Co-creation of Capstone Assessment in Year 1 Undergraduate Integrated Medical Sciences

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Introduction

Modular assessment offers a structured approach to appraising a student's knowledge and skills across discrete units or modules within a curriculum. This system allows for a more granular examination of a student's comprehension and proficiency in specific subjects or topics and is also substantially more flexible, allowing the teacher to divide the content into compartmentalized, simplified and more easily digestible units that aid student focus and gradual acquisition of mastery. This can be particularly beneficial for learners who may require additional time or support in certain areas of study. However, one significant concern of modular assessment is the potential for fragmented learning. Compartmentalisation and simplification aids learning, but by necessity it leads students to introduce artificial barriers between components, and by omitting the connections between subjects, it obscures the holistic view and understanding of the subject matter (Vidal Rodeiro & Nadas, 2009) and hinders students' ability to integrate information across different modules (Knight, 2000). The cumulative effect of multiple assessments can lead to assessment overload, potentially inducing stress and fatigue among students (Leask, 2014), while making the proper contextualisation of assessments within the broader scope of a curriculum more challenging.

This case study presents the initial findings of an ongoing staff-student partnership whose aim is to address the limitations of modular assessment through the introduction of a holistic capstone assessment component. We will provide an overview of the institutional context in which this intervention occurred, the rationale for embracing a student-staff partnership in crafting the capstone assessment, a detailed account of the systematic changes we made to our assessment framework that allowed us to incorporate the capstone component, and the methods we employed to evaluate the student experience.

Institutional Context and Justification for Change of the Assessment Framework

This project took place at the UCL Faculty of Medical Sciences which offers seven distinct undergraduate medical programmes that share a common set of seven core modules in Year 1. The curriculum is taught using a combination of Problem-Based Learning (PBL), Peer Instruction (Hernandez-Guerra et al, 2021) and case-based learning. Each module undergoes separate evaluation through two distinct assessment components: coursework and a concluding multiple-choice question (MCQ) exam. Each component contributes 50% towards the final score, resulting in a total of eight MCQ exams and 7 individual pieces of coursework.

The project began in 2020, when UCL took the decisive step of substituting all first-year undergraduate assessments with a 'capstone' evaluation as a swift response to the initial challenges posed by the COVID-19 pandemic (Davies et al, 2020). A capstone assessment can be broadly characterized as an evaluative process that consolidates and synthesizes learning across various modules, or in this particular emergency scenario, across an academic year. As opposed to modular exams, which focus on specific topics or units within a course, capstones have a broader scope, hence require students to bring together knowledge from the entire curriculum (Lees, 2015).

In light of the successful outcomes of the assessment mitigation measures, particularly the favourable way they were perceived and experienced by the participants, we made the

strategic decision to permanently institute a capstone assessment in our first-year curriculum. This adjustment aimed to rectify the challenges we encountered with assessment overload, promote students' integration of knowledge across diverse modules and facilitate a deeper understanding of the foundational science modules.

In the summer of 2022, four members of the Faculty of Medical Sciences and one member from the Arena Centre for Research-based Education convened a dedicated working group who crafted a meticulously phased plan, beginning with a pilot test involving volunteer participants in the academic year 2022-2023, followed by a full-scale implementation in 2023-2024. This strategy facilitated the integration of changes in a controlled, low-risk setting using formative assessments, allowing us to glean valuable insights from the experience, enabling the identification and rectification of potential challenges before the full implementation. In the initial phase we submitted an assessment modification request which received approval from the UCL Education Committee at the end of the 2021-2022 academic year. Six modules running across term 1 and term 2 were included as part of the planned changes to the assessment framework. The approved changes included the following:

i) Six individual multiple-choice question (MCQ) exams were replaced with two integrated MCQ exams, encompassing content from three modules in each term. This integration requires students to synthesize information across various disciplines, demonstrating their capacity to connect knowledge from diverse subject areas. This exam contributes to 50% of the final score for each module.

ii) The existing module coursework was retained, with word counts reduced to align with the reduced module weighting (from 50% to 30%).

iii) A new capstone assessment component was introduced, contributing to 20% of the final score for each module.

Importantly, these assessment adjustments were made without altering teaching schedules, learning objectives, or the format of existing coursework activities.

