

Slack as a virtual undergraduate dermatology community: a pilot study

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Summary

Background. Dermatology is under-represented in UK undergraduate curricula, and with a diagnostic and educational toolkit that is heavily centred on face-to-face (F2F) clinical examination, dermatology education has been disproportionately affected by the COVID-19 pandemic. Online channel-based messaging apps such as Slack offer an opportunity to engage students in remote, multimodal collaborative learning by reproducing a classroom environment in the virtual space.

Aim. To determine the feasibility, acceptability and proof of concept for an online Slack community in undergraduate dermatology education.

Methods. Undergraduate medical students participated in an online classroom for a 6-week programme encompassing case-based discussions, seminars and journal clubs. The platform was facilitated by junior doctors ($n = 10$) and patient educators ($n = 6$). Students and faculty completed a post-course evaluation. Students additionally completed a pre- and post-intervention dermatology quiz. Mixed methods analyses included quantitative analyses to explore data trends and qualitative phenomenographic analyses to assimilate key underlying themes.

Results. Students ($n = 65$) were enrolled to join the platform. The evaluation was completed by students ($n = 52$) from UK universities ($n = 27$). The majority of students ($n = 27$) interacted with the platform as passive observers (≤ 5 active interactions with the channel), with a small group ($n = 4$) of 'super-users' (≥ 100 active interactions). The overall quality of the course was described as 'excellent' by 96% of participants and 100% of faculty.

Conclusion. A community-based online classroom can act as an enjoyable, acceptable and collaborative means of delivering dermatology education to undergraduate medical students. Its ease of use and supportive nature may also facilitate patient involvement. Such advances may provide vital safeguards against the reduction in F2F learning that has accompanied the COVID-19 pandemic.

Introduction

The COVID-19 pandemic has affected all aspects of medical education, from delivery¹ to assessment,² forcing a migration to the virtual setting that is likely to endure beyond the pandemic.³ Dermatology, already marginalized in traditional curricula relative to patient burden, has been disrupted,⁴ potentially due to an historical reliance on brief face-to-face (F2F) encounters to visualize dermatoses.

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Online dermatological learning resources are widespread and include podcasts, video channels and websites.⁵ However, these are largely unidirectional, rarely allowing for collective, dynamic learning taking place in a community of practice.⁶ Recreation of active learning communities in the online space is imperative, with particular need within dermatology for innovation using technology-enhanced learning (TEL) post-COVID⁷ to avoid exacerbating the discrepancy between undergraduate education and clinical caseload.

There are numerous educational theories underpinning online learning, including Salmon's Five-Stage Model (SFSM), social learning theory and communities of practice. SFSM resonates particularly well with online learning, building on constructivist principles to provide a structured scaffold describing learner progression in the virtual environment (Fig. 1).⁸

This study details the implementation and evaluation of a 6-week pilot of The Derm Hub, a novel, independent, collaborative online learning platform designed to teach dermatology to undergraduate medical students.

The primary objective of this mixed-methods pilot study was to evaluate the impact upon medical student learning of an online Slack community in

undergraduate dermatology education, examined through the lens of SFSM. Secondary objectives were to determine acceptability, feasibility and proof of concept for a larger study.

Methods

Ethics approval was provided by the Research, Policy, Intelligence and Ethics Team at Newcastle University Research Office (12 September 2020; ref 4874/2020), and informed written consent was obtained from all participants.

Study participants

Students self-registered for the platform ($n = 314$). Those eligible ($n = 248$) were randomized into groups by numerical ranking using an Excel spreadsheet (Microsoft Corp., Redmond, WA, USA). Randomized groups received staggered invites to enrol for the platform on a first-come, first-served basis, with 65 places available. One student did not provide consent after enrolling, therefore 64 students participated on the platform.

