

**U.S. Department of Education**  
Washington, D.C. 20202-5335



**APPLICATION FOR GRANTS  
UNDER THE**

**2015 Enhanced Assessment Grant (EAG)**

**CFDA # 84.368A**

**PR/Award # S368A150011**

**Grants.gov Tracking#: GRANT11950623**

OMB No. , Expiration Date:

Closing Date: Jun 29, 2015

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This application was generated using the PDF functionality. The PDF functionality automatically numbers the pages in this application. Some pages/sections of this application may contain 2 sets of page numbers, one set created by the applicant and the other set created by e-Application's PDF functionality. Page numbers created by the e-Application PDF functionality will be preceded by the letter e (for example, e1, e2, e3, etc.)

D(1)

**Application for Federal Assistance SF-424**

* 1. Type of Submission: <input type="checkbox"/> Preapplication <input checked="" type="checkbox"/> Application <input type="checkbox"/> Changed/Corrected Application	* 2. Type of Application: <input checked="" type="checkbox"/> New <input type="checkbox"/> Continuation <input type="checkbox"/> Revision	* If Revision, select appropriate letter(s): <input type="text"/> * Other (Specify): <input type="text"/>
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* 3. Date Received: <input type="text" value="06/29/2015"/>	4. Applicant Identifier: <input type="text"/>
--	--

5a. Federal Entity Identifier: <input type="text"/>	5b. Federal Award Identifier: <input type="text"/>
--	---

**State Use Only:**

6. Date Received by State: <input type="text"/>	7. State Application Identifier: <input type="text"/>
---	---

**8. APPLICANT INFORMATION:**

\* a. Legal Name:

* b. Employer/Taxpayer Identification Number (EIN/TIN): <input type="text" value="680258051"/>	* c. Organizational DUNS: <input type="text" value="8074808430000"/>
---	---

**d. Address:**

\* Street1:   
Street2:   
\* City:   
County/Parish:   
\* State:   
Province:   
\* Country:   
\* Zip / Postal Code:

**e. Organizational Unit:**

Department Name: <input type="text" value="CA Department of Education"/>	Division Name: <input type="text" value="District, School, &amp; Innovation"/>
---	---

**f. Name and contact information of person to be contacted on matters involving this application:**

Prefix:  \* First Name:   
Middle Name:   
\* Last Name:   
Suffix:   
Title:

Organizational Affiliation:

* Telephone Number: <input type="text" value="916-319-0637"/>	Fax Number: <input type="text" value="916-319-0100"/>
---	---

\* Email:

**Application for Federal Assistance SF-424**

**\* 9. Type of Applicant 1: Select Applicant Type:**

A: State Government

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

\* Other (specify):

**\* 10. Name of Federal Agency:**

U.S. Department of Education

**11. Catalog of Federal Domestic Assistance Number:**

84.368

CFDA Title:

Grants for Enhanced Assessment Instruments

**\* 12. Funding Opportunity Number:**

ED-GRANTS-042815-002

\* Title:

Office of Elementary and Secondary Education (OESE): Enhanced Assessment Instruments Grants Program: Enhanced Assessment Instruments CFDA Number 84.368A;

**13. Competition Identification Number:**

84-368A2015-1

Title:

**14. Areas Affected by Project (Cities, Counties, States, etc.):**

AREASAFFECTEDBYPROJECT.pdf

Add Attachment

Delete Attachment

View Attachment

**\* 15. Descriptive Title of Applicant's Project:**

Development of Enhanced Career and College Readiness Indices for Smarter, Balanced High School Assessments

Attach supporting documents as specified in agency instructions.

Add Attachments

Delete Attachments

View Attachments

**Application for Federal Assistance SF-424**

**16. Congressional Districts Of:**

\* a. Applicant

\* b. Program/Project

Attach an additional list of Program/Project Congressional Districts if needed.

**17. Proposed Project:**

\* a. Start Date:

\* b. End Date:

**18. Estimated Funding (\$):**

* a. Federal	<input type="text" value="2,774,133.00"/>
* b. Applicant	<input type="text" value="0.00"/>
* c. State	<input type="text" value="0.00"/>
* d. Local	<input type="text" value="0.00"/>
* e. Other	<input type="text" value="0.00"/>
* f. Program Income	<input type="text" value="0.00"/>
* g. TOTAL	<input type="text" value="2,774,133.00"/>

**\* 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

a. This application was made available to the State under the Executive Order 12372 Process for review on

b. Program is subject to E.O. 12372 but has not been selected by the State for review.

c. Program is not covered by E.O. 12372.

**\* 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

Yes  No

If "Yes", provide explanation and attach

**21. \*By signing this application, I certify (1) to the statements contained in the list of certifications\*\* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances\*\* and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

\*\* I AGREE

\*\* The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

**Authorized Representative:**

Prefix:  \* First Name:

Middle Name:

\* Last Name:

Suffix:

\* Title:

\* Telephone Number:  Fax Number:

\* Email:

\* Signature of Authorized Representative:  \* Date Signed:

**Areas Affected by Project**

California - ALL

## ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

**PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.**

**NOTE:** Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee- 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.
19. Will comply with the requirements of Section 106(g) of the Trafficking Victims Protection Act (TVPA) of 2000, as amended (22 U.S.C. 7104) which prohibits grant award recipients or a sub-recipient from (1) Engaging in severe forms of trafficking in persons during the period of time that the award is in effect (2) Procuring a commercial sex act during the period of time that the award is in effect or (3) Using forced labor in the performance of the award or subawards under the award.

<p>SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL</p> <p>Marcela Enriquez</p>	<p>TITLE</p> <p>Deputy Superintendent.</p>
<p>APPLICANT ORGANIZATION</p> <p>CA Department of Education for the State Board of Education</p>	<p>DATE SUBMITTED</p> <p>06/29/2015</p>

Standard Form 424B (Rev. 7-97) Back

# DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C.1352

Approved by OMB  
0348-0046

<b>1. * Type of Federal Action:</b> <input type="checkbox"/> a. contract <input checked="" type="checkbox"/> b. grant <input type="checkbox"/> c. cooperative agreement <input type="checkbox"/> d. loan <input type="checkbox"/> e. loan guarantee <input type="checkbox"/> f. loan insurance	<b>2. * Status of Federal Action:</b> <input type="checkbox"/> a. bid/offer/application <input checked="" type="checkbox"/> b. initial award <input type="checkbox"/> c. post-award	<b>3. * Report Type:</b> <input checked="" type="checkbox"/> a. initial filing <input type="checkbox"/> b. material change
<b>4. Name and Address of Reporting Entity:</b> <input checked="" type="checkbox"/> Prime <input type="checkbox"/> SubAwardee * Name: CA Department of Education * Street 1: 1430 N Street, Suite 5602    Street 2: _____ * City: Sacramento    State: CA: California    Zip: 95814 Congressional District, if known: 6		
<b>5. If Reporting Entity in No.4 is Subawardee, Enter Name and Address of Prime:</b>		
<b>6. * Federal Department/Agency:</b> U.S Department of Education	<b>7. * Federal Program Name/Description:</b> Grants for Enhanced Assessment Instruments CFDA Number, if applicable: 84.368	
<b>8. Federal Action Number, if known:</b> _____	<b>9. Award Amount, if known:</b> \$. _____	
<b>10. a. Name and Address of Lobbying Registrant:</b> Prefix _____ * First Name n/a _____ Middle Name _____ * Last Name n/a _____ Suffix _____ * Street 1 _____ Street 2 _____ * City _____ State _____ Zip _____		
<b>b. Individual Performing Services</b> (including address if different from No. 10a) Prefix _____ * First Name n/a _____ Middle Name _____ * Last Name n/a _____ Suffix _____ * Street 1 _____ Street 2 _____ * City _____ State _____ Zip _____		
<b>11.</b> Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when the transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure. <b>* Signature:</b> Marcela Enriquez <b>* Name:</b> Prefix _____ * First Name Keric _____ Middle Name _____ * Last Name Ashley _____ Suffix _____ <b>Title:</b> Deputy Superintendent <b>Telephone No.:</b> 916-319-0637 <b>Date:</b> 06/29/2015		
<b>Federal Use Only:</b>		Authorized for Local Reproduction Standard Form - LLL (Rev. 7-97)

PR/Award # S368A150011

## NOTICE TO ALL APPLICANTS

OMB Number: 1894-0005  
Expiration Date: 03/31/2017

The purpose of this enclosure is to inform you about a new provision in the Department of Education's General Education Provisions Act (GEPA) that applies to applicants for new grant awards under Department programs. This provision is Section 427 of GEPA, enacted as part of the Improving America's Schools Act of 1994 (Public Law (P.L.) 103-382).

### To Whom Does This Provision Apply?

Section 427 of GEPA affects applicants for new grant awards under this program. **ALL APPLICANTS FOR NEW AWARDS MUST INCLUDE INFORMATION IN THEIR APPLICATIONS TO ADDRESS THIS NEW PROVISION IN ORDER TO RECEIVE FUNDING UNDER THIS PROGRAM.**

(If this program is a State-formula grant program, a State needs to provide this description only for projects or activities that it carries out with funds reserved for State-level uses. In addition, local school districts or other eligible applicants that apply to the State for funding need to provide this description in their applications to the State for funding. The State would be responsible for ensuring that the school district or other local entity has submitted a sufficient section 427 statement as described below.)

### What Does This Provision Require?

Section 427 requires each applicant for funds (other than an individual person) to include in its application a description of the steps the applicant proposes to take to ensure equitable access to, and participation in, its Federally-assisted program for students, teachers, and other program beneficiaries with special needs. This provision allows applicants discretion in developing the required description. The statute highlights six types of barriers that can impede equitable access or participation: gender, race, national origin, color, disability, or age. Based on local circumstances, you should determine whether these or other barriers may prevent your students, teachers, etc. from such access or participation in, the Federally-funded project or activity. The description in your application of steps to be taken to overcome these barriers need not be lengthy; you may provide a clear and succinct description of how you plan to address those barriers that are applicable to your circumstances. In addition, the information may be provided in a single narrative, or, if appropriate, may

be discussed in connection with related topics in the application.

Section 427 is not intended to duplicate the requirements of civil rights statutes, but rather to ensure that, in designing their projects, applicants for Federal funds address equity concerns that may affect the ability of certain potential beneficiaries to fully participate in the project and to achieve to high standards. Consistent with program requirements and its approved application, an applicant may use the Federal funds awarded to it to eliminate barriers it identifies.

### What are Examples of How an Applicant Might Satisfy the Requirement of This Provision?

The following examples may help illustrate how an applicant may comply with Section 427.

(1) An applicant that proposes to carry out an adult literacy project serving, among others, adults with limited English proficiency, might describe in its application how it intends to distribute a brochure about the proposed project to such potential participants in their native language.

(2) An applicant that proposes to develop instructional materials for classroom use might describe how it will make the materials available on audio tape or in braille for students who are blind.

(3) An applicant that proposes to carry out a model science program for secondary students and is concerned that girls may be less likely than boys to enroll in the course, might indicate how it intends to conduct "outreach" efforts to girls, to encourage their enrollment.

(4) An applicant that proposes a project to increase school safety might describe the special efforts it will take to address concern of lesbian, gay, bisexual, and transgender students, and efforts to reach out to and involve the families of LGBT students.

We recognize that many applicants may already be implementing effective steps to ensure equity of access and participation in their grant programs, and we appreciate your cooperation in responding to the requirements of this provision.

### Estimated Burden Statement for GEPA Requirements

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless such collection displays a valid OMB control number. Public reporting burden for this collection of information is estimated to average 1.5 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The obligation to respond to this collection is required to obtain or retain benefit (Public Law 103-382). Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the U.S. Department of Education, 400 Maryland Ave., SW, Washington, DC 20210-4537 or email [ICDocketMgr@ed.gov](mailto:ICDocketMgr@ed.gov) and reference the OMB Control Number. 1894-0005.

**Optional - You may attach 1 file to this page.**

CDEGEPA.pdf

Add Attachment

Delete Attachment

View Attachment

**California Department of Education for the State Board of Education**

**Development of Enhanced Career and College Readiness Indices for  
Smarter Balanced High School Assessments**

**General Education Provisions Act (GEPA)**

The California Department of Education (CDE) for the State Board of Education will ensure to the fullest extent possible that all project beneficiaries will have equal access to participation in the proposed funded project. The CDE assures equitable access and participation in all grant opportunities or activities consistent with state and federal law.

