

ASSESSMENT AND TRACKING OF BASIC SCIENCE KNOWLEDGE DURING PRECLINICAL AND CLINICAL YEARS

Mark A.W. Andrews, Ph.D.^{1*}, Donald Linville, Ph.D.¹, and Christopher Keller, Ph.D.² The Lake Erie College of Osteopathic Medicine, ¹at Seton Hill Univ., Greensburg, PA, and ²Erie, PA., U.S.A.

While there has always been a desire and need to track and assess the progress of medical students through their preclinical years, this need may become even greater as the COMLEX (and USMLE) affect changes to their series of licensure examinations.

PURPOSE

As changes in these examinations are made, and the Level 1 is combined with Level 2, in a "Phase 1" examination, it is becoming incumbent that the individual schools track and assess student progress to assure that students meet, or exceed, minimal competency to enter their clinical clerkship.

METHODS

To aid in this process, we are developing an assessment tool that primarily tests basic science knowledge. This assessment examination contains 200 items which deal with cell biology, biochemistry, physiology, pharmacology, pathology and microbiology. It is planned that students will sit for this assessment examination, 1) immediately upon matriculation, then 2) at the end of the first year, 3) at a point during the second semester of the second year, and finally, 4) during the Spring of the MS 3 year, prior to sitting for the "Phase 1" examination. Items will be appropriately altered in order to minimize reader bias.

RESULTS

On initial assessment, given the diversity of the medical college population, we expect a low average score, somewhere in the 30-40% average, a large range, and a high standard deviation. During follow-up testing, we expect the average scores to rise, the range to shrink, and standard deviation to decrease, as the students, in general, become more homogeneous, and ready to enter the clinical clerkship years. The final assessment will test our expectation that the students will be able to retain, and build upon, their preclinical knowledge base during their initial year of clerkships.

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CDM QUESTIONS: SOFTWARE ALLOWS STUDENTS TO PRACTICE NEW QUESTION STYLE ONLINE BEFORE SUMMATIVE EXAMS

Jackie Carnegie*, Marco Iafolla & Hannah Weinstangel, Faculty of Medicine, University of Ottawa, 451 Smyth Road, Ottawa, ON. K1H8M5 CANADA

PURPOSE

Clinical decision making (CDM) questions are now included in the summative exams of the University of Ottawa undergraduate medical curriculum. QuandaryR, an action maze software, was used to develop weekly online formative exams for Foundations, the first major unit of Year 1. The goal was to give students practice with CDM questions while simultaneously providing feedback on their learning.

METHODS

The exams (French and English) were created in tables with basic science and clinical learning objectives guiding the creation of questions, answers, and feedback. The exercises were then inserted into Quandary and the scoring customized to reward correct answers, penalize seriously incorrect choices and block repeated selection of a correct answer. The software allowed unlimited numbers of choices and correct answers per question. Each student received feedback for every answer (correct or incorrect) and could retry each question and each exam as often as needed. Student use of the exams was tracked via Google Analytics.

RESULTS

Students welcomed the opportunity to self-test and increased use of the practice exams was noted during the two weeks before the Foundations final exam. For example, with regard to the Anglophone stream (112 students) and the weeks 5-10 exams, 189 visits occurred during December 7-13 with an average visit time of 6.32 minutes. Traffic further increased during the subsequent week (December 14-17; exam day was December 18) to reach a total of 286 visits and an average time per visit of 11.34 minutes.

CONCLUSION

The flexibility of Quandary supports the design and online provision of practice CDM questions. Instructional feedback encourages learning while students self-assess their application of new basic science knowledge within the context of clinical scenarios.

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USING AN AUDIENCE RESPONSE SYSTEM FOR LARGE GROUP TESTING AND SESSION EVALUATION

Peter G.M. de Jong^{*1}, Nynke R. Bos², Jacqueline Bustra², Roel Sijstermans². ¹Leiden University Medical Center, ²Academic Medical Center Amsterdam, THE NETHERLANDS

PURPOSE

Audience Response Systems (ARS) or ‘clickers’ are widely used in higher education. Students appreciate the use of clickers as it activates and motivates the audience. Most teachers use ARS to interact with the audience and to adjust their teaching on the spot. However, the system is also useful for formal testing and evaluation purposes.