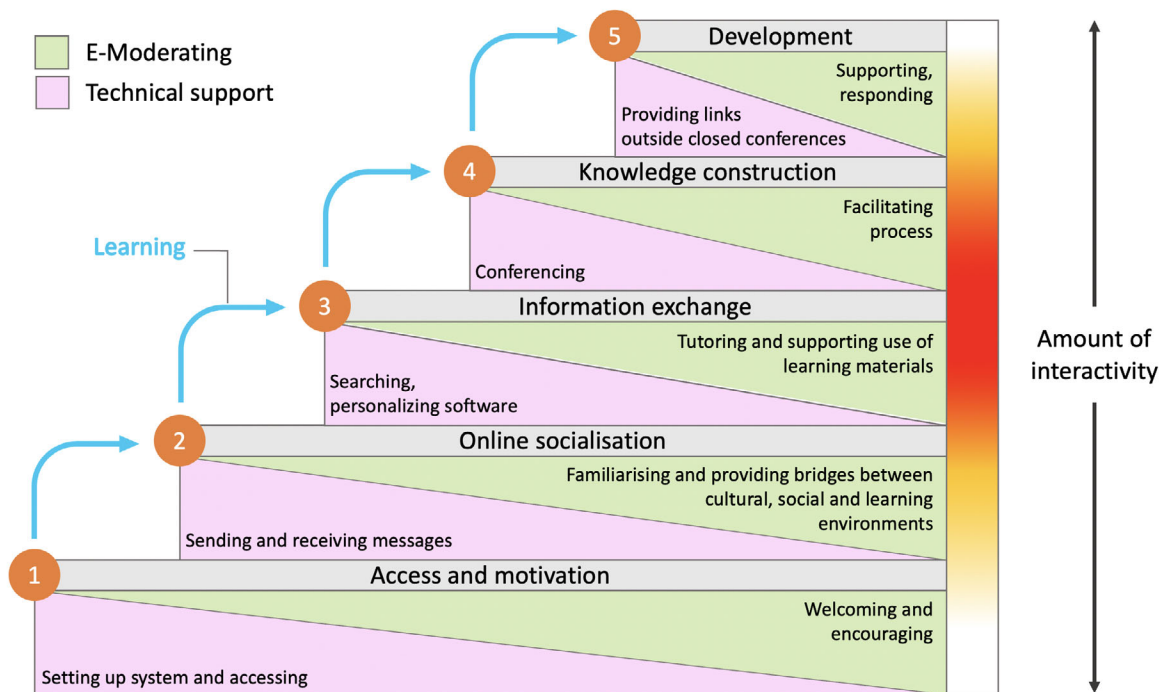


Figure 1 Salmon's Five-Stage Model of online learning (adapted from Salmon⁸).

Table 1 Comparison of frequently used collaborative online platforms (adapted from Montrief *et al.*,⁹ accurate as of 26 January 2021).

Feature	Slack	Teams	WebEx
Messaging	Single-person direct message, group direct message, open channels, closed channels	Single-person direct message, group direct message, open channels, closed channels	Single-person direct message, group direct message, open channels, closed channels
Message history	Searchable message history of 10 000 messages on free tier; unlimited on paid	Unlimited searchable message history for all tiers	Unlimited searchable message history for all tiers
Voice/video calls	One-on-one on free tier; up to 15 participants on paid tier	Meetings with up to 300 participants on all tiers	Up to 100 users for 50 min free, escalating through paid tiers
Record meetings	No native capability, but available through third-party integrations	Available on paid tiers	Available on paid tiers
Screen sharing	None on free tier, only on paid tier	Available on all tiers	Available on all tiers
File storage limits	5 GB total on free tier, 10 GB per user on middle tier, 20 GB per user on highest tier	2 GB per user + 10 GB shared on free tier, 1 TB per user on paid tiers	Cloud available on paid tiers only, from 5 GB to unlimited depending on tier
Core differences	Centred around team communication, significantly more third-party app integrations	Centred around video calls, added security compliance (commonly used within NHS Trusts), integrates with Outlook services	Chat-focused with end-to-end encryption throughout
Operating company	Slack Technologies	Microsoft Corporation	Cisco Systems
Minimum pricing	Free, additional paid options start at £5.25/user/month	Free, additional paid options start at £3.80/user/month	Free, additional paid options start at £11.25/host/month

NHS, National Health Service.

Participant recruitment

Students were invited to register interest via Twitter and at multiple Facebook-based national undergraduate webinars. Inclusion criteria were students undertaking the clinical phase of a UK-based undergraduate medical degree. Faculty were recruited via Twitter, including doctors ranging from Foundation Year 1 to specialty registrar level with a self-declared interest in dermatology and medical education. Patient educators were recruited through faculty contacts.

