Online Exams: Opportunities and Challenges

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Online Exams: History

- Computer-based assessments, beginning in the 1980's
- Question banks were deployed with database software
- Hypercard for the Mac
- A few computers in the campus library…
- Then…the World Wide Web

Modes of Delivery

- Server side: program and files reside on a central computer server and accessed over a network connection; inherent security measures are in place
- Client side: program and files downloaded and run on an individual desktop/laptop computer or mobile device; inherently unsecure, but portable anywhere

Online Exams: Formative

- Practice exams for students
- Unsecure = user may access other functions, like “open book” exam, but…
- May be limited by time, or by environment (proctor)
- Free – academic sites on the internet
- Subscription – numerous publishers
- Interface – typically a web browser

Online Exams: Build your own

- Server Side – need IT support
  - Blackboard® Learn – marketed to schools
  - Moodle – open source
  - Proprietary exam banking software
- Client side – just a downloaded file
  - Simple text file by e-mail; something is better than nothing
  - Web browser interface; use html markup, javascript, flash, etc.

Online Exams: Design & Delivery

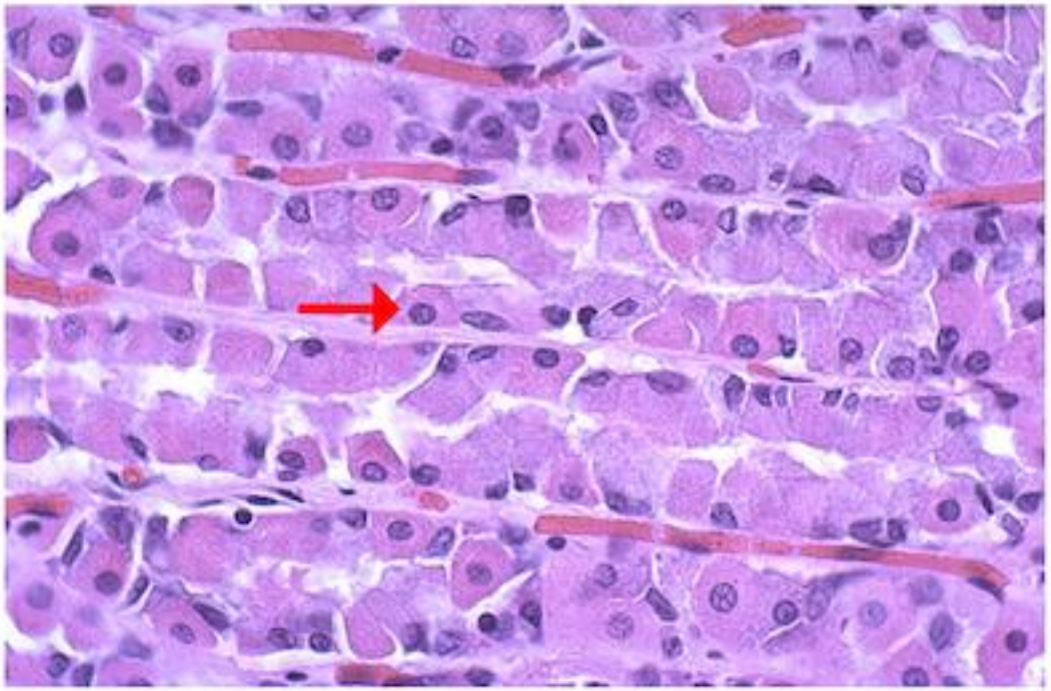
- Discipline specific, or integrated?
- Is this exam for a course or module? End of year? What if the course content changes?
- Randomization vs subject sequence
- Timed (requires considerable programming skill) vs Untimed

Online Exams: Design & Delivery

- Scoring: continuous vs. non-continuous
- Feedback: right / wrong; increases development time but improves quality (Karay et al, Med Teach. March 12, 2012. (doi:10.3109/0142159X.2012.652707)
- Linkouts to web resources – moving targets
- If the project gets too grandiose, then…
  - it can't be completed, or
  - it is developed and reviewed poorly, if at all, or
  - if completed, it won't be used

Online Exams: Question Types

- Question type
  - MCQ, single best answer
  - Extended matching
  - Identification
  - Fill-in-the-blank



Your score: 1 right

out of 1 total

Your average: 100 %

Lab

Question 1

A 55-year-old woman has had nausea along with increasing fatigue for the past 8 months. An antibody is directed against the cell type identified here. Which of the following conditions is she most likely to have?

