

RESEARCH

REPORT

**A JOB ANALYSIS OF THE CONTENT KNOWLEDGE AND
SKILL AREAS IMPORTANT FOR NEWLY LICENSED
(CERTIFIED) ELEMENTARY SCHOOL TEACHERS
(GRADES K-6)**

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THE PRAXIS SERIES: Professional Assessments for Beginning Teachers®

**A Job Analysis of the Content Knowledge and Skill Areas
Important for Newly Licensed (Certified) Elementary School Teachers
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Gregory K. Kocher

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Content Knowledge and Skill Areas Important for Elementary School Teachers

Michael Rosenfeld and Gregory Kocher

Executive Summary

A job analysis was conducted to define the content-related, background knowledge and skill that all newly licensed (certified) elementary school teachers (grades K-6) should possess in order to perform their job in a competent manner. The results of this job analysis will be used to develop test specifications for a new Praxis II assessment. The Praxis Series: Professional Assessments for Beginning Teachers® are standardized examinations that provide measures of academic achievements and proficiencies for individuals entering or completing college or provisional teacher preparation programs and for individuals in professional areas. Praxis II examinations focus on subject assessments which measure content area knowledge. This new assessment will not measure knowledge related to pedagogy. Measures of pedagogical knowledge are included in other Praxis examinations.

The rationale for this new assessment is based on the fact that elementary school teachers provide instruction in a wide range of subject matter. For this reason, the Praxis Program believes that elementary school teachers should have a broad understanding of a variety of subjects as background for the content they teach. This report presents the methods used to create the *Job Analysis Inventory for Elementary School Teachers (Grades K-6)*, describes the job analysis survey and the statistical analyses conducted, reports the results of these analyses, and specifies the implications of the results for developing test specifications.

A draft domain of content-related, background knowledge and skill areas was developed by Educational Testing Service (ETS) Research staff. This draft content domain was constructed based on a review of previous elementary school teacher job analysis studies, relevant literature, and national standards for elementary education. The draft domain was then subjected to an internal review by ETS Test Development staff who possess subject-matter expertise in elementary education. The resultant draft domain consisted of five major content areas and included 111 knowledge and skill statements. The five major content areas were: (1) *Reading, Language Arts, and Literature*, (2) *Mathematics*, (3) *Social Studies*, (4) *Science*, and (5) *Critical Thinking*.

The draft content domain was then reviewed by a national Advisory Committee comprised of 11 education professionals (9 elementary school teachers and 2 elementary education teacher educators). Prior to the meeting, each Committee member was mailed a copy of the draft domain and asked to review it. Telephone interviews were then conducted with each Committee member by ETS Research staff to gather and document their initial reactions to the draft domain. No changes were made to the draft at this point. However, the information gathered from these interviews was shared with Committee members at the meeting and served as the catalyst for many of the changes made.

The Advisory Committee meeting took place on December 7, 1996 in Princeton, NJ. The committee was charged with modifying the draft domain so that it accurately reflected what the members believed were the content-related, background knowledge and skill areas important for newly licensed (certified) elementary school teachers (grades K-6). A thorough discussion of the comments and suggestions made in the pre-meeting interviews led to substantial changes to the draft domain and also fostered discussion that generated suggestions not previously made. As a result, the committee made numerous changes to the draft domain. These changes included clarification of language used, the addition and deletion of knowledge and skill statements, and the addition of a new content area (*Health and Well Being*). During the course of the meeting, the committee also had an opportunity to review and approve the proposed rating scale and background information questions that were included in the job analysis inventory. The finalized content domain consisted of 116 knowledge and skill statements grouped into six major content areas: (1) *Reading, Language Arts, and Literature*, (2) *Mathematics*, (3) *Social Studies*, (4) *Science*, (5) *Health and Well Being*, and (6) *Critical Thinking*.

This revised domain of knowledge and skill statements was then put into survey format and subjected to verification/refutation through a national survey of 1500 elementary education professionals (1,000 elementary school teachers and 500 elementary education teacher educators). The sample of elementary education professionals was weighted in terms of a state's estimated population of elementary school teachers and teacher educators. For example, in the case of teachers, 111 potential respondents were identified from California as opposed to 17 from Alabama. Similarly, in the case of teacher educators, 40 respondents were identified from California as opposed to 11 from Alabama. Elementary school teacher and teacher educator population information and the subsequent sample drawn for this study were obtained from Market Data Retrieval (MDR). MDR is a survey research organization whose data base contains the names of over 90% of all the teachers and teacher educators in the United States. Two weeks after the initial mailing, a follow-up postcard was sent requesting completion of the inventory.

The survey participants were asked to rate the knowledge and skill statements in terms of their importance for newly (licensed) certified elementary school teachers (grades K-6). The five-point rating scale ranged from (0) *Not Important* to (4) *Very Important*. The purpose of the survey administration was to identify a core of content-related, background knowledge and skill areas that relatively large numbers of elementary education professionals verified to be important to newly licensed (certified) elementary school teachers (grades K-6). This objective was accomplished through the analysis of the mean importance ratings provided by the two groups of education professionals (elementary school teachers and elementary education teacher educators) and by relevant subgroups of teachers (e.g., geographic region, sex, school setting). Statements that were judged to be important (mean rating of 2.50 or higher) by both groups of education professionals and the relevant subgroups of teachers were used to define the core. The core becomes the primary resource for the development of test specifications. The derivation of test specifications from those knowledge and skill areas verified to be important by the surveyed education professionals will provide a substantial evidential basis for the content validity of this future Praxis II assessment.

Three types of data analyses were conducted to support the development of content valid test specifications for the Praxis II assessment: (1) means were computed of the importance ratings for each knowledge and skill statement by the two groups of education professionals and the relevant subgroups of teachers; (2) the percentage of agreement was computed between both groups of education professionals and among relevant subgroups of teachers concerning the level of importance of each knowledge and skill statement; and (3) correlations were computed between the arrays of mean importance ratings for both groups of education professionals and among relevant subgroups of teachers.

A cut point of 2.50 (the midpoint between *Moderately Important* [scale value of 2] and *Important* [scale value of 3]) was established to identify the core of important knowledge and skill statements. Statements that were judged by both groups of education professionals and all relevant subgroups of teachers to be 2.50 or higher comprised the core, and therefore, were considered eligible for inclusion in the development of test specifications. (However, because the survey participants were not involved in the development of the content domain, they may lack certain insights that the Advisory Committee members have because of their high level of involvement in the definition of the domain. As a consequence, if the Committee believes that a knowledge or skill statement rated below 2.50 should be included in the specifications, and can provide compelling written rationales, those knowledge and skill statements may be reinstated for inclusion in the test specifications.)

The results of the mean analysis conducted on the total groups of teachers and teacher educators showed that 20 statements were rated less than 2.50. This represents 17% of the content domain. In the subgroup analyses, an additional 17 statements were identified as being unimportant. In total, 37 of the 116 statements (32%) did not meet the 2.50 criterion for inclusion. Nearly half of these statements (17) were found in *Social Studies*. Thirteen were concentrated in the subcategories of *Major Concepts in Economics* and *Major Concepts in Anthropology, Psychology, Sociology, and Philosophy*. The remaining 20 statements judged to be unimportant were distributed relatively evenly across the following three content areas: *Reading, Language Arts, and Literature, Mathematics, and Science*. All statements in the *Health and Well Being* and *Critical Thinking* content areas were verified to be important by both groups of education professionals and the relevant subgroups of teachers.

The percentage of agreement in terms of the knowledge and skill statements judged to be either important (mean importance rating of 2.50 or higher) or unimportant (mean importance rating of less than 2.50) was computed between both groups of education professionals and among the relevant subgroups of teachers. The percentage of agreement for the comparison between teachers and teacher educators was 85%. Percentages computed among the relevant subgroups of teachers were all equal to or exceeded 86%. The vast majority of these agreement indices were in the 90s. These findings indicate a high level of agreement between teachers and teacher educators concerning those knowledge and skill statements judged to be either important or unimportant.

Correlation coefficients were computed to assess relative agreement, in terms of the perceived importance of knowledge and skill statements, between each group of education professionals and among the relevant subgroups of teachers. The coefficient for the comparison between teachers and teacher educators was .91. Coefficients computed among the relevant subgroups of teachers were all equal to or exceeded .91. The vast majority of these correlation coefficients exceeded .95.

The 79 knowledge and skill statements (68% of the content domain) that were verified to be important by the surveyed elementary school teachers and teacher educators should be used as the foundation for the development of test specifications. Test specifications that are linked to the results of a job analysis provide support for the content validity of the derived assessment measure and may be seen as part of an initial step in ensuring the fairness of that measure. It is reasonable to assume that, due to testing and psychometric constraints (e.g., time limits, ability to measure some content reliably), not all of the verified content will be included in the assessment measure. One source of information that may be used to guide the Test Development committee in their decision as to what verified content to include in the assessment measure is the mean importance rating. Although a rank ordering of the content by mean importance rating is not implied, it is recommended that initial consideration be given to content that is well above the cut point and represents the appropriate breadth of content coverage.

Evidence was also provided in this study of the comprehensiveness of the domain within each of the six major content areas. All mean ratings were equal to or exceeded 3.11 which indicates that respondents felt all six content areas were adequately covered.

INTRODUCTION

Background/Purpose

The Praxis Series: Professional Assessments for Beginning Teachers® are standardized examinations that provide measures of academic achievements and proficiencies for individuals entering or completing college or provisional teacher preparation programs and for individuals in professional areas. The Praxis series is divided into three stages: Praxis I: Academic Skills Assessments, measure basic proficiency in reading, mathematics, and writing; Praxis II: Subject Assessments, measure content area knowledge; Praxis III: Classroom Performance Assessment, is a performance-based assessment that is used to judge the classroom performance of beginning teachers.

A need has been expressed by the Praxis program to develop a new Praxis II assessment. This new assessment will be used to measure the content-related, background knowledge and skill that all newly licensed (certified) elementary school teachers (grades K-6) should possess in order to perform their jobs in a competent manner. This assessment will not measure what a newly licensed (certified) elementary school teacher should know about pedagogy. Pedagogical knowledge is covered in other Praxis examinations.

The rationale for this new assessment is based on the fact that elementary school teachers provide instruction in a wide range of subject matter. For this reason, The Praxis Program believes that elementary school teachers should have a broad understanding of a variety of subjects as background for the content they teach. This report will describe the job analysis study that was conducted, present the methods used to define the job-related knowledge and skill areas, describe the types of statistical analysis conducted, report the results of these analyses, and specify the implications of the results for developing test specifications.

Standards for Educational and Psychological Testing

The Standards for Educational and Psychological Testing (1985) is a comprehensive technical guide that provides criteria for the evaluation of tests, testing practices, and the effects of test use. It was developed jointly by the American Psychological Association (APA), the American Educational Research Association (AERA), and the National Council on Measurement in Education (NCME). The guidelines presented in the Standards have, by professional consensus, come to define the necessary components of quality testing. As a consequence, a testing program that adheres to the Standards is more likely to be judged to be valid (defensible) than one that does not.

There are two categories of criteria within the Standards, primary and secondary. Those classified as primary “should be met by all tests ... unless a sound professional reason is available to show why it is not necessary, or technically feasible, to do so in a particular case. Test developers and users ... are expected to be able to explain why any primary standards have not been met” (AREA et al., 1985, p. 2). One of the primary standards is that the content domain of a licensure or certification test should be defined in terms of the importance of the content for

competent performance in an occupation. "Job analyses provide the primary basis for defining the content domain." (p. 64).

The use of job analysis to define the content domain is a critical component in establishing the content validity of licensure and certification examinations. It refers to the extent to which the content covered by an examination overlaps with the important components (tasks, knowledge, skills, or abilities) of a job (Arvey & Faley, 1988). Demonstration of content validity is accomplished through the judgments of subject-matter experts. It is enhanced by the inclusion of large numbers of subject-matter experts who represent the diversity of the relevant areas of expertise (Ghiselli, Campbell, & Zedeck, 1981). The lack of a well-designed job analysis is frequently cited (by the courts) as a major cause of test invalidity.

Job Analysis

Job analysis refers to procedures designed to obtain descriptive information about the tasks performed on a job and/or the knowledge, skills, and abilities thought necessary to perform those tasks (Gael, 1983). The specific type of job information collected by a job analysis is determined by the purpose for which the information will be used. For purposes of developing licensure and certification examinations, a job analysis should identify the important knowledge or abilities necessary to protect the public -- interpreted as the importance of the content for competent performance in an occupation (Standards, AERA et al., 1985). In addition, a well-designed job analysis should include the participation of various subject-matter experts (Mehrens, 1987); and the data collected should be representative of the diversity within the job. Diversity refers to regional or job context factors and to subject-matter expert factors such as race/ethnicity, experience, and sex (Kuehn, Stallings, & Holland, 1990). The job analysis conducted for elementary school teachers (grades K-6) was designed to be consistent with the Standards and current professional practice.

