Teaching Psychometrics: The Importance of Validity in Assessment Design

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WHAT IS PSYCHOMETRICS?

- Psychometrics is a field, traditionally part of psychology, concerned with designing tests and measures to tap psychological and/or behavioral **constructs**: abstract, general concepts like intelligence, language ability, or personality.
- Psychometrics is chiefly concerned with two fundamental properties:
    - **Reliability:** whether a test gives consistent results over multiple administrations
    - **Validity:** whether the test measures what it is intended to measure
- The measurement of a construct is often muddied by **confounding variables** that are related to the construct of interest but which we do not want to measure. Validity is chiefly concerned with minimizing the influence of these confounding variables to more purely measure the construct of interest.
- As teachers, the various quizzes, papers, exams, and group projects we assign are all designed to assess students' knowledge. From a psychometrics point of view, **content knowledge**, or the amount of learning, is our construct. But rarely do we think about the *validity* of these assessments.

OBJECTIVE

Here I share three things that teaching a course on psychometrics has made me re-consider about my assessments and instructional style.

1) DO DEADLINES REALLY MATTER?

Situation 1: Inflexible midnight deadline, student loses points for late submission
- Student does not allow enough time to complete the assignment, perhaps because of other unforeseen circumstances that arose.
- Student stays up late finishing the assignment but does not put their best effort into it and likely gets a poor grade.
- Poor grade may reflect content knowledge, but also includes confounding variables of lack of sleep, stress over leaving things to the last minute, and/or various other life factors.
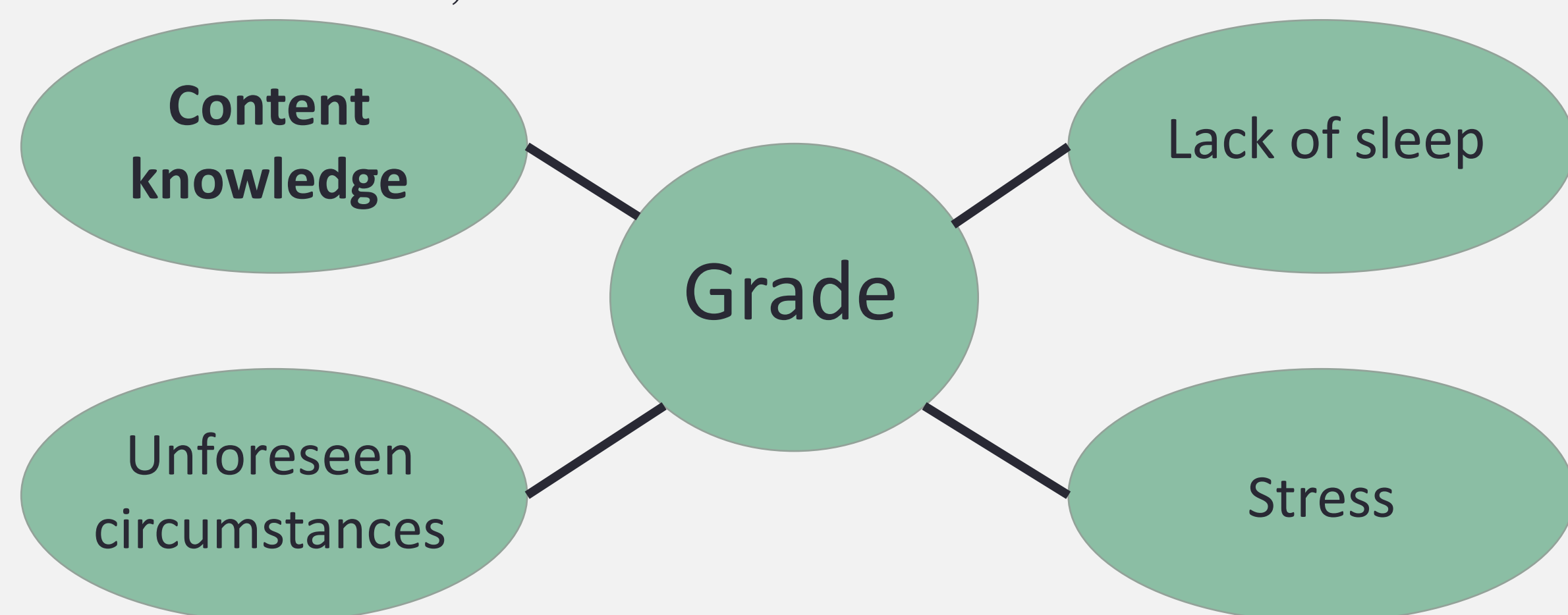
Situation 2: Option of a flexible deadline without penalty to grade
- Student can negotiate (within reason) a due date that will allow them to submit their best work.
- Student will be prouder of the finished product and likely earn a higher grade.
- Confounding variables are minimized, so grade is more likely to be a better representation of their content knowledge.
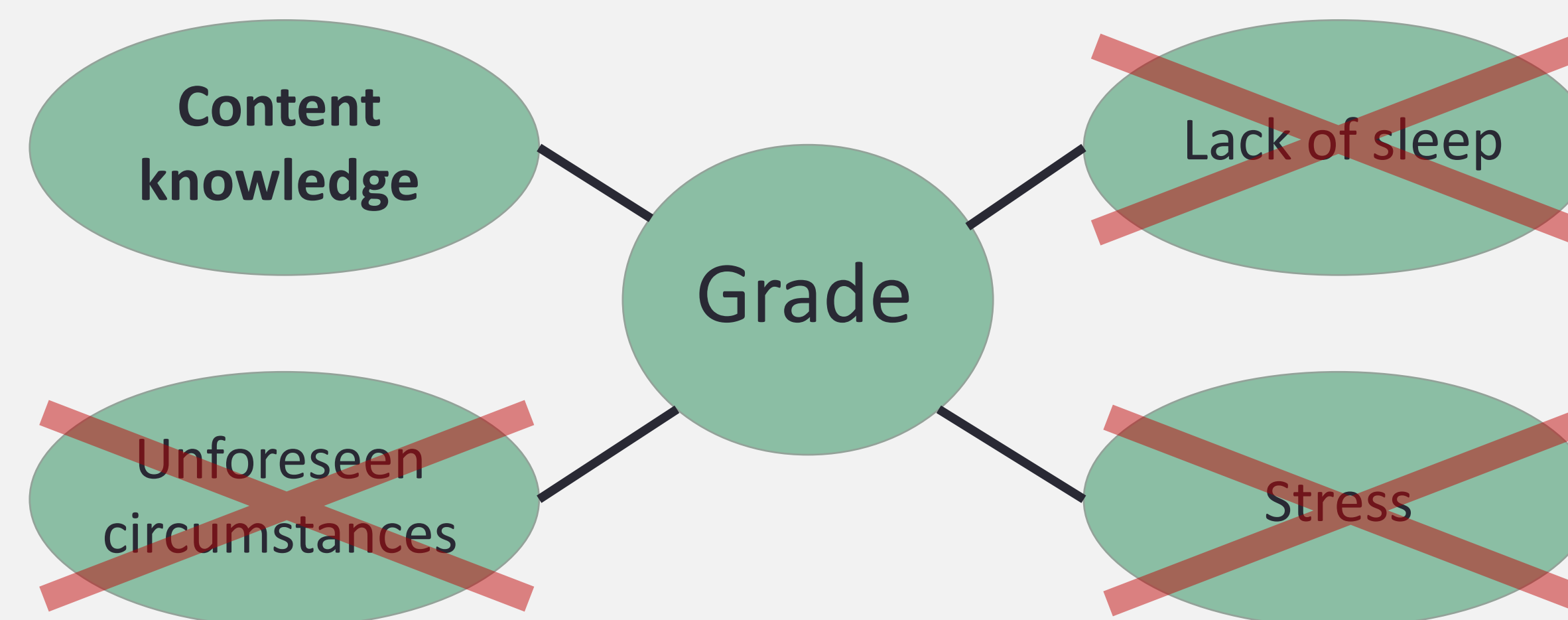
Additional Thoughts:
- Not all assignments will allow for flexible due dates, and extensions should be negotiated with consideration for time needed for grading.
- However, encouraging students to ask for more time if they need it can give them control over the quality of work they put into their assignments.
- As a result, I believe that those submitted assignments are a more valid reflection of their knowledge, which is what we are trying to measure.

2) SHOULD ALL ASSESSMENTS BE OFFERED MULTIPLE TIMES?