Platform design and delivery

The platform was hosted on Slack, a team-based messaging platform, and was active for 6 weeks between September and November 2020. Slack was chosen over other closed-network community platforms because of its searchability, collaborative functionality and free use⁹ (Table 1). Faculty members received Slack training and had curricular input. Students received detailed induction. Allocating 'mentors' to students aimed to provide one-to-one interaction with a faculty member, ensuring concerns could be raised privately and faculty development supported.

Learning resources and activities covered clinical components of the British Association of Dermatologists' undergraduate curriculum and were hosted

within eight channels, highlighted in Table 2. Faculty members monitored and co-ordinated the platform, facilitating discussion, delivering teaching and providing learning resources. Student learning opportunities included 'live-chat' case-based learning (Fig. 2a) and journal clubs, as well as embedded interactive webinars featuring talks from patients. Regular input of quiz questions, revision notes and collated educational social media posts provided engagement between live sessions. Patient educators were recruited to deliver teaching sessions in order to explore whether a patient-centred approach could be easily translated to the online environment.

Data collection

Data were collected from students through pre- and post-course assessments consisting of a 10-question quiz, and from students and faculty through evaluation questionnaires. The assessments were normed using responses from 47 students (pre-course mean 6.70, post-course mean 6.48, $P = 0.97$), and their contents were directly aligned with the platform learning objectives (Fig. 2b). The questionnaires were directly adapted from Cook and Ellaway's¹⁰ validated framework for evaluating TEL (Data S1). This yielded both qualitative and quantitative data for platform evaluation. Slack usage was analysed by counting active individual

Table 2 Summary of Slack channel activities.

Channel	Activity
#somederm	Social media posts featuring dermatology content, including from dermatologists, patients and students
#revisionbites	Brief 'bite-sized' learning points on a diverse range of dermatology topics
#resources	Useful and accessible learning resources, including podcasts, textbooks, websites and videos
#imagequiz	Regular image-based quizzes on rashes and skin lesions, with a poll feature utilized to create multiple choice, exam-style questions
#caseoftheweek	Live, pre-scheduled case discussions between faculty and students based on fictional patients, with students asking questions 'in the moment'
#presentations	Presentations from patients and dermatologists were held via Zoom, integrated within Slack
#careersandstuff	Presentations and discussions regarding dermatology careers, or careers featuring dermatology, including GP and Internal Medicine
#journalclub	Flipped-classroom method used for live discussions on pre-selected dermatology journal articles to ground students in foundations of dermatology research

interactions with the platform. Active interaction was defined as an individual joining a webinar through the Slack app, posting to a channel, and replying or 'reacting' to channel content. Student participants were grouped into passive observers (≤ 5 active interactions), active users (between 6 and 99 active interactions) or super-users (≥ 100 active interactions).

Data analysis

Assessments and questionnaire responses were directly recorded into separate Google Sheets (Google LLC, Mountain View, CA, USA) then analysed using Python (V3.9.0; www.python.org) alongside the `scipy.stats` module for statistical tests (V1.5.3; www.scipy.org). Slack data were obtained as a JSON file and also analysed with Python. Pre- and post-intervention questionnaires were normed using a two-sided Mann–Whitney *U*-test for unpaired samples. Comparisons between all participants and subgroups were then conducted using two-sided Wilcoxon signed-rank tests for paired samples. Statistical significance was determined at $P < 0.05$. Qualitative data were thematically analysed and coded by one researcher (SE) and reviewed by two further researchers (JG, AP). Disagreements were resolved by discussion.

Results

Participants included students from 27 different institutions across the UK (Fig. 2c); 76% of the students were female, with 53% of students identified as belonging to one of a variety of ethnic minority groups. In total, 45 students provided information on clinical experience in dermatology; of these, 53% reported no prior experience in clinical dermatology and 33% reported < 2 weeks of clinical experience.

Complete questionnaire responses were obtained from 52 of 64 participants (81%). The remaining 12 (19%) of the 64 participants were excluded from analysis; 10 students did not complete the learner evaluation, 1 student was found to attend a university outside of the UK and 1 student withdrew from the study. Ten faculty members provided complete evaluation responses.

