Test Analysis

There are four steps in becoming a better test taker: analyzing tests, preparing for tests, taking tests, and managing test anxiety. With the first step, test analysis, we want to see what questions students are missing and why they’re missing them. Patterns will begin to emerge as one looks at the questions on the test. Students can see what’s being missed and why. From that process students know what to study and how to spot the kind of questions that they are likely to miss.

The most important knowledge for anyone is knowledge of what one doesn’t know. If students can identify the concepts that they clearly don’t understand (and are not likely to get right on a test), then they can study that information. The last test is the guide to what mistakes a student makes—a corrected test is golden because it holds the key to what students are missing and why.

We have devised a way of analyzing the tests so that students can learn from past tests; they can analyze their own mistakes. Once they know what kind of questions they have missed, they can work out a way to stop missing these questions—to minimize their mistakes.

The Minimax Strategy of Test Taking

We suggest a “minimax” test-taking strategy in which students minimize their mistakes and maximize their winners. It is an axiom that students tend to miss the same sort of questions over and over and over. We all have styles of test taking that match our personal ways of completing tasks, which are as individual to us as our thumbprints. The analysis of tests will show students what they do wrong and where their mistakes tend to fall.

There are three basic kinds of errors that students make on a test. The first one, Type 1, is a careless mistake. Students groan when they find that they have made these mistakes. One such careless mistake is writing down the wrong answer. Students write A when they meant to choose C, they bubble in the wrong answer on the answer sheet, they forget to bubble in the answer, or they misread the question, solve the wrong problem or solve for the wrong variable. They might click on the wrong choice on the computer screen. The classic Type 1 error is when a student puts the answer for number 7 in the slot for number 8, the answer for 8 in the place of 9, the answer for 9 in the place for 10, and winds up missing twenty questions in a row. Computer testing precludes many of the above mistakes, but some Type I mistakes are still possible. This
mostly happens in bad dreams, but it does happen often enough to be real. In short, students make a careless, foolish mistake that makes them upset with themselves when they read over the test after they get it back. They say, “Oh \textit{how} did I miss that?!” They missed the question because they misunderstood, misread, or misinterpreted the question. Typically, Type 1 errors happen when there is a lack of attention and concentration. Students who make many such careless errors can improve. Making Type 1 errors is not a permanent condition. There are many Type 1 mistakes, and we try to help students minimize these mistakes through practice and analysis.

A Type 2 error occurs when students don’t know something. Some element of knowledge, information, or technique is missing, so they can’t get the required answer. Students can’t do a calculation, or they’ve forgotten a definition, or they never knew the definition. Type 2 errors typically happen when students have not studied the right information or have not studied it well enough to know it for the test. They may not be able to remember the information accurately or in the right contexts.

Type 3 errors occur when students have guessed or chosen the wrong answer. They were choosing between two ambiguous answers, and they picked \textit{A} but, alas, it was \textit{C}. A Type 3 error is an artifact of the multiple choice question. Most test questions of this sort have at least one distractor answer, a choice that’s almost but not quite right. Students’ ability to discriminate between the distractor(s) and the target answer, the answer for which students are given credit, is the criterion for becoming a capable student.

The first step in the process to becoming a better test taker is thus to do a post-test analysis. First, the student lists the numbered questions that s/he got wrong (We have a form for this.), and the student characterizes each error by why the error was made, what type of error it was, what the student could do to correct it, and what the student could do \textit{not} to miss that question again. For example: “On number 13, I misread the question. How could I have avoided that? I could have read it more carefully, I could have read it twice, or I could have been more focused when I read it. That was a Type 1 error. I missed number 15 because I didn’t know what this concept meant. And how could I have fixed it? Well, I could have studied better. I guess I should have known to study that concept. It was in the lecture. I guess I should have learned it. That’s a Type 2 error. I missed number 21 because I thought it was A, but it was D. I see now why I thought it was A. If I had known the information better, I would have known that D was the preferred
answer.” Students go through the test and figure out why they missed each question and how they could study more effectively, learn the material, and make fewer mistakes on future tests.

The process of test analysis results in a stronger student. Students learn from their mistakes. Test analysis is the key to becoming a better test taker. It’s also the student’s key out of the prison of test anxiety. Students can teach themselves how to excel at tests instead of being defeated by them.

Test Preparation

The next thing that we talk about in damage control with struggling students is effective test preparation. There are several steps to this. The first useful step is to identify a set of likely questions. The set can be fairly small, depending on the subject and the confidence (or panic) of the student involved. Students should try to identify anywhere from 30 to 50, or even 75 possible questions and learn the answer to those questions with some specificity. If students choose wisely, they’re likely to choose many of the questions that are actually on the test.

Students who have been implementing the steps of going to class, listening, reviewing the transcripts, preparing to listen, and making study cards will find that many of the concepts that they think will be on the test will already be familiar to them. They will not be coming from way, way back in learning this information. They will have some knowledge about the concepts that will be on the test.