- When an assignment is offered multiple times with the same grading format, such as a series of case studies over a semester, students typically do better on later submission(s).

First submission – Grade may reflect:
- Content knowledge
- Unfamiliarity with you how grade/grading rubric
- Misunderstanding about the expectation(s) and most important aspect(s) of the assignment

Subsequent submission(s) – Grade may reflect:
- Content knowledge
- Incorporation of feedback from earlier submission(s)
- Greater familiarity with how you grade/grading rubric
- Greater understanding about the expectation(s) and most important aspect(s) of the assignment

Suggestions for minimizing confounding variables:
- Whenever possible, include multiple submissions of an assignment over a semester
- Having students include a self-assessment (mandatory or extra credit) using the grading rubric requires them to look at the grading criteria
- Be explicit about the requirements for an assignment (see the TILT framework [1])
- Include scaffolding, repetition, and practice in activities and assignments [2] so students know what is required from the assignment
- Employ adaptive grading to place more weight on later submissions (Table 1), in which confounding variables are minimized.

Table 1: Example of adaptive grading. For a series of lab reports due throughout the semester, traditional grading would allocate equal numbers of points to each submission. In contrast, adaptive grading puts more weight on submissions due later in the semester, when confounding variables are minimized

Lab reports	Traditional Grading	Adaptive Grading
Report #1	25 pts	10 pts
Report #2	25 pts	20 pts
Report #3	25 pts	30 pts
Report #4	25 pts	40 pts
TOTAL	**100 pts**	**100 pts**

3) HOW MUCH DOES MY GRADING REALLY MEASURE CONTENT KNOWLEDGE?

- If your rubric includes points for writing style and mechanics like grammar, punctuation, and accurate citation format, then you should also be teaching these in your course!