The CDE, as well as its contractors, are committed to ensuring equal, fair, and meaningful access to employment and education services. The CDE does not discriminate in any employment practice, education program, or educational activity on the basis and/or association with a person or group with one or more of these actual or perceived characteristics of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, marital status, medical condition, national origin, political affiliation, pregnancy and related conditions, race, religion, retaliation, sex (including sexual harassment), sexual orientation, Vietnam Era Veterans' status, or any other basis prohibited by California state and federal nondiscrimination laws respectively. Not all bases of discrimination will apply to both education services and employment. The Office of Equal Opportunity is charged with overseeing, leading, and directing the CDE's efforts to meet the legal obligations set forth in state and federal civil rights laws, and regulations in CDE employment and delivery of education services.

## CERTIFICATION REGARDING LOBBYING

### Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

### Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

If any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions. Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

#### \* APPLICANT'S ORGANIZATION

CA Department of Education for the State Board of Education

#### \* PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE

Prefix: Mr. \* First Name: Keric Middle Name:

\* Last Name: Ashley Suffix:

\* Title: Deputy Superintendent

\* SIGNATURE: Marcela Enriquez

\* DATE: 06/29/2015

## Abstract

The abstract narrative must not exceed one page and should use language that will be understood by a range of audiences. For all projects, include the project title (if applicable), goals, expected outcomes and contributions for research, policy, practice, etc. Include population to be served, as appropriate. For research applications, also include the following:

- Theoretical and conceptual background of the study (i.e., prior research that this investigation builds upon and that provides a compelling rationale for this study)
- Research issues, hypotheses and questions being addressed
- Study design including a brief description of the sample including sample size, methods, principals dependent, independent, and control variables, and the approach to data analysis.

[Note: For a non-electronic submission, include the name and address of your organization and the name, phone number and e-mail address of the contact person for this project.]

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## You may now Close the Form

**You have attached 1 file to this page, no more files may be added. To add a different file, you must first delete the existing file.**

\* Attachment:

## **Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments**

Over the last several years, great strides have been made across many States in the implementation of rigorous career and college ready standards and the development and/or adoption of aligned assessments. At the same time, many researchers, educators, employers, and policymakers contend that graduates often lack the knowledge, skills, and attributes (KSAs) necessary to compete and succeed in high growth fields. Critical bridges are needed to better connect assessment results with the world of work, to support understanding and use of assessment results in the area of career readiness.

The proposed project represents a partnership between the California Department of Education (CDE) and the National Center for Research on Evaluation, Standards, and Student Testing (CRESST) at UCLA, with a focus on both directly supporting California's current K-12 assessment initiatives and producing information, tools, and methodologies that will inform the work of the larger Smarter Balanced Assessment Consortium. The proposed project will address, in various ways, Absolute Priorities 1-4 and Competitive Priorities 1-2.

We aim to fill a critical void in K-12 assessments by providing innovative indices of the Smarter Balanced high school assessments that can support improved career readiness inferences. Central to the study design is CRESST's feature-based functional approach to test design, item analysis, scoring, and validation, which involves detailed qualitative feature analysis paired with rigorous psychometric modeling analysis of existing state test item response data (drawing from a database of approximately six million students). The resultant new item factor models will allow the computation of scaled scores that carry the intended career readiness interpretations. The project will also gather preliminary validity evidence in support of new and improved inferences by comparing assessment results across groups with ranging career expertise, including 11th grade students, community college students, and individuals in the world of work (estimated total  $n = 100$  for each group).

This development of our new item factor model will also reveal possible gaps between features that are currently covered and the results of our analyses. This gap analysis will guide the development and

preliminary usability testing of innovative technology-enhanced items and interactive development resources for teachers, learners, and other stakeholders to use in understanding assessments. Finally, we will aim to internationally benchmark the resulting inferences by applying the feature analysis to national assessments in other countries with more streamlined career and college readiness pipelines such as South Korea. Data collection sites will include data drawn from the 1325 high schools in the state of California. Additional data for validation studies will be collected from students at two California community colleges (College of the Canyons and San Bernardino Valley College) as well as the Surface Warfare Officers School in Newport, RI (representing the world of work).

The outcomes of the proposed work will result in substantial added value of the current CDE high school assessments without adding testing time. Combining qualitative and quantitative approaches, the project will develop a coherent and scalable means of reusing the current item pool, as well as undertake development of new items of richer and technology-enhanced types. CDE will have available a framework for understanding the Smarter Balanced assessment in a new way that will inform reporting and interpretation statewide, as well as a new set of digital support resources and innovative item formats that will serve 10,000+ schools who in turn service more than six million students. The findings and resources from this project will also inform the work of the larger Smarter Balanced Assessment Consortium, of which California is a member.

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**Development of Enhanced Career and College Readiness Indices  
for Smarter Balanced High School Assessments**

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## 1. Introduction/Need for Project

Over the last several years, great strides have been made across many States in the implementation of rigorous career and college ready standards and the development and/or adoption of new assessment systems that are aligned to those standards. The Smarter Balanced Assessment Consortium is a case in point. An inclusive assessment development process with substantial input from higher education partners has ensured that the assessments have built-in qualities that enable college readiness inferences. As a result, a number of colleges and universities are currently using scores from the Smarter Balanced high school assessment as evidence that students are ready for credit-bearing entry-level college courses without the need for remediation. This extends the experience and success of earlier K-12 and higher education collaborative efforts such as California's Early Assessment Program (EAP).

At the same time, it is widely held that there is and will be a substantial shortage of qualified job candidates in many high-demand, high-skill, and high-wage career categories currently and well into the next decade (Executive Office of the President of the United States of America, 2014). Despite the shortage, unemployment remains persistently high, especially for young minorities out of high school or community colleges. While the causes are many, one that is consistently called out by researchers, educators, employers, and policymakers is that many graduates lack the knowledge, skills, and attributes (KSAs) necessary to compete and succeed in fields such as advanced manufacturing, energy, health care, information technology, and science, technology, engineering, and mathematics (STEM) (CCSSO, 2013, 2014; O\*Net Online, <https://www.onetonline.org/find/career>).

Another reality of the workplace is the extraordinary increase in the use of technology involving more complex information in workplace tasks which results paradoxically in simplifying some tasks while increasing cognitive complexity for the worker. For example, instead of performing simple procedural and predictable tasks, a worker becomes responsible for basing inferences, diagnosis, planning, judgment, and decision making on information in various forms often under severe time pressure. These cognitive and metacognitive skills are rarely explicitly taught or assessed in our schools. Furthermore, the emphasis on teamwork more than ever adds a requirement not systematically addressed in learning or

assessment. In summary, there is a knowledge, skills, and attributes (KSA) gap for all jobs, but particularly high-demand, high-skill, and high-wage jobs.

To secure positions and professional advancement, individuals need to develop these KSAs in high school, work-based training programs, community and technical colleges, and universities. This development means that much more is expected of even entry-level members of the American workforce. Consequently, even more is expected of our secondary and postsecondary educational institutions to provide this type of workforce.

However, classrooms still remain largely unconnected to the workplace and success in postsecondary education and 21st century careers. In a recent report, the Southern Regional Education Board (2015) went on to state that “(s)imply put, the bridge from high school to postsecondary attainment and career opportunities is broken” (p. 2). This is a truly scathing critique of the current state of affairs. The proposed EAG project is situated within this larger context, and is intended to contribute to repairing the bridge from high school to careers.

The proposed project represents a partnership between the California Department of Education (CDE) and the National Center for Research on Evaluation, Standards, and Student Testing (CRESST), with a focus on both directly supporting California’s current K-12 assessment initiatives while producing information, tools, and methodologies that will inform the work of the larger Smarter Balanced Assessment Consortium of which California is a member.

California is a state of diverse demographics, numerous industries from agriculture to media, and an extensive network of organizations committed to preparing students for the challenges of postsecondary life. California has a robust economy supported by immigrants from Mexico, Central and Latin America, and Asia, in addition to a continuing expansion of immigrants from Europe. The opportunities in California reflect those in the U.S. at large, in sectors such as health, social support for seniors, early education, and commercial service, as well as technology, construction, energy, and finance. The struggle is for schools to recognize that the new standards that have been adopted include cognitive and social

practices with practical application to the workplace. Tools should be provided to make the best use of current assessments in support of the transition to new standards without adding more testing.

Therefore, we aim to fill a critical void in K-12 assessments by providing innovative indices of the Smarter Balanced high school assessments that can support improved career readiness inferences. The project will enhance and improve career readiness inferences by performing analyses that cut across multiple outcomes currently reported by the Smarter Balanced assessments (math and English language arts [ELA] and the multiple sub-constructs under each). The analyses proposed here will result in substantial added value and interpretations out of the current high school assessments without adding more testing time. Combining qualitative and quantitative approaches, the project will develop a coherent and scalable means of reusing the current item pool, as well as undertake development of new, richer, technology-enhanced items.

Central to the study design is CRESST's feature-based functional approach to test design, item analysis, scoring, and validation (Baker, 2015). This is a generalizable approach that can be scaled up and sustained. It also facilitates comparability studies such as international benchmarking (to be discussed later). Features related to career readiness will be extracted from multiple sources, including systematic review of previous studies and through the convening of experts to provide input on specific needs in civilian and military careers. The study will also employ what we regard as a true innovation: the direct and automated extraction of categorizations, skill, and expectations that are associated with job placement in the real world (e.g., using the Department of Labor's categorization and content and filters from career building websites). From these features, we will leverage CRESST's past success in building complex domain ontologies (Baker, 2012; Baker & Delacruz, 2013) to put together a coherent, operational, and generalizable graphical representation for the domain(s) of career readiness.

The existing Smarter Balanced item pool will be subject to qualitative meta-tagging to identify features of the items that are consistent with the domain ontologies. These features will most certainly include content, cognition, task, and linguistic elements such as: the item invokes knowledge in particular strands of math content standards, a performance task requires multiple steps in problem identification

and solution, the task itself contains irrelevant information for decision making, or the item prompt includes additional guidance using complex language. The full list of features from prior CRESST research is numbered in the hundreds. Together the features “parameterize” the items qualitatively and broadly. Thus it is possible that existing items thought to measure a family of standards might each differ in the particular features that each separate item includes. Integrating the features, such as problem identification or the use of complex discourse, rigorous psychometric analysis of the existing item response data will then result in new item factor models (Cai, 2010a, 2010b, 2010c; Cai & Hansen, 2013; Cai, Yang, & Hansen, 2011) to allow the computation of scaled scores that carry the intended career readiness interpretations. These analyses create a substrate of instructionally useful information as well as a new descriptive model related to career ready KSAs. The project will also gather preliminary validity evidence for the new inferences by working in a range of collaborating sites, from postsecondary institutions to work sectors, including military jobs.

The development of our new item factor model will reveal possible gaps between features that are currently covered in the existing high school assessments and what is expected from the career ready ontologies. The gap analysis will guide the development of new technology-enhanced items that may involve simulations, performance tasks that focus on collaboration and teamwork, and development of other “soft” skills.

We will aim to internationally benchmark the resulting inferences by applying the feature analysis to national assessments in other countries with more streamlined career and college readiness pipelines such as South Korea, with whom we have signed a set of memoranda of understanding. The cross-country comparison will also help us validate the domain ontologies and the new inferences that we are drawing. We will develop and pilot test technology-based interactive resources for teachers, learners, and other stakeholders to use in understanding and implementing improvement strategies based on career and college readiness information from the assessments.

## 2. Significance

### Theory of Action

The role of K-12 assessments is an important one in repairing the bridge between the classroom, careers, and postsecondary success. When scores from assessments directly correspond to criteria that reflect the necessary KSAs for career and college success, with the results and feedback they provide, coupled with resources and guidance that are made available to appropriately interpret and elaborate the feedback, and with subsequent efforts taken by learners, teachers, and policymakers, we may see a pathway for K-12 assessments to begin to offer long-term value to students.

