Video Assessment

New procedural guidance was developed to instruct clinician-candidates in how to approach, conduct and submit clinical practice video assessments filmed in their authentic practice contexts. Modelled according to Kane's framework of assessment [35], Figure 2 presents the defining features of the clinical encounter video assessment approach within our new subject. Most students in the inaugural three-subject cohorts demonstrated the ILOs through video assessment of clinical skill performance according to a transparent marking rubric (n = 21/22, 95%).

3.3. Students Shared a Range of Experiences Relating to Advancing Clinical Skills and DT Integration

A low student response to our student experience surveys (n = 4/22, 18%) was insufficient for meaningful analysis. However, we report these limited data to support our narrative synthesis on implementing new educational methods. The proportion of students who agreed with each survey category is represented in Figure 3 (pedagogical subject aspects—student perception of value) and Figure 4 presents a student survey data summary in the form of numerical scores, direct quotations and author-identified themes. All student survey respondents (n = 4, 100%) agreed online tutorial discussions improved preparation for clinical video assessments. Student comments valued confident and clear clinician-educator engagement (offered via in-person zoom meetings), timely instructional guidance and constructive feedback towards meeting assessment requirements. The student perspective also captured unfamiliarity with DT, including requirements to self-video authentic consultations. Attitudes favoured tutor-review of practice, with low value placed on self- and peer-review. Acknowledging the pre-determined wholly online environment, preferences for in-person alternatives were expressed.

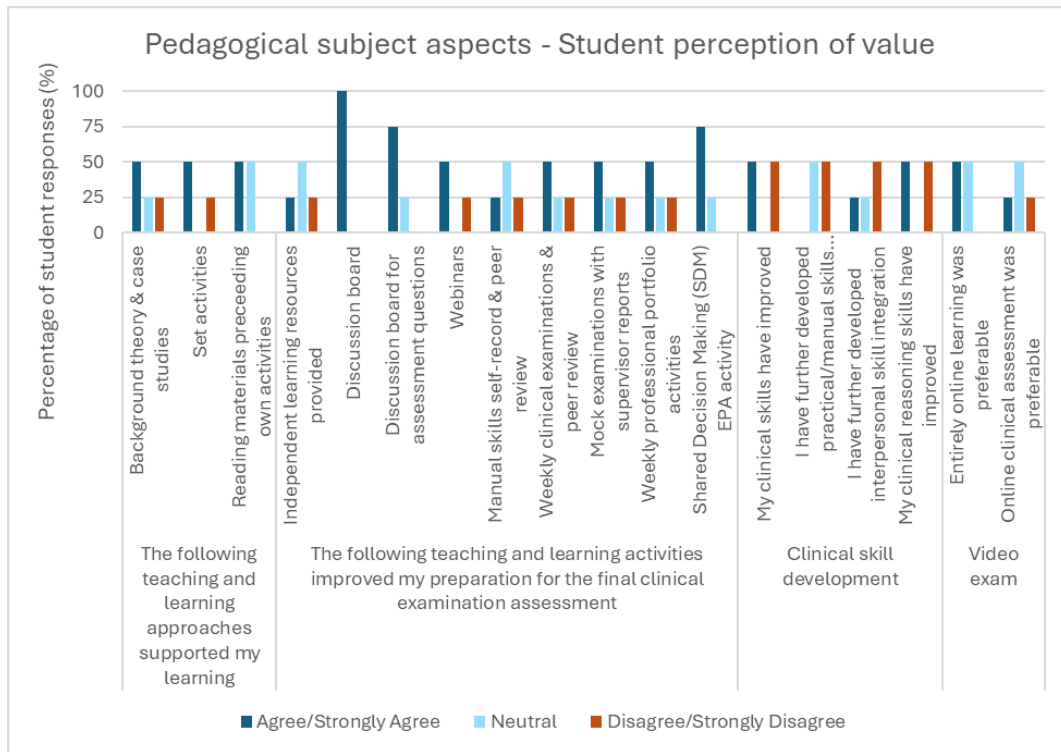


Figure 3. Pedagogical subject aspects—Student perception of value. This figure represents the proportion of students who agreed with each survey category.

