Measured student outcomes

Here are the measurable student outcomes listed on the course syllabus, tabulated with actual measured outcomes on a corresponding assignment. (Some assignments, for which there was no clear correspondence, aren't mentioned here.) Each outcome is the sum s of the scores $0, 1, 2$ = poor, ok, fine for the $n = 9$ students who completed the course. A final column rates the class's performance on each assignment as poor, ok, or fine, according to whether $0 \le s < 6 = 2n/3$, $6 \le s < 12$, or $12 \le s$.

#	*Measurable outcome*	*Assignment*	*s*	*rating*
1	*Manipulate* sets and relations algebraically according to ZF (or some other specified) set theory.	*Basic Set Th. S3*	11	ok
2	*Avoid* use of extensions of predicates unjustified by ZF.	*not assigned*		
3	*Use* ZF to construct functions for comparing cardinalities of sets.	*Ax. of Choice, 2 of S3, S4, S6*	10	ok
4	*Recognize* applications of the axiom of choice in algebra and analysis.	*Ax. of Choice, 2 of R3–5*	12	fine
5	*Explain* the relationship between various equivalent forms of the axiom.	*contained in #4*		
6	*Apply* the axiom in the form of a maximal principle.	*Max. Pr., 2 of R3–5*	9	ok
7	*Manipulate* cardinal numbers algebraically according to ZF plus the choice axiom.	*Cards II,3 substantial problems*	5	poor
8	*Distinguish* sets that are finite, countable, equinumerous with the continuum, or larger.	*Cards II, 2 of R1, R5, R6*	5	poor
9	*Analyze* the Boolean structure of English sentences and arguments.	*Tarski 2.12–13, 15*	16	fine
10	*Rewrite* a sentence using no Boolean connectives save 'and', 'or', and 'not'.	*not assigned*		
11	*Rewrite* a sentence using no Boolean connectives except 'nor'.	*Boolean 6*	14	fine
12	*Convert* a quantifier-free sentence to disjunctive normal form.	*Boolean 5*	14	fine
13	*Determine* under what conditions a quantifier-free sentence is true.	*Tarski 2.5b*	18	fine
14	*Explain* the relationship between truth of a quantifier-free sentence and its deducibility from an adequate set of Boolean axioms.	*not assigned*		
15	*Analyze* the use of quantifiers in English sentences and arguments.	*Tarski 1.6*	17	fine
16	*Classify* the theories studied in upper-division courses as first- or second-order.	*only partly covered*		
17	*Formulate* those theories in first- or second-order languages.	*not assigned*		
18	*Explain* the relationship between the truth of a first-order sentence with no free variables and its deducibility from an adequate set of first-order axioms.	*not assigned*		
19	*Describe* the relationships between the axiom of choice, cardinal arithmetic, and the equivalence of truth and deducibility.	*not assigned*		
20	*Describe* the Gödel and Tarski limitations on the strength of first-order theories.	*not assigned*		
21	*Discover* information about a limited area of foundations study.	*term paper*	11	ok
22	*Brainstorm*, *outline*, *document*, and *write* a term paper about it.	*term paper*	11	ok
23	*Present* a brief oral report.	*in last meetings*	13	fine

This course covered some undergraduate material at unusually high speed, and some graduate material. All of the measureable outcomes on which the class rated "fine", except for #4, concerned undergraduate material. All of the measureable outcomes on which the class rated "poor" concerned graduate material.

Most measurable outcomes not covered by assignments were covered later in the course in lectures, while students were working on term papers and previously assigned homework.

Term paper grades

I graded the papers using the following scheme, adapted from last year's Math. 300 history course. The borderline between the first two categories is vague. The presence of both was intended to reflect the fact that a student could write a paper worth 5/5 in scope, but covering subjects inappropriate for that course. For the present course, that danger didn't loom so near, and thus it would be better to amalgamate those two categories.

		Paper scores t	*Students* (9)	
Appropriateness:	5	$15.2 \le t \le 19.0$	*A*	*****
Scope:	5	$12.4 \le t < 15.2$	*B*	**
Originality:	4	$9.5 \le t < 12.4$	*C*	**
Presentation:	5	$7.6 \le t < 9.5$	*D*	
Total t :	19	$t < 7.6$	*F*	

Paper titles:
Intuitionism and Constructive Math
The Comparison of Two Methods for Constructing the Real Numbers
Equivalence of Turing Computable Functions and General Recursive Functions
A Survey of Thomsen's Treatment of Elementary Geometry by a Group Calculus
Measurement Theory: Development of a Structure
Forcing and the Continuum Hypothesis
Cantor and Russell
Quine's New Foundations
Domain Theory as a Basis for Denotational Semantics

Homework grades

Assigned homework totaled 63 points.

Homework scores h	*Students* (9)	
$50.4 \le h \le 63.0$	*A*	***
$41.0 \le h < 50.4$	*B*	***
$31.5 \le h < 41.0$	*C*	**
$25.2 \le h < 31.5$	*D*	
$h < 25.2$	*F*	*

Course grades

The course grade was based 55% on homework, 10% on class presentations, and 35% on the term paper. All but one student received the full 10% credit for presentations. I did use +/– grades, but chose not to report them here. The highest course score was 94.9%.

Course scores g	*Students* (9)	
$80 \le g \le 100$	*A*	***
$65 \le g < 80$	*B*	****
$50 \le g < 65$	*C*	**
$40 \le g < 50$	*D*	
$g < 40$	*F*	