The research and development activities of the proposed project highlight all key aspects of the theory of action shown graphically in Figure 1. First, the feature extraction and ontology building will result in a clearer definition of the KSAs for career readiness that should be assessed, using information from scholarly, policy-based, and real-world sources. Next, the reanalysis (qualitative and quantitative) of the existing Smarter Balanced item pool will result in immediately available item sets for constructing the new indices. But because the reanalysis can be understood as retrofitting the existing assessment items and tasks with a new framework, gaps will likely be present. This is where the proposed development of new items and new formative resources are potentially most useful. With the resulting domain ontology, new interpretations from existing items and tasks, the digital resources, and the broad collaboration and outreach efforts, we hope to create the necessary impetus for improvement in the use of assessments to help bridge the gap between high school graduation and career and college readiness.

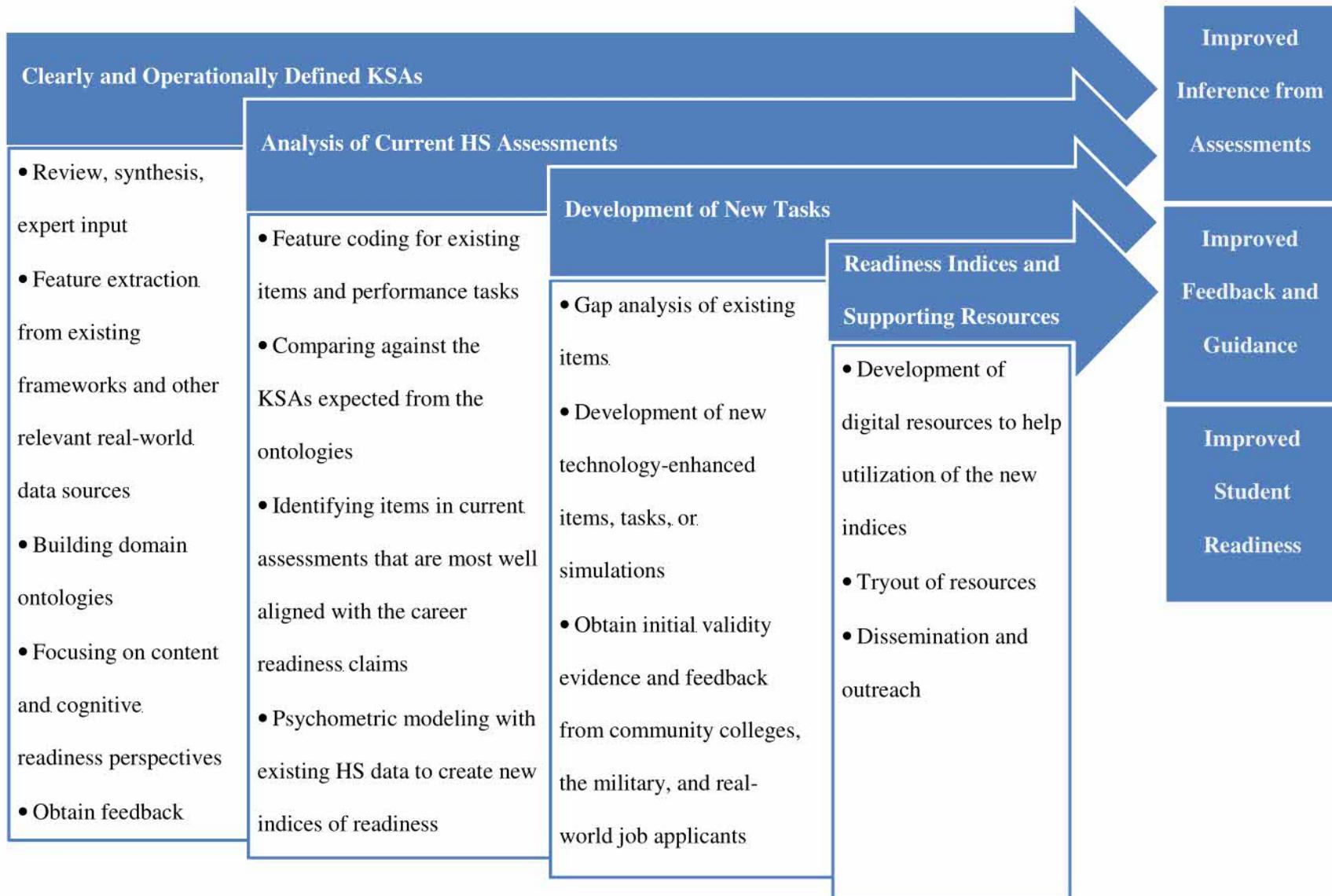


Figure 1. Theory of Action.

## Significance of Overall Approach

This proposal is characterized in the following integration of factors: (a) a focus on the assessment of competencies; (b) a focus on KSAs for individuals as well as for groups or teams; (c) contexts in workforce training as well as education; and (d) a focus on the transition from high school to entry-level positions in the world of work as well as from the community college to the world of work. We highlight several aspects of the proposed work that individually represent significant new contributions to the area.

*Conceptual framework.* We will adapt, based on the analysis of assessments supported by the Council of Chief State School Officers (CCSSO), the Gates Foundation, the Defense Advanced Research Projects Agency (DARPA), the Public Broadcasting System (PBS), and other prominent sources, a modified version of the CRESST framework as the conceptual model of the KSAs needed for career readiness with a strong emphasis on career. CRESST has been active in the career readiness area since the 1990s Secretary's Commission on Achieving Necessary Skills (SCANS) work (O'Neil, Allred & Baker, 1992) and has kept abreast of the most recent excellent sources, for example, the CCSSO study (CCSSO, 2013, 2014) which included industry input and international benchmarks. Other frameworks reviewed include OECD's (2013) definition of PISA problem solving, the Partnership for 21st Century Learning (2015), and the Hewlett Foundation Education Program's definition of "deeper learning."

It should be noted that PISA has defined collaborative problem solving (a set of projects beginning at CRESST in the mid-1990s) to be assessed in PISA 2016. Further, NAEP is also designing collaborative problem solving assessments which will be added to future NAEP assessments (O'Neil & Chuang, 2008; NCES, <http://nces.ed.gov/nationsreportcard/>). However, what remains largely undone is the development of assessments to measure these KSAs in high schools and community colleges at scale and particularly in a way that conserves time devoted to new testing, especially in the light of public concern. The issues related to measuring these KSAs are conceptualized as (a) what to measure (e.g., knowledge, skills, and attributes); (b) technology-based performance assessment approaches (e.g., portfolios, games, simulations, knowledge maps); (c) criteria (e.g., validity, fairness, utility, transparency, transfer and generalizability, cost, and efficiency); and (d) type of technology (e.g., paper-and-pencil, platforms both hardware—tablets,

computers—and software support). Addressing these issues in a coherent conceptual framework is one of the main contributions of the proposed work.

We will base our work in particular on CRESST’s research on “cognitive readiness” for 21<sup>st</sup> century skills (O’Neil, Lang, Perez, Escalante, & Fox, 2014). Although there are many definitions of this construct, we view cognitive readiness through a knowledge, skills, and attributes lens, that is, knowledge is domain-specific, skills are either domain-specific or domain-independent, and attributes are relatively domain-independent. Attributes are considered as widely applicable and range from those that seem to be related to personality and life experience, such as confidence, to those that can be directly affected by education and training, such as teamwork. The term “attribute” may be considered interchangeable with the term competency, when subject matter content is not paramount.

Table 1 provides a list of CRESST core cognitive readiness skills and attributes most relevant to the proposed work at hand and most appropriate to the K-16 learning context: adaptive expertise, communication, creative thinking, metacognition, and teamwork (O’Neil et al., 2014).

Table 1

CRESST’s Cognitive Readiness Skills and Attributes

Skills and attributes	Definition
Adaptability	Adaptability is a functional change (cognitive, behavioral, and/or affective) in response to actual or correctly anticipated alterations in environmental contingencies. (Banks, Bader, Fleming, Zaccaro, & Barber, 2001, p. 4).
Adaptive problem solving	Adaptive problem solving involves the ability to invent solutions to problems that the problem solver has not encountered before. In adaptive problem solving, problem solvers must adapt their existing knowledge to fit the requirements of a novel problem (Mayer, 2014). Adaptive problem solving has also been conceptualized by O’Neil (1999) as being composed of content understanding, problem solving strategies, and self-regulation.

Skills and attributes	Definition
Communication	Communication is the timely and clear provision of information (Bowers, Braun, & Morgan, 1997) and the ability to know whom to contact, when to contact, and how to report (Hussain, Bowers, & Blasko-Drabik, 2014).
Creative thinking	Creative thinking is a predictor of creative accomplishment. Creative thinking is the ability to generate ideas and solutions that are novel, appropriate, and of high quality (Hong & Milgram, 2008).
Decision making	Decision making involves the use of situational awareness information about the current situation to help evaluate the utility of potential courses of action and then execute a course of action and judge its effectiveness. It involves the ability to follow appropriate protocols, follow orders, and take the initiative to complete a mission (Hussain et al., 2014).
Metacognition	Metacognition is awareness of one's thinking and is composed of two components: planning and self-monitoring. Planning means that one must have a goal (either assigned or self-directed) and a plan to achieve the goal. Self-monitoring means one needs a self-checking mechanism to monitor goal achievement (O'Neil, 1999).
Teamwork	Teamwork is a trait of the individual that predisposes the individual to act as a team member. There are six teamwork processes: (a) adaptability, (b) coordination, (c) decision making, (d) interpersonal, (e) leadership, and (f) communication (O'Neil, Wang, Lee, Mulkey, & Baker, 2003). A complementary definition is provided by Bowers and Cannon-Bowers (2014). Their definition of teamwork includes knowledge of teamwork, leadership, mutual performance monitoring/backup, communication, interpersonal skills, and positive teamwork attitudes.

*Refinement of readiness ontologies.* Figure 2 shows a prototype domain ontology. An ontology is a graphical domain representation and delineates:

- domain scope, for example, math, cognitive demands, and readiness for careers in a field
- domain entities and their definitions, for example, knowledge, skills, and learner attributes (KSAs), standards, and assessments
- possible entity relations, for example, learning progressions, curricula, big ideas, KSA dependencies

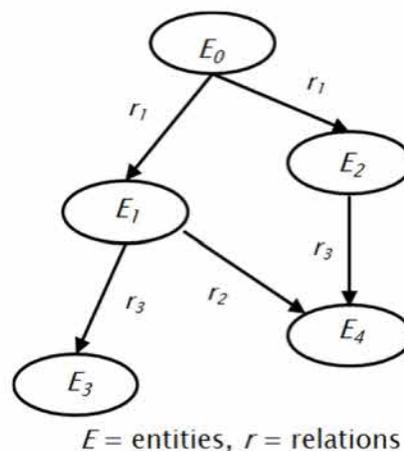


Figure 2. Example of domain ontology.

CRESST has successfully developed domain ontologies for a wide variety of K-12 and adult learning and assessment contexts ranging from ship handling, to engineering, to medical skills, and to mental health (Baker, 2012; Baker & Delacruz, 2013; Chung, Delacruz, & Bewley, 2006; Iseli, Koenig, Lee, & Wainess, 2010). A major focus of this project will be to refine the ontology for career readiness.

Ontologies offer distinct perspectives on instruction and learning. They show logical sequencing, and help design lesson plans and curricula. Dependencies within ontologies also directly translate into *features*. Features can be used “parameterize” existing assessment items and tasks, and they systematize new item development. For instance, instead of descriptively stating item A is less difficult than item B, as in typical psychometric analyses, feature analysis may reveal that item A is associated with features that would serve to reduce the language complexity or cognitive load. Consistent use of features offers a

more complete and explanatory view of the items, which may facilitate further item refinement and model, as well as gap analysis and new item design. Of essential importance, features can be used directly in models such as probabilistic graphical models, item response models, or diagnostic classification models that underlie psychometrics and validity studies in assessment programs.

The raw ingredients of ontology building can take any number of forms. For instance, they could come from textual statements in existing sources. To this end, we will conduct a thorough review of the literature on career readiness. We will begin with the review of key frameworks including the ACT (2006) framework, the frameworks developed by Conley and colleagues (Conley, 2010; Conley & McGaughy, 2012), and results of the study conducted by the Conference Board (Casner-Lotto & Barrington, 2006).

Both shared and unique features across the various frameworks contribute useful information to ontology development. The raw ingredients of career readiness ontologies can also come from direct extraction of real-world data. For instance, one can analyze the categorizations and filters that job placement websites utilize (such as CareerBuilder, Monster, etc.)—both for job seekers and for employers—as a proxy for how career readiness is defined in a real-world context. Similarly, we will draw upon authoritative information that the Department of Labor uses regarding job categorizations and skills found in occupation databases such as O\*NET OnLine (<https://www.onetonline.org/find/career>), and compare those with what job websites utilize. Finally, information useful for building ontologies can come from direct input from employers, instructors, the military, and other experts familiar with the topic.