Analysis of Slack usage revealed that most students were passive observers of the platform ($n = 27$), actively interacting through messages or reactions ≤ 5 times, with a small group of super-users ($n = 4$) actively interacting ≥ 100 times (Fig. 3).

Student evaluation: quantitative

Quantitative evaluation data were strongly positive (Fig. 4); 96% of students agreed that the quality of the course was excellent, 62% agreed that the course would change their practice, and 85% agreed that the educational activities encouraged interaction and collaboration with other participants.

Student evaluation: qualitative

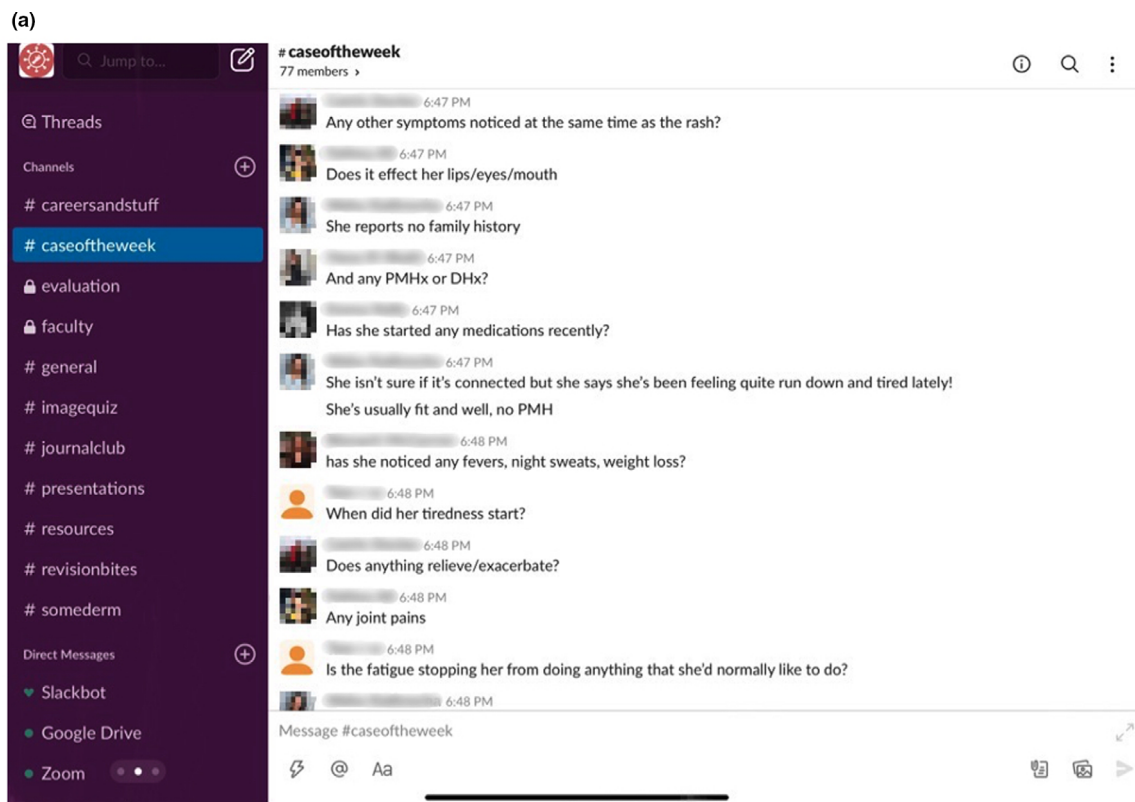
Thematic analysis and coding of qualitative evaluation data elicited themes of collaboration (Stage 3 of SFSM), consolidation of learning (Stage 4 of SFSM) and patient perspectives. Case-based discussions, live Zoom webinars, image quizzes and patient educator sessions were the most valued learning opportunities (Stages 4 and 5 of SFSM).

"The patient experiences ... consolidated my learning and gave a broader perspective of dermatology."

Collaboration was frequently referenced as a positive attribute of the platform, with students expressing their enjoyment of collaborating and learning with others.

