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Online Medical Education: Utilization of Google Forms for Remote Active Learning Experiences in a Large Medical School Class During the COVID-19 Pandemic

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INNOVATION

Online Medical Education: Utilization of Google Forms for Remote Active Learning Experiences in a Large Medical School Class During the COVID-19 Pandemic

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Abstract
Remote delivery of preclinical medical scientific curriculum during the COVID pandemic to a large medical school class ($n=429$) provided limited options for active learning. We implemented adjunct Google Forms in a first-year medical school class to provide online, active learning with automated feedback and mastery learning approaches.

Keywords Distance learning · Online education · Medical curriculum

The ongoing COVID-19 pandemic created a need for the Kansas City University College of Osteopathic Medicine Mechanisms of Disease (MOD) course to be delivered remotely in the spring of 2021. We anticipated this remote learning scenario and formulated an educational tool that could be delivered online while providing an interactive, individualized session for this large class of first-year medical students ($n=429$).

We created three Google Forms, utilizing instruction provided by the Google Teacher Center online resource [1]. Each form contained patient case scenarios reflecting clinical diseases taught in the MOD course, with course materials placed strategically within the Google Forms as lecture video excerpts or images from the course textbook. Images of patient conditions, peripheral blood smears, and laboratory data were also embedded.

The case scenarios within the forms incorporated multiple-choice questions (MCQs) regarding the clinical presentation, physiology, and diagnostic approaches. These MCQs were based on course learning objectives, framed in a clinical context. Educational materials preceded the quiz questions to juxtapose fundamental content to the applicative exercises (Fig. 1), allowing immediate prospective framing of content. Our approach to form construction incorporated an "escape room" format [2], requiring mastery of concepts to progress through the cases. Correct answers allowed learners to view the question rationale for retrospective feedback, after which they proceeded further into the case. Incorrect answers took users to a "retry" page, where the question was repeated with redirecting guidance (see Fig. 2). The learners were allowed unlimited attempts to answer questions. This build allowed a mastery approach to learning within a fully automated template.

The Google Forms were distributed to the class via URL links provided on the university learning management system. The faculty sent a message along with the links clarifying that individual learners could access any or all of them from home at any point they chose during this 7-week course and that completion was optional, anonymous, and not part of the course grade.

Engagement for this optional exercise was significant: of the 429 students enrolled, 260 completed the online Google Form for case 1, 247 completed Google Form case 2, and 204 completed Google Form case 3.

Google Forms allows collection of response data in real-time. This allowed us to determine the relative difficulty of each question, since our build allowed "first-try" data to be collected. With this unique insight, we could reassess easy questions to make them more challenging for future use, while unexpectedly challenging questions could be reviewed to explore fundamental or widespread conceptual gaps. Identifying an area with a low percentage of correct first-try responses gave us the ability to clarify or expound upon this material before graded assessments.

We utilized Google Form's data analytics to gather experiential survey data through Likert-style one-click response

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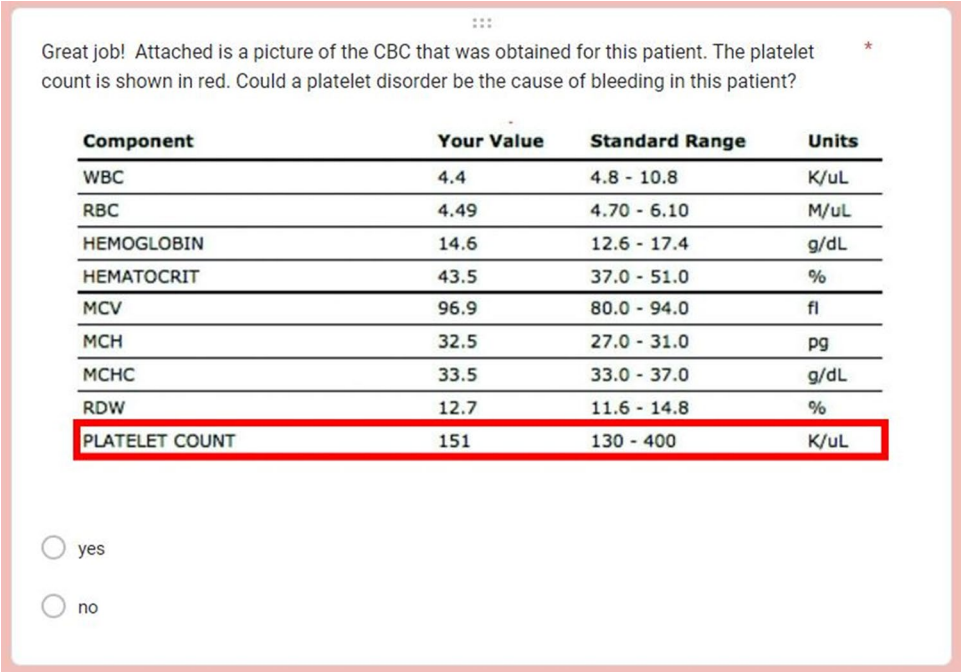