Objectives of the Job Analysis Study

The objectives of this study were: (1) to construct a comprehensive domain of content-related, knowledge and skill areas that are important for newly licensed (certified) elementary school teachers, and then (2) to obtain, using survey methodology, the independent judgments of a national sample of elementary education professionals (elementary school teachers and elementary education teacher educators) to verify or refute the importance of the domain of knowledge and skill areas. The verification/refutation component plays a critical part in ensuring that the content domain (in whole or part) is judged to be relevant to the job of a newly licensed (certified) elementary school teacher (grades K-6) by an array of elementary education professionals. The components of the domain that are verified will be used in the development of test specifications for this new Praxis II assessment.

METHODS

Overview of the Job Analysis Methodology

The job analysis study described in this report involved a multi-method approach that included subject-matter expert participation and a national survey. First, a group of subject-matter experts defined a domain of content-related, background knowledge and skill areas important for newly licensed (certified) elementary school teachers (grades K-6). A description of this knowledge and skill domain was then sent out to elementary education professionals through a large-scale national survey. The purpose of the survey administration was to obtain verification and/or refutation from large numbers of elementary education professionals that the previous group of subject-matter experts had defined a domain of knowledge and skill areas important for newly licensed (certified) elementary school teachers (grades K-6). The survey functions as a “check and balance” on the judgments of the subject-matter experts and reduces the likelihood that unimportant knowledge and skill areas will be included in the development of the test specifications. The use of a job analysis inventory is also an efficient and cost-effective method of obtaining input from large numbers of subject-matter experts and makes it possible for ratings to be analyzed separately by relevant subgroups (e.g., geographic region, sex, school setting).

The sample of survey recipients (elementary school teachers and elementary education teacher educators) was obtained from Market Data Retrieval (MDR), a survey research organization. Survey Recipients were asked to rate each knowledge and skill statement in terms of its importance for the competent performance of newly licensed (certified) elementary school teachers (grades K-6). The specific steps in the job analysis process are described below.

Definition of the Draft Content Domain

The first step in the process of conducting the job analysis was to construct a preliminary knowledge and skill domain. This draft content domain served as a starting point, a “straw person,” for a panel of subject-matter experts to review critically and revise. Experience indicates that it is much easier and more productive for panel members to react to an existing draft domain than for them to create a domain. Educational Testing Service (ETS) Research staff constructed this draft domain based on previous elementary school teacher job analysis studies, relevant literature, and national standards for elementary education. This draft domain was then internally reviewed by ETS Test Development staff who have subject-matter expertise in elementary education. The resultant draft content domain consisted of 111 knowledge and skill statements organized into the following five major content areas: (1) Reading, Language Arts, and Literature, (2) Mathematics, (3) Social Studies, (4) Science, and (5) Critical Thinking.

Advisory Committee of Subject-Matter Experts

Consistent with a content validity framework, the job analysis study was designed to obtain input from many subject-matter experts at several critical points in the domain definition process. To this end, an Advisory Committee of 11 elementary education professionals was formed to review the draft domain. This group consisted of nine elementary school teachers of various grade

levels (K-6) and two elementary education teacher educators. Individuals were recruited for membership through state department of education nominations. All Committee members had classroom experience and both teacher educators were involved with the supervision of their institution's student teacher program. Generally, the Committee members were prominent and active in professional associations and/or teacher licensure. In addition to their subject-matter expertise, the Committee was formed so as to have representation by sex, ethnicity, and geographic location. Members of the panel are listed in Appendix A.

Telephone interviews with Advisory Committee members. Advisory Committee members were sent a copy of the draft domain along with a letter of introduction and instructions for their review. They were asked to review the draft for the appropriateness of the knowledge and skill statements and the five categories for defining the content-related, background knowledge and skill that all newly licensed (certified) elementary school teachers (grades K-6) should possess in order to perform their jobs in a competent manner. In addition, Committee members were asked to suggest any changes to the domain they felt would serve to more accurately portray the knowledge and skill areas most important for elementary school teachers (grades K-6). Each member of the Advisory Committee was interviewed via telephone by ETS Research staff to obtain their initial reactions and comments regarding the draft domain. The information gathered from these interviews was compiled and documented by ETS Research staff. This pre-meeting exercise was conducted to facilitate the revision process during the actual Advisory Committee meeting (described below). Committee members were asked to come prepared to discuss their comments and suggestions at the meeting.

Advisory Committee meeting. The Advisory Committee met on December 7, 1996 in Princeton, NJ. This meeting was led by the ETS Project Director with assistance from other ETS Research staff. The purpose of this meeting was to critically review the draft content domain, and to come to consensus on any modifications believed necessary by the Committee. That is, the Committee members were asked to revise the domain (to add, delete, or reorganize content, and to make wording changes) so that it accurately reflected their consensus on the content-related, background knowledge and skill important for newly licensed (certified) elementary school teachers (K-6).

Considerable discussion took place during the meeting. Comments and suggestions gathered from the pre-meeting interviews led to substantial changes to the draft domain and also fostered discussion that generated suggestions not previously made. As a result, the committee made numerous changes to the draft domain. These changes included clarification of language used, the addition and deletion of knowledge and skill statements, and the addition of a new content area (*Health and Well Being*).

Another benefit to conducting interviews prior to the meeting was the conservation of meeting time. Because each Committee member came into the meeting with some thoughts and suggestions for change, the time taken to reach consensus on the content domain was cut considerably. This allowed time for Committee members to review and approve the proposed rating scale and background information questions to be used in the final version of the inventory. The latter was included so that we could describe the composition of the survey

respondent group and conduct analyses of the survey responses by various subgroups of teachers (e.g., geographic region, sex, school setting).

After the meeting, the revised content domain, rating scale, and background information questions were sent for final review and approval to each member of the Advisory Committee. Approval was obtained from all Committee members. The finalized content domain consisted of 116 knowledge and skill statements grouped into the following six major content areas:

- *Reading, Language Arts, and Literature*
- *Mathematics*
- *Social Studies*
- *Science*
- *Health and Well Being*
- *Critical Thinking*

Pilot test of the job analysis inventory. Once final approval was obtained from the Advisory Committee, the content domain, rating scale, and background information questions were put into survey format and pilot tested on a group of elementary school teachers and teacher educators. Like the members of the Advisory Committee, pilot test participants had documented knowledge of the subject matter. Pilot test participants were asked to review the job analysis inventory in terms of its clarity of wording, ease of use, and comprehensiveness of content coverage.

ETS Research staff had secured a commitment to participate from nine elementary education professionals. Those nine participants were sent the job analysis inventory along with instructions for their review. Participants were asked take no more than 10 days for their review. Upon completion of their review, telephone interviews were to be conducted with each pilot test participant to collect their comments. Four interviews were conducted within the agreed upon time frame. Responses were obtained from two teachers and two teacher educators. Repeated efforts were made by ETS Research staff to interview the five remaining participants. However, they were not able to respond within the 10-day deadline.

The interviews that were conducted with the four elementary education professionals indicated that the inventory was clear and easy to complete. While there were a few suggestions for minor wording changes to be made to some of the knowledge and skill statements, there was no consistency in the particular statements that were identified or in the wording that was suggested. Since the wording of the content domain had been carefully reviewed by the Advisory Committee several times throughout the course of the domain development process, no changes were made as a result of the pilot test. The final version of the job analysis inventory is described in the next section of this report.

Large-Scale Survey

Description of the job analysis inventory. Parts I and II of the job analysis inventory consisted of the 116 knowledge and skill statements clustered into six major content areas: (1) *Reading, Language Arts, and Literature*, (2) *Mathematics*, (3) *Social Studies*, (4) *Science*, (5) *Health and Well Being*, and (6) *Critical Thinking*. Survey Recipients were asked to make judgments regarding the importance of each knowledge and skill statement to newly licensed (certified) elementary school teachers (grades K-6) using the following rating scale:

How *important* is this knowledge area to the competent job performance of *newly licensed (certified)* elementary school teachers?

- (0) Not Important
- (1) Slightly Important
- (2) Moderately Important
- (3) Important
- (4) Very Important

The importance scale, shown above asks respondents to make judgments about *knowledge* statements. An identical scale was used for skill statements. The only difference was the terminology used to describe the statement type (i.e., knowledge as opposed to skill). Both scales are in compliance with the Standards, which state the content domain to be covered in a licensure or certification exam should be defined clearly and explained in terms of the importance of the content for competent job performance (AERA et al., 1985).

Part III of the inventory asked respondents to indicate, using a 5-point scale, how well the knowledge and skill statements within each content area covered the important aspects of that category. Responses to this scale provided an indication of the comprehensiveness of the content domain. Respondents were asked to use the following rating scale for making their judgments about each content area:

How well did the knowledge or skill statements cover the important aspects of this category?

- (1) Poorly
- (2) Somewhat
- (3) Adequately
- (4) Well
- (5) Very Well

This section of the inventory also allowed respondents to have an opportunity to identify and write-in any content areas or knowledge and/or skill statements they believed should be added to the content domain.

In Part IV, recipients were asked to indicate the weight (emphasis) that each major content area should receive on the assessment. This was accomplished by distributing 100 total points across

the major categories. These point distributions were converted into percentages, representing the percent of items that the survey respondents believed should be devoted to content each area.

Part V of the inventory asked recipients for demographic and background information. As noted previously, these items are used to describe the respondents and to perform subgroup analyses. A copy of the final survey is provided in Appendix B.

Administration of the Job Analysis Inventory. The job analysis inventory was mailed with an accompanying cover letter (see Appendix C) and a postage-paid return envelope to a national sample of 1,000 elementary school teachers (grades K-6) and 500 elementary education teacher educators. The sample was weighted in terms of a state's estimated population of elementary school teachers (grades K-6) and elementary education teacher educators. For example, in the case of teachers, 111 potential respondents were identified from California as opposed to 17 from Alabama. Similarly, in the case of teacher educators, 40 potential respondents were identified from California as opposed to 11 from Alabama. Elementary school teacher and teacher educator population information and the subsequent sample for this study were obtained from MDR. As mentioned earlier, MDR is a survey research organization whose data base contains the names of over 90% of all teachers and teacher educators in the United States. Two weeks after the initial mailing, a follow-up postcard was sent requesting completion of the inventory (see Appendix D).

The purpose of the survey administration was to identify a core of content-related, background knowledge and skill areas that large numbers of elementary education professionals judged to be relevant (verified to be important) to licensed (certified) elementary school teachers (grades K-6). This objective was accomplished through the analysis of the mean importance ratings provided by the two groups of education professionals and by relevant subgroups of teachers. Statements that were judged to be important by both groups of education professionals and relevant subgroups of teachers were used to define the core. The core becomes the primary resource for the development of test specifications. The derivation of test specifications from those knowledge and skill areas verified to be important by the surveyed education professionals will provide a substantial evidential basis for the content validity of the future Praxis II assessment.

RESULTS

Data Analyses of Survey Responses

Three types of data analysis were conducted to support the development of content valid (content relevant) test specifications for the new Praxis II assessment: (1) means of importance ratings were computed for each knowledge and skill statement for each of the two groups of education professionals (elementary school teachers and elementary education teacher educators) and for the relevant subgroups of teachers (e.g., geographic region, sex, school setting); (2) percentage of agreement between the two groups of education professionals and among relevant subgroups of teachers; and (3) correlations of the profiles of mean importance ratings across the two groups of education professionals and among relevant subgroups of teachers.

Means. The mean analysis is used to determine the level (absolute value) of importance attributed to each knowledge and skill statement. Means were computed for both groups of education professionals as well as for the relevant subgroups of teachers. A subgroup category was required to have at least 30 respondents to be included in the mean analysis. This condition is necessary to ensure an accurate estimate of the population mean (Walepole, 1974). Knowledge and skill statements that meet or exceed a critical mean importance value of 2.50 (to be discussed in a later section) by all both groups of education professionals and by all relevant subgroups of teachers may be considered for inclusion in the development of test specifications. Means were also computed for responses to the content coverage and the recommendations for test content sections of the inventory.

Percentage of agreement. The percentage of agreement is used to determine the extent of agreement, in terms of the perceived importance of the knowledge and skill statements, between both groups of education professionals and among the relevant subgroups of teachers. High levels of agreement between both groups of education professionals and relevant subgroups of teachers further reinforces the job-relatedness of the content domain.

Correlation coefficients. The correlational analysis is used to determine the extent of relative agreement, in terms of the perceived importance of the knowledge and skill statements, between both groups of education professionals and among the relevant subgroups of teachers. The correlation coefficient describes the similarity of the pattern of mean ratings generated by the different respondent groups. For example, the profile of 116 mean ratings for teachers is correlated with the profile of 116 mean ratings for teacher educators. If these two profiles are similar (the shapes of the profiles are complimentary), the value of the correlation will be close to 1.00.