Equipped with the conceptual framework and its elaboration into operationally defined domain ontologies, the proposed reanalysis of the Smarter Balanced high school test is an attempt at producing a set of new indices with criterion-referenced career readiness interpretations without adding to the current testing time, logistics of test administration, or added cost. Fully cognizant of the limitations of the reanalysis of existing items, the proposed project contains work to identify and cover gaps. Furthermore, a significant aspect of the approach is that the analyses are not isolated. The resulting new indices are accompanied by international benchmarks and additional digital resources for formative use.

The nature of the project is collaborative. Not only does it represent general collaboration between CDE with a research and technical assistance partner (CRESST), we emphasize that collaboration and input from relevant sources (K-12, higher education, business community, the military, etc.) run across the development cycle of the conceptual framework, evaluation of the domain ontology, definition of features of the KSAs, interpretation of the resulting indices, and the validation of the new item development as well as formative resources.

### **Significance of Improvement in Assessment Design and Analysis Methods**

A variety of methodological approaches from qualitative to quantitative will be used. The qualitative approach involves the use of feature analysis to tag assessment items and performance tasks. The features will correspond to entities from the career readiness ontologies and reflect the various KSAs. More importantly, the features are directly integrated into the psychometric modeling to be undertaken in this project. There are several important implications that can result from feature analysis, especially when it is used to serve (1) as the basis of item selection for further refinement into career readiness indices, (2) as the basis of further psychometric modeling to demonstrate the degree to which the features are associated with and can explain item and student characteristics thereby rendering criterion-referenced interpretations of the resulting indices of readiness, and (3) to identify gaps in covering the critical KSAs of the existing item pool in order to facilitate new item or task development.

### **Qualitative Feature Analysis Approach**

*Theoretical background.* One of the earliest references to the idea of feature analysis can be attributed to Gordon (1970) in the *Report of the Commission on Tests: II*. In this brief Gordon mentions qualitative analysis of assessments in his call to emphasize description and prescription (i.e., the qualitative description of cognitive functions leading to the prescription of the learning experiences required to more adequately ensure academic success). Gordon suggests that existing instruments could be examined with a view to categorization and interpretation to determine whether or not the data can be reported in descriptive and qualitative ways in addition to traditional quantitative ways. Gordon for

instance mentions that response patterns can be reported differently for information recall or vocabulary, and further refers to features such as problem solving, expression, and information management, etc.

The main rating framework underlying the feature analysis work is derived from Baker and O'Neil's (2002) approach to designing problem solving assessments, Jonassen's (2000) typology of problems, and CRESST's problem solving ontology. Baker and O'Neil's approach first characterizes three types of problem solving tasks: (a) a task in which an appropriate solution is known in advance, (b) a task in which there is no known solution to the problem, and (c) a task that requires an application of a given tool set to a broad range of topics. These are all features of problem solving that can be rated as part of a particular item and that require a specific associated cognitive demand or process on the part of the learner, student, or user.

Identifying the problem is often one of the most difficult aspects of problem solving (see Baker & O'Neil, 2002). The ambiguity of problem identification may be dependent on the prior knowledge of the learner and the purpose of the assessment. Essentially, an assessment developer can adjust the difficulty of a task or item by stating the problem explicitly or obscuring it in an embedded setting or context, such as within a narrative. These types of adjustments might not only contribute to increased difficulty, but also require an associated cognitive demand or cognitive process that might be more complex.

Similar to Baker and O'Neil (2002), Jonassen (2000) articulates different problem types with varying attributes that follow a continuum from well-structured to ill-structured tasks. Jonassen's problem typology assumes that there are similarities in the cognitive processes required to solve each problem, that the problem types are not mutually exclusive, and that each problem category varies with respect to abstractness and complexity. Baker and O'Neil's (2002) approach to developing problem solving assessments is part of an overarching model developed by CRESST to determine the functional validity of assessments (Cai, Baker, Choi, & Buschang, 2014a). Essentially, this model surpasses other forms for providing criterion-referenced evidence in support of assessment validity claims by integrating in-depth and detailed feature and step-by-step analysis with modern statistical modeling. This model ensures validity by going beyond simple task descriptions, and by yielding explanation for possible areas of

growth, identifying task elements that are suitable for instruction, and lastly, providing a method for comparability and prediction.

*Previous CRESST feature analysis work.* CRESST's early work conducting feature analysis was targeted to new types of assessments in the educational game area. For instance, Chung et al. (2008) sought to address the need for tools and technologies to support rapid development of assessments that conform to good design principles by delineating an approach to designing an authoring system, particularly for tests that required complex performance, such as in the case of problem solving. Their approach was grounded in a constraint network (Montanari, 1974), which allows detailed specifications of important problem solving variables, the states that the variables can assume, and the set of permissible variable and state combinations. The researchers aimed to answer first, to what extent a problem solving assessment framework could be codified in computational form, and second, to what extent a user's design of a problem solving assessment could be evaluated computationally. Some of the key features detailed in their approach included attributes related to problem identification (e.g., explicitness, time constraints, barriers to getting information), problem characteristics (e.g., type of task), solution strategy (e.g., steps, contingency planning, help seeking, cognitive strategies), and solution characteristics (e.g., solution correctness, solution contingencies).

Similarly, in another CRESST feature analysis project, Wolf et al. (2008) sought to provide validity evidence to improve the assessment of English language learner (ELL) students by particularly investigating the language demands in State content-area and English language proficiency tests, and detecting test items that differentially impacted ELL student performance. The researchers rated linguistic features (e.g., length, academic vocabulary, grammatical features), non-linguistic features (e.g., visuals, directness of information, scope), academic language functions (e.g., rhetorical mode, organizational features), and thinking skills (e.g., comprehension type). Their results contained descriptive data related to the respective feature categories across Grades 4 through 8 and for math, science, and ELA content.

*Feature analysis application and benefits.* As indicated previously, features are typically conceptually related to problem solving, cognitive demands and processes, and problem types. Features

can also be rated or derived according to specific content/concepts, task elements, user interactions, and response modes, among many other features dependent on the task and content at hand. Features can therefore also be analyzed across tasks including, but not limited to, game levels, scenarios, instructional activities, computer simulations, tests, and other media, thereby applying across contexts and situations to include instruction and learning, as well as assessment. The fact that the same features can be rated and analyzed across contexts and tasks provides a parsimonious tool to ensure alignment between instruction, assessment development, and student learning, but also enables novel validity analyses prior to and after the data analysis stage. Essentially, validity can be ensured, verified, and “built in” during the development process by incorporating salient (valid) features into target products, whether they are instructional activities, games, assessments, or related to specific student learning behaviors and cognition.

*Goals and objectives of feature analysis.* In the context of the current proposal, feature analysis is defined as the qualitative rating of tasks against a set of attributes, particularly career and college readiness features, followed by a subsequent quantitative analysis to determine how these attributes determine task performance. There are three main goals of feature analysis associated with the three main components of the feature analysis process: feature rating and step-by-step analysis, cognitive labs, and combination of feature analysis with quantitative analysis. These three goals fulfill the following overarching questions:

1. What particular attributes/features does each item contain?
2. What are the dominant attributes/features across items?
3. To what extent do items measure career readiness features?
4. To what extent do items measure college readiness features?
5. What particular attributes/features of items/tasks explain variations in item characteristics such as increased or reduced difficulty across items/tests/tasks and why?
6. What feature combinations explain variations in item characteristics and why?
7. What features are most valid to elicit and assess key readiness outcomes?

*Feature rating and step-by-step analysis.* The goal of the feature rating or scoring process is to determine what features/attributes are present or absent in a particular item and what particular steps need to be completed to solve an item or task correctly, and to perform descriptive analyses across features and items. This task is performed by content experts in feature rating and the associated content areas. The attributes or features are defined or refined targeting a particular content area prior to feature rating by the experts in the specified content areas. Typically features are rated according to the following overarching task categories: problem stimulus, prompt, and problem type. Problem stimulus refers to what is presented as part of the task. The prompt refers to what is asked for as part of the task. The prompt could for instance refer to the stem of an assessment item. The problem type category involves the problem solving that is inherent in the task, including cognitive demands/processes and problem interaction types (i.e., a combination of the response mode and task format).

The goal of the step-by-step analysis is to determine the particular sequence of steps needed to solve a problem completely and correctly. This type of analysis is essential to determine expert and novice differences in problem solving. Experts in the particular content area perform the step-by-step analysis and their solution pathways and steps are used as comparison for student performance data on cognitive labs as well as student item data.

*Cognitive labs.* Cognitive labs essentially serve to verify and validate features. There are three target goals for a cognitive lab study: (1) to determine the thought processes that students went through when solving each item; (2) to determine aspects/features of the items that might pose difficulties or facilitate students' learning and understanding of the items; and (3) to determine what problem steps students used to solve each respective problem.

During the cognitive lab study students solve questions one-on-one with a researcher. Students are asked to think aloud as they solve the problems and are asked to describe their steps and their thinking once they complete each problem. Additional follow-up questions are asked of students while they solve problems and after they solve problems to clarify steps or difficulties. As the students are solving

problems, the researchers note student problem steps, thinking and reasoning processes, and any student difficulties on a protocol containing select items broken down into a step-by-step sequence.

*Recent CRESST work on feature analysis.* Features can be rated across content areas dealing with problem solving processes and types, as well as task elements and interactions, and also within content areas dealing with particular concepts. For previous CRESST projects we have performed feature analysis across content areas (e.g., math, ELA, physics) as well as task types (e.g., game levels, technology-based and paper assessments). Below we provide some general examples of features that we have rated across and within content areas including math, ELA, and problem solving, followed by some specific examples related to some of our key feature analysis projects.

In a Gates-funded project we applied feature analysis to analysis of ELA and mathematics summative assessment items in Kentucky for Grades 4, 8, and 11 (Baker, 2015; Cai, Baker, Choi, & Buschang, 2014a, 2014b). The main goals of the project were to: describe and reliably judge the features found on each test item, to identify features that distinguish tasks from each other and can guide instructional practice, and to use the feature analysis in quantitative models of student performance to determine how specific features contribute to variance in student performance. To provide an example from eighth grade math, the integrated analysis for this project determined that items that contained no math terminology, algorithmic and recall problem solving, function, square/cube root, slope/rate of change (math concepts), and rigid transformations are strongly associated with reduced item difficulty, whereas items that contained additional guidance, decision-making problem solving, explicitly stated prompts, Pythagorean theorem, and scatter plots are associated with increased item difficulty. Together a dozen or so features explain more than half of the empirically observed item-level variation in difficulty, indicating that they are of strong predictive value in both assessment design and analysis, and have potential instructional utility.

Similar to the Gates project, the Council of Chief State School Officers (CCSSO) funded Mathematical Reasoning Project aimed to perform feature ratings and integrated analysis of Grades 4, 8, and 11 Smarter Balanced assessment items, also including step-by-step analysis and cognitive labs

(Madni et al., 2014, 2015). The main goals for this project included determining (1) whether certain item features facilitate or impede student performance, and (2) what item features contribute to variance on student item performance and why. Findings across grades indicated significant results with respect to key features contributing to variance on item performance. To provide an example from 11th grade, four math concepts (i.e., factoring slope/rate of change, linear equation, and exponentiation) appeared to be associated with elevated item difficulty, whereas three math concepts (i.e., polynomial, creating equations, and function) appeared to be the opposite. Moreover, math vocabulary contributed to reduced item difficulty the most. This finding was consistent with cognitive labs for 11th grade, which indicated that these students had accumulated background knowledge in key math terminology. For 11th grade, the feature of cognitive load increased difficulty the most.

The current operational Smarter Balanced high school summative assessments for math and ELA each contain over 1400 items in the computerized adaptive item pool (in the case of math more than 1600), plus an additional 89 items from the Performance Tasks (PT) section for math and over 100 PT items for ELA. The items are grouped under four claims for math (Concepts and Procedure, Problem Solving, Communicating Reasoning, and Modeling and Data Analysis). For ELA, the claims are Reading, Writing, Speaking and Listening, and Research/Inquiry.