METHODS

At the Academic Medical Center Amsterdam, the system has been used to perform formal testing in students. In the fourth year course ‘Oncology’ an exam was taken in 200 students. In contrast to normal lecture procedures, the clickers were handed out personalized to associate each person with the right set of responses. The exam consisted of 15 multiple-choice questions. The questions were projected on the screen for about 1 minute per question. Within that period the students had to answer the question using their clicker, while changing answers was allowed as long the voting for that particular question had not been closed. The responses of the students were not displayed in public. At Leiden University Medical Center, the system has been used for evaluating educational conferences and symposia. In general, participants of such meetings have to answer several questions at the end of a session for evaluating purposes. In this setup, randomly provided clickers were used instead of paper forms. The questions were projected on the screen for about 30 seconds per question. Participants answered the questions using their clicker. The responses of the audience were not displayed in public to avoid unpleasant feedback for the speakers under evaluation.

RESULTS

Clickers are suitable to perform an exam or evaluation in a large group setting. The participants feel comfortable with the technique. It is highly beneficial that the results are available immediately after the session saving a lot of time in performing statistical analyses. In case of formal testing, the personalization of clickers and fraud prevention needs solid preparation. In our setup, some students did try to talk with each other and to copy other students’ answers. In case of session evaluation, the use of the clickers results in a much higher response rate than normally with paper evaluation forms.

CONCLUSIONS

Audience Response Systems can successfully be used to perform formal testing in students and evaluation of speakers and sessions in symposia.

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REPETITIVE TASK BASED LEARNING TO MEASURE COMPETENCE IN DIAGNOSTIC REASONING

Carlos M. Isada, M.D.*, Cleveland Clinic, Cleveland OH 44195, U.S.A.

PURPOSE

Training programs at the residency and fellowship level are required to measure and document multiple areas of clinical competence. These metrics should be convenient and demonstrate quantifiable improvement in most trainees over time. However, the “toolbox” to measure clinical competency is limited, particularly for complex behaviors such as diagnostic reasoning. We have introduced a core curriculum based on the presentation of multiple unknown clinical cases, the majority of which are diagnostic dilemmas. In this pilot study, we devised a simple scoring system to quantify competence in diagnostic reasoning.

METHODS

Fellows in infectious diseases were presented 2-3 unknown cases per week over two years. 70% of cases were seen at this institution. All cases were presented as unknowns and grouped into teaching blocks for 2-3 months (e.g. neurologic infections). Course content was delivered using Moodle, a web-based course management software system. Fellows were allotted 30 minutes per case, worked separately, and were allowed access to reference materials. Answers were submitted in a standardized short-essay format. For each case, the fellow listed his/her “top 3” differential diagnoses, outlined the pros and cons of each diagnosis, and then chose the single best diagnosis. Grade “1” was assigned if the actual diagnosis matched the fellow’s top choice; grade “2” if the actual diagnosis was within the top 3 diagnoses; grade “3” if the actual diagnosis was not within the top 3.

RESULTS

Each trainee completed an average of 190 cases over two years (n = 10 fellows, 2007-9). Year 2 fellows had significantly more grade 1 and 2 responses vs. first year fellows (84% versus 40%, p < 0.05). In 7 of 8 teaching blocks the number of grade 1 and 2 responses increased from the first week to the final week. The rate of diagnostic error (grade 3 responses) fell for all trainees in a linear fashion. 90% showed individual increases in grade 2 responses from year 1 to 2.

CONCLUSIONS

Repetitive task based learning is a potential metric for measuring competence in complex tasks, such as diagnostic reasoning.