Criterion for Interpretation of Mean Importance Ratings

To aid the Test Development Committee in determining which knowledge and skill statements should be considered for inclusion in the test specifications and which should not, a mean rating of 2.50 was chosen as a cutpoint. The mean of 2.50 is the midpoint between *Moderately Important* (scale value of 2) and *Important* (scale value of 3) and is consistent with the intent of content validity, which is to include important knowledge and skill statements and exclude unimportant statements from the assessment measure. Therefore, knowledge and skill statements that receive a mean rating of 2.50 or more may be considered eligible for inclusion in the development of test specifications; knowledge and skill statements that receive a mean rating of less than 2.50 may not be considered for inclusion. (However, because survey respondents were not involved in the development of the content domain, they may lack certain insights that the Advisory Committee members had due to their high level of involvement in the definition of the domain. As a consequence, if the Test Development Committee believes that a knowledge or skill statement rated below 2.50 should be included in the specifications and the committee can provide a compelling written rationale for doing so, that knowledge or skill statement may be reinstated for inclusion in the test specifications.)

Survey Respondents

Response rate. Of the 1,500 inventories mailed out (1,000 teacher inventories and 500 teacher educator inventories), 11 were returned not completed due to a variety of reasons (e.g., incorrect address, individual had retired, individual declined to participate). Of the remaining 1,489, 381 were completed and returned (256 teachers inventories and 125 teacher educator inventories). This represents an overall response rate of 26%.

Demographic characteristics of respondents. Appendix E describes the demographic characteristics of each respondent group (teachers and teacher educators) across all the background information categories. Overall, 22% of the respondents were from the Northeast region of the country; 30% were from the Central region; 31 were from the Southern region; and 17% were from the Far West region. Eighty-three percent were female and 17% were male. The vast majority of the respondents (91%) were White. Thirty-eight percent of the respondents reported holding a master's degree as their highest level of educational attainment; 28% reported holding a doctorate; and 34% reported holding a bachelor's degree. Nine percent had fewer than 6 years of teaching experience; 20% had from 6-15 years of teaching experience, and 70% had taught more than 15 years.

Mean Importance Ratings

Education professionals. Means and standard deviations were computed for both teachers and teacher educator respondents. These results are presented in Appendix F.

Those statements rated less than 2.50 by either teachers or teacher educators are provided in Table 1 shown below. Of the 116 knowledge and skill statements, 20 (17%) were rated less than 2.50 by one or both of the two groups of education professionals. Over half (12) of these statements were found in the *Social Studies* content area. The remaining 8 statements judged to be unimportant by either of the two groups of education professionals were found in the following content areas: *Reading, Language Arts, and Literature* (2 statements), *Mathematics* (2 statements), and *Science* (4 statements).

TABLE 1
Statements Rated Below 3.50 by Teachers and/or Teacher Educators

	Teachers (N = 256)	Teacher Educators (N = 125)
Part I - Knowledge Areas for Elementary School Teachers		
A. KNOWLEDGE OF READING, LANGUAGE ARTS, AND LITERATURE		
10. Adult Literature (e.g., nonfiction and fiction)	2.03	2.32
15. Creative dramatics (e.g., role playing, puppetry, play production)	2.41	
B. KNOWLEDGE OF MATHEMATICS		
36. Statistics and probability (e.g., measure of central tendency, dispersion, prediction)	2.33	

	Teachers (N = 256)	Teacher Educators (N = 125)
Mathematical Reasoning		
40. Historical, cultural, and ongoing development of major mathematical concepts and principles	1.97	2.38
C. KNOWLEDGE OF SOCIAL STUDIES		
Major Concepts in History		
50. Inter-regional relationships over time (e.g., trade and commerce, The United Nations)	2.35	
Major Concepts in Political Science		
53. Traditional political institutions among diverse cultural groups (e.g., matriarchy, tribal hierarchy)	2.18	
Major Concepts in Economics		
57. Market as distribution and information system (e.g., supply and demand, production, inflation, international relations)	2.36	
58. Individual and the market (e.g., employment, labor movement, distribution of income and allocation of resources, banking, investments)	2.13	
59. Effects of economic and historical forces on human populations and natural resources	2.30	
60. Governmental actions and effects on the market	2.10	
61. Economic systems (e.g., capitalism, socialism)	2.22	
Major Concepts in Anthropology, Psychology, Sociology, and Philosophy		
65. Political, social, and economic conditions of ethnic groups	2.43	
66. Cross-cultural considerations (e.g., communication, value systems, modes of dress)	2.40	
67. Physical anthropology (e.g., human origins and variations)	1.92	
68. Logic	2.41	
70. Philosophical traditions (e.g., idealism, pragmatism, realism, existentialism, Zen, Yoga)	1.39	
D. KNOWLEDGE OF SCIENCE		
Basic Concepts in Physical Science		
71. Molecular structure	2.13	
Basic Concepts in Life Science and Ecology (Plants and Animals)		
87. Classification systems (e.g., phylum, kingdom)	2.17	
88. Anatomy and physiology	2.36	
Inquiry in Science		
98. Ethics in science (e.g., animal experimentation, human-subject research, genetic engineering)	2.24	

Subgroups of teachers. Mean ratings were computed for the relevant subgroups of teachers based on geographic region, sex, school setting, and teaching experience. These data are

presented in Appendix G. (It should be noted that data are not presented for the race/ethnicity subgroup because of the small number of minority teacher respondents [25]. However, preliminary analyses indicated that there were no instances where a statement that was flagged by minority teachers was not also flagged by one or more of the other subgroup[s] of teachers).

Those knowledge and skill statements rated less than 2.50 by any relevant subgroup of teachers are noted in Appendix G. Thirty-seven (32%) of the 116 knowledge and skill statements were rated below 2.50 by the relevant subgroups of teachers. However, only 17 of these were additional statements that had not already been identified as a result of the teacher and teacher educator comparisons. The additional 17 statements flagged by the subgroups of teachers were found in the following content areas: Reading, Language Arts, and Literature (2 statements), Mathematics (4 statements), Social Studies (5 statements), and Science (6 statements).

In total, 37 (32%) of the 116 statements did not meet the 2.50 criterion for inclusion by either of the two groups of education professionals or the relevant subgroups of teachers. Nearly half (17) of these statements were found in the content area of *Social Studies*. Thirteen were concentrated in the sub-categories of *Major Concepts in Economics* and *Major Concepts in Psychology, Sociology, and Philosophy*. The remaining 20 statements judged to be unimportant were distributed across the following three content areas: *Reading, Language Arts, and Literature* (4 statements), *Mathematics* (6 statements), and *Science* (10 statements).

Percent Agreement of the Mean Importance Ratings

Education professionals. The percentage of agreement was computed between the arrays of means for teachers and teacher educators. For each statement, a comparison was made of whether it was judged to be important or unimportant by teachers and teacher educators. They were in agreement on 85% of the knowledge and skill statements.

Subgroups of teachers. The percentages of agreement were computed among the arrays of means for the relevant subgroups of teachers (e.g., geographic region, sex, school setting). These percentages represent the level of agreement among subgroups. The percentages of agreement among the various subgroups of teachers all were equal to or exceeded 86%, with the vast majority in the 90's (see Table 2). These findings, combined with the results for the education professionals, indicate a high level of agreement among the respondent groups with respect to the perceived importance of the knowledge and skill statements.

Table 2
Percent Agreement of Mean Importance Ratings Among Subgroups of Teachers

	1	2	3	4
Geographic Region				
1. Northeast				
2. Central	93%			
3. Southern	92%	96%		
4. Far West	96%	92%	91%	
Sex				
1. Female				
2. Male	86%			
Work Area				
1. Urban				
2. Suburban	91%			
3. Rural	91%	97%		
Race/Ethnicity				
1. Minority				
2. White	95%			
Teaching Experience				
1. Less than 6 years				
2. 6 -15 years	91%			
3. Greater than 15 years	94%	94%		

Correlations of the Profiles of Mean Importance Ratings

Education professionals. A correlation of .91 was obtained between the arrays of means for teachers and teacher educators.

Subgroups of teachers. Correlations were computed among the arrays of means for the relevant subgroups of teachers. This analysis was conducted as another way of evaluating agreement between subgroups. The correlations among the various subgroups of teachers were all equal to or exceeded .91, with the vast majority exceeding .95 (see Table 3). These findings, combined with the results for the education professionals, indicate a high level of relative agreement among the respondent groups with respect to the perceived importance of the knowledge and skill statements.

TABLE 3
Correlations of Mean Importance Ratings Among Subgroups of Teachers

	1	2	3	4
Geographic Region				
1. Northeast				
2. Central	.98			
3. Southern	.97	.97		
4. Far West	.96	.96	.93	
Sex				
1. Female				
2. Male	.91			
Work Area				
1. Urban				
2. Suburban	.97			
3. Rural	.96	.98		
Race/Ethnicity				
1. Minority				
2. White	.94			
Teaching Experience				
1. Less than 6 years				
2. 6 -15 years	.96			
3. Greater than 15 years	.95	.98		

Mean Ratings of Content Coverage

The survey participants were asked to indicate, using a 5-point scale, how well the statements within each of the six major content areas covered the important aspects of the category. Responses to this section provide an indication of the adequacy (comprehensiveness) of the content domain. The scale values ranged from a low of 1 (*Very Poorly*) to a high of 5 (*Very Well*); the midpoint of the scale was a value of 3 (*Adequately*). The means and standard deviations of these ratings for teachers and teacher educators are presented in Table 4. All means were equal to or exceeded 3.11. This indicates that both groups of respondents judged the six major content areas to be adequately covered.

Table 4
Mean Ratings of Content Coverage

Major Content Areas	Teachers (N = 256)		Teacher Educators (N = 125)	
	Mean	SD	Mean	SD
Reading, Language Arts, and Literature	3.40	0.83	3.33	0.92
Mathematics	3.48	0.75	3.41	0.84
Social Studies	3.26	0.86	3.24	0.91
Science	3.38	0.80	3.26	0.96
Health and Well Being	3.33	0.84	3.11	1.03
Critical Thinking Skills	3.46	0.79	3.51	0.73

Mean Percentage Weights for Test Content Emphasis

In addition to being asked to rate each knowledge and skill statement and provide content coverage judgments, respondents were asked to indicate how many test questions (out of 100) should be included from each of the major categories. Table 5 shows the mean percentage weights and standard deviations allocated to each category by both teachers and teacher educators. It is interesting to note that the rank order of each of the six content areas in terms of the percentages allocated for test emphasis was identical for both teachers and teacher educators. The content areas of *Reading, Language Arts, and Literature* and *Mathematics* received the highest weightings from both groups of respondents while *Social Studies* and *Health and Well Being* received the lowest. The Test Development Committee should consider these judgments as “rough guides” and as points for discussion as they set about developing final test specifications.

Table 5
Mean Percentage Weights

Major Content Areas	Teachers		Teacher Educators	
	Mean	SD	Mean	SD
Reading, Language Arts, and Literature	26.09	7.40	22.31	6.85
Mathematics	22.81	5.47	20.13	4.21
Social Studies	12.55	4.19	15.00	4.47
Science	13.65	4.77	15.59	4.57
Health and Well Being	10.29	4.12	10.10	3.99
Critical Thinking Skills	14.01	7.77	15.68	7.62

SUMMARY/CONCLUSIONS

A job analysis was conducted to define the content-related, background knowledge and skill that all newly licensed (certified) elementary school teachers (grades K-6) should possess in order to perform their job in a competent manner. The results of this job analysis will be used to develop test specifications for a new Praxis II assessment.

A draft domain of content-related, background knowledge and skill areas was developed jointly by ETS Research and Test Development staff. This draft content domain was then reviewed, modified, and approved by an external Advisory Committee comprised of elementary education subject-matter experts. The revised content domain was then subjected to verification/refutation through the use of a national survey of elementary education professionals. The survey participants were asked to rate each knowledge and skill statement in terms of their importance for newly (licensed) certified elementary school teachers (grades K-6). A mean importance cutpoint of 2.50 (midpoint between *Moderately Important* and *Important*) was established to designate knowledge and skill statements as eligible (≥ 2.50) or ineligible (< 2.50) for inclusion in the development of test specifications.

The results of the mean analysis conducted by teachers and teacher educators indicated that 20 statements were rated less than 2.50. This represents 17% of the content domain. Seventeen additional statements were rated below 2.50 by one or more of the relevant subgroups of teachers. In total, 37 of the 116 statements (32%) did not meet the 2.50 criterion for inclusion. However, 68% of the domain (79 knowledge and skill statements) is eligible for inclusion in the development of test specifications.

The percentage of agreement in terms of the knowledge and skill statements judged to be either important or unimportant was computed between both groups of education professionals and among the relevant subgroups of teachers. The percentage of agreement for the comparison between teachers and teacher educators was 85%. Percentages computed among the relevant subgroups of teachers were all equal to or exceeded 86%.

Correlation coefficients were computed to assess relative agreement, in terms of the perceived importance of knowledge and skill statements, between each group of education professionals and among the relevant subgroups of teachers. The coefficient for the comparison between teachers and teacher educators was .91. Coefficients computed among the relevant subgroups of teachers were all equal to or exceeded .91.