Fig. 1 The Google Form exercises incorporated images pertinent to patient care, demonstrated by the laboratory values seen in the image. An immediate question following the data allowed active learning as students progressed through the patient scenario

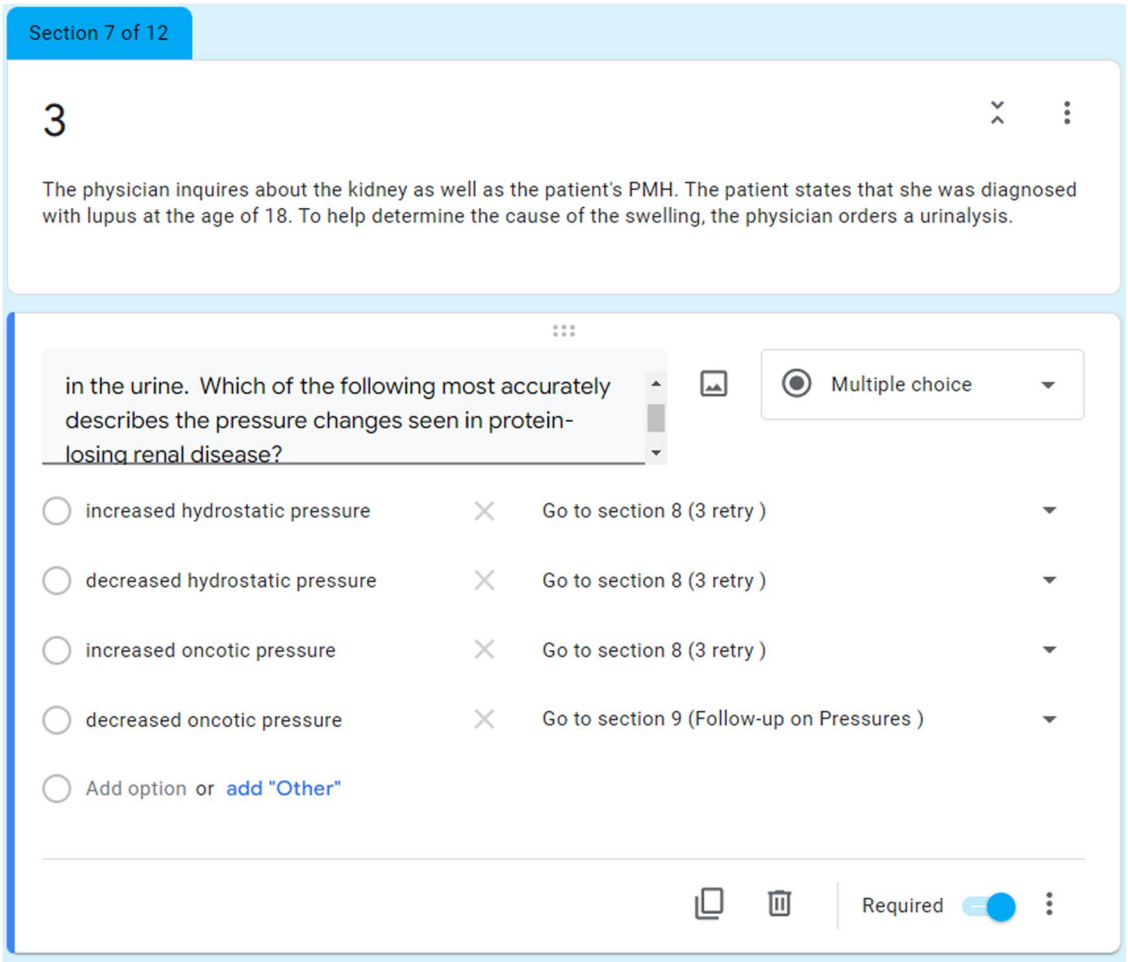

Fig. 2 The Google Form exercises allowed formative mastery experiences through redirection in "retry" pages. In this construction excerpt, the first three (incorrect) answer options routed to a retry page for this question; the fourth (correct) option routed to a page with a rationale and allowed progression through the case