For the sake of discussion, consider ELA Claim 4 in high school: Students can engage in research/inquiry to investigate topics, and to analyze, integrate, and present information (Smarter Balanced Assessment Consortium, 2013a). Items are specifically developed to measure this claim. In the content specifications, these summative items further measure assessment targets that correspond to related groups of standards. These ELA targets are:

- ELA Target 2. Analyze/integrate information: Gather, analyze, and integrate multiple sources of information/evidence to support a presentation on a topic.
- ELA Target 3. Evaluate information/sources: Use reasoning, evaluation, and evidence to assess the credibility and accuracy of each source in order to gather and select information to support

analysis, reflection, and research. Evaluate relevance, accuracy, and completeness of information from multiple sources.

- ELA Target 4. Use evidence: Cite evidence to support arguments or conjectures.

Let us also take a moment to examine Math Claim 4 in high school: Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems (Smarter Balanced Assessment Consortium, 2013b). A similar development in content specification of the math items results in the following targets that are each measured by a number of items.

- Math Target A: Apply mathematics to solve problems arising in everyday life, society, and the workplace.
- Math Target B: Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.
- Math Target C: State logical assumptions being used.
- Math Target D: Interpret results in the context of a situation.
- Math Target E: Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon.
- Math Target F: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas).
- Math Target G: Identify, analyze and synthesize relevant external resources to pose or solve problems.

As one can see, both ELA and math content specifications contain targets that pertain generally to the list of cognitive readiness skills and attributes in Table 1, such as adaptive problem solving, communication, creative thinking, decision making, and metacognition. Where the features that characterize the KSAs of career readiness enter the picture is in providing a potentially far richer and more detailed description of how each of the currently available summative items is measuring content

knowledge and cognitive readiness skills and attributes related to career readiness. In later parts of the proposal we will describe in more detail our plan for conducting feature analysis.

*Combining the qualitative feature analysis with quantitative analysis.* There are several ways in which the qualitative features can be integrated into quantitative analysis, drawing on CRESST's previous work described above. First, items sharing common features associated with KSAs of career readiness can be grouped together in secondary analyses, potentially cutting across the content areas. This results in an innovative use of a new generation of multidimensional item response models such as the two-tier item factor analysis model (Cai, 2010a) that generalizes other hierarchical item factor models such as the item bifactor model (Cai et al., 2011; Gibbons & Hedeker, 1992) and the testlet model of Wainer et al. (Wainer, Bradlow, & Wang, 2007).

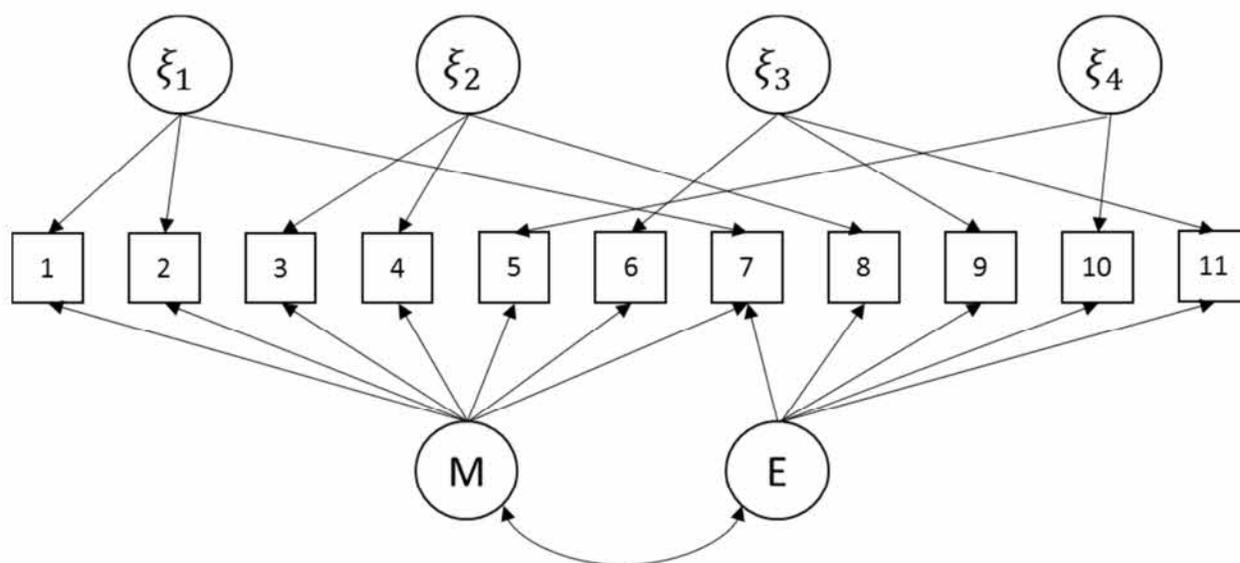


Figure 3. Example path diagram set.

Figure 3 shows an example path diagram set of 11 hypothetical items (rectangles in the middle) each uniquely associated with one of four hypothetical career readiness KSAs (represented as the  $\xi$  variables at the top). The items come from both math and ELA assessments, with the domain variables shown as M and E in the circles at the bottom. The math and ELA domains are correlated (curved double arrow), as is often the case in large-scale summative assessments (e.g., PISA). The arrows indicate direction of influence. Most of the items are presupposed to be influenced strongly by either math or ELA

domain factors. On the other hand, it is possible that some of the math items may also depend strongly on the ELA dimension due to item features that are empirically determined. One interpretation of Figure 3 is it models pure measures of individual differences on career readiness KSAs “net of” content. The qualitative feature analysis across the two content domains thus provides the first cut of model specification, which could be enhanced and corrected by specification searches that are guided by model fit indices and cross-validation (see e.g., Cai & Hansen, 2013). The operational burdens of fitting these high-dimensional models to large data sets have been overcome with recent advancement in computational algorithms (e.g., Cai, 2010a, 2010b, 2010c) and software (e.g., Houts & Cai, 2013).

The second way in which features are used is more explanatory and detailed. For example, the crudest item-level model for feature integration is the classical linear logistic test model (LLTM, Fischer, 1973, 2005). More recent updates to these models include the explanatory item response models (De Boeck & Wilson, 2004; Wilson, De Boeck, & Carstensen, 2008), including random item versions of these models (De Boeck, 2008). These models address a key question: What are the item or item-cluster features, in particular career and college readiness features, that are significantly related to item characteristics, which in turn determine student performance and proficiency estimation? The fitting of these explanatory models not only provide estimates of the percentage of variance explained by the features, but also answer questions related to feedback. Are there particular features, as determined by empirical analyses which should be emphasized in providing guidance to students on readiness for careers? Are there feature combinations that interact? For students within a close neighborhood of certain performance-level cut scores, are there features that are more predictive, so focusing on them in a formative manner can lead to more “bang for the buck” in terms of instructional efforts?

The explanatory analyses also address questions that are design focused. Are there item or task-related features that are undesirable in that they may be associated with domain- or KSA-irrelevant variance? The features also shed more light on other, more general classification frameworks such as DOK (Webb, 1997). For example, are math items or tasks classified as cognitively complex associated

consistently with high cognitive load and narrative text? Do features related to response format explain item difficulty variation?

Thus, obtaining data on an item feature basis takes the largely descriptive item parameters such as difficulty or discrimination to a new level by pinpointing what particular aspects or attributes of the items are contributing item-level differences. This type of information and level of detail are highly valuable to all stakeholders within the educational process including, but not limited to students, teachers, test developers, funding institutions, and policymakers. For example, teachers can utilize the results for not only understanding their students' strengths and weaknesses, but also formatively responding to their students' needs by redesigning and adjusting both their instruction and assessment accordingly. For item/test developers, this conceptual and analytical framework facilitates customizing items and tests beyond alignment to contents and standards. An additional benefit to test developers is that one could create items that target specific salient features, for example career and college readiness features, that might be problematic for students across consecutive years to gauge student progress and improvement.

The information obtained from such items is also fundamental to decision makers related to funding and policies. If one can determine where and why a particular school district or school is having difficulties with respect to student performance one year, then funding can be provided and target test packages can be created including items with salient feature components for the following year, to accurately assess student performance and progress. This will provide much more exact information on student performance and improvement, and thereby much more accurate information on what instructional areas need to be focused on and where funding needs to be provided.

### **Quality of Research and Evaluation**

The National Center for Research on Evaluation, Standards, and Student Testing (CRESST) will be the main research site and partner of this EAG project. At the same time, in addition to oversight by the California Department of Education, a rigorous evaluation of the proposed project will be conducted by the SRM Evaluation Group, under the direction of Christina Christie, Professor of Education and Social Research Methodology Division Head in the UCLA Graduate School of Education & Information Studies

(GSE&IS). Details of project evaluation will be provided later in the proposal. CRESST has high internal standards for quality of research and here we highlight the more detailed quality assurance procedures and internal procedures that CRESST will follow for each of the main project activities.

*Ontology building.* The ontology for career readiness is one of the core results from this EAG project. To ensure its quality, we will utilize multiple sources of information, for example, review of existing literature, expert input and review, analysis and automatic extraction of U.S. Department of Labor job categorization, career website filters of skills and categories, etc. The progression from more human input to more automated extraction and ontology building provides a consistent pathway for improving and validating the quality of the domain representations. The initial ontologies may be small, and may lack the full breadth. For instance, experts in given areas (e.g., the military) will tend to focus on disciplinary specific aspects of the ontology. But because ontologies use consistent graphical representations, they may be merged and recombined just as any other graphical representations. The success of ontologies constructed entirely out of “supervised” input can be validated by using it to analyze textual data from large job and skill categorization databases.

*Feature analysis.* A critical aspect of the quality of feature analysis is in the intra- and inter-rater consistency of the tagging of items against the list of features derived from the KSAs identified in the ontologies. In all cases we will utilize at least two raters for each item. The selection, qualifications, and training of raters will follow established procedures from prior feature analyses. The consistency of the ratings will be statistically examined using indices such as Cohen’s kappa. We have historically been able to achieve intra-individual kappa values of well above .90 and inter-individual kappas of above .8.

*Psychometric analysis.* The core of quality assurance in psychometric data analyses is in the ability to replicate. Typical item analysis and item factor analyses require two data analysts to conduct analyses in parallel and check program output with one another (e.g., IRT software output) so that the results are identical. In projects related to Smarter Balanced operational psychometrics, CRESST routinely uses more than one approach to conduct data analysis with the same goal. For example, a linking study may use two approaches, one based on multiple-group IRT and one based on test characteristic curve methods,

allowing independent confirmation of results. Replications ensure that the analyses produce sensible results and can be trusted. In addition, an independent auditing by a third spot-checker is typically employed in psychometric analyses.

*New items and digital resources.* The quality of new item development and digital resources will follow established test development and validation procedures outlined in the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014) with validity of career readiness inference at the core of the design and validation. The new items and digital resources will be reviewed, studied, and modified in small-scale tryouts with community college students, faculty, the military, and people working in employment/staffing agencies. The feedback will be used to improve the understanding of response processes, and consequences of assessment use. Other aspects of validation (e.g., reliability, predictive validity) will be addressed in the validation of new measures to be outlined later.

### **Significance of Capacity Building and Outreach**

Ensuring stakeholders are informed and invested is key to the success of any assessment development process—particularly when that involves assessment use and practice connected to an ultimate outcome of K-16 education. The results of the new indices will affect not only students, but teachers, administrators, parents, community colleges, future districts, employers, policymakers, and State education agency staff.

The outreach and communication with teachers and administrators will follow the development cycle of the new indices. Engagement between CRESST and CDE staff will occur throughout the project. Both CDE and CRESST will reach out to district-level staff early in the development process. We will disseminate information about the development of the new indices through various media such as email, school meetings, online networks, web-based information sessions, and newsletter articles. We will explain the focus of the project, the development timeline, opportunities for input, and the consequent adjustments and the approach to the resulting data. Teachers and administrators will have the first opportunity to hear of developments in new item types and new digital resources.

Similar to the outreach plan for teachers and administrators, the outreach to the public and key stakeholders also begins early in the development process. We will highlight the benefits of the new indices to high school students, teachers, colleges, employers, and ultimately the community and the State of California. We anticipate the fact that we can leverage existing assessment assessments without adding cost. International benchmarking for career and college readiness, engagement with the military, and technology-enhanced new measures of achievement in career readiness are all topics the public and key stakeholders will understand to be the resulting benefits of the new indices.