The 79 knowledge and skill statements that were verified to be important by the surveyed elementary school teachers and elementary education teacher educators should be used as the foundation for the development of test specifications. Test specifications that are linked to the results of a job analysis provide support for the content validity of the derived assessment measure and may be seen as part of an initial step in ensuring the fairness of that measure. It is reasonable to assume that, due to testing and psychometric constraints (e.g., time limits, ability to measure some content reliably), not all of the verified content will be included in the assessment measure. One source of information that may be used to guide the Test Development committee

in their decision as to what verified content to include in the assessment measure is the mean importance rating. Although a rank ordering of the content by mean importance rating is not implied, it is recommended that initial consideration be given to content that is well above the cut point and represents the appropriate breadth of content coverage.

Evidence was also provided in this study of the comprehensiveness of the content domain with each of the six major content areas. The results indicated that the survey respondents thought the categories were adequately covered by the knowledge and skill statements.

Finally, data was collected regarding the emphasis that should be given to each of the six major content areas in the new Praxis II assessment. This information will be used by the Test Development Committee in their decisions about the appropriate weighting of the assessment.

In summary, this study took a multi-method approach to identify a domain of content-related, background knowledge and skill that is related to the job of a newly licensed (certified) elementary school teacher (grade K-6). The job analysis process allowed for input from many practicing professionals in elementary education. The results of the study will be used to develop specifications for a new assessment measure to be included as part of the subject assessments of The Praxis Series: Professional Assessments for Beginning Teachers®.

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Appendix A

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Appendix B

Survey Instrument

Job Analysis Inventory

For

Elementary School Teachers (Grades K-6)

Marking Instructions

- Use a No. 2 pencil or blue or black ink pen only.
- Do not use pens with ink that soaks through the paper.
- Make solid marks that fill the circle completely.
- Make no stray marks on this form.
- Do not fold, tear, or mutilate this form.

CORRECT MARK ●

INCORRECT MARKS    



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Testing Service**

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Mark Reflex® by NCS EM-211877-1:654321

PLEASE DO NOT WRITE IN THIS AREA



1030

Introduction

Educational Testing Service (ETS) is developing a new generation of PRAXIS™ assessments for the purpose of licensing (certifying) elementary school teachers. The inventory that follows is part of our development effort and is designed to gather information concerning the job of a *newly licensed (certified)* elementary school teacher (grades K-6). It was developed by ETS Research staff with the assistance of elementary school teachers and college faculty.

Those who constructed this inventory recognize that elementary school teachers provide instruction in a wide range of subject matter. For this reason, the collaborators believe that elementary school teachers should have a broad understanding of a variety of subjects as background for the content they teach. The content in this inventory does not contain knowledge of pedagogy. Content related to pedagogy is covered in other PRAXIS™ examinations. This inventory asks you to respond to a list of knowledge areas and critical thinking skills and to judge the importance of these for newly licensed (certified) elementary school teachers. **Please do not relate each statement to your own job but rather to what you believe a newly licensed elementary school teacher should know.**

The information you provide will guide the development of this PRAXIS™ Elementary School Teacher module. We expect the results of the study to be widely disseminated and to be very useful to the profession.

The inventory has been mailed to a group of 1,500 professionals. Its value is directly related to the number of individuals who return their completed inventories. Because you represent a large number of professionals, your responses are extremely important! Please take the time to **complete and return this inventory within 10 days.**

Part I - Knowledge areas for elementary school teacher

The purpose of Part I is to determine the background knowledge that you believe *newly licensed (certified) elementary school teachers* should have in order to perform their job in a competent manner. In this section you will find five major content areas and, beneath each, a list of knowledge statements that define each particular content area.

The five content areas are:

- A. Reading, Language Arts, and Literature**
- B. Mathematics**
- C. Social Studies**
- D. Science**
- E. Health and Well Being**

For each statement within each of these content areas, you will be asked to make the following judgement:

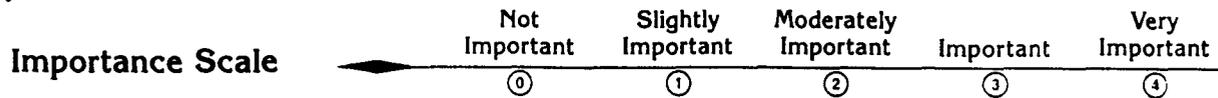
How *important* is this knowledge area to the competent job performance of *newly licensed (certified)* elementary school teachers?

Importance Scale

Not Important	Slightly Important	Moderately Important	Important	Very Important
①	②	③	④	⑤

Fill in your response using the scale adjacent to each statement. To familiarize yourself with the content areas and statements, you may wish to glance through Part I before making your judgements. If you feel an important category is missing or that an important knowledge area is missing from a particular category, please make note of it on page 7 of this survey.

How *important* is this knowledge area to the competent job performance of *newly licensed (certified)* elementary school teachers?



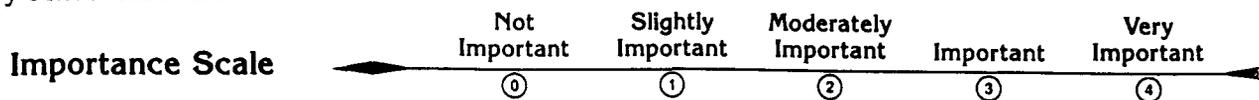
A. Knowledge of Reading, Language Arts, and Literature

	Importance				
	0	1	2	3	4
1. Conventions of language (e.g., spelling, capitalization, punctuation, handwriting)	0	1	2	3	4
2. Language structure (e.g., parts of speech, verb tenses, plurals, figurative language, sentence types)	0	1	2	3	4
3. Word recognition strategies (e.g., sight vocabulary, phonic analysis, structural analysis, contextual clues)	0	1	2	3	4
4. Comprehension strategies (e.g., vocabulary, and metacognitive strategies; activating prior knowledge)	0	1	2	3	4
5. Text structure (e.g., expository text, narrative text, organizational patterns, vocabulary)	0	1	2	3	4
6. Language usage (e.g., interpretive and communicative aspects, requesting, questioning, nonverbal communication)	0	1	2	3	4
7. Library skills (e.g., catalogue and computer search systems, reference materials)	0	1	2	3	4
8. Study skills (e.g., note taking, organizing materials and time, planning, outlining, reading in the content area)	0	1	2	3	4
9. Children's literature (e.g., nonfiction and fiction, poetry, drama, myths, multicultural literature, Caldecott and Newberry award winners)	0	1	2	3	4
10. Adult Literature (e.g., nonfiction and fiction)	0	1	2	3	4
11. Functional literacy (e.g., documents, advertisements, newspapers, magazines)	0	1	2	3	4
12. Graphic literacy (e.g., illustrations, photographs, charts, media)	0	1	2	3	4
13. Oral communication (e.g., voice modulation, public speaking, storytelling, leading group discussions)	0	1	2	3	4
14. Presentation skills (e.g., use of media and technology)	0	1	2	3	4
15. Creative dramatics (e.g., role playing puppetry, play production)	0	1	2	3	4
16. Composing processes (e.g., prewriting/planning, drafting, revising, editing, publishing)	0	1	2	3	4
17. Types of writing (e.g., expressive, personal, informational, poetic, imaginative)	0	1	2	3	4

B. Knowledge of Mathematics

	Importance				
	0	1	2	3	4
18. Preenumeration (e.g., classification, patterns, sets)	0	1	2	3	4
19. Numeration (e.g., place value, cardinal and ordinal numbers, number bases)	0	1	2	3	4
20. Number theory (e.g., prime, composite, greatest common factor)	0	1	2	3	4
21. Number sense (e.g., number meaning and use, operations)	0	1	2	3	4
22. Estimation	0	1	2	3	4
23. Mental computation	0	1	2	3	4
24. Basic operation and conditions under which the use of technology is appropriate (e.g., calculator and computer)	0	1	2	3	4
25. Paper/pencil computation	0	1	2	3	4
26. Whole numbers	0	1	2	3	4
27. Rational numbers (e.g., fractions, decimals)	0	1	2	3	4
28. Percents	0	1	2	3	4
29. Inequalities	0	1	2	3	4
30. Integers	0	1	2	3	4
31. Geometry and spatial sense (e.g., area, perimeter and volume, symmetry, congruence)	0	1	2	3	4
32. Measurements to describe and compare phenomena (e.g., length, capacity, weight, area, volume, time, temperature, angle measure, perimeter, mass)	0	1	2	3	4
33. Metric System	0	1	2	3	4
34. Organizing and interpreting data (e.g., tables, charts, graphs)	0	1	2	3	4
35. Basic algebraic methods to solve a variety of problems	0	1	2	3	4
36. Statistics and probability (e.g., measure of central tendency, dispersion, prediction)	0	1	2	3	4

How *important* is this knowledge area to the competent job performance of *newly licensed (certified)* elementary school teachers?



Mathematical Reasoning

	<i>Importance</i>				
	0	1	2	3	4
37. Methods of using mathematics to make sense of the world (e.g., solving real world problems, seeking patterns, organizing data in useful ways)	0	1	2	3	4
38. Methods of mathematical investigation (e.g., collaborating with others, applying a variety of strategies and pathways, multiple solutions)	0	1	2	3	4
39. Strategies for problem solving (e.g., acting it out, making a list, drawing a picture, guess and check)	0	1	2	3	4
40. Historical, cultural, and ongoing development of major mathematical concepts and principles	0	1	2	3	4

C. Knowledge of Social Studies

41. Methods of inquiry and validation of evidence in social studies (e.g., map skills, graphs, statistical information, reports)	0	1	2	3	4
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Major Concepts in Geography

42. Location (e.g., absolute [compass coordinates, street address]; relative [north of the city, a half hour away])	0	1	2	3	4
43. Place (e.g., physical [climate, landforms, vegetation]; human [political systems, economic systems, culture])	0	1	2	3	4
44. Human/environment interactions (e.g., use of resources, adaptation)	0	1	2	3	4
45. Movement (e.g., transportation of goods, ideas, people)	0	1	2	3	4
46. Regions (e.g., physical, natural, political, cultural)	0	1	2	3	4

Major Concepts in History

47. Chronology, sequence, change	0	1	2	3	4
48. Major events and movements in United States history up to the present	0	1	2	3	4
49. Major events and movements in global history (e.g., early civilizations, Renaissance, population migration, space exploration, independence movements)	0	1	2	3	4
50. Interregional relationships over time (e.g., trade and commerce, The United Nations)	0	1	2	3	4

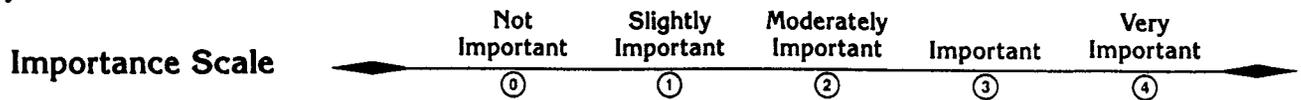
Major Concepts in Political Science

51. Nature and purpose of government	0	1	2	3	4
52. Forms of government (e.g., democracy, oligarchy, monarchy)	0	1	2	3	4
53. Traditional political institutions among diverse cultural groups (e.g., matriarchy, tribal hierarchy)	0	1	2	3	4
54. United States Constitution	0	1	2	3	4
55. Rights and responsibilities of citizens (e.g., voting, naturalization process, civil rights, laws)	0	1	2	3	4
56. Relations among nations (e.g., alliances, wars, treaties)	0	1	2	3	4

Major Concepts in Economics

57. Market as distribution and information system (e.g., supply and demand, production, inflation, international relations)	0	1	2	3	4
58. Individual and the market (e.g., employment, labor movement, distribution of income and allocation of resources, banking, investments)	0	1	2	3	4
59. Effects of economic and historical forces on human populations and natural resources	0	1	2	3	4
60. Governmental actions and effects on the market	0	1	2	3	4
61. Economic systems (e.g., capitalism, socialism)	0	1	2	3	4

How *important* is this knowledge area to the competent job performance of *newly licensed (certified)* elementary school teachers?



Major Concepts in Anthropology, Psychology, Sociology, and Philosophy



62. Culture (e.g., belief systems, language, music, artistic creations, traditions, family structure)	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
63. Human behavior and development	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
64. Socialization and acculturation	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
65. Political, social, and economic conditions of ethnic groups	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
66. Cross-cultural considerations (e.g., communication, value systems, modes of dress)	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
67. Physical anthropology (e.g., human origins and variations)	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
68. Logic	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
69. Ethics	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
70. Philosophical traditions (e.g., idealism, pragmatism, realism, existentialism, Zen, Yoga)	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4

D. Knowledge of Science

Basic Concepts in Physical Science

71. Molecular structure	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
72. Physical and chemical change	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
73. Heat and temperature	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
74. Sound	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
75. Light	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
76. Energy sources	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
77. Transformation of energy (e.g., potential energy to kinetic energy)	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
78. Simple machines	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
79. Magnetism and electricity	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
80. Flight	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4

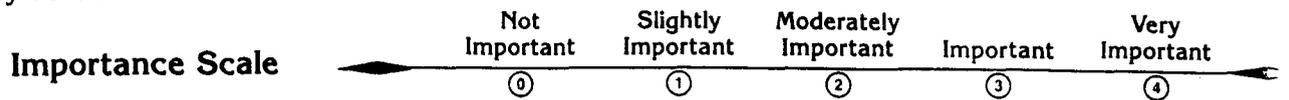
Basic Concepts in Earth Science

81. Surface features of the earth and changes in these features (e.g., erosion, mountain building)	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
82. Rocks and minerals	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
83. Air, water, and weather	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
84. Solar system	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
85. The universe	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4

Basic Concepts in Life Science and Ecology (Plants and Animals)

86. Origins of life	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
87. Classification systems (e.g., phylum, kingdom)	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
88. Anatomy and physiology	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
89. Relationships of structure and functions (e.g., stamen and pistil)	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
90. Life cycles	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
91. Habitat, climate, adaptation, and population dynamics	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
92. Ecosystems (e.g., food chains, food webs and interdependence)	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4
93. Human effects on the environment	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4

How *important* is this knowledge area to the competent job performance of *newly licensed (certified)* elementary school teachers?