A ☐ Diabetes mellitus

B ☐ Myasthenia gravis

C ☑ Pernicious anemia

D ☐ Grave's disease

E ☐ Addison's disease

NEXT QUESTION - - INDEX OF QUESTIONS - - EXAM MENU

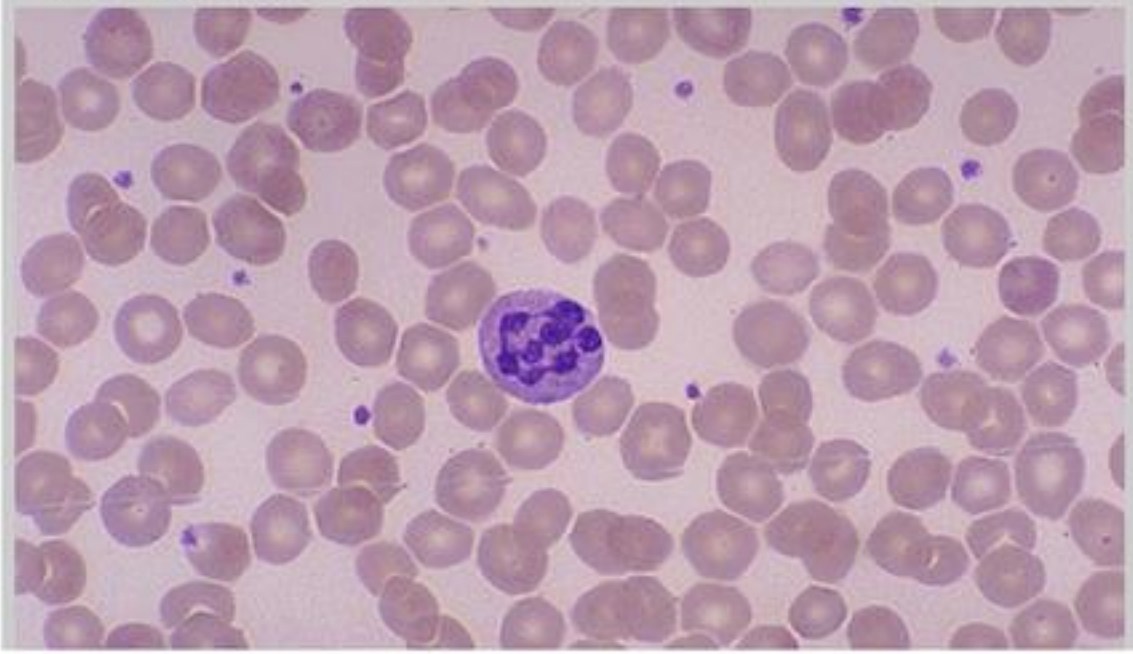
CORRECT. This is a parietal cell of the gastric mucosa. Destruction of these cells leads to loss of intrinsic factor secretion which aids in the absorbtion of vitamin B12 in the terminal ileum.

Q #	Ans	Flag
1	☑	☐
2	☑	☐
3	☐	☐
4	☐	☐
5	☐	☐
6	☐	☐
7	☐	☐
8	☐	☐
9	☐	☐
10	☐	☐
11	☐	☐
12	☐	☐
13	☐	☐
14	☐	☐
15	☐	☐
16	☐	☐
17	☐	☐
18	☐	☐
19	☐	☐
20	☐	☐
21	☐	☐
22	☐	☐
23	☐	☐
24	☐	☐
25	☐	☐
26	☐	☐
27	☐	☐
28	☐	☐
29	☐	☐
30	☐	☐

Question 2

A 40 year old female has been feeling tired for weeks. There are no abnormal physical examination findings. A stool occult blood test is negative. A complete blood count is performed, and she is found to have a hemoglobin of 9.3 g/dL with total WBC count 7500/microliter and platelet count 175,000/microliter. The microscopic appearance of the peripheral blood smear is seen here. Which of the following laboratory test findings would you most expect to be present:

- ○ A) Elevated serum D-Dimer
- ○ B) Decreased mean corpuscular volume
- ○ C) Positive antinuclear antibody test
- ◉ D) Decreased serum vitamin B12
- ○ E) Positive direct Coombs test

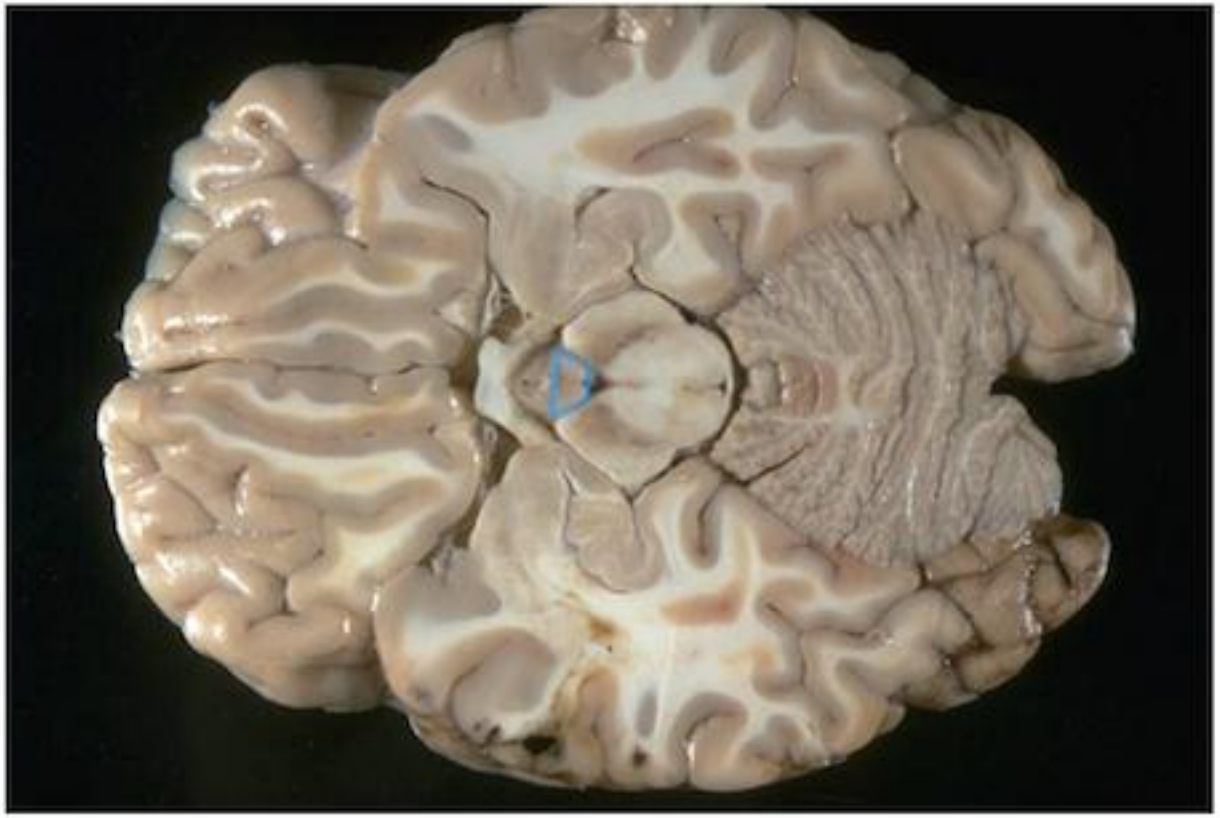


Identify the following regions of the brain on transverse section by clicking in the image below:

MRI

Optic Chiasm - Mammillary Bodies - Midbrain - Gyrus Ructus - Cerebellum - Amygdala - Hippocampus - Orbital Gyrus - Infundibulum

You have clicked on Mammillary Bodies



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C.O.W. Contest Cases - Set 21

file:///WebPath-CDROM/webpath/exam/cow/cowfr

Google

A 63-year-old woman has developed worsening dyspnea with syncope for the past week. On examination she has a systolic crescendo-decrescendo murmur on auscultation over the left sternal border. The image shown is representative of her disease. What is the diagnosis?