"Loved being part of a community of people who love derm too!"

"Like the inter-medical school aspect."



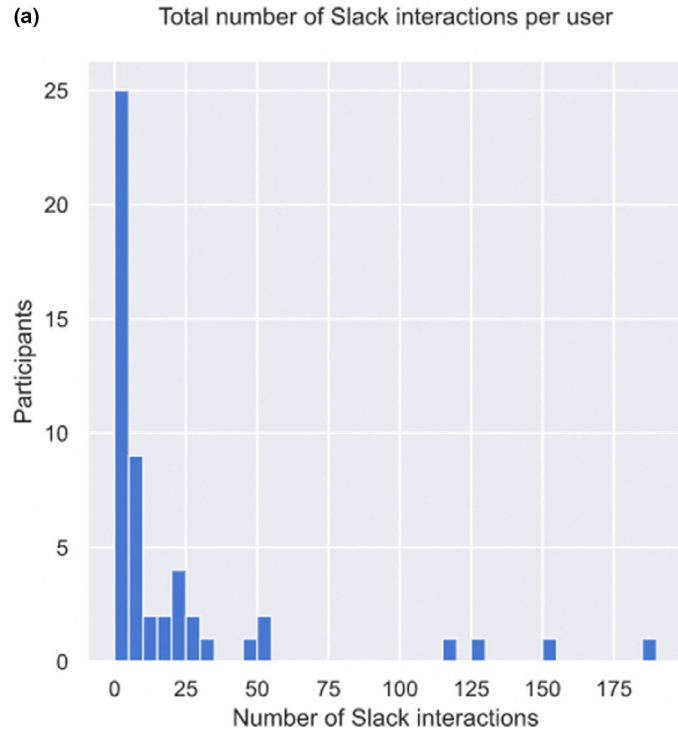
(b)

LEARNING OBJECTIVES

- To acquire a systematic approach to describing a dermatological presentation
- To understand core components of the dermatology history
- To be able to identify classic presentations of core dermatology conditions, including eczema, psoriasis, skin cancers, blistering disorders and dermatological manifestations of systemic disease
- To understand career paths involving dermatology
- To gain experience in critical appraisal of a variety of research methodologies involved in dermatology



Figure 2 (a) Screenshot of activity from the #caseoftheweek channel of the Derm Hub Slack workspace; (b) learning objectives for the Derm Hub; (c) map showing locations of participants across the UK.



(b)

Active members

See how many people are active — meaning they posted a message or read at least one channel or direct message.



Figure 3 (a) Total number of active platform interactions vs. number of students; (b) total active weekly Slack group members.

