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Subject:	Mad Lit talk

Examinations for teachers in the past and present

Richard Askey

First, a disclaimer. I am far from an expert on most of the topics which will be illustrated by questions. One of my aims in giving this talk is to let others know about a serious problem which exists beyond the problem of mathematical knowledge of teachers. I have written about the problem in mathematics and hope that some others will use the resouces which exist to write about similar problems in other areas.

In his American Educational Research Association Presidential Address, which was published in Educational Researcher in 1986, Lee Shulman introduced the phrase "pedagogical content knowledge". This is a mixture of content and knowing how to teach this content and is the one thing from his speech which has been picked up by the education community. However, there are a number of other points which he made which are important. Here is an early paragraph from this speech.

We begin our inquiry into conceptions of teacher knowledge with the tests for teachers that were used in this country during the last century [the 19th] at state and county levels. Some people may believe that this idea of testing teacher competence in subject matter and pedagogical skill is a new idea, an innovation spawned in the excitement of this era of educational reform, and encouraged by such committeed and motivated national leaders as Albert Shanker, President, American Federation of Teachers, Bill Honig, State Superintendent of Schools, California, and Bill Clinton, Governor of Arkansas. Like most good ideas, however, its roots are much older.

It took Wisconsin almost 20 years to adopt this "good idea". What I will do in this paper is contrast some questions from exams for teachers from over 100 years ago with sample questions which are available from some current tests or as close to that as I can get. We will see that there is a significant difference between what was expected then than now. How good the idea is can depend on how it is implemented.

First, what subjects were tested in the past. The Wisconsin State Historical Society has a large collection of State Superintendent Reports from many states. Many of these contain examinations taken by teachers. Shulman listed the topics in the March, 1875 exam in California. Many other states had similar tests on some or all of these topics.

Credits
100
50
100
25
50
50
g 50
50

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9.	Physiology	50
10.	Natural Philosophy (Physics)	50
11.	Constitution of the United	25
	States and California	
12.	School Law of California	25
13.	Penmanship	25
14.	Natural History (Biology)	50
15.	Composition	50
16.	Reading	50
17.	Orthography	100
18.	Defining (Word Analysis and Vocabulary)	50
19.	Vocal Music	25
20.	Industrial Drawing	25

There were 1000 credits. The three worth 100 credits each, Written Grammar, Written Arithmetic and Spelling, had to be passed at a level of 50 credits or the candidate failed no matter what the scores were on the other subjects. Unless all of these three were passed at the level of 60 credits, only a license valid up to third grade was possible. Spelling is no longer tested, and grammar is almost gone. There is a mathematics test, but it differs significantly from the written arithmetic problems asked over 100 years ago.

Shulman mentioned the small representation of pedagogy in comparison with subject matter content, since only one of twenty sections dealt specifically with the theory and practice of teaching. This is somewhat misleading since in some of the content parts there are questions dealing with how to teach a topic. However, his overall point that in the 19th century content was paramount is correct. Shulman listed some categories on pedagogy which a state he had advised was listing as topics for evaluation.

1. Organization in preparing and presenting instructional plans

- 2. Evaluation
- 3. Recognition of individual differences
- 4. Cultural awareness
- 5. Understanding youth
- 6. Management
- 7. Educational policies and procedures

These were justified as "research based", a phrase which hits me in the gut everytime I read it in connection with education. The words "research based" are still used, but some of the Praxis tests dealing with pedagogy have questions set in a specific content area, as well as more general ones as suggested by the list above.

Here is one sample question from Principles of Learning and Teaching: Grades K-6.

During a visit to a second-grade classroom, a student teacher observed a child spending the time allotted for a worksheet either looking out the window or doodling on his paper. When the student teacher asked the child if he needed help on the assignment, he said no. When asked why he wasn't doing it, he pointed to another student and said, "She does all her work fast and when she's done, she gets more work."

The boy's reaction suggests which of the following about his classroom?

(A) A routine has been established for students who are having trouble finishing an assignment to ask the teacher for assistance.
(B) A routine for rewarding students who finish work promptly is not in place.
(C) Students must work alone on seatwork, without consulting other students.
(D) Students who finish work before the whole class is finished must not interrupt the students who are still working.

One thing to do after each of the sample Praxis questions I will be giving is to think if you needed any special knowledge to answer it. The answer is frequently, no. That is clearly the case here.

Shulman refered to the California exam as a day-long essay examination, but the time was more than one day. "In written grammar, written arithmetic and a few other papers, at least two hours ought to be allowed. A credit was deducted for every misspelled word; likewise errors in composition and grammar must subject the applicant to a loss of credits. A great many papers heretofore submitted to the State Board, would disgrace, in regard to spelling, grammar, and composition, a twelve year-old scholar."