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WHAT DO THEIR PEERS THINK? A QUALITATIVE ANALYSIS OF A REQUIRED FOURTH YEAR TEACHING MONTH

Eileen Cichoski Kelly, Ph.D., **William B. Jeffries, Ph.D.*** University of Vermont College of Medicine, Burlington VT, U.S.A.

PURPOSE

To address national concerns that curriculum reform has paid insufficient attention to communication, reasoning and analytical skills in the third and fourth year of medical education, and to reinforce longitudinal integration in the four year curriculum known as the Vermont Integrated Curriculum, fourth year students at the University of Vermont College of Medicine are required to complete a teaching or research project. The purpose of this study is to determine what impact the teaching assistants (TAs) have had on their peers who received their support. A qualitative analysis of all student evaluations was performed to determine impact.

METHODS

First and second year medical students completed course and TA evaluations commenting on the effectiveness of each TA. The TA evaluation data was collected for the first year that the teaching requirement was in effect (2007). TA evaluations were collected from all students (first years n=105; second years n= 103) for each of the teaching assistants (n= 52). Two researchers independently categorized all qualitative comments and met to verify categories. A second set of independent researchers met to categorize all qualitative comments and those categories were used to verify and amplify the original set. Categories were named, defined and illustrative quotes pulled to exemplify each.

RESULTS

The comments found in these evaluations focus on three broad categories: Teaching, Advice, and TA Attributes. The Teaching category is further divided into effective and ineffective styles. Definitions for each category have been fully developed and include specific quotes from student evaluations.

CONCLUSION

The fourth year teaching assistants had a positive impact on the education of their first and second year peers. The impact included curricular gains (such as increased student retention of material) as well as nonacademic gains (such as providing mentorship for medical education).

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2ND YEAR MEDICAL STUDENTS EVIDENCE BASED PRACTICE SKILLS: AN ONLINE COMPETENCY ASSESSMENT

Kathryn E. Kerdolff*, Maureen Knapp, Tong Yang, Richard DiCarlo. Louisiana State University Health Sciences Center, New Orleans LA 70112, U.S.A.

PURPOSE: To measure second year medical student competencies in evidence based practice skills: 1) search and retrieval using electronic resources and the Internet, 2) critical appraisal and evaluation of research studies, and 3) synthesizing evidence for application in clinical decision making and patient care. Evidence based practice skills, effective literature searching, evidence based question formulation, and basic evaluation of primary research studies are introduced to 2nd year medical students as part of the curriculum.

METHODS: A 30 minute computerized pre- and post-test assessment administered to all students at the beginning and end of the second year of medical school (n=180). Two clinical vignettes with four questions each: Vignette 1, (implications of a causal relationship between MMR vaccine and autism) has open ended questions (OEQ) that require students to use the Internet to find: 1) an authoritative website that supports MMR vaccination, 2) a health information website with patient information about the vaccine, 3) three research studies from a PubMed search that support vaccination, and 4) the original research study that started the controversy. Vignette 2 (glucocorticoids for bacterial meningitis in adults) has multiple choice questions (MCQ) where students: 5) select the best evidence-based question to answer the clinical problem, 6) choose the strongest study design to look at the problem, 7) evaluate research methodology from abstracts and select the strongest study, and 8) synthesize evidence from the abstract and select good study methods.

RESULTS: The chi-square test was utilized to evaluate change between pre and post testing. There was no significant change ($p>0.10$) between pre and post-testing for MCQs 5, 6, and 7 (evidence based question building, study design, and methodology). There was statistically significant change between pre and post-test results for (OEQ1) professional authoritative website selection ($p<0.005$), and no significant distinction between the results for (OEQ2) patient education website selection ($p>0.1$).

CONCLUSIONS: Second year medical students show general knowledge of evidence based practice skills. Introducing basic skills early in the curriculum promotes good information seeking habits and encourages life-long learning behaviors. Measuring competencies of 3rd and 4th year students as well as first year residents will give us a better understanding of the progression of a rigorous evidence based curriculum.