We will aim to identify gaps in existing communication regarding high school tests and career readiness inferences. New messaging materials will be developed or existing materials will be refined to address identified gaps in message or means of delivery. The media package to be developed will communicate to the public and key stakeholders the essential features, benefits, and values of the new indices, especially from a high potential return-on-investment perspective.

### **3. R&D Approach with Measureable Objectives**

Building on the foundation of the innovative techniques and methodologies described above, we propose a work plan that will both support further methodological innovation and provide tangible findings, tools, and resources that can be used by California and others in their assessment planning. Although clearly the various aspects of work we propose are synergistic and interdependent, for purposes of discussion of our plan we have divided it into six strands: (1) qualitative feature analytics; (2) quantitative psychometric modeling integrating feature analysis findings; (3) international benchmarking analyses; (4) follow-on validity study plan; (5) gap analysis and resultant new item development; and (6) development and testing of digital resources.

#### **Qualitative: Ontology Building and Feature Analysis**

As mentioned earlier, ontology building and feature analysis will each take a phased approach during development to allow for ample feedback and iterative improvement. Here we outline the steps and the deliverables.

*Ontology.* Using textual data from review of literature, information and mapping provided by experts in career readiness in various disciplines, and mining and extraction of job categorization and skill filters on career building websites, initial ontologies will be built and improved upon by gathering feedback from experts and potential users. We anticipate that during the first 3 to 6 months when the project is starting, a series of ontology working group meetings will be held at CRESST. This development goes in tandem with CRESST acquiring access to student item response data on the current high school tests so that when the ontologies are finalized, the feature and psychometric analyses can begin without delay. For examples of ontologies, see Chung et al. (2006).

*Feature analysis.* Because current Smarter Balanced high school test items already contain item meta-tags that identify content strands and depth of knowledge (DOK) ratings, the goal of feature analysis is to add a significant set of meta-tags to each item that are directly related to core domain KSAs identified in the ontologies for career readiness. Because the number of items is large, we will phase the coding of features to provide for opportunities of revision and improvement. First, given the current high school test achievement level cut scores, we may take an initial selection of a subset of items at each of the three cut scores (between performance levels 1-2-3-4). We are fortunate that the items have been calibrated with IRT, with known difficulty estimates and standard errors of difficulty estimates. Because a core attribute of IRT modeling is that the item parameters are on the same scale as the latent achievement dimension, the cut scores and difficulty estimates are directly comparable. We can choose items that do not differ statistically significantly from the cut scores to identify the initial batch to be coded. The reason we would like to include all performance levels is that the items may differ qualitatively across the range of difficulty/achievement levels, and the expected differences in features as a result will let us know whether the list of features sufficiently capture the item variation in complexity and in correspondence to career readiness KSAs. The initial coding can begin as soon as preliminary ontologies are developed in the first 3 to 6 months of the project and will continue to be refined as ontologies and features are finalized. The initial batch will also serve as a training set for the raters to clarify any irregularities in item coding or incompleteness in the coding rubric. The final deliverable will take the form of full item-by-

feature matrices (aka Q-matrices in the cognitive diagnostic modeling field) that identify how each of the items are associated with (and measure) career readiness features that include content knowledge, cognitive readiness skills, and individual or group readiness attributes. From the Q-matrices, the items that are associated with career readiness KSAs will be selected for further quantitative analyses.

### **Quantitative: Integrated Psychometric Modeling**

The analysis of existing data from Smarter Balanced high school tests includes the following steps. In each step we will use several methods, both well-accepted and novel, for cross-checking our findings.

*Initial descriptive and non-parametric analysis.* First, we will generate basic item-level descriptive statistics. We will screen the responses for potentially missing categories and the proportions in each response category for highly skewed univariate distributions that might cause problems for subsequent analysis. Next, we will examine the bivariate tables for item pairs and compute the bivariate association measures, given the item responses and the known item characteristics that are used in the CAT administration and administration of PT items.

*Exploratory and confirmatory item factor analysis.* As suggested by Cudeck and Browne (1983), we will split the sample into multiple random subsets. We will use some of the random samples to conduct exploratory item factor analyses with target rotation (Browne, 2001), and use the remainder for confirmatory item factor analysis as cross-validation (Cai, 2010a, 2010c). The purpose of the exploratory factor analyses are twofold: (1) to examine the number of dimensions as well as the factor structure underlying the test items in terms of content and KSAs, and (2) to identify problematic items for deletion such as ones that load poorly on all dimensions. Once we have a final set of items and understand the factor structure well enough, we will propose several competing confirmatory item factor models based on the findings from the exploratory analysis and fit these confirmatory models to independent random subsets of the sample. Candidate models might be similar to the two-tier model shown in Figure 3, with exact form to be determined and cross-validated empirically. We will employ the full-information item factor analysis approach using a maximum marginal likelihood estimator on the raw item response data (Bock, Gibbons, & Muraki, 1988; Cai, 2010a, 2010b, 2010c; Cai et al., 2011). We will use flexMIRT

(Houts & Cai, 2013) for all item factor analyses because it has built-in algorithms for handling large data sets and high dimensionality. It also has implementation of statistics for evaluating model fit (e.g., Cai & Hansen, 2013; Cai & Monroe, 2014; Hansen, Cai, Monroe, & Li, 2014).

*Final calibration.* With the final selected items, we will use the item factor models developed previously to calibrate the scoring models for new career readiness indices. The calibrated item parameters will result in operational-ready scoring approaches to create these additional career readiness indices, given high school test data.

### **International Benchmarks**

Our feature-based functional approach to test design, item analysis, scoring, and a set of new indices with criterion-referenced career readiness interpretation will be facilitated by conducting comparability studies using international benchmarking. To achieve this aim, two approaches will be employed: (1) analysis of PISA problem solving items and (2) feature analysis using career readiness KSAs on Korea's 12th grade practice tests for college entrance.

PISA items in the areas of collaborative problem solving, reading, and mathematics will be analyzed using our feature-based functional approach, that is, item feature analysis identifying KSAs of career readiness and combining feature analysis with quantitative analysis such as LLTM and/or hierarchical item factor models. There are two reasons to choose Korea as the benchmarking country. In 2015 PISA results, Korea ranked first among OECD countries in terms of performance in reading and mathematics, for the third time after 2006 and 2009. In addition to Korea being one of the highest performing countries, since an MOU exchange in 2002, CRESST has had a close institutional relationship with the Korea Institute for Curriculum and Evaluation (KICE) that is responsible for the design and implementation of PISA in Korea. CRESST's international relationships readily enable us to conduct the feature analysis for international benchmarking.

Korea implements two practice tests per year before the official college entrance exam at the end of the school year (usually in November), and items in those practice tests are publicly available. Both for ELA and math tests, feature analysis will be focused on examining the extent to which Korea's item

features associated with KSAs of career readiness are similar or different compared to features of KSAs of career readiness identified in Smarter Balanced 11th grade tests. We hope to provide empirical supports of the KSAs associated with career readiness from an international perspective.

### **Validation Plan**

The qualitative feature analysis and related psychometric modeling studies described above will provide detailed information about the career readiness constructs addressed in the current CDE assessments and the clusters of items/scales associated with each of these constructs. Although these advanced analyses of existing CDE items and State data sets will be the foundation to our work scope, we propose to conduct a follow-up validity study to provide additional support to our findings and gain better understanding of the constructs and scales identified.

*Approach and design.* The goal of this proposed validity study will be to examine how our identified career-readiness constructs and scales perform across different participant groups with different levels of experience in the career/vocational world. This approach draws on the expert/novice validation study designs used previously by CRESST and others (Baker, Aschbacher, Niemi, & Sato, 2005; Baker, Chung, & Delacruz, 2008; Herl, Baker, & Niemi, 1996). Specifically, if our career readiness constructs/identified scales are capturing measurable, usable information about KSAs relevant to the world of work, one would expect that individuals with differing levels of vocational experience and training would differ meaningfully in their scores on these assessments, with increased experience/expertise predicting higher scores and lower expertise/novice status predicting lower scores.

Our proposed study will include three groups of participants: 11th grade students, community college students in their final semester of completion of vocational education programs, and individuals with full-time employment in a professional setting. CDE will work with its constituent districts to identify a sample of 11th grade students for participation in this study. Although the range of potential community college vocational programs and resultant careers are vast, for the purposes of our validity study we plan to focus on two core career areas—instructional technology and medical/health sciences. These areas were selected given their identification as continued “high growth” career areas by the

Department of Labor (Richards & Terkanian, 2013). We will recruit community college students who are in the process of completing vocational programs in these two arenas (please note in our attached letters of support that both College of the Canyons and San Bernardino Valley College have agreed to serve as sites for recruitment if funded; both colleges serve diverse student bodies and offer a range of vocational programming in the health and technology areas). We will also recruit individuals with at least two years of post-education experience in these career fields, focusing on careers where an AA degree or community college vocational certificate are both necessary and sufficient for hiring. We will recruit these participants currently in the world of work through a combination of temporary employment agencies and military settings (e.g., the Surface Warfare Officers School Command/SWOS, which has agreed to participate in this aspect of the work).

These groups of participants will complete the same sets of CDE assessment items, identified from our feature analysis and associated psychometric modeling as the best measures of our identified career ready constructs. Note that, depending on the results of our feature analyses and psychometrics, there may be multiple forms/item sets that need to be completed by each group. So, while each participant will complete only one form/one set of items, within each participant group there may be subgroups of participants completing different forms. For example, if there are two forms, half of the 11th grade participants will complete Form A and half will complete Form B, half of the community college students will complete Form A and half will complete Form B, etc. In addition to completing the CDE assessment items, participants will be asked to complete a short survey about their education/training, vocational experience, career interests, career goals, and basic demographics. It is anticipated that completion of the assessment items and survey questions will take each participant 45-60 minutes.

*Analysis.* We estimate that we will require 100 participants per group (100 11th grade students, 100 community college students, 100 in the “world of work”); this is a conservative sample size powerful enough to detect small to medium group differences (e.g.,  $d=.4$ ) in the planned analysis (Cohen, 1988).

Our analyses of the data will have two major goals. First, we want to determine whether the scores differ across the groups based on our hypothesis—that is, does extent of career experience predict career

readiness scores, with 11th grade students scoring the lowest and those with experience in the world of work scoring the highest. Second, we will examine what role background factors, as collected in our survey, play in predicting scores. We plan to use a linear regression approach to predict differences based on group membership and the background variables noted above.

Ultimately, this study will provide critical additional information about the career readiness constructs and scale score we develop through this project, either further supporting/validating their use or providing information about how they could be further refined and improved before broader implementation.

### **Gap Analysis, New Item Development, Try-Outs**

The area of career readiness assessment is particularly ripe for the use of nontraditional/innovative item formats. Although not the major thrust of our proposed work, we plan to build on the findings of our feature and psychometric analyses to develop and do small-scale tryouts of some innovative item formats focused specifically on career ready constructs. We will use an adaptation of model-based assessment for the creation of technology-based items. This model relies on the use of ontologies, plus the identification of assets to be included in the tasks. Various values of these assets, for instance, different narratives, different representation modes, different response criteria, are used to parameterize the design of items and tasks. The result is a more systematic representation of career readiness KSAs.

It is of interest to note that in the current Smarter Balanced high school assessments, several targets are currently not assessed in the summative test. For instance,

- ELA Target 1. Plan/Research: Devise an approach and conduct short, focused research projects to explore a topic, issue, or problem, analyzing interrelationships among concepts or perspectives.
- ELA Target 6. Edit: Apply grade-appropriate grammar usage and mechanics to clarify a message (narrative, informational, and opinion/argumentative texts).
- ELA Target 7. Technology: Use tools of technology to gather information, make revisions, or produce texts/presentations.

We believe these newly developed items will also provide templates and options that could be used in the future by both the State of California and the larger Smarter Balanced Assessment Consortium.

Our initial analysis of the appropriate KSAs for career readiness focused on several existing frameworks. These frameworks are provided by CDE, CCSSO, ACT, and CRESST. We have provided our synthesis in Table 2 and Table 3 from the perspective of attributes and skills, with the understanding that content knowledge is always in the background as the context for attributes and skills. As may be seen in Table 3 there is less overlap in terms of attributes than skills. Drawing on CRESST's conceptual work in cognitive readiness described earlier in this proposal (O'Neil et al., 2014) we have decided to measure creative thinking and collaborative problem solving. However, we will revisit this plan based on both the results of our feature and psychometric analytics and feedback from our expert advisors.