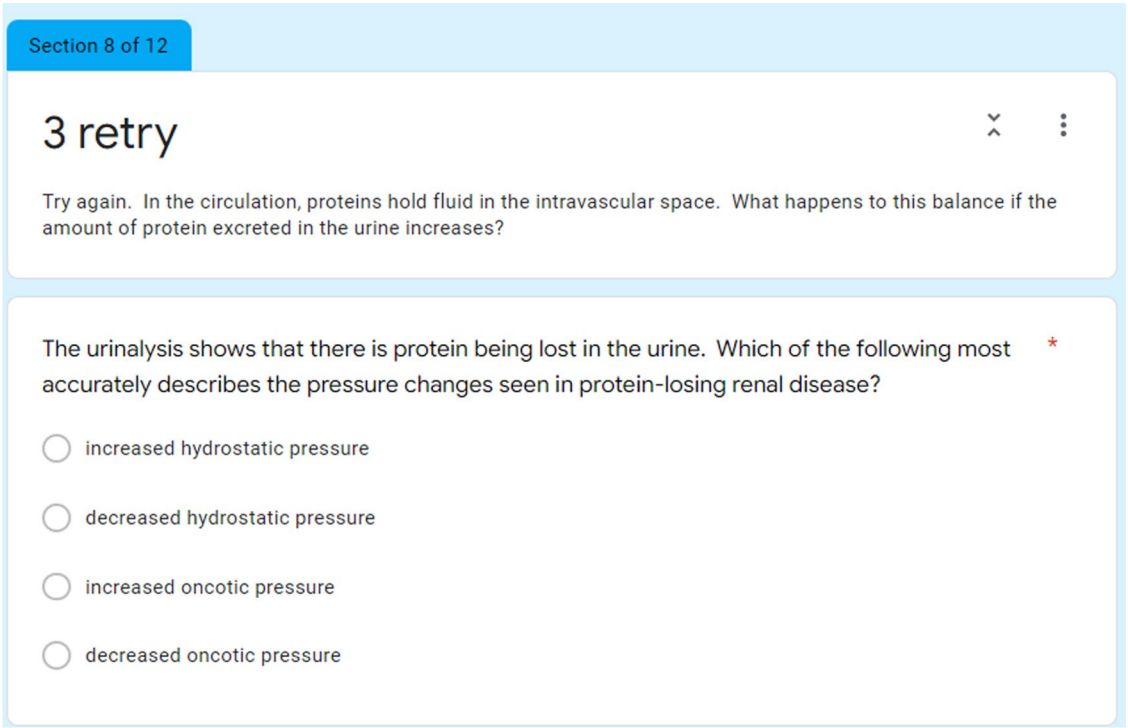

Fig. 2 (continued)

items and free-text options. A survey link was provided for learners at the end of the exercises. The high rate of opt-in responses (~ 80% of form participants) on the post-course survey may reflect the ease of survey participation. The overwhelming majority of survey respondents found the Google Forms to be an effective learning tool (93.6%), felt they were easy to navigate (98.4%), and recommended they be incorporated in future courses (96.3%).

A downside of using Google Forms is that, as an independent platform, its durability is not assured. We do not own these forms, and do not have an assured product.

Our experience adding Google Forms to our curriculum revealed a versatile, remote-access educational tool, which was positively received by students. As educators, we found Google Forms effective for collecting valuable aggregate performance data. Furthermore, Google Forms could be custom-designed and distributed with ease. We believe these Google Forms exercises increased the quality of remote educational delivery during the COVID-19 pandemic and offer enduring value for the future.

Data Availability Datasets available from corresponding author upon reasonable request.

Declarations

Ethical Approval Approved by Kansas City University IRB #1368384-4.

Consent to Participate Student participation was considered exempt through the university IRB.

Conflict of Interest The authors declare no competing interests.

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