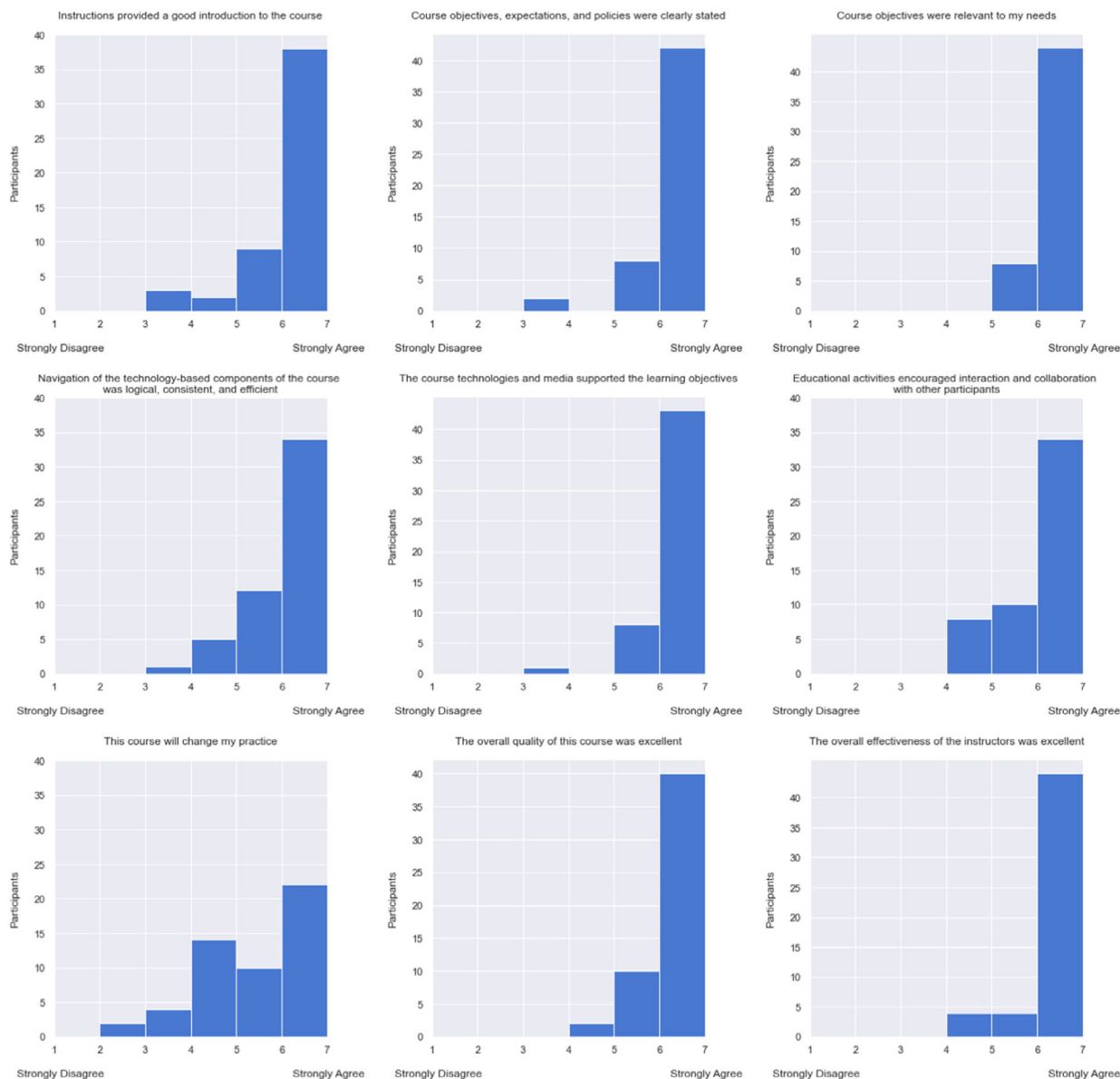


Figure 4 Results of participants' post-course evaluation.

Students reported increased understanding and enjoyment of dermatology, as well as improved exposure to the specialty. For several this translated to practical application of knowledge acquired through the platform (Stage 5 of SFSM).

“I had not enjoyed derm before this course. [It] really facilitated my understanding of derm and so I can now put this into practice.”

“I have found myself actively examining patients' skin in hospital for dermatological conditions.”

Negative feelings included anxiety about others judging their comments and difficulty engaging with the platform due to medical school commitments and the timing of live teaching sessions.

Knowledge assessment

Analysis of objective knowledge acquisition revealed no statistically significant difference in the mean pre- and post-intervention scores of participants (7.13 vs. 6.71, $P = 0.09$). This remained the case when subgroup analyses were conducted, stratifying students by

clinical experience, stage of training and engagement with the platform.

Faculty evaluation

Thematic analysis of the faculty responses elicited two main themes: the value of the teaching to help personal learning, and the value of learning from other educators.

“Being on the teachers end and the learners end at the same time excited me the most.”

Quantitative analysis of faculty responses revealed unanimous agreement that the overall course quality was excellent, with individual course components such as use of technology, educational activities and course objectives also receiving highly positive scores (Fig. 4).

Discussion

To our knowledge, this is the first study investigating the effectiveness of Slack as a teaching platform for undergraduate dermatology medical education. We found that an online Slack community enables delivery of high-quality, collaborative and patient-centred undergraduate dermatology teaching. Of note, the delivery, inception, planning and development of the platform was undertaken entirely online, with several of the research team and none of the faculty having met in person. If delivered alongside traditional F2F teaching, this initiative presents a sustainable method of ensuring educational continuity without compromising opportunities to learn with and from others.