Situation 1: Students are graded on writing abilities without practice/teaching
- Students who are "bad writers" will receive poorer grades even if they understand the content perfectly
- Writing ability becomes a confounding variable
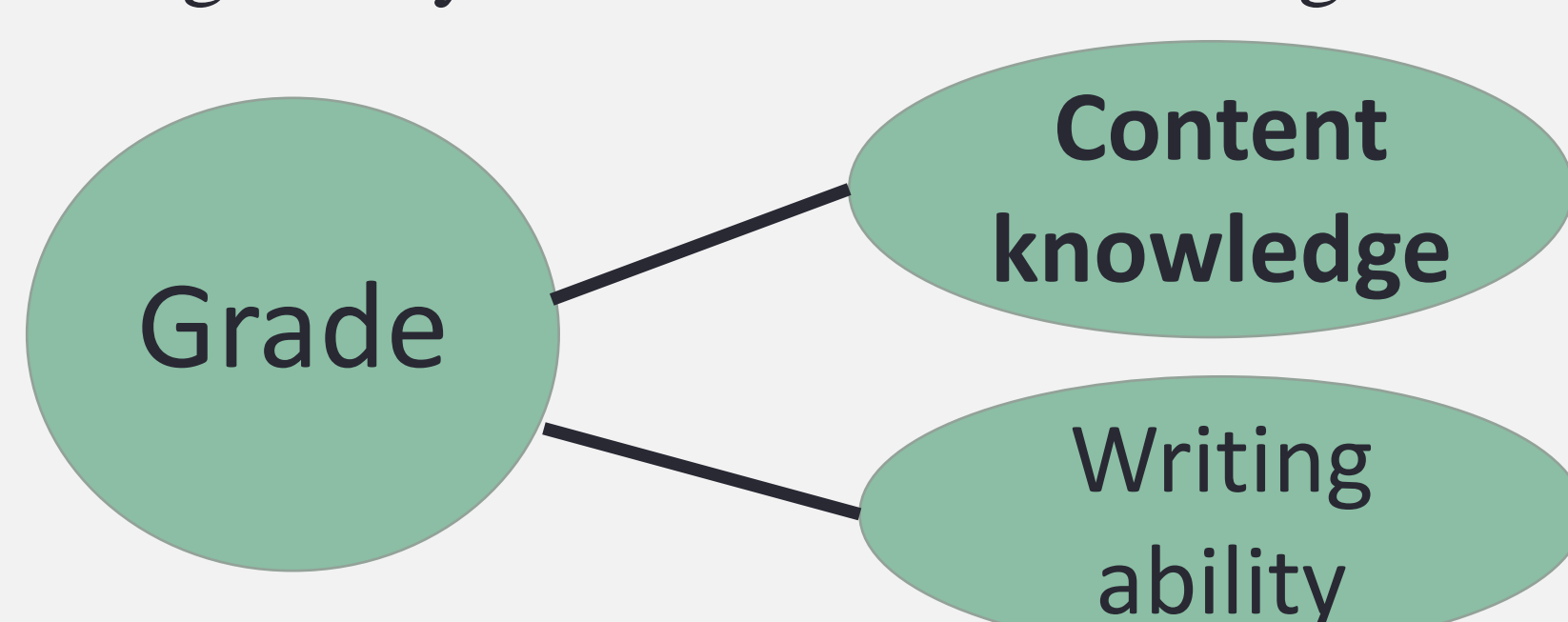
Situation 2: Students are graded on writing abilities with in-class writing practice/teaching
- Writing skills become part of the content being taught in the class, so it is appropriate to assess students on it
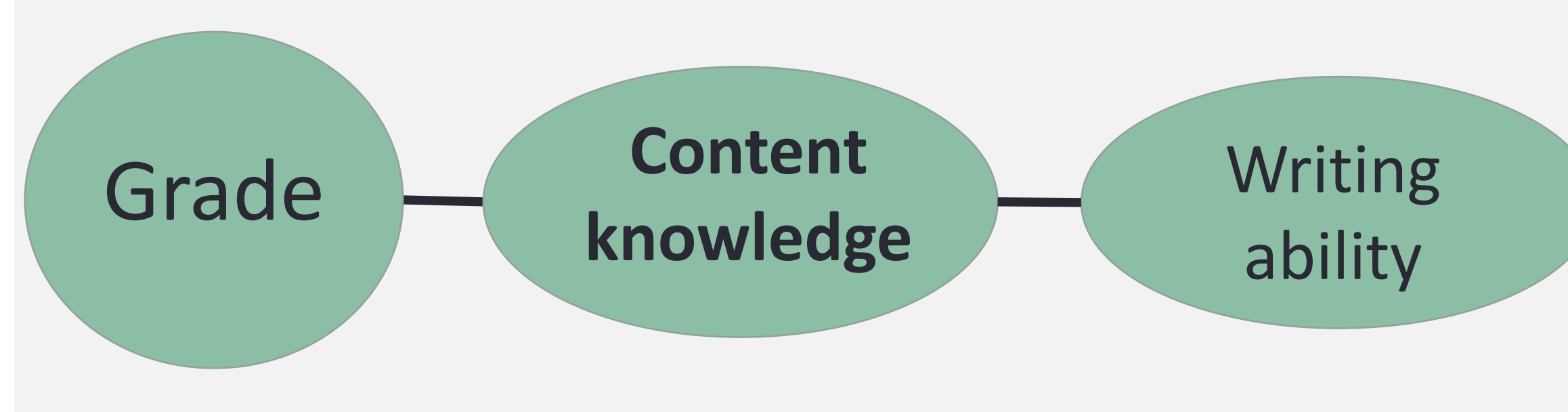
Additional Thoughts:
- If you value writing ability in your course, that should be reflected in: 1) your course learning outcomes; 2) your class activities; and 3) your feedback on assignments. If any of these domains is not met, then it is not appropriate to grade students on this skill.
- Letting go of grading on writing ability makes it easier to incorporate principles of Universal Design for Learning [3], which can enhance equity in your assignments as well as creativity (and therefore engagement!) in your students.

CONCLUSIONS

The purpose of assessment and evaluation is to measure students' knowledge and learning in our courses. By remembering that our assessments also have to be valid metrics of this construct, we can re-examine our teaching goals, principles, and techniques to minimize confounding variables and ensure that students' grades truly reflect their learning.

REFERENCES

[1] TILT Higher Ed. 2014. "Transparency in Teaching and Learning." 2014. https://tilthighered.com/.
[2] Ambrose, Susan A., Michael W. Bridges, Michele DiPietro, Marsha C. Lovett, and Marie K. Norman. 2010. *How Learning Works: Seven Research-Based Principles for Smart Teaching.* Jossey-Bass.
[3] CAST. 2018. "Universal Design for Learning Guidelines." 2018. http://udlguidelines.cast.org.