Reasons were required when possible. For example: "[I]n written arithmetic, applicants are instructed that `no credits are to be allowed unless the answer is correct and the work is given in full, and, when possible, such explanations as would be required of a teacher in instructing a class; a rule is not an explanation.' This instruction has generally been disregarded. In future this will be ground for the rejection of the paper."

One other rule was: "Reject all applicants who are less than eighteen years of age." One can infer from this that many candidates have at most a high school education.

One piece of advice given was: "Do not attempt to `cram' for the examination, for it will only confuse you."

I will be giving examples from exams held in California between 1873 and 1875, from Wisconsin in 1878 and from Michigan in 1900. One change between the first two and the third is that Michigan had replaced the two levels of passing by three, with the new level for teaching high school. Here is what the Michigan report says about arithmetic. "In arithmetic a knowledge of principles and general accuracy in method, shall be considered not less than three times as important as obtaining a correct answer."

Since some of you may be concerned that the sole focus will be on mathematics questions, let us start with some history questions from a County Examination in Michigan in 1900. The first set of questions is for candidates who want a license to teach in grammar school, i.e. up to grade 8. Those omitted are similar to those given here.

 Tell what work was accomplished by Miltiades, and state its effect upon the country.
 Briefly describe Ireland during the reign of Elizabeth.
 Briefly state the result and effect of the battle of Waterloo, naming the leading general.
 (a) What was the bone of contention between Austria and Germany in 1866?

(b) Give the result and effect of this trouble. 7. Name the leaders of the Italian struggle for freedom, and state the result of their efforts. 9. Mention some supplementary reading which you would recommend in a history class. 10. When was the present form of government in France organized, and who is president today?

Contrast these questions, which expected candidates to know some details of what was then thought to be important historical events, with a sample question from the general exam on Middle School Content Knowledge which is posted on the Educational Testing Service Praxis website. There are 120 multiple choice questions to answer in two hours. Here is a sample from the History/Social Studies quarter of this exam.

"We hold these truths to be self-evident: that all men and women are created equal; that they are endowed by their Creator with certain inalienable rights; that among these are life, liberty, and the pursuit of happiness; that to secure these rights governments are instituted, deriving their powers from the consent of the governed. Whenever any form of government becomes destructive of these ends, it is the right of those who suffer from it to refuse allegiance to it, and to insist upon the institution of a new government."

-Seneca Falls Declaration of Sentiments and Revolutions, 1848

The excerpt above is from a major declaration of which of the following movements?

- (A) Abolitionism
- (B) Revivalism
- (C) The women's rights movement
- (D) The public school movement

In 1900 the question would have been to ask for a description of what was included in the Seneca Falls Declaration of 1848. It may have been too early to ask what impact this declaration had, but that would be an appropriate question to ask now. The Seneca Falls Declaration is included in all of the current high school books on American History, and it is more than just mentioned. Even if it were not treated in all current high school texts, two of the possible answers can be ruled out immediately, revivalism and the public school movement. Since the first sentence has the change from 'all men are created equal" to "all men and women are created equal", one should be able to figure out that this refers to the women's rights movement.

Here are some questions for candidates who wanted to teach in high school in Michigan in 1900.

- 1. Speak briefly of the Aryan dispersion.
- 4. (a) How did the geographical position of Rome aid in her success? . (b) Briefly give reasons for her downfall.
- 6. What commercial effect had the revocation of the Edict of Nantes? 8. Give the political organization of Austro-Hungary, and tell what features of its make-up threaten her government.
- 9. What has been the influence of the Suez canal on commerce?

Here are some geography questions from Michigan, 1900.

- 2. Why is a sinking coast likely to be irregular?
- 3. Explain the formation of artesian wells.
- 7. State the advantages and objections, if any, to the Hay-Pauncefote

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treaty. 9. Contrast the civilization of Russia with that of the United States, England, or Prussia, giving reasons for the difference. Geography questions for primary school teachers (grades 1-4) include: 2. Write a model lesson on water. 3. What is the shortest route from New York to Yokohama? 5. Compare the life of Chinese and American children. 6. Name the agents that produce physical changes. 8, Why do we find so few railroads in South America? 9. Tell what state is south of Pennsylvania, north of Iowa, west of Illinois, north of Maryland, west of Virginia, respectively, locating the principal city in each state. There are factual questions, but there are also questions which require more than just a knowledge of facts. Here are sample social studies questions from the general Middle School Praxis test.

All of the following river valleys are densely populated EXCEPT the

- (A) Yangtze
- (B) Amazon
- (C) Nile
- (D) Indus

Contrast that with the question above about why are there so few railroads in South America, which was asked on the test for people who want a license to teach in grades 1-4.