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A 3-PRONGED APPROACH TO WEEKLY FORMATIVE ASSESSMENTS: INDIVIDUAL AND GROUP QUIZZES, PLUS FEEDBACK

Rick Ash and Janet Lindsley*, University of Utah School of Medicine, Salt Lake City, UT 84112, U.S.A.

PURPOSE

As part of restructuring and integrating our curriculum we sought a new method for regular, formative student assessment and providing feedback.

METHODS

At 8:00 AM every Monday our students take a quiz consisting of 30-40 vignette MCQs on laptops using Respondus Lockdown Browser and Blackboard/WebCT. At 9:00 AM the individual quiz closes and a second copy of the same quiz opens. The students have 35 minutes to re-take the quiz in teams of four. At 9:35 AM the group quiz closes and a third version of the quiz appears for 15 min. with answers and explanations. The final quiz score is 90% from the individual and 10% from the group. Scores are exported from Blackboard into Excel spreadsheets that calculate the statistics for each item and discipline.

RESULTS

As predicted, the group scores are significantly higher than individual scores ($94 \pm 4\%$ vs. $80 \pm 5\%$ for 21 quizzes). By first discussing the answers and then viewing faculty feedback, students have the opportunity to learn what they missed from the previous week. Questions that receive low scores on the group quizzes are flagged as either faulty questions or material that students have not mastered. Appropriate faculty are then alerted to re-teach this material during the upcoming week. While there was initial faculty pushback at having to provide explanations for each question, most now realize that this forces them to critically evaluate and improve their questions. We discovered that the Lockdown browser software does not prevent students from capturing the quiz questions. We now provide laptops for students to take all of their quizzes and final exams on.

CONCLUSIONS

Seeing the same quiz 3 times within 2 hours has been an effective and efficient way to provide formative weekly feedback on knowledge acquisition.

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DEVELOPMENT OF A COMPREHENSIVE CURRICULUM EVALUATION

Veronica Michaelsen, M.D., M.Ed.*, Elizabeth Bradley, Ph.D. Office of Medical Education, University of Virginia School of Medicine

PURPOSE

Like so many other schools, the University of Virginia (UVA) School of Medicine is undergoing curriculum reform. The design and development of a curriculum calls for a parallel system of program evaluation. This poster details the design and development of the curriculum evaluation at UVA.

METHODS

With this in mind, the Curriculum Evaluation Community (CEC) was assembled in the Spring 2009. The participants of the CEC were chosen to represent several roles within medical education at UVA. Additionally a network of consultants provides input and feedback to the CEC. The first task of the CEC was to define the logic model for the UVA curriculum in order to provide a framework for the development of subsequent evaluation questions. The logic model used by the Curriculum Evaluation Community contained the following five basic elements - Inputs, Activities, Outputs, Outcomes, and Impact. Once the Logic Model was developed, the CEC interviewed stakeholder groups from around School of Medicine to determine what questions and concerns were most prevalent. A content analysis of these interviews found five main areas of concern: pedagogy, faculty development, accreditation concerns, student assessment and other. This list was refined with further input from stakeholders and a final list of evaluation questions developed reviewed by the Curriculum Committee.

RESULTS

The final Curriculum Evaluation questions was divided along 1) the goals of the curriculum design that were specified by the Curriculum Committee, 2) the areas of concern identified by stakeholder input and 3) implementation time lines. Plans for collecting data to speak to each of these questions is underway.

CONCLUSIONS

A comprehensive plan of program evaluation is vital to the success of curriculum reform and renewal. This process should be developed concurrently with the curriculum and involve all stakeholders.

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**EMOTIONAL INTELLIGENCE AND PERFORMANCE IN MEDICAL SCHOOL: A
PRELIMINARY ANALYSIS**

Stanley J. Nazian^{1*}, Michael T. Branick² and Steven B. Goldin³. Departments of ¹Molecular Pharmacology and Physiology, College of Medicine, ²Psychology, College of Arts and Sciences, and ³Surgery, College of Medicine; University of South Florida, Tampa, FL, U.S.A.