Try to work for specificity of knowledge. We take great pains to explain to students the difference between understanding and knowing. As students, we understand a great many things, but we only know a few things with enough detail to answer them convincingly on tests. Part of a student’s main task is to learn enough “cepts” with enough specificity to answer any question, no matter how diabolical, correctly. Some students use cards and graphic organizers, charts, and other study aids. Experience in working with students has shown us that the study card or the chart is far and away the best way to achieve that level of specificity for most students.

In order to study for the test, the major axiom is “Start early.” Students need to begin creating study materials the first week of each section. If they wait until the week of the test, they’ve waited too long. They won’t have time to make the cards, charts, and diagrams and have time to study them as well. After making the study materials early, students should begin looking at them on a daily basis. The goal is to look at one side of the card and say, without error, what’s
on the other side. That’s the best way for students to know that they know the “cept.” Cards keep students from fooling themselves. If they can’t look at one side of the card and say without error what’s on the other side, they may understand the information, but they don’t know it. This strategy makes students aware of what knowledge they have and what knowledge they don’t have. Likewise, if students cannot reproduce a chart from memory, they don’t know it. The students may be able to use the chart, and it may be a very helpful tool, but they must memorize the information to answer test questions on the chart.

The successful student must come to understand well the distinction between knowledge and understanding. Many students study for the test with the text open in their laps and the notes on their desk, and they even explain the questions to a roommate, but on the test they find that the “cepts” that they thought they knew, they only understood. They don’t know the information specifically enough to pass the test. Students need to be able to quote definitions and medical terms precisely from memory; they need to be able to apply formulas; they need to be able to draw distinctions where small distinctions exist; and they need to know with some confidence and firmness the information that they are likely to be asked.

Understanding is valuable, and students do well to seek it eagerly. Understanding is what they will remember when they graduate from school. They may have forgotten some of the specific definitions that they’ve memorized, but they will remember the broad points that will carry them forward. But that is the irony. We read and listen for understanding, and we use the understanding far into our careers. We are, however, tested on knowledge, not understanding. In order to pass the standard med school test or the Boards, students need specific knowledge and lots of it.

Managing Time in the Preparation for Tests

Another aspect of test preparation is time management. Using time productively in test preparation is a skill that can be developed. First, students make a time chart, a calendar of their time for the weeks prior to the test, and they should plan in everything, including time for meals and recreation, for exercise, for sleep, for study, for everything. They must plan their study time with great carefulness so that none is wasted. In order to maximize their time, they prepare for tests from notes, cards, and organizers. They read the text, though it is often better to work toward the test from notes and an outline text rather than going back to the basic text. The basic
text is often just too much, too prolix. Students study old tests and notes or last year’s transcripts (and this year’s as they become available). Most of the test questions should come from those sources.

In test preparation, students thus learn how to identify the questions that they expect to be asked and devise ways to memorize the information necessary to answer to each of those prospective questions. Doing well gives students the courage to think for themselves. They may say, “I’m getting somewhere here, I can play this game.” Rising expectations are the welcome sign that a student understands how to identify the information most worth knowing, can learn it, and can perform well on tests.

**Becoming a Better Test Taker During the Test**

The next thing we do for students in test performance skills is to work with them on actually taking the test. How should one take the test and do well on it? We use some practice tests and reading tests that predict—with considerable accuracy, actually—student errors on tests. We look at their reading of test items and at their ability to manage time on tests. We try to track what’s going on as students actually take a test—not as they study for the test, and not what they might do, but what they actually do on tests. Then we help students maximize the right answers and minimize the wrong answers.

In order for students to reach this goal, they need to develop the “minimax” strategy of test taking. They need to minimize their errors and maximize their test scores. There are several steps to this strategy. First, as a test approaches, students should make sure that they know the information that they expect to be asked. Second, students should visualize themselves taking the test. They should visualize what they’re going to wear, where they will be sitting, and how it will feel to do well on the test. In essence, students should pre-live the test. Students should try to pre-experience the good feeling that they have when they’re getting the answers right and doing well. This strategy borrows from the technique of tennis and golf pros, as well as from other athletes, musicians, and performers, who pre-live their performance. They think through every step, every stroke of the play and every hole on the course. They need to consider how they’re going to handle each situation that might arise. Students thus visualize themselves feeling what they’re going to feel as they are performing well on the test. The process has actually worked for those students who have tried it.
The best thing that students can do on the day of a test is to set their alarm for half an hour earlier than usual, eat right, and get their brains into gear by just reviewing a few test items. Without panicking, students should just look over and engage the material enough to get going mentally. They should also do something physical: run around the house, run around the block, skip rope, jump up and down, do push-ups—do something to get into gear. Next, students should eat a good breakfast—but not a huge breakfast. Many a parent sends the teen off to take the SAT’s after the son or daughter has had a coal heaver’s breakfast. The student winds up taking the SAT’s with a sugar high! Students should eat an appropriate breakfast on the day of the test.

Before and during the test there are tips to remember. First, students should arrive at the test a little early, but not too early, and they should avoid talking to other people if they can. Anxiety is the most communicable of human ills, and interacting with a bunch of other anxious people is unlikely to help.

A strategy for multiple choice questions encountered on tests is for the student to commit to an answer before reading those answers that are offered. This strategy is especially helpful when taking practice questions, as it gauges how much a student knows, in distinction from how well the student might “guess.”