Data excerpts: Coherent comment excerpts provided on the delivery, or the teaching and learning activities	Author Analysis: Emerging central aspects for student-centered future-facing pedagogical subject development		Data summary: Represented graphically as Pedagogical subject aspects – Student perception of value
	Qualitative feedback Themes identified	Student perceived value Themes postulated	
“Confidence and clarity from the teaching team from wk 1 would have made the subject much easier” “Have instruction on how to complete an ACRE”	Clear expectations and task instructional guidance are important	Discussion board engagement is important	All respondents agreed or strongly agreed that the Discussion board improved preparation for the final clinical assessment (n=4, 100%).
“It is designed as a competency- based approach, this is only effective if the feedback is specific and timely and relevant.”	Clear, constructive and timely feedback is important	The Shared Decision Making (SDM) EPA represented valued skills	Most agreed or strongly agreed that the Discussion board improved preparation through assessment-related questions (n=3, 75%)
“Strong focus was made on delivering constructive feedback, feedback preferences and the role of structured feedback according to marking criteria, and yet assessment task feedback lacked sufficient information or critique to aid growth as a clinician.”			Most agreed or strongly agreed that the Shared Decision Making (SDM) EPA activity improved preparation through assessment-related questions (n=3, 75%)
“The requirements for consultations to be filmed. In person examinations would be favourable.”	Students expressed preferences for in-person aspects	Future high value evaluation requires grounding in greater participant numbers, before-and-after analysis of students’ perceptions, including quantitative and qualitative results	The number of respondents to the survey is limited to only four students, which is insufficient to draw conclusions. Differential preferences for online or in-person aspects could not be concluded.
“The content in modules was somewhat overwhelming and required a lot of time. The timeframes suggested for each activity did not match the time it actually took to complete them”	Complex learning was represented by significant learner cognitive load		

Figure 4. Student Survey Data Summary and Author analysis. This figure presents present student survey data summary in the form of numerical scores, direct quotations and author-identified themes.

4. Discussion

Our project series characterised a case-example of instructional design enabling post-professional clinicians to advance their clinical skills and to meet industry expectations,

through engaging online integrated real-world situated learning. Video assessment enabled demonstration of authentic clinical consultation performance. New procedural guidance for video assessments and constructive clinician-educator feedback were important to scaffold final assessment performances.

Integrating digital technology and adapting the curriculum to meet evolving needs are standard 21st century education approaches. However, transforming clinical-skill education to a wholly online format represents a significant shift in perspective and possibilities. Scrutinising the impact and student experience of our instructional design and transformative digitally integrated pedagogy enables others in clinical and other practical-skill-based industries to independently judge merits and fit-for-purpose adaptations. Herein, we offer a narrative synthesis of our outcomes, impact, insights and future vision.

4.1. Achieving Clinically Meaningful Outcomes

Our instructional design approach was effective in scaffolding clinician-learners' achievement of intended ILOs, which signifies a successful learning journey, education quality assurance integrity, and satisfied industry needs. This included accountability to industry-accredited benchmarked clinical skills, validated through industry accreditation of our curriculum and constructively aligned assessments. To appreciate the impact of this novel curriculum and evaluation, it is important to define which key clinical skills were assessable using digital technologies.

Practicing clinicians are required to contextually execute clinical skill combinations in domains of cognitive knowledge, manual or technical skills, integrative clinical reasoning and relational communication [39]. Judicious integration of this clinical skills spectrum represents patient-centred high-value-based healthcare [40,41]. Our authentic clinical video assessment approach enabled clinicians to articulate clinical reasoning and demonstrate safe and capable decision-actions in line with their training and scope of practice. Selection and execution of manual and procedural clinical skills captured on video were assessable in the presenting scenario context. Communication and interpersonal skills were also assessable, manifesting as authentic qualities of clinical encounter flow, responsive patient dialogue and adaptation of actions according to evolving outcomes.

This capability to develop and demonstrate lines of clinical reasoning and decision-making are prevailing characteristics of advanced clinical practice. The clinician's process of reflective inquiry and analysis forms a case representation of the presenting problem [42] to guide evidence-informed practice [43]. Recipe-book practice is not evidence informed [43], with patient preferences being significant components of contemporary decision-making models [23]. Each clinical encounter, patient presentation and contextual situation is different, typically presenting clinicians with options and decisions—both familiar and novel. Our innovative education approach cultivated nuanced and connected clinical skills beyond foundation-level proficiency.

Foundational skills previously certified with entry-to-practice qualifications were not the focus of our advanced practice subject. Rather, professional registration and defined practical experience were minimum entry-eligibility requirements. This model assumes that practicing clinicians will maintain 'point-of-service' safety; uphold all ethical and professional registration standards; and sustain their duty of care to select and apply clinical skills within their competence and scope of practice. Failure to select appropriate clinical-tools or unsafe execution represented examples of unsatisfactory practice and therefore unsatisfactory assessment grades in both ours and industry-led post-professional assessment criteria [4,6,12].

There are many factors influencing the construction and validity of fit-for-purpose clinical assessments [44]. Student perception of assessment validity is important, including

credible feedback towards future practice improvements [45]. We postulate that these perspectives are not different from in-person clinical examinations. Our key difference was employing video capture and submission. We will discuss our experience of this further in the overall context of our digitally integrated instructional design approach.