PURPOSE

The MCAT is moderately successful at predicting success in the pre-clinical years of medical school, but loses value as students begin seeing patients. Emotional intelligence (EI) has been linked with interpersonal skill; measures of EI might enhance our methods of predicting performance in the clinical arena.

METHODS

First and second year medical students completed the Mayer-Salovey-Caruse Emotional Intelligence Test (MCSEIT), the Wong & Law Emotional Intelligence Scale (WLEIS) and a standard personality test, the Neuroticism-Extroversion-Openness personality test (NEO). We then correlated these scores, GPA's and MCAT scores with rank in class, scores on the licensing examinations and overall performance on our Clinical Practical Examination (CPX).

RESULTS

MCAT score and undergraduate GPA correlated significantly ($p < 0.05$) with class rank and licensing examination scores, but not with overall performance on the CPX. None of the measures of EI assessed by either the MCSEIT or the WLEIS correlated significantly with any of the examined outcome measures. A number of the sub-domains measured by the NEO, however, showed a significant mild to moderate correlation with the strictly objective measures of performance. Extroversion and Openness were correlated with rank and step scores. Conscientiousness was correlated with rank. Neither the overall score nor any of the sub-scores of the MCSEIT, the WLEIS or the NEO were significantly correlated with overall performance on the CPX.

CONCLUSION

Based on these preliminary data, it appears that EI does not predict performance in medical school as measured by rank in class, score on licensing examinations or overall score on our CPX. Personality measures seem to have a modest predictive value for some objective outcomes.

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DO LOW CRITICAL THINKING MEDICAL STUDENTS REALLY EXHIBIT POOR ACADEMIC PERFORMANCE?

Kevin D. Phelan, Charles L. Desjardin, Carol R. Thrush and **Bruce W. Newton***. University of Arkansas for Medical Sciences, Little Rock, AR 72205, U.S.A.

PURPOSE

Two previous studies demonstrated positive correlations between critical thinking (CT) skills measured using the Watson-Glaser Critical Thinking Assessment (WGCTA) and academic performance during the first two years of medical school. However, these studies were limited to testing of a single class of medical students and did not separately report the performance of high and low critical thinkers.

METHODS

This paper reports on the initial findings of a multi-year study of the CT skills of medical students at our institution and the relationship between WGCTA performance (administered during freshman orientation) and academic performance on all first year in-house exams in three successive matriculating classes (2008-2010) (n = 458; >95% participation).

RESULTS

Our data confirm that significant positive correlations exist between CT skills and academic performance in the first year curriculum, though this varies with individual courses. Students in one year showed significantly less correlation than the other two, indicating some year-to-year variability. Surprisingly, although a subset of students with relatively low CT skills (bottom quintile) exhibited low academic performance, the majority of students in this category were relatively high academic performers. Most low academic performers consisted of students with average CT skills (middle three quintiles).

CONCLUSIONS

Our medical students exhibit a wide range of CT skills and include a group with relatively low CT skills. Despite confirming positive correlations between CT skills and academic performance in year one courses, this study reveals that a significant number of low CT students are actually high academic performers. Comparisons with previously published studies will be discussed.

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PREDICTING AT-RISK STUDENTS USING A DIAGNOSTIC PROFICIENCY EXAMINATION

Cathleen C. Pettepher and Neil Osheroff*. Vanderbilt University School of Medicine, Nashville, TN 37232 U.S.A.

PURPOSE

Getting off to a strong start in medical school lays a strong foundation for the preclinical curriculum. However, it is often difficult to predict student performance based on incoming records. Thus, we wanted to develop a tool that could help identify students who were potentially at risk for early struggles.

METHODS

Our study took place in Molecular Foundations of Medicine (MFM), the first scientific block of the preclinical curriculum. MFM includes biochemistry, cell biology, genetics, and tissue biology. Students were given a mandatory 50 question on-line exam the first day of class to assess their backgrounds in areas covered by MFM. Students were informed that scores would be used only to assess scientific backgrounds and would not be part of their MFM grade.