In the nineteenth century, European powers carved up large regions with little concern for ethnic or cultural bonds, thus splitting some groups and forcing others to live alongside groups with whom they had little in common. All of the following countries experienced ethnic strife after independence EXCEPT

- (A) Nigeria
- (B) Egypt
- (C) India
- (D) Chad

Here is one more, dealing with social science in the form of economics.

Workers in the United States (U.S.) widget industry (a small and specialized labor force) received a substantial increase in wages, making the hourly cost of their wages and benefits the highest for blue-collar workers in the U.S. and much higher than those of widget-producing workers in competing countries.

The wage increase described above is most likely to result in an increase in the

- (A) profits of widget companies in the U.S.
- (B) sales of products that are made with widgets in the U.S.
- (C) number of widges imported into the U.S.
- (D) number of widgets sold in the U.S.

To be fair, the Middle School Praxis Social Studies test contains three questions where an extended response needs to be written. Here is one sample question.

Brown v. Board of Education of Topeka

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"We come then to the question presented. Does segregation of children in public schools solely on the basis of race, even though the physical facilities and other `tangible' factors may be equal, deprive the children of the minority group of equal educational opportunities? We believe it does."

(A) What legal doctrine or principle, established in Plesey v.
Ferguson (1896), did the Supreme Court reverse when it issued the 1954 ruling quoted above?
(B) What was the rationale given by the justices for their 1954 ruling?

This is closer to the type of question which would have been asked 120 years ago, but then the assumption would have been that candidates should know what was in the decision of Brown v. Board of Education of Topeka. The question would have been to summarize this case, and that should include answers to the two questions above, without them having been asked explicitly.

Since grammar was one of the three topics given 100 credits, here are some grammar questions.

3. Explain the difference between ellipsis and abridgment, illustrating each.

6. (a) What are the different ideas that may be conveyed by the verb "will"? Explain fully.

(b) Name some verbs that can be used either transitively or intransitively, and illustrate with sentences.

For primary school teachers (grades 1-4):
5. Name the abbreviations that should be taught in the third grade.
6. Give one sentence that shall illustrate the use of indicative, subjunctive, and potential modes.
7. Give some method that may be used to accustom the child's ear to correct forms of speech.
9. Make a careful outline, with principal heads and subheads, for an essay on any one of the following topics. (Do not write an essay.)
Coal, Great Americans, "Oom Paul," National Flags, Holidays.

Here is a sample question from the high school teacher Praxis exam for prospective English teachers.

Grammar may be taught in two main ways - by experience with discourse that entails the variety of word forms and sentence construction, or by analyzing dummy sentences and diagrammming parts. Plentiful discursive experience is what really teaches grammar, for it exercises judgment and provides language intake, whereas formal grammar study has proved irrelevant. Politics more than pedagogy retards the changing of the curriculum to fit this truth.

(A) using language in a wide variety of situations improves grammar

- (B) good judgment can be improved by studying the rules of formal grammar
- (C) analzing and diagramming provides exercise in logical thinking
- (D) formal study of grammar improves writing ability

While the answer to this question is obvious, the claims in the paragraph are not. See David Mulroy, "The War Against Grammar" and the review of this book by Jeremiah Reedy in Bryn Mawr Classical Review. The review can be read at http://ccat.sas.upenn.edu/bmcr/2003/2003-12-15.html Here is one piece from this review which shows the last sentence in the sample question is false. "Opposition to the teaching of grammar is now almost universal among professors of education and the 80,000 members of NCTE [National Council of Teachers of English] - almost, but not quite. In 2000 Mulroy attended the annual conference of ATEG (The Assembly for the Teaching of English Grammar). There were fewer than thirty in attendance!"

Here is half of a list of spelling words used in California in 1874.

elaborate, achieving, suspicious, centennial, recitation, panacea, complaints, decision, litigation, deceased, commissioner, realizing, lieutenant, business, venire, Cincinnati, carbonaceous, hydrophobia, assassinate, surgeon, statisticians, machine, requisite, reservoir, phlebotomy

In some states, such as Wisconsin, orthography was more than spelling. Here are a few questions on this from a Wisconsin exam in 1878.

2. Give rules and exceptions for forming derivatives from words ending in y.
 Illustrate each.
 4. What is a syllable, and what is the utility of syllabication?
 5. Set forth the dependency of reading upon orthoepy, and of orthoepy upon

psysiology. 7. Represent to the eye, by its regular character only, each of the English vocals, with illustrative word for each. 10. Indicate by the exact means employed in the dictionary, the

pronunciation of the following words, jugular, granary, raspberry, peremptory, stalwart, blatant, glamour, cinchona, despicable, and gondola.

Contrast the last question with a sample Praxis question.

5. ə abut 'kitten ər further a back ā bake ä cot, cart aù out ch chin e less ē easy g gift i trīp I life j joke ŋ sing ö flow ô flaw ôl coin th thin <u>th</u> this ü loot û foot y yet yü few yù furious zh vision

According to the pronunciation guide above, which of the following words would be represented as "tə-'päg-rə-fē"?