Table 2

Career Readiness Skills

CDE (2015)	CCSSO (2013)	ACT (2014)	O'Neil et al. (2014)
<ul style="list-style-type: none"> <li>• Communicate</li> <li>• Develop an education and career plan aligned with personal goals</li> <li>• Apply technology</li> <li>• Utilize critical thinking</li> <li>• Practice personal health and understand financial literacy</li> <li>• Act as a responsible citizen</li> <li>• Model integrity, ethical leadership, and effective management</li> </ul>	<ul style="list-style-type: none"> <li>• Critical thinking</li> <li>• Problem solving</li> <li>• Working collaboratively</li> <li>• Communicating effectively</li> <li>• Metacognition and self-awareness</li> <li>• Study skills and learning how to learn</li> <li>• Time/goal</li> </ul>	<ul style="list-style-type: none"> <li>• Critical thinking</li> <li>• Collaboration skills</li> <li>• ICT</li> <li>• Cognitive ability</li> <li>• Degrees/credentials</li> <li>• Work samples</li> </ul>	<ul style="list-style-type: none"> <li>• Creative thinking</li> <li>• Metacognition</li> <li>• Teamwork</li> </ul>

- 
- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Work productively in teams</li> <li>• Demonstrate creativity and innovation</li> <li>• Employ valid and reliable research strategies</li> <li>• Understand the environmental, social, and economic impacts of decisions</li> </ul> | <ul style="list-style-type: none"> <li>management</li> <li>• Creativity and innovation</li> </ul> |
|---|---|
- 

Table 3

## Career Readiness Attributes

CCSSO (2013)	ACT (2014)	O'Neil et al. (2014)
• Agency (self-efficacy)	• Fit	• Creative thinking
• Initiative	• Integrity	• Metacognition
• Resilience	• Interests	• Teamwork
• Adaptability	• Personality	
• Leadership	• Self-efficacy	
• Ethical behavior and civic responsibility	• Self-esteem	
• Social awareness and empathy	• Values	
• Self-control		

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*Creative thinking.* Creative thinking is common to the frameworks in Table 2 and Table 3 (sometimes as a skill and in others as an attribute) and is required in both organizations and people. For example, in some cases there are complex, unpredictable, and undefined tasks, and there is no acceptable

training solution. Thus, one must create novel and useful solutions (creative thinking) and monitor the success or failure of these new solutions (metacognitive skill of self-monitoring).

Although useful in many situations, domain-independent measures do not predict as well as domain-specific measures in a specific situation. Creative thinking was long considered domain general. It is measured with questions that did not specify any particular domain (e.g., how many uses of a glass, such as use for drinking or use as a paperweight). However, scholars have presented evidence indicating that creative thinking is also domain or task specific and not only domain general. For example, the Ariel Real Life Problem Solving provides respondents with the opportunity to utilize domain-specific creative thinking ability in a wide variety of specific real-life situations (Milgram & Hong, 2000). For example, in a playground bullying context the students would be asked to generate all the ways that a student could solve the bullying problem in the specific playground context. Our current creative thinking research is building on our prior work, and new measures will be designed specifically to assess domain-specific creative thinking in Smarter Balanced performance items. For example, a domain-specific creative thinking fluency item would be to identify as many solutions to the troubleshooting problem you experienced in the simulation.

*Collaborative problem solving.* The term collaborative problem solving involves two different constructs—collaboration and problem solving. It should be noted that the term collaboration has different meanings in different environments. In K-16, collaboration almost always means an individual task can be solved by anyone in the group but collaboration is seen as an instructional strategy to enable learning more efficiently or effectively. In the world of work (industry, military), the term collaborative usually means a group task in which no one member of the group can solve the task. The assumption is that communication and collaboration for a group task are essential because some problem solving tasks are too complex for an individual to work through alone or can benefit from the joint capacities of a team.

*Innovative item formats.* There are a range of innovative item formats we plan to design, drawing on prior work by CRESST and its partners, including the following.

Collaborative problem solving knowledge map. The task is to create a knowledge map collaboration from a simulated website of information on ecology. It is a two-person task, where one person is a leader and the other a searcher. Only a group leader could add concepts to the knowledge map and link concepts to other concepts. In addition, the leader could move or erase concepts and links. Only a searcher could seek information from the simulated Web environment and could also access feedback about their group map. Thus each member in the group has to communicate and collaborate to successfully perform the group task.

There are 18 predefined knowledge map nodes (entities) identified by content experts: atmosphere, bacteria, carbon dioxide, climate, consumer, decomposition, evaporation, food chain, greenhouse gases, nutrients, oceans, oxygen, photosynthesis, producer, respiration, sunlight, waste, and water cycle. There are seven important predefined relationships (links) identified by content experts: causes, influences, part of, produces, requires, used for, and uses. The simulated World Wide Web environment contains over 200 Web pages with over 500 images and diagrams about environmental science and other topic areas. Nature and content of feedback are based on comparing student knowledge map performance to that of expert map performance.

Scenario-based approach. The scenario-based approach as exemplified by IMMEX (Interactive MultiMedia EXercises) format was originally developed by Stevens (e.g., Stevens, Beal, & Sprang, 2013; Stevens, Ikeda, Casillas, Palacio-Cayetano, & Clyman, 1999; Vendlinski & Stevens, 2000). This innovative item type uses a general problem solving framework where students are first presented with a problem scenario and then provided access to information that may or may not be useful to solve the problem. Effective problem solving is dependent on (a) the interpretation of the available information in the context of other information and the problem scenario, (b) the identification of relevant information, and (c) the use of data to draw appropriate causal inferences and conclusions. Evidence that the task evoked problem-solving processing was found by Chung, de Vries, Cheak, Stevens, and Bewley (2002). In their study, Chung et al. found that successful participants, compared to less successful participants, engaged in proportionally more accurate reasoning, exhibited less confusion, and required less bolstering

of content knowledge. Chung et al. also found strong associations between productive (and unproductive) cognitive processes and problem solving success (and failure).

The advantages of scenario-based approaches exemplified by IMMEX for assessment purposes include (a) students are required to engage in a complex problem solving task; (b) the task can be designed to have a clear outcome; (c) the task evokes a range of cognitive processing; and (d) the software can be instrumented to emit fine-grained process data, which was found to relate directly to participants' cognitive processing (Chung et al., 2002) and which can potentially be used for statistical modeling of problem solving.

Negotiation simulation (a collaborative problem solving task). This computer-simulated activity is based on the work of O'Neil (O'Neil, Allred, & Dennis, 1997). It allows, via simulation, for the assessment of collaboration skills in an individual testing setting, making the assessment of collaboration more practically tractable than formats requiring multiple students to work together. Using a common specification, multiple performance items can be generated efficiently and effectively; here we provide one specific example drawn from the work of O'Neil. This computer-simulated negotiation situation is a job contract negotiation between a high school student negotiating a job contract with the personnel manager of a movie theater. There are three issues: the number of movie passes received, the number of weekend work hours required, and the hourly wage received, for the job. There are also some incompatible or competitive aspects to the interdependence between in the two parties. Offsetting priorities create some integrative potential in the negotiation simulation. The student can compromise on the issue of least importance to him or her (wages) in exchange for a concession from the management representative on the issue of most importance to him or her (weekend work hours). The subject's task in the simulation is to exchange proposals by selecting predefined messages to try to reach an agreement. The subject is led to believe that the "other party" is a person. However, the other party is a computer program designed to reciprocate the subject's proposals in terms of the opposing interests identified above.

Game-based assessments. Another innovative item format for this aspect of the proposed work is game-based assessments, drawing on extensive prior R&D in this area by CRESST researchers (e.g.,

Baker, Chung, & Delacruz, 2008, 2012; Baker & Delacruz, 2008; Delacruz, Chung, & Baker, 2010). The general idea is to leverage the engagement and interaction potential of games to create a setting where students are engaged in a complex task because of game design features. In game-based assessments, a task is presented to the player that often involves fictitious scenarios and characters with a storyline that creates a puzzle situation. Solving the puzzle (or problem) requires that players harness resources, devise and attempt solutions, and incorporate feedback from the game into subsequent solution attempts. Typical game-based outcomes that reflect learning include number of content-related errors and successes and player attainment (e.g., final level, number and types of achievements).

An additional advantage of games for assessment purposes is that game-based measures can be derived from game telemetry and be subjected to thorough psychometric and validation testing. We have found across numerous design studies and experimental studies that such game-based measures are consistently sensitive to design differences and correlate with learning outcomes (Chung, in press). Additionally, game data lends itself to advanced data mining and related cluster analytics that can provide rich assessment information. Data mining summarizes the data set into a small set of latent variables that are nontrivial, implicit, and previously unknown—particularly appropriate for the analysis of game event data where little prior information is available. CRESST has used such analyses as a density estimation technique for identifying patterns within player actions taken to reflect differences in underlying attitudes, thought processes, or behaviors. Cluster analysis has yielded discovery of player errors that verified anecdotal accounts and more important, led to the discovery of errors and misconceptions that had not initially been under consideration (e.g., Kerr & Chung, 2011, 2012, 2013).

Although a full-scale pilot testing of these innovative items is beyond the scope of this proposal, we plan to conduct small-scale tryouts of items with small sets of students (25-50) to provide initial information on usability, understanding, and completion process.

### **Development and Piloting of Digital Resources**

As described throughout the proposal, our integrated research and design plan—including qualitative and quantitative feature analysis, international benchmarking, and new item development—

will result in a wealth of information about the State's CCSS assessments and their measurement of career and college readiness. These findings and their implications will be shared by project leadership with the broader CDE administration and also with the other constituent States that are part of Smarter Balanced. In addition, however, we feel it important to build into our proposed project mechanisms for sharing our findings with broader communities of stakeholders in the State, towards the ends of increasing understanding, interpretation, and use of assessment information about career readiness.

In particular, we propose to develop digital resources for teachers, students, and parents. Our digital resources for students and parents will focus on providing information about the career ready constructs addressed in the State assessments, how they connect to the CCSS and classroom instruction, and how they connect with the world of work and exemplar careers. Students and parents will be able to interactively explore specific constructs, trace pathways through virtual ontologies/learning maps, and view practical examples of how constructs are evidenced in the world of work.

CRESST will draw on its extensive experience in designing computer-based learning supports in developing these resources, including our prior work developing standards-based formative assessment tools and instructional resources as part of our IES-funded National Assessment Center and Instructional Technology Center (Buschang, Chung, Delacruz, & Baker, 2012; Chung, Choi, Baker & Cai, 2014; Phelan, Choi, Vendlinski, Baker, & Herman, 2009; Phelan, Vendlinski, Choi, Dai, Herman, & Baker, 2011) and an extensive line of work developing training tools and resources for the military (Dietel, Bewley, Chung, Vendlinski, & Lee, 2012).

The potential importance and impact of teachers' formative use of assessment data—to understand student learning and inform instructional decision making—has been documented by CRESST and other experts in the field (Black & Wiliam, 2009; Herman, 2010; Herman, Osmundson, & Silver, 2010; James et al., 2007). Critical in this formative assessment process are both the ability of teachers to understand and interpret the assessment results as presented and to make connections between those results and instructional strategies and responses (Herman, 2010). It is clear that to make the results of our project most accessible and usable to teachers we need to develop resources specifically targeted at providing

them the information that they would need to use assessment data in a meaningful way. We propose to develop a computer-based resource with several goals in mind—providing clear information about the career-ready constructs we identify, their connection to the CCSS, and what career readiness indices on the State tests mean. The resource will be interactive, in that teachers would be able to dig deeper into specific constructs, to explore connections within and between constructs and the Common Core and learning pathways via ontologies, and to access instructional resources and score interpretation information based on specific career readiness construct scores.

While teachers are a critical audience for the findings and applications of our project, we also feel that students and parents should be of central consideration. Although students continue to spend considerable time being assessed, there typically is not consideration given to making them active participants in the testing process who have an understanding of the rationale for and potential utility of their assessments. While schools, States, and districts are acknowledging the importance of career education and readiness in their educational programs (e.g., Perry & Wallace, 2012), it is clear that students' knowledge and understanding of these issues often does not meet the need (Johnson & Rochkind, 2010; Strom, Strom, Whitten, & Kraska, 2014).