Results regarding students' dermatological experience corroborate well-documented under-representation of dermatology within undergraduate curricula.^{11,12} This has been heightened during the COVID-19 pandemic, with widespread cancellation of F2F outpatient clinics, which previously accounted for the majority of undergraduate clinical experience.¹¹ This dearth of dermatology exposure risks undermining clinical competence and the likelihood of considering a career in dermatology. Although online communities cannot – and should not – replace patient contact, supplementary exposures can improve confidence in skin examination as well as promoting consideration of dermatology as a career. These outcomes indicate attainment of the final development stage of SFSM⁸ and achievement of higher levels of Bloom's Taxonomy,¹³ an established hierarchical model classifying learning into levels of increasing complexity. Students achieved 'application' and 'understanding' of taught principles, compared with classic

unidirectional online resources, which are based around 'remembering' information.

The platform facilitates implementation of disruptive innovations that address the shortfalls of classic medical education models by fostering a learner-centred approach.¹⁴ Flipped classroom learning,¹⁵ for example, was utilized within the #journalclub channel and was well-received by students.

Rates of active interaction with the platform were lower than expected, with widespread passive observation. Such 'lurkers' have become a well-recognized phenomenon within online collaborative education.^{8,16} Although few students felt that the course required inappropriately high technology skills, students did report usability issues, despite circulation of an induction document and video as well as live induction sessions. Many students found it difficult to commit time to active engagement alongside other university commitments, or felt overwhelmed by the volume of messages received. Although the collaborative nature of the platform was appreciated by students, a minority reported that their engagement was hindered through fear of judgement by peers of incorrect or slow answers. These barriers to active participation are recognized reasons for lurking.^{8,16,17} From a constructivist viewpoint, these students could be expected to struggle to achieve meaningful learning without engaging in active participation,¹⁸ and they remain at the initial access and motivation stage of SFSM.⁸ This could explain the lack of difference between the pre- and post-course test scores, a finding incongruent with the self-reported utility of the course.

There were some limitations to the study. Although the cohort provided an adequate sample size, it was insufficient to generate user subgroups that were adequately powered for robust analysis. Other limitations included the brief duration necessitated by this pilot, in addition to the possibility of bias in recruitment methodology resulting from advertising exclusively through social media.

We have a number of recommendations. This pilot has revealed opportunities for improvement of online collaborative platforms prior to implementation by educators. Uncertainty surrounding timings of live events was a frequently cited barrier, and embedded calendars might provide clarity. We highlight the importance of high-quality, intensive induction when facilitating migration of students onto an unfamiliar platform; despite three modes of induction, our cohort cited practical uncertainties, leading to reduced engagement. Learning spaces and platform design should be rationalized and streamlined to avoid

excessive cognitive load,¹⁹ previously demonstrated to reduce participation in online learning.²⁰ Areas for further study include the impact of factors such as prior dermatology knowledge, stage of training and technological familiarity upon engagement, so as to target resources.

We encourage recruitment, induction and engagement of patient educators as they augment the learning experience. It is important to minimize technological unfamiliarity reducing accessibility for some patient groups in order to ensure that representative, patient-centred resources can be provided.

Conclusion

Dermatology educators have called for technological innovation to address pandemic-related disruption to undergraduate teaching, in an already pressured landscape.^{4,7} This pilot study highlights Slack as a supplementary, remote solution that does not compromise collaborative learning. Lessons from this pilot demonstrate that students value online communities of practice and that patient-centred education must not be lost in the rapid shift to online learning.

What's already known about this topic?

- Dermatology is under-represented in undergraduate curricula relative to patient burden and has been disproportionately affected by the COVID-19 pandemic.
- TEL resources are widely available to supplement F2F undergraduate dermatology education, but are largely unidirectional.
- The value of learning through participation in a community of practice is well established, but collaborative learning is neglected by these forms of TEL resources.

What does this study add?

- An online undergraduate community based on Slack is an enjoyable, acceptable and collaborative way to deliver remote dermatology teaching.
- Such innovations can augment traditional teaching methodologies and can provide educational continuity in the context of a pandemic.
- Patient-centred education is valued by students and can be established through online learning by incorporating teaching from patient educators.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Data S1. The Derm Hub Learner Evaluation Questionnaire (adapted from Cook and Ellaway, 2015¹⁰).