Inquiry in Science

	Importance				
	0	1	2	3	4
94. Scientific Method	0	1	2	3	4
95. Current trends in science and technology	0	1	2	3	4
96. Interrelationship of the sciences	0	1	2	3	4
97. The impact of science and technology on society (e.g., bio-engineering, pollution)	0	1	2	3	4
98. Ethics in science (e.g., animal experimentation, human-subject research, genetic engineering)	0	1	2	3	4

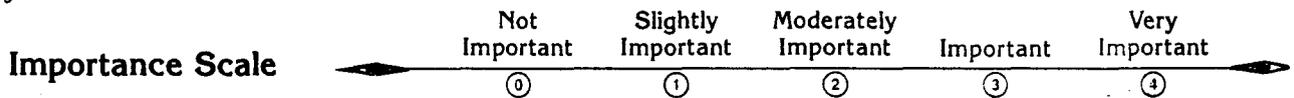
E. Health and Well Being

	0	1	2	3	4
99. Effects of physical, emotional and social health on learning	0	1	2	3	4
100. Basic information about personal care (nutrition, hygiene, exercise, dental health, personal safety)	0	1	2	3	4
101. Signs and symptoms of child abuse	0	1	2	3	4
102. Drug and alcohol awareness	0	1	2	3	4

Part II - Critical thinking skills for elementary school teachers

The purpose of Part II is to determine the critical thinking skills that you believe *newly licensed (certified)* elementary school teachers should possess in order to perform their job in a competent manner. In this section you will find a list of 14 critical thinking skills. For each skill you will be asked to make the following judgement:

How *important* is this critical thinking skill to the competent job performance of *newly licensed (certified)* elementary school teachers?

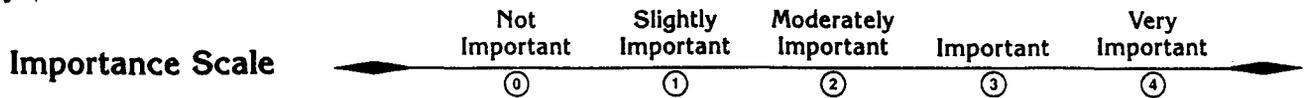


Fill in your response using the scale adjacent to each statement. To familiarize yourself with the skill statements, you may wish to glance through them before making your judgements. If you feel an important critical thinking skill is missing, please make note of it on page 7 of this survey.

Critical Thinking Skills

	Importance				
	0	1	2	3	4
103. <i>Logical Thinking</i> : Following a set of rules that specify how we "ought to" derive conclusions	0	1	2	3	4
104. <i>Inductive Reasoning</i> : Collecting facts and using them to provide support for or negation of conclusions or hypotheses	0	1	2	3	4
105. <i>Deductive Reasoning</i> : Beginning with a statement known or believed to be true, form hypotheses or conclusions based on that knowledge or belief	0	1	2	3	4
106. <i>Adaptive Reasoning</i> : Applying existing information to new situations	0	1	2	3	4
107. <i>Forecasting</i> : Predicting future—patterns, trends, series—given current information	0	1	2	3	4
108. <i>Synthesizing Information</i> : Combining information from multiple sources	0	1	2	3	4
109. <i>Hypothesis Generation</i> : Accumulating observations and formulating assumptions based on those observations	0	1	2	3	4
110. <i>Hypothesis Testing</i> : Making systematic observations that could confirm or negate the hypothesis	0	1	2	3	4
111. <i>Decision Making</i> : Specifying a goal, gathering and judging information to evaluate and choose the best solution	0	1	2	3	4

How *important* is this critical thinking skill to the competent job performance of *newly licensed (certified)* elementary school teachers?



Critical Thinking Skills (cont.)

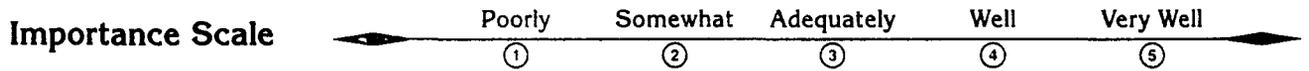
Importance

112. <i>Creative Thinking</i> : Using novel methods of defining a problem to generate and evaluate possible solutions that are perceived as being unique and appropriate	0	1	2	3	4
113. <i>Planning and Organizing</i> : Arranging materials, facts, figures, or documents into meaningful clusters, patterns, or sequences; developing a course of action for oneself or others to accomplish a goal	0	1	2	3	4
114. <i>Data Interpretation</i> : Seeing patterns in qualitative and quantitative information	0	1	2	3	4
115. <i>Problem Analysis</i> : Identifying the main issue, breaking it into component parts and evaluating the situation	0	1	2	3	4
116. <i>Problem Solution</i> : Evaluate and use available information to develop alternative possibilities/actions, assess the positive and negative consequences of those actions, and choose the most appropriate alternative	0	1	2	3	4

Part III - Content coverage

The purpose of this section is to obtain your judgement of how well this inventory covered the knowledge areas and critical thinking skills that are important to the competent job performance of a *newly licensed (certified) elementary school teacher*. Please mark the number on the rating scale that best represents your judgement.

How well did the knowledge or skill statements cover the important aspects of this category?



Importance

117. Reading, Language Arts, and Literature	1	2	3	4	5
118. Mathematics	1	2	3	4	5
119. Social Studies	1	2	3	4	5
120. Science	1	2	3	4	5
121. Health and Well Being	1	2	3	4	5
122. Critical Thinking Skills	1	2	3	4	5

123. Please use the space below to list any important *categories* that you feel were not included in the inventory.

124. Please use the space below to list any important *knowledge areas or critical thinking skills* that you feel were not included in the inventory. For each statement, please indicate the category to which it belongs.

Part IV - Recommendations for test content

Listed below are the topic areas that may be covered in this module for elementary school teachers. If the module contained 100 questions, how many questions do you feel should be included from each topic? If you feel a topic should not be included in the module, put 0 in the space provided. Make sure your responses sum to 100.

Number of Test Questions (out of 100)

	125. Reading, Language Arts, and Literature	126. Mathematics	127. Social Studies	128. Science	129. Health and Well Being	130. Critical Thinking Skills	Total = 100																																																																																																																																																																																																																																																																																								
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Part V - Background information

The information that you provide in this section is completely confidential and will be used for research purposes only. Please answer the questions by marking the circle that most closely describes you or your professional activities.

131. Where do you work?
- | | |
|--|--------------------------------------|
| <input type="radio"/> Alabama | <input type="radio"/> Montana |
| <input type="radio"/> Alaska | <input type="radio"/> Nebraska |
| <input type="radio"/> Arizona | <input type="radio"/> Nevada |
| <input type="radio"/> Arkansas | <input type="radio"/> New Hampshire |
| <input type="radio"/> California | <input type="radio"/> New Jersey |
| <input type="radio"/> Colorado | <input type="radio"/> New Mexico |
| <input type="radio"/> Connecticut | <input type="radio"/> New York |
| <input type="radio"/> Delaware | <input type="radio"/> North Carolina |
| <input type="radio"/> District of Columbia | <input type="radio"/> North Dakota |
| <input type="radio"/> Florida | <input type="radio"/> Ohio |
| <input type="radio"/> Georgia | <input type="radio"/> Oklahoma |
| <input type="radio"/> Hawaii | <input type="radio"/> Oregon |
| <input type="radio"/> Idaho | <input type="radio"/> Pennsylvania |
| <input type="radio"/> Illinois | <input type="radio"/> Rhode Island |
| <input type="radio"/> Indiana | <input type="radio"/> South Carolina |
| <input type="radio"/> Iowa | <input type="radio"/> South Dakota |
| <input type="radio"/> Kansas | <input type="radio"/> Tennessee |
| <input type="radio"/> Kentucky | <input type="radio"/> Texas |
| <input type="radio"/> Louisiana | <input type="radio"/> Utah |
| <input type="radio"/> Maine | <input type="radio"/> Vermont |
| <input type="radio"/> Maryland | <input type="radio"/> Virginia |
| <input type="radio"/> Massachusetts | <input type="radio"/> Washington |
| <input type="radio"/> Michigan | <input type="radio"/> West Virginia |
| <input type="radio"/> Minnesota | <input type="radio"/> Wisconsin |
| <input type="radio"/> Mississippi | <input type="radio"/> Wyoming |
| <input type="radio"/> Missouri | |
132. What is your gender?
- Male
 Female
133. Which of the following best describes the area in which you work?
- Urban
 Suburban
 Rural
134. Which of the following best describes your race/ethnicity?
- American Indian/Alaskan Native
 Asian or Pacific Islander
 Hispanic
 African American (non-Hispanic)
 White (non-Hispanic)
135. Which of the following best describes your highest educational attainment?
- | | |
|---|---|
| <input type="radio"/> Less than a bachelor's | <input type="radio"/> Master's |
| <input type="radio"/> Bachelor's | <input type="radio"/> Master's + additional credits |
| <input type="radio"/> Bachelor's + additional credits | <input type="radio"/> Doctorate |
136. How many years, including the current school year, have you taught?
- | | |
|--|--|
| <input type="radio"/> Less than a year | <input type="radio"/> 11 to 15 years |
| <input type="radio"/> 1 to 2 years | <input type="radio"/> 16 to 20 years |
| <input type="radio"/> 3 to 5 years | <input type="radio"/> 21 or more years |
| <input type="radio"/> 6 to 10 years | |
137. What grade are you currently teaching?
- | | |
|------------------------------------|---|
| <input type="radio"/> Kindergarten | <input type="radio"/> Fourth |
| <input type="radio"/> First | <input type="radio"/> Fifth |
| <input type="radio"/> Second | <input type="radio"/> Sixth |
| <input type="radio"/> Third | <input type="radio"/> College (Teacher Education) |

Thank you for completing this inventory.
Please return it *within 10 days* using the envelope provided.

PLEASE DO NOT WRITE IN THIS AREA



Appendix C

Cover Letter



609-921-9000
CABLE-EDUCTESTSVC
FAX-609-734-5410

November, 1996

Dear Colleague,

Educational Testing Service (ETS) is in the process of developing a new licensure exam aimed at measuring the content knowledge and skill that all newly licensed (certified) elementary school teachers (grades K-6) should possess in order to perform their job in a competent manner. This exam will become part of The Praxis Series: Professional Assessments for Beginning Teachers®. Knowledge of pedagogy will not be assessed on this exam. Content related to pedagogy is assessed in other Praxis licensure exams. The purpose of this assessment is to assist states in identifying beginning elementary school teachers who may be considered competent practitioners.

One of the first steps in the assessment-development process is to define the job of a newly licensed (certified) elementary school teacher. This entails identifying the important knowledge and skill areas required for competent performance. The enclosed inventory asks you to react to a series of knowledge and skill areas that may be important to the competent performance of newly licensed (certified) elementary school teachers. This inventory was carefully developed by a committee of content experts composed of elementary school teachers and teacher educators. We hope you will be candid as you tell us what is important for newly licensed (certified) elementary school teachers, what is not, and what is missing from this inventory.

You were chosen to participate in this study as a member of a carefully selected sample of elementary school teachers and teacher educators. The sample is intended to be broadly representative of elementary education professionals throughout the United States. Because you represent a larger number of elementary education professionals with characteristics similar to your own, your responses are very important to us. Your participation in this survey effort will give you the opportunity to have an active voice in shaping this licensure exam.

Your responses will be kept in strict confidence. You will notice that the inventory asks for some background information about you; this is solely for purposes of describing the group of respondents. We ask that you send us the completed inventory within 10 days of your receiving it (a postage paid envelope is enclosed for your convenience). This will enable us to process your responses in a timely manner. If you would like a summary of the survey results, enclose your name and mailing address with your completed inventory. If you have any questions about the study or your participation in it, feel free to call my colleague, Greg Kocher, collect at (609) 734-1790.

Thank you for participating in this very important phase of the assessment-development process.

Sincerely,

Michael Rosenfeld, Ph.D.
Director - Professional & Occupational Studies

Appendix D

Follow-up Postcard

Follow-up Post Card

A Job Analysis Inventory for Newly Licensed Elementary School Teachers (Grades K-6)

Dear Colleague:

Educational Testing Service recently sent you an inventory to obtain your opinions of what a newly licensed (certified) Elementary School Teacher (Grades K-6) should know and be able to do. If you have not already done so, please complete the inventory and return it in the postage-paid envelope to:

Educational Testing Service
Mail Stop 12-T
Princeton, NJ 08541

If you have already returned the inventory, please accept my thanks for your help in this important project.