RESULTS

The proficiency exam was a strong predictor of student performance in MFM. Over a 3-year period, there was a strong positive correlation ($P < 0.0001$) between proficiency exam scores and final scores in MFM. $67.6 \pm 4.2\%$ of students who scored below average on the proficiency exam also scored below average in MFM. Moreover, $73.4 \pm 7.2\%$ of students who scored in the lower third and $87.7 \pm 4.0\%$ of students who scored in the bottom 10 on the proficiency exam scored below average in MFM. Viewed differently, $83.3 \pm 5.7\%$ of students who scored in the bottom 10 in MFM also scored below average on the proficiency exam.

CONCLUSION

Information derived from the proficiency exam allowed early intervention and helped guide decisions regarding academic support for students. Feedback from at-risk students indicates that early assistance positively impacted their learning, helped them pass MFM, and reduced anxiety. We believe that the exam is a valuable tool to aid our students with their transition to medical school.

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**MAKING THE TRANSITION TO MCQ-BASED ASSESSMENTS: OPTIONS AND
DISTRACTERS**

Tomlin, J. Paul* and Donna Beman, University of the West Indies, Mona, JAMAICA

PURPOSE

Over the last decade, the medical school at the University of the West Indies, Jamaica, has seen a marked increase in the use of multiple choice questions (MCQs) in student assessment. Generating and managing large numbers of MCQ-based examinations has become an important part of the work for course leaders and curriculum administrators. This abstract describes the options involved in making the transition and the factors limiting success.

METHODS

With curriculum reform in 2001 came the setting up of an Examinations Committee (EC) charged with managing and ensuring the quality of the examinations. Initially large numbers of item writing workshops were held with multidisciplinary teams of teachers. The items produced were vetted by a team from the EC prior to conducting assessments. Later standard setting using Angoff's method was used to set performance cut-points. We reviewed and analysed the progress made through this approach.

RESULTS

Management of questions generated from past workshops has been limited as a proper bank to allow for tracking and recall of questions has not been developed. Continuing options for meeting the demand for quality items include "buying banks", renewing efforts to organize a local bank and expanding item writing to include students' efforts. The distracters to moving ahead are perceived as waning enthusiasm on the part of teachers for developing new items and the search for the right item bank. GRIPE is being currently used for pathology courses. Heavy workload of teachers and administrators such as extensive standard setting of items, tied with a sense of complacency has also reduced initiative for expanding and managing the transition to MCQ-based examinations.

CONCLUSIONS

The dominance of MCQ-based assessments in a reformed curriculum has called for heavy staff training and a search for item banks. Waning enthusiasm for the process and heavy workloads have taken away focus from this initiative.

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EFFECTS OF THE CHANGE IN CALL STRUCTURE ON THE OVERALL PEDIATRIC CLERKSHIP EXPERIENCE

Nasreen Talib*, Serkan Toy, Kristen Moore, Jennifer Quaintance, Vidya Sharma. University of Missouri, Kansas City School of Medicine, Kansas City, MO 64108, U.S.A.

PURPOSE

The educational value of the night call structure for medical students is not well studied. This study examines the effects of the change in call structure on cognitive skills, number of general pediatric patients seen by medical students, and overall satisfaction with the pediatric clerkship.

METHODS

The intervention was a change from a scheduled 5 times a month day call (6AM-10PM) in 2008-09 academic year to a continuous 5 night calls (6 PM -7AM) in 2009-10. Included in the study were 43 students who completed their pediatric clerkship during Nov-Feb 2008-09 and 36 students from Nov-Feb 2009-10 time period. For both groups, cognitive performance scores from the National Medical Board Exam; data on the number of new admissions seen by medical students from medical records; and data on medical students' overall satisfaction with the clerkship experience using a 5-point Likert scale were collected at the end of each rotation. Students' perceptions of time residents spent teaching was also obtained by surveys collected weekly from the medical students in the academic year of 2009-10.