- (A) Telepathy
- (B) Typographer
- (C) Topography
- (D) Telegraphic

While the suggested reasons why one of these words is correct given on the Praxis website goes into the way the given word would be pronounced, that is not the way almost all candidates would answer the question. The words listed as (A) and (D) are clearly incorrect since there is no "1" in the given word. (B) is incorrect since the given word does not end in "r". Thus Topography has to be correct.

I mentioned earlier it took Wisconsin almost 20 years to start testing prospective teachers. For middle school teachers, rather than using specific content area tests, as Minnesota does, Wisconsin uses the general one which contains 120 multiple choice questions to be answered in 120 minutes. A quarter of the questions are in each of the areas of Literature and Language Studies, History/Social Studies, Mathematics, and Science.

Here are some mathematics questions from California. First, two mental mathematics questions.

4. Divide 88 into two such parts that shall be to each other as 2/3 is to 4/5.

The last time I taught our course in arithmetic for prospective elemenaty school teachers, this was included in the diagnostic test given the first day. Two out of 26 students solved it correctly, one using algebra, and one using "guess and check". Neither of these is appropriate as a way to teach how to solve problems like this. This is an arithmetic problem, and should be done using arithmetic. Here is how that can be done.

Change 2/3 and 4/5 to 10/15 and 12/15, so the two parts are to each other as 10 is to 12. This gives 22 parts, one of size 10 and one of size 12. Multiply by 4 to get 40 and 48 parts out of 88. It is problems like this which help build knowledge which is useful when learning algebra. We used to have them in our school books, but they are gone. Here is another.

7. A farmer sold two horses, at \$210 each; for one he received 25 per cent more that its value, and for the other 25 per cent less than its value. Did he gain or lose by the sale of both, and how much?

Here is a sample middle school Praxis math question.

If there are exactly 5 times as many children as adults at a show, which of the following CANNOT be the number of people at the show?

(A) 102
(B) 80
(C) 36

(D) 30

The number has to be divisible by 6 since for each adult there are five children, so a group of six. 80 is not divisible by 6.

Here is one sample question from the general Middle School Praxis publication.

8. If $a^3 \cdot b^2 \cdot a^4 \cdot b^3$ can be written as a^7b^5 , then $2^3 \cdot 3^4 \cdot 2^2 \cdot 3^3$ can be written as

(A) 25·37

(B) 45 · 91

- (C) 6¹¹
- (D) 36¹²

The hint given at the start should not have been given, since candidates should know that $a^5 = a \cdot a \cdot a \cdot a$, but if a reminding note is felt to be needed, an appropriate way to start the question would be:

Since $a^5 = a a a a a a$, then $2^3 \cdot 3^4 \cdot 2^2 \cdot 3^3$ can be written as

My concern with the level of the Praxis exams came when Tom Loveless of the Brown Center at Brookings asked me to comment on a sample high school math test in a Praxis book. Here is one of the questions which could have been a reasonable question, but was not because of the form in which it was asked. As a contrast, another geometry question from an exam held in Michigan in 1900 will be given.



Angle ABC is 50 degrees and AB is a diameter of the circle. Which of the following is the measure of the arc BC?

A 90 degreesB 80 degreesC 50 degreesD 40 degrees

4. Demonstrate: If three circles intersect one another the common chords all pass through the same point.

Given the level set by states for passing Praxis exams, it should be possible to pass the high school math Praxis test of 50 multiple choice problems to do in two hours with a solid knowledge of two years of what was high school math when I was a student and a little more, but not much. The questions on this test are all multiple choice. There is another test where full answers have to be written out, but few states use it. There is a report from the National Research Council dealing with examinations for teacher certification. About this second math exam, which is the one math test commented on in the book "Testing Teacher Candidates", a faculty member at the University of Nebraska who looked at five exams in five different areas, wrote that the questions seem reasonable but a content specialist would have to look at the questions to make sure. What is the National Research Council doing putting out reports on content without having content specialists look at the content?

Let me close with two questions on teaching from California in 1875.

What is your method to teach children to discontinue the sing-song, or monotonous tones which many acquire in reading? Is the method original with yourself?

I wish this had been done with me since I turned out to be a very poor reader to the older of our children when he was young. Liz can tell you how painful it was to hear me for a while.

How do you interest lazy and careless pupils? Answer in full.

Don't we wish we had an answer book which would answer such questions?

Finally, while I do not expect many of you, or maybe any of you, to take up the suggestion of writing about exams for teachers in different subjects, the California exams which you all have can be shared with others. The more people who are aware of the difference between what was expected knowledge in the past, and what is expected now, the better the chance of recovering some of what was once expected knowledge, both for teachers and for students.