Sincerely,

Michael Rosenfeld, PhD

Appendix E

Respondent Demographics

**Elementary School
Respondent Demographics**

	Overall		Teachers		Teacher Educators	
	Number	Percent	Number	Percent	Number	Percent
GEOGRAPHIC REGION						
Northeast	83	21.8	55	21.6	28	22.4
Central	115	30.3	70	27.5	45	36.0
Southern	119	31.3	88	34.5	31	24.8
Far West	63	16.6	42	16.5	21	16.8
Total	380		255		125	
SEX						
Female	275	82.6	213	94.2	62	57.9
Male	58	17.4	13	5.8	45	42.1
Total	333		226		107	
SCHOOL SETTING						
Urban	108	28.7	53	20.9	55	44.7
Suburban	149	39.6	113	44.7	36	29.3
Rural	119	31.6	87	34.4	32	26.0
Total	376		253		123	
RACE/ETHNICITY						
American Indian/Alaskan Native	3	0.8	2	0.8	1	0.8
Asian or Pacific Islander	4	1.1	2	0.8	2	1.6
Hispanic	10	2.7	8	3.2	2	1.6
African American (non-Hispanic)	18	4.8	13	5.1	5	4.1
White (non-Hispanic)	340	90.7	228	90.1	112	91.8
Total	375		253		122	
HIGHEST EDUCATIONAL ATTAINMENT						
Less than a Bachelor's degree	0	0.0	0	0.0	0	0.0
Bachelor's degree	22	5.8	22	8.6	0	0.0
Bachelor's degree + additional credits	106	27.8	106	41.4	0	0.0
Master's Degree	42	11.0	39	15.2	3	2.4
Master's Degree + additional credits	104	27.3	88	34.4	16	12.8
Doctorate	107	28.1	1	0.4	106	84.8
Total	381		256		125	
TEACHING EXPERIENCE						
Less than a year	2	0.5	2	0.8	0	0.0
1 - 2 years	4	1.0	4	1.6	0	0.0
3 - 5 years	29	7.6	29	11.3	0	0.0
6 - 10 years	38	10.0	34	13.3	4	3.2
11 - 15 years	40	10.5	33	12.9	7	5.6
16 - 20 years	62	16.3	49	19.1	13	10.4
21 or more years	206	54.1	105	41.0	101	80.8
Total	381		256		125	
GRADE CURRENTLY TEACHING						
Kindergarten	27	7.1				
First	52	13.6				
Second	40	10.5				
Third	48	12.6				
Fourth	47	12.3				
Fifth	29	7.6				
Sixth	13	3.4				
College (Teacher Educator)	125	32.8				
Total	381					

Appendix F

Mean Importance Ratings: Teachers and Teacher Educators

Elementary School
Mean Importance Ratings: Teachers and Teacher Educators

Part I - Knowledge areas for elementary school teachers

A. KNOWLEDGE OF READING, LANGUAGE ARTS, AND LITERATURE

- 1 Conventions of language (e.g., spelling, capitalization, punctuation, handwriting)
- 2 Language structure (e.g., parts of speech, verb tenses, plurals, figurative language, sentence types)
- 3 Word recognition strategies (e.g., sight vocabulary, phonic analysis, structural analysis, contextual clues)
- 4 Comprehension strategies (e.g., vocabulary, and metacognitive strategies; activating prior knowledge)
- 5 Text structure (e.g., expository text, narrative text, organizational patterns, vocabulary)
- 6 Language usage (e.g., interpretive and communicative aspects, requesting, questioning, nonverbal communication)
- 7 Library skills (e.g., catalogue and computer search systems, reference materials)
- 8 Study skills (e.g., note taking, organizing materials and time, planning, outlining, reading in the content area)
- 9 Children's literature (e.g., nonfiction and fiction, poetry, drama, myths, multicultural literature, Caldecott and Newberry award winners)
- 10 Adult Literature (e.g., nonfiction and fiction)
- 11 Functional literacy (e.g., documents, advertisements, newspapers, magazines)
- 12 Graphic literacy (e.g., illustrations, photographs, charts, media)
- 13 Oral communication (e.g., voice modulation, public speaking, storytelling, leading group discussions)
- 14 Presentation skills (e.g., use of media and technology)
- 15 Creative dramatics (e.g., role playing, puppetry, play production)
- 16 Composing processes (e.g., prewriting/planning, drafting, revising, editing, publishing)
- 17 Types of writing (e.g., expressive, personal, informational, poetic, imaginative)

B. KNOWLEDGE OF MATHEMATICS

- 18 Preenumeration (e.g., classification, patterns, sets)
- 19 Numeration (e.g., place value, cardinal and ordinal numbers, number bases)
- 20 Number theory (e.g., prime, composite, greatest common factor)
- 21 Number sense (e.g., number meaning and use, operations)
- 22 Estimation
- 23 Mental computation
- 24 Basic operation and conditions under which the use of technology is appropriate (e.g., calculator and computer)
- 25 Paper/pencil computation

Teachers (N = 256)		Teacher Educators (N = 125)	
Mean	SD	Mean	SD
3.80	0.47	3.81	0.43
3.59	0.67	3.42	0.83
3.76	0.50	3.60	0.66
3.70	0.56	3.69	0.56
3.13	0.78	3.37	0.66
3.27	0.75	3.39	0.69
2.83	0.84	3.16	0.80
3.26	0.76	3.32	0.80
3.12	0.88	3.45	0.73
2.03	0.91	2.32	0.96
2.62	0.86	3.03	0.95
2.74	0.85	3.09	0.79
3.33	0.77	3.53	0.66
3.09	0.82	3.19	0.81
2.41	0.94	2.91	0.92
3.41	0.71	3.53	0.63
3.03	0.81	3.26	0.76
3.47	0.71	3.67	0.52
3.60	0.65	3.70	0.51
3.08	0.88	3.20	0.82
3.64	0.62	3.71	0.55
3.25	0.79	3.52	0.61
3.19	0.78	3.29	0.77
3.27	0.76	3.36	0.74
3.50	0.66	3.21	0.86

Elementary School
Mean Importance Ratings: Teachers and Teacher Educators

	Teachers (N = 256)		Teacher Educators (N = 125)	
	Mean	SD	Mean	SD
26 Whole numbers	3.52	0.67	3.58	0.65
27 Rational numbers (e.g., fractions, decimals)	3.35	0.75	3.51	0.65
28 Percents	3.15	0.86	3.48	0.64
29 Inequalities	2.89	0.98	3.20	0.83
30 Integers	2.74	1.05	3.21	0.84
31 Geometry and spatial sense (e.g., area, perimeter and volume, symmetry, congruence)	3.11	0.85	3.30	0.79
32 Measurements to describe and compare phenomena (e.g., length, capacity, weight, area, volume, time, temperature, angle measure, perimeter, mass)	3.29	0.79	3.63	0.65
33 Metric System	2.60	1.04	2.76	1.01
34 Organizing and interpreting data (e.g., tables, charts, graphs)	3.45	0.68	3.49	0.68
35 Basic algebraic methods to solve a variety of problems	2.80	0.96	2.85	0.91
36 Statistics and probability (e.g., measure of central tendency, dispersion, prediction)	2.33	1.04	2.60	0.97
Mathematical Reasoning				
37 Methods of using mathematics to make sense of the world (e.g., solving real world problems, seeking patterns, organizing data in useful ways)	3.68	0.63	3.77	0.49
38 Methods of mathematical investigation (e.g., collaborating with others, applying a variety of strategies and pathways multiple solutions)	3.40	0.77	3.53	0.71
39 Strategies for problem solving (e.g., acting it out, making a list, drawing a picture, guess and check)	3.56	0.72	3.76	0.48
40 Historical, cultural, and ongoing development of major mathematical concepts and principles	1.97	0.99	2.38	0.95
C. KNOWLEDGE OF SOCIAL STUDIES				
41 Methods of inquiry and validation of evidence in social studies (e.g., map skills, graphs, statistical information, reports)	3.49	0.68	3.74	0.54
Major Concepts in Geography				
42 Location (e.g., absolute [compass coordinates, street address]; relative [north of the city, a half hour away])	3.27	0.73	3.50	0.68
43 Place (e.g., physical [climate, landforms, vegetation]; human [political systems, economic systems, culture])	3.02	0.81	3.44	0.68
44 Human/environment interactions (e.g., use of resources, adaptation)	2.95	0.84	3.47	0.68
45 Movement (e.g., transportation of goods, ideas, people)	2.91	0.83	3.20	0.76
46 Regions (e.g., physical, natural, political, cultural)	2.92	0.85	3.37	0.74
Major Concepts in History				
47 Chronology, sequence, change	2.90	0.87	3.32	0.74

Elementary School
Mean Importance Ratings: Teachers and Teacher Educators

	Teachers (N = 256)		Teacher Educators (N = 125)	
	Mean	SD	Mean	SD
48 Major events and movements in United States history up to the present	3.05	0.89	3.43	0.76
49 Major events and movements in global history (e.g., early civilizations, Renaissance, population migration, space exploration, independence movements)	2.51	0.96	3.18	0.79
50 Interregional relationships over time (e.g., trade and commerce, The United Nations)	2.35	0.92	2.94	0.80
Major Concepts in Political Science				
51 Nature and purpose of government	3.15	0.85	3.54	0.64
52 Forms of government (e.g., democracy, oligarchy, monarchy)	2.73	0.96	3.25	0.83
53 Traditional political institutions among diverse cultural groups (e.g., matriarchy, tribal hierarchy)	2.18	1.03	2.87	0.81
54 United States Constitution	3.06	0.96	3.42	0.78
55 Rights and responsibilities of citizens (e.g., voting, naturalization process, civil rights, laws)	3.32	0.81	3.66	0.65
56 Relations among nations (e.g., alliances, wars, treaties)	2.51	0.95	2.95	0.90
Major Concepts in Economics				
57 Market as distribution and information system (e.g., supply and demand, production, inflation, international relations)	2.36	0.93	2.89	0.89
58 Individual and the market (e.g., employment, labor movement, distribution of income and allocation of resources, banking, investments)	2.13	1.01	2.76	0.89
59 Effects of economic and historical forces on human populations and natural resources	2.30	0.93	2.89	0.92
60 Governmental actions and effects on the market	2.10	0.95	2.64	0.87
61 Economic systems (e.g., capitalism, socialism)	2.22	1.00	2.81	0.91
Major Concepts in Anthropology, Psychology, Sociology, and Philosophy				
62 Culture (e.g., belief systems, language, music, artistic creations, traditions, family structure)	2.83	0.95	3.52	0.66
63 Human behavior and development	2.98	1.01	3.51	0.69
64 Socialization and acculturation	2.51	1.01	3.24	0.81
65 Political, social, and economic conditions of ethnic groups	2.43	1.00	3.09	0.86
66 Cross-cultural considerations (e.g., communication, value systems, modes of dress)	2.40	1.04	3.12	0.87
67 Physical anthropology (e.g., human origins and variations)	1.92	0.99	2.60	0.94
68 Logic	2.41	1.13	2.95	0.87
69 Ethics	2.67	1.13	3.31	0.81
70 Philosophical traditions (e.g., idealism, pragmatism, realism, existentialism, Zen, Yoga)	1.39	1.11	2.25	1.06

Elementary School
Mean Importance Ratings: Teachers and Teacher Educators

D. KNOWLEDGE OF SCIENCE

Basic Concepts in Physical Science

- 71 Molecular structure
- 72 Physical and chemical change
- 73 Heat and temperature
- 74 Sound
- 75 Light
- 76 Energy sources
- 77 Transformation of energy (e.g., potential energy to kinetic energy)
- 78 Simple machines
- 79 Magnetism and electricity
- 80 Flight

Basic Concepts in Earth Science

- 81 Surface features of the earth and changes in these features (e.g., erosion, mountain building)
- 82 Rocks and minerals
- 83 Air, water, and weather
- 84 Solar system
- 85 The universe

Basic Concepts in Life Science and Ecology (Plants and Animals)

- 86 Origins of life
- 87 Classification systems (e.g., phylum, kingdom)
- 88 Anatomy and physiology
- 89 Relationships of structure and functions (e.g., stamen and pistil)
- 90 Life cycles
- 91 Habitat, climate, adaptation, and population dynamics
- 92 Ecosystems (e.g., food chains, food webs and interdependence)
- 93 Human effects on the environment