4.2. Digitally Integrated Instructional Design

The conventional ADDIE (Analyse, Design, Develop, Intervene, Evaluate) [15] and Bloom's Taxonomy [24] models are evident throughout our instructional design and academic integrity approach. Our analysis posited that university education needs to offer higher-level clinically meaningful curricula, aligned to industry career pathways, deliverable while clinicians remain in continuing practice. We designed and developed learning materials, mediating tools and assessments to meet specific and contextualised needs of physiotherapy and podiatry, across clinical interest areas of sports and exercise medicine, pelvic health, paediatrics and clinical rehabilitation. This interprofessional approach aligned with progressive Universal Design for Learning (UDL) guidelines which cater for diverse access and participation in meaningful and challenging learning opportunities [17]. Our instructional design model was contextually dynamic and offered extended application for advancing high-level clinical skill integration in a variety of clinical professions, diverse practice accessibility, professional intersectionality and world-wide connectivity. We chose the 4C-ID model to position a suite of online learning materials and guidance from knowledgeable clinician-educators in Vygotsky's ZPD. This drove the clinician-learner journey towards cultivating self-awareness, deconstructing part-task practice, engaging need-aligned clinical skill practice, and meanwhile re-integrating new learning into their continuing practice.

Our clinical video assessment approach scaffolded achievement of industry requirements and clinical skills integrated in real-world situated clinical consultations. For example, the SDM EPAs [23] were embedded in our curriculum as a non-assessed 'part-task' within the 4C-ID instructional design model. Clinician-learners demonstrated SDM EPAs within the context of authentic 'whole-task' clinical encounter video assessments. While the authentic clinical assessment tasks represent a meaningful skill transfer to practice, clinical examinations—whether online or in-person—only ever offer a snapshot of clinical skills in particular moments of time, place and circumstance. A distributed assessment model could alternatively consider the merits of purpose-designed serial 'part-task' assessments, which could offer greater constructive alignment of focal clinical skill assessment, an inclusion of multiple perspectives and an overall assessment portfolio which represents a broader range of clinical scenarios.

4.3. Learner Experiences of Online Clinical Skill Education

Industry approaches to clinical practice examination include well established in-person models and growing use of video [4–6]. There are currently no standardised peer-reviewed guidelines for video clinical assessments. One of our project outcomes was the design and implementation of a real-world clinical encounter video assessment model. This achieved the intended university purpose of assessing industry-aligned clinician skills in clinicians' own practice. Although video recording technology is widely accessible and utilised in general society, our learners experienced reluctance towards self-recording, self-review and peer-review of their own practice. Barriers included ethical insecurity surrounding client consent, data protection, image sharing and file storage. In addition, learners experienced the stress-load of navigating the digital technology to record and submit videos. Clinician-educator-led feedback was highly valued, although clinician-learners did not report that

engagement in self- or peer-feedback (giving and receiving) assisted their own practice development or video assessment preparation.

Separating the barriers into domains of clinical practice video-recording considerations, digital literacy and peer-review safety allowed us to employ a solution-focussed lens. Our response was to emphasise all relevant clinical practice ethical guidelines and uphold their commonality across all clinical practice scenarios, which include clinical points-of-service and learning environments [46]. In addition to stepwise instructions, we enhanced our video-recording practical guidance to include an array of digital literacy tips, troubleshooting and a variety of acceptable file-formats within ethical and academic integrity guidelines.

Self- and peer review were significant components of our instructional design approach, representing contemporary pedagogy [19] and important quality and safety professional skills [47]. Furthermore, observing others and sharing practice extends the learning environment boundaries beyond one's own experience [48] and is aligned with industry competency standards of communication, collaboration, role modelling and mentoring [5]. To cultivate greater "readiness" for peer review and "readiness" for digital integration, we adapted our curriculum to include learning activities and supportive pastoral coaching, addressing the scholarship, merits and opportunities of these skill-dependent pedagogical approaches. We postulate that these additional insights have contributed to meaningful improvements, which will be a focus of future cohort evaluation [49].

This insight towards digital literacy and "readiness" for digital integration transcends clinical learning, clinical practice and society. Evolving possibilities and perspectives will impact medical education [50], with the emerging influence of artificial intelligence (AI) on clinical education, clinical competence and clinical work [51]. Virtual reality (VR) could substitute real-world clinical learning experiences that are challenging to re-create authentically [52]. Varied and emerging digital technologies could be integrated according to needs, opportunities, future visions and available resources. Clinicians with sufficient digital literacy, and/or preparedness to embrace skill development beyond their comfort zone, have the potential to create and access clinical education in contexts that were not previously possible.

