

Designing an active learning module for medical students: Population genetics and disease risk estimation

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Scholarly Concentration in Medical Education

Introduction

Education in clinical genetics for health professionals rarely keeps pace with current advances in genetic testing, such as the widespread clinical use of DNA sequencing technology. Furthermore, clinical use of population genetics to estimate different disease risks is now often replaced by the use of genetic tests. However, the subject of population genetics is still included in detail on medical licensing examinations such as the *United States Medical Licensing Exams* (USMLE). The aim of this project was to design active learning modules for medical students at Alpert Medical School (AMS) of Brown University. We hypothesized that a self-study module would provide a more active and effective approach to teach population genetics than the video-recorded 80-minute lecture previously used in the curriculum.

Methods

We used learning objectives from prior AMS lecture materials to develop handouts about population genetics for the first-year Genetics course at AMS (for the M.D. class of 2021), along with two problem sets accompanied by solutions and explanations. The educational materials were available as a self-study module to be completed during the students' own time in preparation for the Genetics course final exam. The students did not have access to the prior lecture used by the M.D. Class of 2020. The module consisted of a seven-page handout with suggested videos for further reference, the problem sets, and their accompanying solutions and explanations. We assessed satisfaction with the module using a survey built in Qualtrics software; and responses were rated on a five-point Likert scale.

Results

The population genetics module was implemented in November 2017. All 144 first-year students at Alpert Medical School were responsible for the content on their final exam; 73 students (51%) responded to the survey. Of these students, 50 (69%) felt that the module was appropriate as a self-study module rather than a lecture and 17 (23%) were uncertain (Figure 1). Among the respondents, 50 (69%) rated the materials as "very helpful" or "extremely helpful" for teaching population genetics content; 54 (74%) agreed that the materials were "very helpful" or "extremely helpful" for applying learned content (Figure 2). The mean rating of the module was 3.5 on a five-point Likert scale (Figure 3). Some of the respondents suggested that the most helpful component of the module materials was the abundance of application-type questions; respondents also suggested that the materials could be improved by providing copies without solutions. Multiple students commented that incorporating a group-based activity would be helpful for consolidation and application of principles learned in the module. The overall class performance on specific questions related to population genetics demonstrated no difference in performance for the M.D.21 class compared to the M.D. '20 class.

Conclusions

Students were generally satisfied with the genetics self-study materials and felt that the module was an effective and appropriate way to teach population genetics. The results suggest that additional lectures in other preclinical courses at health professions schools may be transitioned to active learning modules while remaining effective teaching tools. This module may not be of sufficient detail for educating genetic counselors or other health professionals who deal extensively with genetics on a daily basis. We plan to further develop this project by implementing a comprehensive medical genetics team-based learning activity in the Genetics course at Alpert Medical School.

Figure 1. Was the module appropriate as a self-study module rather than a lecture?

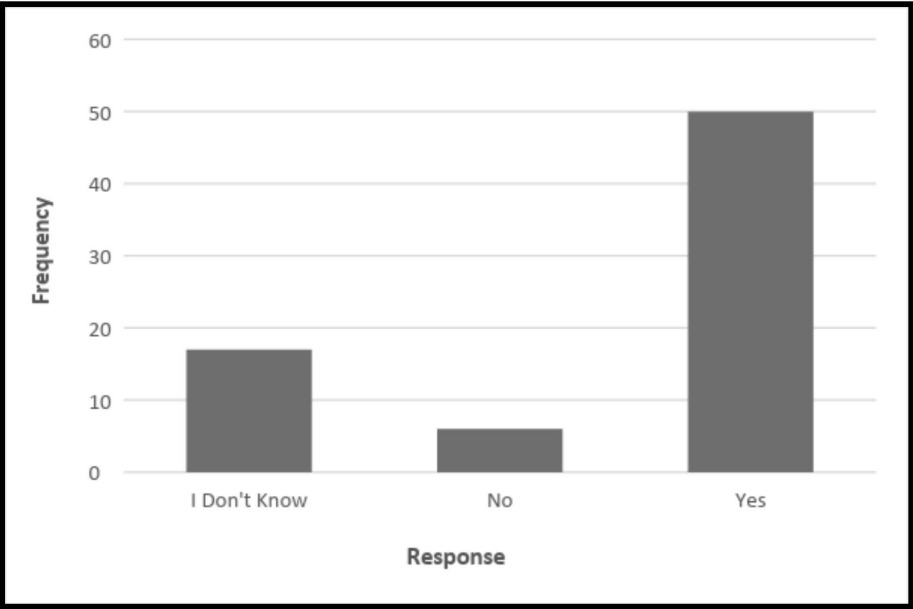


Figure 2. How helpful was the module for a) teaching content, and b) applying concepts?

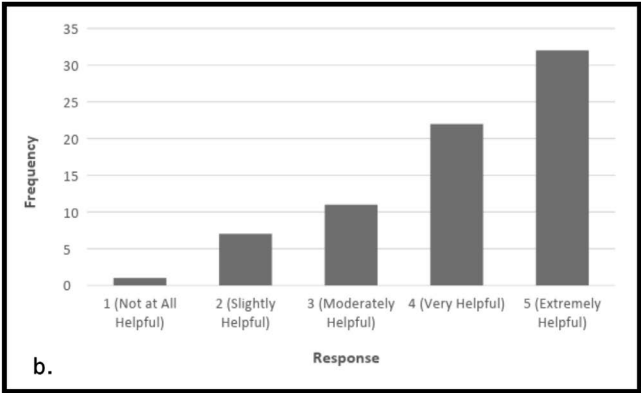
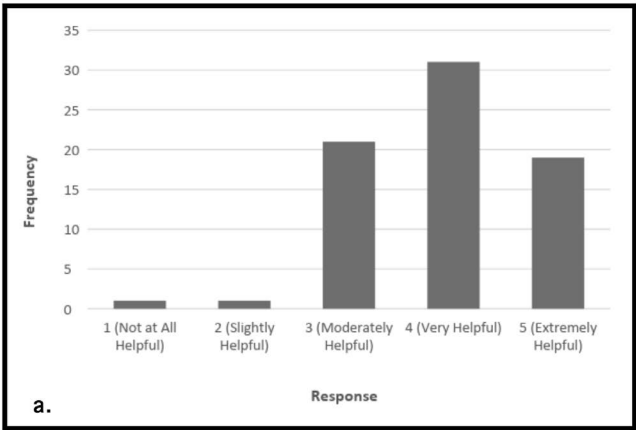


Figure 3. Overall rating of the module.