Teachers (N = 256)		Teacher Educators (N = 125)	
Mean	SD	Mean	SD
2.13	1.16	2.75	0.97
2.76	0.99	3.14	0.86
3.02	0.82	3.27	0.80
2.94	0.87	3.22	0.82
2.93	0.88	3.23	0.84
3.04	0.90	3.37	0.79
2.54	1.01	2.93	0.95
3.01	0.87	3.25	0.85
2.98	0.86	3.28	0.81
2.52	0.95	2.92	0.89
3.10	0.83	3.38	0.77
2.82	0.87	3.12	0.82
3.25	0.76	3.43	0.73
3.10	0.81	3.37	0.76
2.87	0.92	3.20	0.85
2.53	1.12	3.12	0.96
2.17	1.04	2.69	1.08
2.36	1.04	2.85	0.98
2.57	0.94	2.85	1.02
3.08	0.84	3.41	0.71
3.06	0.87	3.37	0.77
3.18	0.84	3.47	0.67
3.38	0.78	3.63	0.62

Elementary School
Mean Importance Ratings: Teachers and Teacher Educators

	Teachers (N = 256)		Teacher Educators (N = 125)	
	Mean	SD	Mean	SD
Inquiry in Science				
94 Scientific Method	3.18	0.94	3.61	0.67
95 Current trends in science and technology	2.82	0.96	3.25	0.76
96 Interrelationship of the sciences	2.63	0.95	3.27	0.77
97 The impact of science and technology on society (e.g., bio-engineering, pollution)	2.81	1.02	3.35	0.78
98 Ethics in science (e.g., animal experimentation, human-subject research, genetic engineering)	2.24	1.16	3.18	0.92
E. HEALTH AND WELL BEING				
99 Effects of physical, emotional and social health on learning	3.54	0.75	3.73	0.53
100 Basic information about personal care (nutrition, hygiene, exercise, dental health, personal safety)	3.66	0.63	3.64	0.68
101 Signs and symptoms of child abuse	3.68	0.68	3.69	0.60
102 Drug and alcohol awareness	3.70	0.53	3.59	0.67
Part II - Critical thinking skills for elementary school teachers				
CRITICAL THINKING SKILLS				
103 Logical Thinking: Following a set of rules that specify how we "ought to" derive conclusions	3.31	0.78	3.41	0.83
104 Inductive Reasoning: Collecting facts and using them to provide support for or negation of conclusions or hypotheses	3.33	0.77	3.68	0.58
105 Deductive Reasoning: Beginning with a statement known or believed to be true, form hypotheses or conclusions based on that knowledge or belief	3.19	0.81	3.60	0.61
106 Adaptive Reasoning: Applying existing information to new situations	3.42	0.74	3.73	0.50
107 Forecasting: Predicting future - patterns, trends, series - given current information	3.10	0.89	3.54	0.62
108 Synthesizing Information: Combining information from multiple sources	3.34	0.79	3.72	0.55
109 Hypothesis Generation: Accumulating observations and formulating assumptions based on those observations	3.18	0.83	3.48	0.79
110 Hypothesis Testing: Making systematic observations that could confirm or negate the hypothesis	3.13	0.87	3.48	0.80
111 Decision Making: Specifying a goal, gathering and judging information to evaluate and choose the best solution	3.53	0.67	3.78	0.47
112 Creative Thinking: Using novel methods of defining a problem to generate and evaluate possible solutions that are perceived as being unique and appropriate	3.21	0.85	3.65	0.60
113 Planning and Organizing: Arranging materials, facts, figures, or documents into meaningful clusters, patterns, or sequences; developing a course of action for oneself or others to accomplish a goal	3.57	0.69	3.79	0.53
114 Data Interpretation: Seeing patterns in qualitative and quantitative information	3.03	0.86	3.50	0.71
115 Problem Analysis: Identifying the main issue, breaking it into component parts and evaluating the situation	3.29	0.83	3.65	0.64

Elementary School
Mean Importance Ratings: Teachers and Teacher Educators

116 Problem Solution: Evaluate and use available information to develop alternate possibilities/actions, assess the positive and negative consequences of those actions, and choose the most appropriate alternative

Teachers (N = 256)		Teacher Educators (N = 125)	
Mean	SD	Mean	SD
3.45	0.80	3.70	0.61

Appendix G

Mean Importance Ratings: Subgroups of Teachers

Elementary School Teachers
Mean Importance Ratings: Subgroups of Teachers

	Geographic Region								Sex				School Setting				Teaching Experience							
	NE (N = 55)		CE (N = 70)		SE (N = 88)		FW (N = 42)		F (N = 213)		M (N = 13)		URB (N = 53)		SUB (N = 113)		RUR (N = 87)		< 6 YRS (N = 35)		6-15 YRS (N = 67)		>15 YRS (N = 154)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Part I - Knowledge areas for elementary school teachers																								
A. KNOWLEDGE OF READING, LANGUAGE ARTS, AND LITERATURE																								
1	Conventions of language (e.g., spelling, capitalization, punctuation, handwriting)																							
2	Language structure (e.g., parts of speech, verb tenses, plurals, figurative language, sentence types)																							
3	Word recognition strategies (e.g., sight vocabulary, phonic analysis, structural analysis, contextual clues)																							
4	Comprehension strategies (e.g., vocabulary, and metacognitive strategies; activating prior knowledge)																							
5	Text structure (e.g., expository text, narrative text, organizational patterns, vocabulary)																							
6	Language usage (e.g., interpretive and communicative aspects, requesting, questioning, nonverbal communication)																							
7	Library skills (e.g., catalogue and computer search systems, reference materials)																							
8	Study skills (e.g., note taking, organizing materials and time, planning, outlining, reading in the content area)																							
9	Children's literature (e.g., nonfiction and fiction, poetry, drama, myths, multicultural literature, Caldecott and Newberry award winners)																							
10	Adult Literature (e.g., nonfiction and fiction)																							
11	Functional literacy (e.g., documents, advertisements, newspapers, magazines)																							
12	Graphic literacy (e.g., illustrations, photographs, charts, media)																							
13	Oral communication (e.g., voice modulation, public speaking, storytelling, leading group discussions)																							
14	Presentation skills (e.g., use of media and technology)																							
15	Creative dramatics (e.g., role playing, puppetry, play production)																							
16	Composing processes (e.g., prewriting/planning, drafting, revising, editing, publishing)																							
17	Types of writing (e.g., expressive, personal, informational, poetic, imaginative)																							
B. KNOWLEDGE OF MATHEMATICS																								
18	Prenumeration (e.g., classification, patterns, sets)																							
19	Numeration (e.g., place value, cardinal and ordinal numbers, number bases)																							
20	Number theory (e.g., prime, composite, greatest common factor)																							
21	Number sense (e.g., number meaning and use, operations)																							
22	Estimation																							
23	Mental computation																							
24	Basic operation and conditions under which the use of technology is appropriate (e.g., calculator and computer)																							
25	Paper/pencil computation																							
26	Whole numbers																							
27	Rational numbers (e.g., fractions, decimals)																							
28	Percents																							
29	Inequalities																							
30	Integers																							
31	Geometry and spatial sense (e.g., area, perimeter and volume, symmetry, congruence)																							
32	Measurements to describe and compare phenomena (e.g., length, capacity, weight, area, volume, time, temperature, angle measure, perimeter, mass)																							
33	Metric System																							

Elementary School Teachers
Mean Importance Ratings: Subgroups of Teachers

	Geographic Region								Sex				School Setting						Teaching Experience								
	NE (N = 55)		CE (N = 70)		SE (N = 88)		FW (N = 42)		F (N = 213)		M (N = 13)		URB (N = 53)		SUB (N = 113)		RUR (N = 87)		< 6 YRS (N = 35)		6-15 YRS (N = 67)		>15 YRS (N = 154)				
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
34 Organizing and interpreting data (e.g., tables, charts, graphs)	3.46	0.66	3.47	0.67	3.51	0.65	3.31	0.73	3.52	0.64	3.08	0.67	3.59	0.61	3.42	0.73	3.40	0.64	3.46	0.70	3.37	0.70	3.48	0.66			
35 Basic algebraic methods to solve a variety of problems	2.83	0.84	2.89	0.92	2.82	1.06	2.62	1.04	2.84	0.95	2.33	0.78	3.02	0.87	2.79	0.95	2.67	1.03	2.89	0.83	2.75	1.02	2.81	0.97			
36 Statistics and probability (e.g., measure of central tendency, dispersion, prediction)	2.28	0.97	2.31	0.98	2.46	1.18	2.25	1.00	2.37	1.06	2.08	1.00	2.51	0.93	2.25	1.06	2.31	1.08	2.23	1.00	2.25	1.01	2.39	1.07			
Mathematical Reasoning																											
37 Methods of using mathematics to make sense of the world (e.g., solving real world problems, seeking patterns, organizing data in useful ways)	3.74	0.54	3.65	0.69	3.76	0.59	3.56	0.60	3.72	0.60	3.58	0.51	3.70	0.64	3.63	0.70	3.71	0.53	3.86	0.36	3.64	0.62	3.65	0.67			
38 Methods of mathematical investigation (e.g., collaborating with others, applying a variety of strategies and pathways multiple solutions)	3.54	0.56	3.31	0.87	3.43	0.80	3.36	0.74	3.44	0.77	3.42	0.67	3.38	0.81	3.38	0.82	3.45	0.69	3.49	0.70	3.40	0.76	3.39	0.80			
39 Strategies for problem solving (e.g., acting it out, making a list, drawing a picture, guess and check)	3.72	0.48	3.46	0.83	3.57	0.74	3.49	0.72	3.59	0.68	3.33	0.78	3.51	0.80	3.63	0.69	3.48	0.71	3.71	0.46	3.48	0.75	3.56	0.75			
40 Historical, cultural, and ongoing development of major mathematical concepts and principles	1.98	1.08	1.99	0.88	2.00	1.07	1.90	0.88	1.99	1.01	1.92	1.00	2.17	1.01	1.89	1.02	1.93	0.93	1.89	0.99	1.86	0.95	2.03	1.02			
C. KNOWLEDGE OF SOCIAL STUDIES																											
41 Methods of inquiry and validation of evidence in social studies (e.g., map skills, graphs, statistical information, reports)	3.59	0.56	3.51	0.71	3.43	0.70	3.41	0.72	3.53	0.66	3.31	0.75	3.60	0.63	3.42	0.68	3.48	0.70	3.49	0.70	3.31	0.74	3.57	0.63			
Major Concepts in Geography																											
42 Location (e.g., absolute [compass coordinates, street address]; relative [north of the city, a half hour away])	3.28	0.67	3.30	0.75	3.31	0.79	3.21	0.66	3.31	0.74	3.08	0.86	3.25	0.78	3.24	0.80	3.32	0.60	3.31	0.72	3.22	0.76	3.29	0.73			
43 Place (e.g., physical [climate, landforms, vegetation]; human [political systems, economic systems, culture])	3.05	0.74	3.03	0.84	3.01	0.85	2.97	0.84	3.07	0.81	2.77	1.01	3.02	0.84	3.02	0.83	3.02	0.78	2.86	0.91	2.97	0.82	3.08	0.79			
44 Human/environment interactions (e.g., use of resources, adaptation)	3.09	0.86	2.86	0.85	2.87	0.89	3.08	0.62	2.99	0.87	2.85	0.69	2.92	0.86	2.94	0.88	2.99	0.78	2.86	0.81	2.82	0.96	3.03	0.79			
45 Movement (e.g., transportation of goods, ideas, people)	3.11	0.73	2.91	0.81	2.81	0.93	2.79	0.78	2.98	0.82	2.54	0.88	2.89	0.87	2.89	0.86	2.93	0.78	2.74	0.89	2.83	0.92	2.98	0.77			
46 Regions (e.g., physical, natural, political, cultural)	3.00	0.87	2.95	0.83	2.85	0.91	2.90	0.75	2.98	0.84	2.69	1.03	2.81	0.92	2.98	0.89	2.90	0.76	2.91	0.85	2.85	0.82	2.95	0.87			
Major Concepts in History																											
47 Chronology, sequence, change	2.98	0.84	2.77	0.88	2.95	0.88	2.95	0.89	2.91	0.87	2.77	1.09	2.92	0.90	2.91	0.85	2.85	0.90	2.74	0.89	2.90	0.82	2.94	0.89			
48 Major events and movements in United States history up to the present	3.22	0.86	3.04	0.87	2.95	0.96	3.05	0.83	3.04	0.91	2.92	0.95	3.02	1.01	3.06	0.88	3.03	0.86	3.09	0.95	3.06	0.83	3.03	0.91			
49 Major events and movements in global history (e.g., early civilizations, Renaissance, population migration, space exploration, independence movements)	2.62	0.95	2.43	0.97	2.48	1.06	2.59	0.75	2.54	0.98	2.15	0.99	2.66	1.02	2.42	0.89	2.52	1.02	2.57	1.17	2.48	0.84	2.51	0.97			
50 Interregional relationships over time (e.g., trade and commerce, The United Nations)	2.45	0.90	2.26	0.84	2.35	1.02	2.44	0.85	2.38	0.93	2.08	1.04	2.49	0.99	2.30	0.88	2.31	0.96	2.54	0.98	2.18	0.83	2.38	0.94			
Major Concepts in Political Science																											
51 Nature and purpose of government	3.28	0.78	3.18	0.87	3.05	0.87	3.05	0.86	3.17	0.84	2.92	1.00	3.23	0.80	3.09	0.87	3.16	0.85	3.24	0.89	3.03	0.83	3.18	0.84			
52 Forms of government (e.g., democracy, oligarchy, monarchy)	2.77	0.96	2.64	0.98	2.71	1.00	2.90	0.82	2.72	0.98	2.67	0.98	2.83	0.85	2.71	0.91	2.67	1.08	2.82	1.14	2.63	0.83	2.75	0.97			
53 Traditional political institutions among diverse cultural groups (e.g., matriarchy, tribal hierarchy)	2.39	1.05	2.03	0.91	2.11	1.14	2.41	0.91	2.19	1.04	1.92	1.08	2.44	1.07	2.11	0.96	2.11	1.09	2.45	1.23	2.11	0.90	2.15	1.04			
54 United States Constitution	3.15	0.91	3.06	1.00	3.08	0.97	2.97	0.94	3.08	0.94	2.90	1.10	3.16	0.92	3.04	0.92	3.02	1.05	3.23	0.80	3.06	0.99	3.03	0.98			
55 Rights and responsibilities of citizens (e.g., voting, naturalization process, civil rights, laws)	3.45	0.75	3.32	0.83	3.29	0.86	3.23	0.81	3.35	0.80	2.82	0.98	3.23	0.95	3.34	0.77	3.37	0.77	3.27	0.91	3.26	0.86	3.36	0.77			
56 Relations among nations (e.g., alliances, wars, treaties)	2.60	0.93	2.48	0.87	2.47	1.02	2.51	0.97	2.52	0.93	2.23	1.24	2.72	0.93	2.40	0.93	2.52	0.97	2.57	1.09	2.51	0.89	2.49	0.94			
Major Concepts in Economics																											
57 Market as distribution and information system (e.g., supply and demand, production, inflation, international relations)	2.37	0.91	2.38	0.99	2.36	1.00	2.41	0.68	2.38	0.94	2.31	0.85	2.47	0.85	2.31	0.93	2.36	0.96	2.46	0.95	2.37	0.87	2.34	0.95			
58 Individual and the market (e.g., employment, labor movement, distribution of income and allocation of resources, banking, investments)	2.18	0.98	2.24	1.02	2.09	1.07	2.00	0.92	2.18	1.00	1.54	1.20	2.35	0.97	1.99	1.00	2.16	1.01	2.23	1.00	2.04	0.96	2.14	1.03			
59 Effects of economic and historical forces on human populations and natural resources	2.59	0.92	2.24	0.92	2.27	0.93	2.36	0.99	2.32	0.92	2.08	1.26	2.43	0.87	2.25	1.00	2.28	0.88	2.34	0.87	2.24	0.84	2.31	0.98			
60 Governmental actions and effects on the market	2.13	0.92	2.09	0.98	2.15	0.98	2.03	0.93	2.13	0.95	1.92	1.19	2.31	0.92	2.02	0.96	2.08	0.94	2.09	0.95	2.18	0.90	2.07	0.97			
61 Economic systems (e.g., capitalism, socialism)	2.58	1.06	2.14	1.04	2.19	0.98	2.26	0.88	2.23	1.01	2.08	1.32	2.40	0.91	2.22	1.00	2.11	1.05	2.00	1.16	2.25	0.93	2.28	0.99			