Implementation of Student-Staff Partnership

At the heart of our commitment to student-centered education is a profound collaboration with our student partners. The project leads received a Changemakers grant from the Arena Centre that was used to pay for two student stipends and to purchase online vouchers to incentivise students to volunteer for the pilot capstone assessment activities. Two students in the second year of their Integrated Medical Sciences (IMS) programmes were recruited, aiming to ensure a balanced gender representation and provide a more comprehensive perspective of the intervention. Guided by their firsthand experience as learners, our student partners proactively engaged in ethical research training and took the lead in a dynamic exchange of ideas and perspectives, allowing us to craft a comprehensive and student-centric capstone assessment framework:

1. Co-design of the Capstone Assessment timetable

The timetable was structured in the early planning phase to guarantee a well co-ordinated and smooth implementation of the new capstone assessment activities in the upcoming academic year. In order to avoid assessment clashes, measures were taken to ensure the timely completion of all summative assessments within the initial three weeks of term 3, allocating the final three weeks of the academic calendar solely for capstone teaching and assessment endeavours.

2. Co-design of the capstone assessment format

In aligning the aims of the capstone assessment, the group convened with three primary objectives: i) to encourage collaborative learning, peer-to-peer dialogue and utilization of key transferrable skills; ii) to streamline the evaluation process, and include opportunities for the participants to practice the format and obtain formative feedback, and iii) to provide a

summative feed-forward process to ensure the experience can enhance future student performance. Thus, we elected to adopt a team-based assessment modality, centering on the collaborative solution of a problem and the creation of a narrated integrative diagram as the assessable output. The diagram showcases their understanding of the physiological context of the problem, explains and justifies their preferred solution and demonstrates the new connections they made between content across modules.

3. Co-creation of PBL clinical scenarios

Prioritising alignment with our established instructional approach, the staff-student partrnership group opted to leverage participants' proficiency in analyzing and navigating uncomplicated PBL clinical scenarios as the foundational pedagogical approach for the capstone assessment. Subsequently, the group crafted various PBL case studies of heightened complexity and their respective model answers. The problems were designed to not only challenge participants in assessing the accuracy of previous diagnoses but also to unravel the determinants of clinical progression. This approach encourages participants to leverage their existing understanding, while actively engaging in additional research and encompasses an exploration of the contributions from various organ systems, consideration of plausible precipitating events, and an in-depth examination of the future management of the patient alongside their prognosis.

4. Co-creation of a marking rubric

The student-staff working group designed a customized marking rubric, aimed at evaluating a wide range of competencies, including: accurate case solution; in-depth discussion of pathophysiological mechanisms; demonstrated integration between organ systems; utilization of supplementary research, and quality of presentation delivery. The marking scheme consists of a system that awards points for specific achievements, such as identifying key features of the diagnosis, individual elements of the patient management, or a certain amount of valid advanced research that goes beyond what the participants were taught in class. The difficulty of the achievements qualifying for points, ranges from basic to very challenging, to ensure

effective differentiation of performance differences and to align the marking scheme with the grade descriptors provided to the participants.

5. Co-design of capstone teaching and assessment activities

The group collaboratively designed the capstone teaching and assessment activities, delineating them into a formative PBL phase and a competitive summative assessment PBL phase. The formative phase spans three sessions: In session 1, participants analyze a clinical case emphasizing common principles without revealing concepts related to the competition case. Working in teams, they actively engage, think critically, and integrate prior knowledge. Session 2 allows deeper exploration, refining hypotheses and settling on a diagnosis and management strategy. Participants create comprehensive diagrams to understand the case and integrative physiology. In session 3, the facilitator provides feedback and presents an exemplar diagram co-created with student partners, serving as a visual model. Tutors mark the exemplar with participants, using a rubric aligned with the competition assessment. This streamlined approach enhances collaborative learning, problem-solving skills, and effective assessment preparation.

The competitive mock-summative assessment PBL phase spans three sessions. Participants tackle a new PBL case over two sessions and have five days to craft and submit their integrative diagrams for mock-summative assessment. Two staff members grade the submissions using the jointly developed rubric. The final session hosts an online competition where the highest-scoring diagram is presented to all participants and faculty. Summative feedback analyses strengths, weaknesses, and how the diagram fulfills the capstone event's learning objectives. Winners are announced during a formal ceremony, fostering a culture of knowledge sharing and recognition. This event not only showcases participants' achievements but also encourages the exchange of knowledge.

