Instructional technology can add a great deal to teaching (e.g., Web-based courses, PowerPoint, Blackboard). It has the potential to increase the depth, breadth, and longevity of student learning. But technology by itself will not achieve these ends. Instructional technology will reach its potential only if it is built upon sound principles of teaching and learning. I suggest considering the following five points when designing, implementing, and evaluating instructional technology:

1. **Motivation.** Course design and implementation, including the use of technology, can influence students’ motivation to learn. For example, does the technology increase students’ interest and attention? Does it help make the subject matter relevant to students’ individual lives? Does it aid in providing ample and prompt feedback to students? Does it help build a positive atmosphere and productive learning environment in the course?

2. **Active learning.** Students learn more when they are actively involved in the learning process. Does the instructional technology help students learn by doing? Are the learning strategies active or passive? Are students encouraged to actively engage in learning activities and then reflect on and learn from these experiences, both inside and outside the classroom?

3. **Connections.** Does the use of instructional technology facilitate a connection between new information and what students already know? This includes connections to students’ knowledge of things outside the course and connections within the course curriculum.

4. **Examples and models.** Does the instructional technology help provide ample examples and models from which students can learn? For instance, students may learn from events in the world, from structural and theoretical models, and from the actions, experiences, feelings, and thoughts of others.

5. **Collaboration.** Students collaborating with one another can be a powerful learning process. Does the use of instructional technology help students learn through interaction and dialogue? Are there opportunities for inquiry, analysis, and reflection in a collaborative, supportive environment where students can learn from one another?

Although these points are certainly not exhaustive, they do highlight important issues to consider when using technology in teaching. Instructional technology is a valuable tool for teachers; using it effectively requires careful thought about its influence on student learning.

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**TO CURVE OR NOT TO CURVE: NORM-REFERENCED GRADING VS. CRITERION-REFERENCED GRADING**

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Assessment is one of the most important—and also one of the most difficult—aspects of any course. It’s no easy task to create and score fair, accurate exams; neither is it a simple matter to develop an effective grading system.

Effective assessments give instructors data with which to (1) discern whether students have achieved course goals for learning, (2) identify content areas where students are performing well or poorly, and (3) improve learning activities and assessment practices within the course. With that data in hand, instructors can calculate scores and grades and make course adjustments when necessary.

Depending on instructor preference and course policy, scores are usually based on either performance standards (criterion-referenced) or by comparing scores among students (norm-referenced)—also known as “curve.” This article highlights the benefits and concerns for both types of assessment. My purpose is not to champion
one over the other but to point out issues that you should be aware of as you work to make your assessments fair and meaningful.

CRITERION-REFERENCED ASSESSMENT
The main benefit of criterion-referenced assessments is that assessments and scores are based on the individual student’s performance in relation to specified learning goals and performance standards. The course syllabus usually defines the skills and knowledge that students are expected to learn. These skills are introduced, modeled, practiced, improved upon, and mastered as part of the course (both inside and outside the classroom). As students learn the knowledge and skills, teachers should also introduce the standards that determine proficiency and success. Here are some tips for designing valid and reliable criterion-referenced assessments:

- Define the content for the assessment in terms of what knowledge and skills the students must demonstrate.
- Define a grading scale for judging student performance. If the assessment is a test, the judgment will be a simple “correct/incorrect.” If the assessment is a presentation, project, essay, term paper, etc., then the criteria should be more detailed and include the major knowledge and skill categories along with their scoring standards.
- Make sure that your assessments require the students to demonstrate the same skills that they practiced during their learning activities prior to the assessment.

A major characteristic of criterion-referenced assessments is that it is possible for all students to excel or to perform poorly. Since scores are not standardized, the distribution can take virtually any shape. For example, in criterion-referenced assessments, students who perform exceptionally well may not be readily distinguished from those who barely exceed the established performance standard.

NORM-REFERENCED ASSESSMENT
Sometimes the purpose of an assessment is to obtain information about a learner’s performance in relation to others’. This is especially true with assessments that are used for college or graduate school admission decisions, such as the ACT, GRE, MCAT, etc.

Gatekeeping entities like admissions committees, scholarship boards, and licensing agencies use norm-referenced assessments to make judgments about the placement or certification of an individual. To normalize the scores of these assessments, the sponsoring agencies go through an extensive process of applying psychometric theory and analysis to guarantee that their tests are legally defensible, ethical, and fair in their content presentation and that they conform to strict standards of validity and reliability. In most cases it can take at least a year of data gathering for a single multiple-choice question before it will be included in a real norm-referenced exam.

In assigning grades, some instructors apply some normalizing, or “curving,” of their test scores for various reasons. These reasons may include department requirements, personal preference, compensating for a pattern of lower-than-expected scores, etc. If the scores are lower than expected, before you curve the scores I suggest that you examine the test questions to make sure that your assessment is aligned with your learning goals and activities. In the case of poor performance, it would be better to drop the items on which students performed poorly and then rescore the test based on the usable items, rather than to curve the test while it contains bad questions.

Curving test scores usually involves computing the mean of the scores and the standard deviation and then plotting the scores along the adjusted curve and assigning grades within that revised distribution. At the course level these assessments are not generally put through the rigors of validity or reliability studies. The main concern with curving exams on the university level is that instructors take on significant risk (in terms of fairness, validity, and reliability) because they usually don’t have sufficient statistical data to adequately prove the validity and reliability of the students’ scores.

As you consider curving your exams, you should take into account some critical questions:

- Is the adjusted distribution of scores fair to all of the students?
- Are the test scores statistically reliable?
- Do you have other assessments that reflect similar score distributions for the same students?

Both criterion-referenced and norm-referenced assessments have their pros and cons. The question is, Which scoring technique is best for your course goals and fairest for your students?

There is a wealth of research and good-practice publications about these two assessment strategies. I would be happy to share some of this research with you or to discuss questions you may have about these or other assessments. Please feel free to contact me at the Faculty Center (bryan_bradley@byu.edu or extension 2-8194).