4.4. Cultivating "Readiness" for Change

Our new subject was designed to develop clinical skills online, which are traditionally taught in-person; and to meet the needs of practicing clinicians in industry. Therefore, it was always our intention to iteratively disseminate our approach, invite scrutiny and respond with a dynamically evolving pedagogy. In practice, our instructional design was "ready" for the opportunities digital learning and assessment offers, and clinician-learners embraced the accessibility and flexibility of online learning. However, the process implementation required significant technical, educator and pastoral support to transition from more familiar traditional face-to-face approaches. Digital technology readiness was required for a rewarding learning journey and is worthy of independent consideration to allow participants to thrive in digital learning environments.

In practice, "readiness" to navigate differences between in-person and digital environments will better prepare one's skillset and mindset to access future possibilities. The digital environment does not directly substitute in-person education, and the exchange from an in-person tool to a digital tool is not linear. Rather, it works via an SARM (substitute–augmentation–modification–redefinition) model [53] which re-imagines traditional education and clinician activities. Interacting and engaging with transformative digital tools requires a change in dynamics. If nothing else, it feels different, which is a relevant consideration for meeting the needs of humanistic professionals. Of clinicians and

educators alike, this demands a readiness for change and extension into Vygotsky's ZPD from multiple perspectives, including clinical, digital and learning preferences.

Truly listening, recognising and valuing the lived experience of participants are crucial to sustaining cultural safe learning environments [29]. Progressive changes in response to student and educator experiences could harness our initial success of online learning and authentic in-practice self-video, with further imagining of new ideas to drive clinical practice advances through integrating digital technologies. This is more broadly applicable to other settings remotely capturing and evolving entrusted clinical, practical or in-person activities.

4.5. *Imagining the Future*

Just as clinical scenarios are diverse and nuanced, so too are clinician-learners and their experiences. Dynamic pedagogical models are needed to match post-professional clinicians' learning needs, including for internationalisation, post-colonialism, diversity and inclusion. Formulation of peer reviewed guidance for remote assessment of clinical skills, including the accommodation of emerging digital technologies, would offer enhanced quality assurance, ethical parameters and standardisation across assessment contexts. Preserving professionalism, game-based learning could de-threaten peer review, debunk consequences of failure and promote creative solutions through play. Authentic clinical encounter assessment approaches are needed to honour intersectionality and represent the multiplicity of sophisticated, evidence-informed, dynamic clinical practice performance.

4.6. *Limitations*

Our inaugural student cohorts were all linked to one clinical interest area and substantive data analysis was not feasible with the small participant group. Future cohort evaluation will extend upon initial insights and diversify student experience perspectives, including before-and-after analysis. Data deidentification excluded grade-performance and student experience triangulation, disabling any relationship insights. We were also unable to separate the impact of individual teaching tools on clinical skill performance. Other eligible Australian university programmes may have been inadvertently omitted from invitation to participate in our video clinical assessment enquiry; however, no further participants were identified through updated searches. A more extensive inquiry, both internationally and beyond sports and exercise medicine, could have discovered relevant and context-adaptable video approaches.

4.7. *Summary and Recommendations*

Based on our experience, industry-relevant skills which are traditionally taught and assessed in-person can be translated into innovative online curricula. Our narrative synthesis captures opportunities, deliberations and early insights adaptable towards other fields with similar endeavours. For future adopters we can recommend the following:

- Aligning contemporary skill education with industry benchmarks to drive meaningful engagement with diverse learners;
- Substantiating novel curriculum approaches using post-colonial pedagogies and instructional design models to construct grounding for successful learning;
- Evaluating impacts and experiences to inform active change, driving outcomes towards intentions;
- Anticipating emerging digital and clinical possibilities to imagine the next transformative space;
- Safeguarding ethical fidelity, professionalism and academic integrity to sustain stability beside dynamic changes.

5. Conclusions

Our instructional design approach employing transformative, digitally integrated pedagogy offered a successful journey for clinicians to meet industry-aligned learning objectives in a university setting. Our new wholly online subject advanced and assessed clinical skills online, which catered to new and contextualised learning opportunities for diverse and practicing clinicians. Our project characteristics, evaluation and experiential insights offer a platform to reimagine emerging possibilities for future digitally integrated medical education and other clinical-skill professions.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/ime4020018/s1>, Advanced Clinical Practice Handbook; Supplementary File—Subject Survey; Supplementary File—NSS.

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Abbreviations

The following abbreviations are used in this manuscript:

4C-ID	Four-Component Instructional Design model
ADDIE	Analyse, Design, Develop, Intervene, Evaluate
AI	Artificial Intelligence
DT	Digital Technology
EPA	Entrustable Professional Activity
GP	Grade Performance
ILO	Intended Learning Outcome
NSS	National Student Survey
OLA	Online Learning Activity
SARM	Substitute–Augmentation–Modification–Redefinition
SDM	Shared Decision-Making

TCF	Teacher Change Framework
UDL	Universal Design for Learning
VR	Virtual Reality
ZPD	(Vygotsky's) Zone of Proximal Development

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