Capstone assessment pilot test and evaluation

The capstone assessment pilot test was introduced as a voluntary activity at the end of 2022-2023, offering participants further opportunities for academic engagement and enrichment. This ensured that participants were self-selected, reflecting a genuine interest in academic advancement and personal growth. To further incentivise engagement, participants were informed that the capstone event would involve a competition in which the top three scoring groups would be awarded monetary prizes, and their achievement would be recognized formally with a certificate endorsed by the institution. In total, 71 participants, drawn from a cohort of 248, participated in the pilot test.

The pilot test was evaluated through a feedback questionnaire crafted and analysed by our student partners. Among 62 participants, only 3 described their experience as neutral, and none as negative. The majority expressed a clear preference for the capstone, with only 7 favoring MCQ or regular coursework. Participants particularly valued the capstone's integrative nature, enhancing their understanding of modular content connections, and its application of knowledge to realistic scenarios. Of the 18 respondents, 89% found exam instructions clear, 94% found the exemplar informative, and all agreed that the problem's depth stimulated research acumen and critical thinking. Despite some reservations about group work, the overall average rating for the capstone event was 4.44/5, indicating highly satisfactory educational experiences for participants. However, it is essential to consider the voluntary nature of participation, potentially impacting the representativeness of feedback compared to a mandatory, comprehensive assessment.

The suitability of the capstone event as an assessment was evaluated by comparing the marks received by the participants in the capstone assessment, with the results of previous coursework components in the core Year 1 modules. The marking distribution covered nearly the full range (40%-82%) with 41% of the submissions achieving scores above 70%. The average grade was 62% and there was a clear correlation (R^2 ~ 65%) between the average score of the participants within a submission group in previous coursework and the mark obtained for the

capstone assessment. However, some participant groups substantially overperformed or underperformed, confirming that the capstone is not only capable of discriminating between participants of different abilities but also assesses different skills and knowledge from the core module coursework, justifying its use in the assessment mix.

Discussion

The decision to engage former Year 1 students as co-creators in the development of the capstone assessment is underpinned by a substantial body of research affirming the profound potential of student-staff partnerships within higher education (Cook-Sather and Kaur, 2022). The student partners brought a unique and invaluable perspective, having first-hand experience with the curriculum, an acute awareness of student challenges, and keen insights into the strengths and weaknesses of current assessments. Their recent involvement equips them with a deep understanding of the specific context, needs, and expectations of Year 1 students, ensuring that the assessment is tailored to the current cohort's requirements, addressing their unique learning needs and challenges. Moreover, the student partners possess a relatability factor with current peers, empathetically understanding their concerns, anxieties and aspirations. This empathetic perspective leads to the development of assessments that are more attuned to the students' experiences and needs. Former students are also uniquely positioned to provide insights into the progression of learning from Year 1 to subsequent years, identifying potential gaps or areas where assessments can better prepare students for the challenges they will face in later stages of their academic journey. This invaluable perspective ensures a seamless transition and continuity in learning.

Future directions and full-scale implementation

The educational advantages of a holistic capstone assessment include mitigating for the fragmented learning experience of a modular programme, the acquisition of a multidisciplinary

udertanding of subject material, and an integrated and collaborative approach to learning (Knight, 2000). However, the transition from a relatively small-scale pilot study to a fully embedded summative assessment poses additional challenges. The first of these challenges is the upscaling to accommodate a larger student cohort, which places additional pressures on tutor resources with regard to teaching and marking. Secondly, and most importantly, the integrated capstone assessment must be placed within institutional programme structures, which tend to compartmentalise assessments within discrete modules. Difficulties may therefore arise when equitably attributing grades to individual modules, based on the successful completion of the learning objectives associated with those modules. This may be particularly problematic should students require second attempts on individual assessment components or individual modules, considering the capstone assessment bridges the grade acquisition of several modules. A possible consideration for the incorporation of future capstone assessments would be the design and implementation of an integrative capstone module. This would circumvent the obligation for contained module assessments while simulatneously providing the positive learning experiences of a holistic capstone approach.

Conclusion

Involving student partners has proven instrumental in validating the new capstone assessment methodology. Their contributions offered a practical viewpoint of how well the assessment aligns with intended learning outcomes, ensuring it accurately measures student understanding and skills. Importantly, the co-creation process, where both staff and students' voices are equally valued, granted students meaningful roles. This empowered them to contribute intellectual capital to the project and gave them autonomy and influence in decision-making processes (Cook-Sather, 2019). Simultaneously, staff gained deeper insights into their students' perspectives and experiences, leading to more culturally sensitive and inclusive educational practices which fosters a sense of belonging and contributes to culturally sustaining pedagogy.

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