**Elementary School Teachers
Mean Importance Ratings: Subgroups of Teachers**

	Geographic Region								Sex				School Setting						Teaching Experience						
	NE (N = 55)		CE (N = 70)		SE (N = 88)		FW (N = 42)		F (N = 213)		M (N = 13)		URB (N = 53)		SUB (N = 113)		RUR (N = 87)		< 6 YRS (N = 35)		6-15 YRS (N = 67)		>15 YRS (N = 154)		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean
Major Concepts in Anthropology, Psychology, Sociology, and Philosophy																									
62	Culture (e.g., belief systems, language, music, artistic creations, traditions, family structure)																								
63	Human behavior and development																								
64	Socialization and acculturation																								
65	Political, social, and economic conditions of ethnic groups																								
66	Cross-cultural considerations (e.g., communication, value systems, modes of dress)																								
67	Physical anthropology (e.g., human origins and variations)																								
68	Logic																								
69	Ethics																								
70	Philosophical traditions (e.g., idealism, pragmatism, realism, existentialism, Zen, Yoga)																								
D. KNOWLEDGE OF SCIENCE																									
Basic Concepts in Physical Science																									
71	Molecular structure																								
72	Physical and chemical change																								
73	Heat and temperature																								
74	Sound																								
75	Light																								
76	Energy sources																								
77	Transformation of energy (e.g., potential energy to kinetic energy)																								
78	Simple machines																								
79	Magnetism and electricity																								
80	Flight																								
Basic Concepts in Earth Science																									
81	Surface features of the earth and changes in these features (e.g., erosion, mountain building)																								
82	Rocks and minerals																								
83	Air, water, and weather																								
84	Solar system																								
85	The universe																								
Basic Concepts in Life Science and Ecology (Plants and Animals)																									
86	Origins of life																								
87	Classification systems (e.g., phylum, kingdom)																								
88	Anatomy and physiology																								
89	Relationships of structure and functions (e.g., stamen and pistil)																								
90	Life cycles																								
91	Habitat, climate, adaptation, and population dynamics																								
92	Ecosystems (e.g., food chains, food webs and interdependence)																								
93	Human effects on the environment																								

Elementary School Teachers
Mean Importance Ratings: Subgroups of Teachers

	Geographic Region								Sex				School Setting						Teaching Experience						
	NE (N = 55)		CE (N = 70)		SE (N = 88)		FW (N = 42)		F (N = 213)		M (N = 13)		URB (N = 53)		SUB (N = 113)		RUR (N = 87)		< 6 YRS (N = 35)		6-15 YRS (N = 67)		>15 YRS (N = 154)		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean
Inquiry in Science																									
94	Scientific Method	3.32	0.92	3.20	0.88	3.01	1.05	3.29	0.77	3.22	0.93	3.08	0.86	3.25	0.90	3.24	0.90	3.03	1.01	3.14	0.91	3.18	0.90	3.18	0.96
95	Current trends in science and technology	2.86	0.85	2.86	0.98	2.64	1.07	3.05	0.80	2.84	0.93	2.62	1.19	2.96	0.83	2.69	0.96	2.87	1.03	2.57	1.22	2.75	0.91	2.90	0.91
96	Interrelationship of the sciences	2.71	0.95	2.61	0.96	2.45	1.00	2.95	0.73	2.66	0.93	2.38	1.12	2.77	0.80	2.52	0.92	2.69	1.07	2.54	1.17	2.52	0.84	2.70	0.94
97	The impact of science and technology on society (e.g., bio-engineering, pollution)	2.95	0.98	2.82	0.96	2.63	1.17	3.00	0.77	2.85	1.00	2.54	1.13	2.92	0.81	2.67	1.12	2.91	1.00	2.66	1.26	2.70	0.97	2.90	0.97
98	Ethics in science (e.g., animal experimentation, human-subject research, genetic engineering)	2.42	1.19	2.19	1.12	2.01	1.24	2.58	0.98	2.26	1.15	2.00	1.53	2.40	1.10	2.21	1.23	2.18	1.14	2.11	1.30	2.22	1.03	2.28	1.19
E. HEALTH AND WELL BEING																									
99	Effects of physical, emotional and social health on learning	3.60	0.75	3.51	0.76	3.58	0.74	3.43	0.80	3.62	0.68	3.08	1.12	3.65	0.62	3.50	0.81	3.53	0.76	3.46	0.89	3.54	0.75	3.56	0.73
100	Basic information about personal care (nutrition, hygiene, exercise, dental health, personal safety)	3.71	0.55	3.55	0.71	3.70	0.59	3.70	0.66	3.68	0.58	3.69	0.85	3.83	0.38	3.63	0.69	3.60	0.66	3.60	0.74	3.54	0.70	3.72	0.56
101	Signs and symptoms of child abuse	3.83	0.45	3.68	0.60	3.57	0.91	3.64	0.64	3.73	0.66	3.33	0.89	3.62	0.87	3.73	0.67	3.66	0.57	3.74	0.61	3.65	0.57	3.68	0.74
102	Drug and alcohol awareness	3.80	0.44	3.66	0.53	3.64	0.61	3.70	0.52	3.72	0.52	3.54	0.66	3.73	0.60	3.71	0.49	3.67	0.54	3.63	0.60	3.64	0.57	3.74	0.50
Part II - Critical thinking skills for elementary school teachers																									
CRITICAL THINKING SKILLS																									
103	Logical Thinking: Following a set of rules that specify how we "ought to" derive conclusions	3.43	0.68	3.23	0.79	3.30	0.87	3.26	0.69	3.29	0.79	3.15	0.80	3.42	0.69	3.20	0.84	3.37	0.74	3.29	0.83	3.22	0.85	3.35	0.73
104	Inductive Reasoning: Collecting facts and using them to provide support for or negation of conclusions or hypotheses	3.45	0.62	3.27	0.83	3.28	0.82	3.35	0.72	3.31	0.79	3.33	0.78	3.33	0.73	3.32	0.80	3.34	0.78	3.56	0.70	3.32	0.73	3.28	0.80
105	Deductive Reasoning: Beginning with a statement known or believed to be true, form hypotheses or conclusions based on that knowledge or belief	3.29	0.68	3.12	0.89	3.18	0.83	3.18	0.77	3.19	0.81	3.00	0.82	3.19	0.71	3.21	0.83	3.15	0.86	3.34	0.76	3.16	0.81	3.16	0.82
106	Adaptive Reasoning: Applying existing information to new situations	3.48	0.67	3.43	0.72	3.39	0.82	3.37	0.75	3.43	0.76	3.38	0.51	3.43	0.72	3.44	0.77	3.37	0.73	3.54	0.66	3.39	0.74	3.40	0.77
107	Forecasting: Predicting future - patterns, trends, series - given current information	3.23	0.79	3.03	0.89	3.09	1.00	3.08	0.82	3.10	0.88	3.15	0.90	3.13	0.94	3.13	0.89	3.05	0.87	3.17	0.98	3.12	0.90	3.08	0.87
108	Synthesizing Information: Combining information from multiple sources	3.31	0.71	3.46	0.73	3.29	0.90	3.29	0.80	3.35	0.78	3.00	0.91	3.42	0.72	3.38	0.80	3.26	0.81	3.63	0.60	3.19	0.84	3.34	0.79
109	Hypothesis Generation: Accumulating observations and formulating assumptions based on those observations	3.15	0.75	3.23	0.79	3.20	0.93	3.08	0.88	3.19	0.83	2.92	1.04	3.23	0.82	3.23	0.82	3.09	0.87	3.26	0.78	3.10	0.89	3.19	0.83
110	Hypothesis Testing: Making systematic observations that could confirm or negate the hypothesis	3.06	0.85	3.22	0.83	3.16	0.93	3.08	0.85	3.14	0.88	2.85	0.80	3.08	0.90	3.22	0.85	3.07	0.89	3.31	0.72	3.04	0.89	3.13	0.89
111	Decision Making: Specifying a goal, gathering and judging information to evaluate and choose the best solution	3.62	0.60	3.55	0.60	3.51	0.72	3.39	0.79	3.56	0.65	3.23	0.73	3.57	0.57	3.56	0.65	3.45	0.74	3.66	0.59	3.52	0.68	3.50	0.68
112	Creative Thinking: Using novel methods of defining a problem to generate and evaluate possible solutions that are perceived as being unique and appropriate	3.34	0.76	3.08	0.95	3.31	0.80	3.08	0.83	3.24	0.85	3.00	1.00	3.19	0.79	3.35	0.84	3.03	0.90	3.37	0.81	3.22	0.79	3.17	0.89
113	Planning and Organizing: Arranging materials, facts, figures, or documents into meaningful clusters, patterns, or sequences; developing a course of action for oneself or others to accomplish a goal	3.64	0.63	3.54	0.74	3.52	0.76	3.57	0.55	3.59	0.69	3.62	0.65	3.42	0.78	3.68	0.60	3.50	0.73	3.69	0.63	3.52	0.66	3.56	0.72
114	Data Interpretation: Seeing patterns in qualitative and quantitative information	3.05	0.87	3.04	0.82	3.04	0.94	2.97	0.76	3.03	0.87	3.08	0.95	2.96	0.79	3.13	0.83	2.95	0.94	3.17	0.79	2.93	0.86	3.04	0.88
115	Problem Analysis: Identifying the main issue, breaking it into component parts and evaluating the situation	3.38	0.80	3.28	0.79	3.27	0.91	3.19	0.84	3.31	0.83	3.08	0.76	3.35	0.79	3.38	0.77	3.14	0.92	3.40	0.65	3.22	0.83	3.30	0.87
116	Problem Solution: Evaluate and use available information to develop alternate possibilities/actions, assess the positive and negative consequences of those actions, and choose the most appropriate alternative	3.55	0.71	3.49	0.78	3.39	0.85	3.32	0.88	3.51	0.76	3.08	1.04	3.58	0.67	3.55	0.73	3.24	0.93	3.51	0.74	3.31	0.76	3.49	0.83