calcific aortic stenosis

Check Answer

Your score:

1

right

out of

1

total

Your average:

100

%

Lab

CORRECT. This is calcific aortic stenosis. Findings consistent with aortic stenosis (AS) include the triad of chest pain (angina pectoris), syncope, and heart failure. In the U.S., because of declining prevalence of rheumatic heart disease, AS is now most commonly a result of progressive aortic valvular calcification later in life. Some degree of AS is present in 29% of persons past age 65 years and 37% past age 75. This explains why most cases of AS are diagnosed after the sixth decade. Patients with AS who remain

cowans21.js

```
a[9] = "<SCRIPT LANGUAGE='JavaScript'>function
evaluate(string) {  string.answer.value =
string.answer.value.toLowerCase();  if (string.answer.value =
= '') alert('Please type in a response'); else  if
(((string.answer.value.indexOf('aortic') != -1) &&
(string.answer.value.indexOf('stenos') != -1)) ||
((string.answer.value.indexOf('calcif') != -1)))
{parent.cR();parent.showR(10)} else
{parent.cW();parent.showW(10)}}</SCRIPT><IMG SRC='../../
jpeg6/cv323.jpg' WIDTH=504 HEIGHT=396 onLoad=
'document.anat.answer.focus()'><TABLE WIDTH=525><TD><FORM
NAME='anat'><P>A 63-year-old woman has developed worsening
dyspnea with syncope for the past week. On examination she
has a systolic crescendo-decrescendo murmur on auscultation
over the left sternal border. The image shown is
representative of her disease. What is the diagnosis?<INPUT
TYPE='text' NAME='answer' SIZE='40'><INPUT TYPE='button'
VALUE='Check Answer' onClick='window.evaluate(this.form)'> </
P><P><INPUT TYPE='button' onClick='parent.nQ(11)' VALUE='NEXT
QUESTION'>"
a[10] = f + "This is calcific aortic stenosis. Findings
consistent with aortic stenosis (AS) include the triad of
chest pain (angina pectoris), syncope, and heart failure. In
the U.S., because of declining prevalence of rheumatic heart
disease, AS is now most commonly a result of progressive
aortic valvular calcification later in life. Some degree of
```

A 15799 117-54

Online Formative Exams - Usage

- The paradigm of the web is surfing
- The likelihood of a student finishing a practice online exam is inversely proportional to its length.
- Uneven usage. Some topics are far more popular than others.
- Posting more exams does not proportionately increase usage.
- Most online usage comes at the end of a term, close to the real exam.
- Modular exams can be tailored to study plans.

Formative Exams Support Summative Exams

Velan GM, Jones P, McNeil HP, Kumar RK. Integrated online formative assessments in the biomedical sciences for medical students: benefits for learning. BMC Med Educ. 2008;8:52.

Kibble JD, Johnson TR, Khalil MK, Nelson LD, Riggs GH, Borrero JL, Payer AF. Insights gained from the analysis of performance and participation in online formative assessment. Teach Learn Med. 2011;23(2):125-9.

Dobson JL. The use of formative online quizzes to enhance class preparation and scores on summative exams. Adv Physiol Educ. 2008;32(4):297-302.

Online Exams: Performance Effect

Stowell JR, Bennett D. Effects of Online Testing on Student Exam Performance and Test Anxiety. J Educ Comput Res. 2010;42(2):161-171.

…students who normally experience high levels of test anxiety in the classroom had reduced test anxiety when taking online exams, while the reverse was true for those low in classroom anxiety. Furthermore, the relationship between test anxiety and exam performance was weaker in an online setting than in the classroom.

DeSouza E, Fleming M. A comparison of in-class and online quizzes on student exam performance. J of Computing in Higher Education. http://dx.doi.org/10.1007/BF02940941, 2003.

…we compared 297 undergraduates who took online quizzes with 291 undergraduates who took traditional paper-and-pencil quizzes. …online students performed significantly better on achievement criteria (four in class exams).

Online Exams: Practice makes perfect?

- High-achieving students are more likely to participate in an optional exercise than low-achieving students.
- Access to the problem solutions increased learning, but the depth of learning may be relatively shallow.
- Formative assessment gives information about the student's overall preparedness for the exam and their particular areas of strength and weakness.