During the test students should use the “minimax” strategy that employs a triage technique. Test questions are divided into three categories. The questions that students can get readily, that they know the answers to, we call the probables. Using the strategy in the paragraph above, the probables are the questions in which the student’s answer is consistent with one of the choices on the test! Students will want to devote most of their time at the beginning of the test to the probables, they will want to work on the ones that they know they’ve got an excellent chance to get right. Then they should go to the possibles—the ones that they could with a little time and patience work out. Students need to work on those next. Then, finally, and only at the end of the test, should students go to the long shots—the questions that they really don’t know, or think that they only have a remote chance of getting right. Those questions should be last.

On the long shots, if there is no guessing penalty, students should guess—shamelessly. We like D in such cases, but students could guess C or B, or whatever their letter of choice is, if they simply don’t know the answer. People who are confirmed guessers often find having a strategy or formula for guessing is much better than nothing. For students without a clue, or for
those who can only get the choices down to two or three, and there is no other distinction, go with the answer toward the end of the string, that is, the latter one. If the choice is between C and E, students should consider going with E. If the student’s choice of answer is between A and D, the student should consider choosing D. That is not much of a strategy, but it’s better than nothing, for it capitalizes on the known, well-established tendency of teachers, as they are constructing tests, to put the right answer toward the end of the options. A teacher preparing a test is more likely to put the answer in one of the last positions, E or D or even C, rather than in the A or B positions. The reason is that teachers like to show the students a few wrong answers before they show the students the right answer. (In multiple-choice questions, students should be actually looking for the best answer. So it’s the answer the professor wants to give credit for that tends to be put at the end of the questions.)

As students sit down to take the test, they should follow a pre-determined plan after looking quickly over the test. First, for a written test, they need to look over the whole test to make sure that there are no surprises. Students should then begin work, attempting to answer all the probables. (Probables are the questions that they are most likely to answer correctly.) Then they may work on the possibles, the ones that they somewhat know. These are the questions that they can answer through the elimination of wrong choices.

Only at this point should students take time for their long shots. Otherwise, if they worry about long shots at the beginning of the test, it does two things to them that they really don’t need. Working on the long shots first erodes their self-confidence. They read one of those questions, and they think, “Gosh, I don’t know the answer to this question, I forgot to study this, or I don’t know this at all! I don’t know any of this stuff! Maybe I’m going to flunk this test!” Soon their poise is shattered.

Second, students use too much of their test time trying to figure out the best answer to a question they don’t know. Instead, they should initially stick with the questions they know. If they don’t know an answer to a question, they should skip it. If they have studied appropriately, there aren’t going to be that many that they don’t know. There will be some that they don’t know enough about; that’s the nature of medical study. They may have to deal with partial knowledge and make the best judgment that they can on the basis of what they do know. Students should answer the questions that they know first, then the ones they kind of know, and then (and only
then) the ones they don’t know. They should answer every question. The odds are good that
they’ll get at least some of those right, which will materially affect their score.

Students also need a plan for time control on the test. Depending on how much time will
be permitted on the tests, they should make a plan for the test and how they’re going to use the
time. Students should always know the answer to the following questions before they go into a
test: How many questions are there? What kind of questions will there be? How much does each
question count? What’s going to be covered on the test? Is there any kind of guessing penalty or
reason not to guess? What range of information is going to be covered? If they know the
answers to these questions, they can make a plan to take full advantage of the test. If there are
100 questions, and they are studying appropriately, there should be a good chance that they will
know 70 to 80 of those questions. The chance is also good that they can work out another 10 to
15. The others they have to leave to chance, but that’s enough to pass the test. Allowing for the
vagaries of ambiguity, chance, and human foibles, students who follow these strategies still
ought to do well.

It is important for students to use a strategy that limits the Type 1 (careless) errors.
Reading carefully and being relaxed sharply reduces such mistakes. The more students can
master their poise and their time on the test, the more likely they are to do well. Effective review
and study techniques prevent students from making so many Type 2 errors that result from not
knowing the information. As students get to know a professor and the course, their ability to
predict test questions will improve, particularly if they draw on the expertise of their colleagues.
We want tests that are an absolute mystery to students to become a thing of the past. We want
students to shape their studying to the course itself so that they’re studying the right information,
and they’re arriving at the test with the kind of knowledge that it takes to do well.

The Type 3 errors are always with us. Students make some of those mistakes because of
the nature of ambiguity. Torn between answers A and C, the teacher is confident that the answer
is A, but the student, however, prefers C. There’s a school of thought that holds that the Type 3
error is basically at its fundamental core a Type 2 error, that is, if students knew more, they
could resolve the question the way the teacher does. That may well be true in most cases, but
students need to understand what answers the teacher is looking for. If the teacher is looking for
a broader answer, and students erroneously choose a narrower answer, they need to remember
that for the next test. If the professor is looking for a narrow answer, and students mistakenly
pick the broad one, remember that for the next test. Students must learn from their mistakes for the next test. Students will take a number of multiple-choice tests in school and after. They should get used to them; tests come with the school.