RESULTS

Preliminary results from unpaired t tests yielded no statistically significant differences between the two different call structures indicating that the change in call structure did not have any negative impact on cognitive skills, exposure to number of general pediatric patients, or students' satisfaction with the pediatric clerkship. Students' perceptions of time residents spent teaching medical students was not statistically significant either.

CONCLUSION

While no negative impact has been found in the overnight call experience, introducing the night call experience for medical students provides a consistent, uniform exposure to residents and general pediatric patients.

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PACE: AN ALTERNATIVE MEASURE OF STUDENT QUESTION RESPONSE TIME

Sheila W. Chauvin*, James J. Thompson, Tong Yang. Louisiana State University Health Sciences Center, New Orleans LA, 70112 U.S.A.

Award Nominee

PURPOSE

At some point in a medical education program, the assessment of learners' achievement may need to address specifically the extent to which learners can access and apply specific knowledge and skills quickly and accurately. In this poster we focus on time assessment because person-level measurement in this domain is relatively underdeveloped.

METHODS

The protocol utilized in this research has been approved by our Institutional Review Board. The data was collected from a single didactic multiple choice examination of 101 questions administered by computer to 167 second-year medical students in a proctored setting. Individual test taker's item response time was recorded to the nearest second for each test item and analyzed in SPSS, QMPE, GENOVA, and Winsteps.

RESULTS

Student response times in a conventional non-speeded multiple-choice test, at both the global and individual question levels, closely approximated lognormal distributions. We propose a new measure, pace, which is derived from the survival function of these distributions, for analysis of individual person response times. These pace estimates could be used both to rank and compare students; pace also performed maximally compared to other parameterizations in generalizability and dependability studies. While pace was very weakly related to person ability, there was no detectable relationship to question parameters of shift, natural logarithmic mean, or natural logarithmic standard deviation. That is, pace was a person-dependent, question-independent measure. Pace measurements were also successfully used as covariates in models for estimation of person response time to specified questions and person accuracy in response to specified questions.

CONCLUSIONS

The analysis of pace can contribute significantly to comprehensive evaluation of student performance in both the speed and ability domains and is a requisite to best practice in testing and assessment. The proposed poster presentation will afford an opportunity to present and discuss practical implications of this new measure, pace.

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INTEGRATING BASIC SCIENCES INTO THE CLERKSHIP YEARS: DEVELOPMENT OF AN ASSESSMENT METHOD

James P. Bruzik*, Terry Wolpaw, Amy Wilson-Delfosse, Kathy Cole-Kelly and Daniel Wolpaw. Case Western Reserve University School of Medicine, Cleveland, OH 44106 U.S.A.

PURPOSE

The CASE INQUIRY+ (IQ+) program at CWRU SOM returns students to the Medical School on Friday afternoons during their core clerkships to 1) reflect on their experiences in a safe environment 2) integrate concepts of emerging knowledge and sciences basic to medicine into clinical case discussions, and 3) practice Clinical Skills. In the context of our immersive clinical experiences, a credible assessment process was needed to support student interest and accountability. Traditional approaches such as preceptor feedback were of limited value in this effort.

METHODS

Students work in teams of 4 to develop IQ+ teaching sessions for their peers based on the session template of reflection, case discussion, expert consultation, and Clinical Skills practice. They receive peer and faculty feedback on their cases prior to running the teaching session for a different group of peers. Assessment observations are focused on case material, presentation, group function and individual contributions of student presenters.

RESULTS

To date, 58 student-written cases have been run and assessed. Topics selected represent a broad array of clinically relevant subjects with important connections to sciences basic to medicine. Analysis of feedback from peers and group members has informed subsequent sessions. Faculty observers have provided specific feedback to both individuals and groups on preparation, participation, and achievement of the goals of the IQ+ curriculum. **CONCLUSION:** We designed an assessment approach for a longitudinal clerkship curriculum that relies on student effort and ownership of teaching sessions. This has enhanced student investment in the educational program and provided a framework for giving formative and summative feedback to students.

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