Fakcharoenphol W, Potter E, Stelzer T. What students learn when studying physics practice exam problems. Physical Review Special Topics - Physics Education Research 7, 010107 (2011). DOI: 10.1103/PhysRevSTPER.7.010107

Online Exams: Summative

- Summative = secure environment
- Secure = no access to other computer functions, such as print screen
- Computer Access
  - School's computer lab (generally a fraction of the class can sit at one time)
  - Students' laptops may be utilized
  - Seating arrangement: screen visibility to others

Online Exams: Access

- Network required
  - Wireless: how reliable is it?
  - Hardwire: not convenient for laptops
- Download to computer
  - Client side
  - Server side
- Student computers
  - Hardware requirements
  - Software training

Online Exams: Question Source

- Vendor supplied question bank
  - NBME customized test assessment
- Use your own question bank
  - Archival: conversion, data entry
  - New: opportunity to move forward
- Quality Issues
  - GIGO
  - Faculty development

Online Exams: Question Entry

- Conversion from a prior bank may be cut and paste
- Special formatting issues:
  - Special characters (‘high end’ ASCII)
  - Formulas
  - Tables
  - Diagrams
  - Normal ranges

Online Exams: Accommodations

- Quiet room
- Extra time

- Electronic exam delivery is easier than transporting and tracking paper exams
- Wireless networks generally have wide coverage

Online Exams: Crash !

- Hardware
  - Complete malfunction unlikely
  - School supplied spare computers
- Network
  - Is it reliable?
  - What is the signal strength?
  - Is the computer's network card viable?

Online Exams: Crash !

- Software conflicts on the computer
  - Viruses
  - Automatic updates
  - Conflicting, background programs
- Recovery methods
  - Resolve ‘on the fly’
  - Restart
  - Paper copy
  - Makeup

Online Exams: Item Analysis

- Statistical parameters (print or export)
  - Difficulty index
  - Discrimination index
  - Biserial
- Categories – subjects
- Reports – by student, subject, class
- No bubble sheet scanner

Online Exams: Personnel

- Training/troubleshooting/support (onsite, online, phone)
- Who enters data?
- Who proctors exam?
- Who scores the exam?
- Who in IT supports problem solving?

Online Exams: Faculty

- How do faculty work with the software?
  - Who provides questions?
  - Who edits questions?
  - Who picks questions?
- Who builds the exam?
- How is peer review accomplished?
- How are results distributed?

Online Exams: Challenges

- Question bank needs updating. If it isn't very good, a format change can’t improve it.
- Institutional computers: far fewer than the class size.
- Student computers:
  - may not meet minimum hardware standards
  - may have software issues (viruses, etc)
- Students may not seek sufficient practice. The experience is different under pressure.

Online Exams: Challenges

- Faculty are unfamiliar with an online exam
- Few personnel are running the system
- Potential security issues, summative exams:
  - During the exam
  - Unauthorized access to question bank
- In regard to all the formative assessments available…we live in an “information toxic” environment.

Online Exams: Challenges

Terzis V, Economides, AA. The acceptance and use of computer based assessment. Computers in Education. 2011;56(4):1032-1044.

… a CBA must be playful, easy to use, and useful with careful design of the content.

For a successful implementation of a summative assessment, the students must have expectations of achieving a good performance.

Social Influence: People who are important to me think that I should use CBA. The seniors in my university have been helpful in the use of CBA. In general, my university has supported the use of CBA.

Online Exams: Opportunities

- Centralize the exam process and the access
- Deliver exams across multiple campuses
- Limit access by login and password
- Provide accommodations
- Blame needed changes on the computer
- Improve exam banking

Online Exams: Opportunities

- Timing is exact – no fudging
- Saves paper and space, no bubble sheets sticking in the scanner
- Increase number and availability of exam statistical analyses
- The future of health care involves information management

Online Exams: Opportunities

- Provide more opportunities for student formative and summative assessments.
- Increase use of visuals: images, videos
- Drive horizontal curricular integration.
- Reduce “strategic learning” by students (scrambled questions).
- Hols-Elders W, Bloemendaal P, Bos N, et al. Twelve tips for computer-based assessment in medical education. Med Teach.2008;30(7):673-8.


Questions ?