All resources will be available via both CDE websites and the CRESST website. Initiation of design and programming of these resources will begin during the second half of the first year of the project, as initial features and findings from project studies become available. Beta testing of the resources will occur in Fall 2016. We will conduct face-to-face testing with 30 to 40 each of volunteer teachers, students, and parents. As part of this beta testing, users will be asked to try out different system components; surveys about usability and satisfaction of the system will be supplemented with “click tracking” data of how users navigate the system. Expert advisors will be drawn on to provide feedback on resource content and design throughout the development process. Refinement of the resources will occur in Winter 2017 (based on the results of the beta testing and expert advisor feedback), and they will be made broadly available, via CDE and CRESST websites, to stakeholders by Spring 2017.

#### 4. Overview and Summary of Priorities

Table 4 summarizes the Absolute and Competitive Preference priorities addressed by this proposal.

Table 4

##### Summary of Priorities Addressed

Priority	Approach
Absolute Priority 1: Collaboration	The proposal represents a collaboration between an IHE (UCLA/CRESST) and SEA to improve the quality of both CDE's assessments and the larger Smarter Balanced assessment pool.
Absolute Priority 2: Multiple Measures	The proposal addresses a range of measures for student achievement, building new constructs and indices not currently part of the State data set.
Absolute Priority 3: Charting Student Progress Over Time	Our statistical modeling approach will analyze multiple waves of student data, from field test, to operational, to additional validity data.
Absolute Priority 4: Comprehensive Academic Assessment Instruments	We plan to develop new and innovative item types that are technology based and address career readiness constructs not part of the current State system.
Competitive Preference Priority 1: International benchmarking	Our plan includes international benchmarking analyses, drawing on both PISA's and CRESST's work with Korea.
Competitive Preference Priority 2: Leveraging technology	We will both develop innovative, technology-based item formats and develop digital support materials for teachers, students, and parents.

#### 5. Quality of Personnel

The proposed project represents collaboration between CDE and CRESST, bringing together leaders in State educational administration with those in educational research and assessment.

**Keric Ashley** (Deputy Superintendent, District, School, and Innovation Branch, California Department of Education) will serve as PI for the project. He will provide overall conceptual and implementation leadership for the project, with an emphasis on the application of the project activities and findings to CDE's assessment system. He will serve as the conduit of the project's work and findings to the larger CDE leadership and constituents. His experience with assessments and assessment data is extensive. For the last 22 years, he has provided leadership related to the California Longitudinal Pupil Achievement Data System, the Academic Performance Index accountability measure, and the Smarter Balanced assessment system. He currently serves as Deputy Superintendent over the divisions that administer assessments, accountability, Title I, and data management activities.

Mr. Ashley will be supported by a full-time project director/manager housed at CDE. This person will be hired at time of award should the project be funded. CDE will conduct a search for an individual with experience in K-12 project management, including budgeting, supervision, reporting, and dissemination, and has already drafted a job description for this position should the project be funded. They will provide day-to-day management and oversight of the project activities, manage budget and timelines, and serve as logistical point of contact with subawards and other CDE departments, oversee production and execution of all deliverables and products, and assure communication and coordination between all partners. The project manager will be required to have prior experience with monitoring large-scale assessments.

Additional key staff for the project will include:

**Li Cai** (Co-Director at CRESST and UCLA Professor of Education and Psychology) will serve as the CRESST team lead, providing intellectual leadership and oversight for all technical aspects of the project and technical quality control for all project publications and documents. Dr. Cai is an internationally known expert in psychometrics, statistical analysis, and measurement. His research focuses on the development and application of innovative psychometric and statistical approaches to solve design and methodological issues in educational assessment and instruction research, complex randomized evaluation studies, and quasi-experimental and longitudinal studies. For his work on

computational statistics, he received the Presidential Early Career Award for Scientists and Engineers and numerous awards from professional associations. He authored psychometric software programs that have been widely used in large-scale educational, psychological, and health outcomes assessment research and practice in the US and abroad. He has collaborated widely with researchers in education, mental health, and substance abuse on a range of measurement and design issues, and has published extensively in the field. He is currently an Editor of *Journal of Educational and Behavioral Statistics*, a joint publication of AERA and American Statistical Association. He leads CRESST's psychometric work in support of the Smarter Balanced Assessment Consortium and CRESST's current work with the ELPA21 consortium.

**Kilchan Choi** is the CRESST Assistant Director/Principal Scientist for Statistical and Methodological Innovations. He will, along with Mark Hansen, lead the statistical and analytic aspects of the project, as well as coordinate data access and data reporting. His expertise is in the development and application of advanced statistical methodologies and hierarchical modeling to applied problems in multi-site evaluation, growth modeling, and school effectiveness/accountability in a large-scale assessment system. He has developed a new value-added model applied to multiple-school, multiple-cohort longitudinal data in estimating different cohort effects and teacher effects that have been applied to a range of CRESST projects. In collaboration with CRESST leadership, Dr. Choi has pioneered the innovative functional validity analytics that will be used in the proposed project and have been applied to both large State databases and the Smarter Balanced assessment data set.

**Mark Hansen** is a Senior Researcher at CRESST and Research Assistant Professor of Education at UCLA. He will, along with Kilchan Choi, lead the statistical and analytic aspects of the project. Dr. Hansen's work focuses on the use of latent variable models (item response theory and cognitive diagnosis models, in particular) to support the design of assessments used in educational, psychological, and health-related research. This has included the development and evaluation of methods for estimating such models and for examining the extent to which they fit real data. Dr. Hansen works closely with Dr. Cai on a range of measurement projects with an emphasis on the assessment of ELs, including CRESST's current work with ELPA21.

**Eva Baker** is Co-Director of CRESST and UCLA Distinguished Professor of Education. She will lead the qualitative feature analysis aspects of the work as well as the new item development. Dr. Baker is an internationally renowned expert in educational assessment whose research focuses on the integration of standards, instruction, and measurement, including design and empirical validation and feasibility of complex human performance, particularly in technology. She was the President of the World Education Research Association, President of the American Educational Research Association, and is a member of the National Academy of Education. Throughout her vast experience, she has led dozens of R&D projects in educational assessment design, research, application, and technology funded by the U.S. Department of Education, NSF, the military, private funders, and SEAs and LEAs. With an extensive bibliography, she has also received numerous awards including the American Educational Research Association and American College Testing Program, E. F. Lindquist Award, 2013 (Outstanding Applied or Theoretical Research in the Field of Testing and Measurement), and is the American Educational Research Association 2014 Award Recipient.

**Ayesha Madni** is a Senior Researcher at CRESST. She will serve as team manager for the CRESST team, providing day-to-day management of CRESST's activities, timeline, and budget, manage all new data collection activities (e.g., pilot studies, usability testing), and will be the administrative point of contact and coordinate with the overall project director/manager. She will also assist Dr. Baker in the qualitative content analysis and item design strands of the work. Dr. Madni brings to the project prior experience in a wide range of areas, including student motivation, social and emotional learning, human learning and memory, assessment design, and instructional technology. She has led the qualitative feature analytic approaches that will be used in this project on several prior CRESST CCSS-based projects including work funded by the Gates Foundation and CCSSO. She has developed assessments, with an emphasis on innovative, technology-based designs, on a range of projects, including the DARPA ENGAGE initiatives and the NSF-funded Mobilize project.

**Christina A. Christie** is Professor and Head of the Social Research Methodology Division in the UCLA Graduate School of Education and Information Studies. She will serve as lead external evaluator

for the project (please note that Dr. Christie, although housed on the UCLA campus, is not affiliated with CRESST). Dr. Christie has received funding from a variety of sources to conduct evaluative research on education, social and behavior programs targeting at-risk and underrepresented populations. Presently, she is leading several studies, including those focusing on early childhood education initiatives in California, a large place-based initiative designed to promote positive early childhood outcomes, and a variety of community college developmental education programs. Her research focuses on deepening our understanding of evaluation use, capacity building, and evaluation policy. Christie served on the board of the American Evaluation Association (2011-2013) and is the former Chair of the Theories of Evaluation and Research on Evaluation Divisions of AEA. She is associate editor of the *American Journal of Evaluation* (2014-2017) and serves on the editorial board of *Studies in Educational Evaluation*. She is the editor of four books and has published over 50 articles and book chapters on evaluation.

**Harold O'Neil** is a Full Professor of Educational Psychology and Technology in the Rossier School of Education at the University of Southern California. He has conducted extensive research in career- and college-ready constructs, such as assessment of 21st century skills (e.g., adaptive problem solving), the teaching and assessment of self-regulation skills (e.g., metacognition and self-efficacy), and the effectiveness of computer simulations and games to solve education and training problems, with work funded by the Institute of Education Sciences (IES), the Office of Naval Research (ONR), and the Defense Advanced Research Projects Agency (DARPA). He has an extensive publication record and recently co-edited books on the assessment of 21st century skills and distance learning. He will collaborate with the CRESST team on the development of content ontologies and qualitative feature analysis for career and college readiness as well as on innovative item design and testing.

Beyond these key personnel, the project team will include a range of other personnel whose expertise will be targeted to meet specific needs of the project. **Noelle Griffin** (CRESST Associate Director) has provided leadership to numerous national studies of instructional, assessment, and professional development interventions over the last two decades, and will lead the development of digital tools and learning support for teachers, students, parents, and other stakeholders as well as participate in

item review/feature analysis. **Greg Chung** (CRESST Assistant Director for Research Innovation) has extensive experience in developing web-based assessments, tools, and learning supports using Bayesian networks, domain ontologies, and other advanced computational approaches, including his work as Co-PI for the IES-funded Center for Advanced Technology in Schools (CATS). He will collaborate with Noelle Griffin on the development of technology-based resources as well as provide overall support and advisement to all technological aspects of the project and participate in item review/feature analysis.

**Jinok Kim** is an experienced psychometrician who has worked extensively with large State and national databases, and will provide statistical and analytic support for the project. **Patricia Carroll** is an expert in English learning instruction and assessment, and will provide content support in these areas throughout all project strands, in addition to participating in item review/feature analysis. The project team will also include a range of CRESST support staff (programmer, researcher assistant, administrative support) who have extensive experience on numerous large-scale educational research and assessment projects.

In addition to our core project staff, we will draw on an expert advisory group in a wide range of fields to provide objective, independent feedback on our progress, activities, and products. This group will provide feedback to our project work plans and findings and serve as a quality control checkpoint, as well as support communication with various professional communities. We plan to include experts in the area of assessment design, statistics/psychometrics, college readiness, career readiness, and educational policy, with a goal to include constituents from academia, educational administration, practitioners, and the business community. The final membership of this group will be selected at the outset of the project with feedback from DoE, but some initial experts identified who have agreed to serve if asked include experts in assessment design and policy (Robert Mislevy, Michael Nettles, Edmund Gordon), statistics and psychometrics (David Thissen, Stephen Raudenbush), career and career readiness (David Conley, William Tierney), metacognitive skills (Sandra Graham, Robert Rueda), instructional technology (Jeremy Roberts, Louis Gomez), and business (Simon Maskell). We will also draw on leadership from our already identified potential data collection sites (e.g., College of the Canyons, San Bernardino Valley College, SWOS) for advisement and feedback as needed.

## **6. Institutional Resources/Capacity**

As a collaboration between CDE and CRESST, the project will draw on the extensive expertise, experience, and organizational/infrastructure resources of these two esteemed organizations, as well as of other partner groups in the project.

CDE is the lead/prime organization for the proposal. The CDE is a State agency with headquarters located in Sacramento. The CDE oversees California's diverse and dynamic public school system, which is responsible for the education of more than 6.2 million students in more than 10,000 schools, including over 1,100 charters, in over 1,000 districts statewide. The CDE is responsible for enforcing education law and regulations; and for continuing to reform and improve public education programs. The CDE includes over 1200 employees within five separate branches. In the District, School, and Innovation Branch supervised by Mr. Ashley, the CDE oversees various large scale statewide testing programs, including the new California Assessment of Student Performance and Progress (CAASPP) System that utilizes both computer-based and paper-pencil assessments such as the computer-based Smarter Balanced Assessment Consortium interim assessments, summative assessments, and formative tools (Digital Library). Since 2011, California has been a member of the Smarter Balanced Assessment Consortium and has worked with over 21 States in the development of the Smarter Balanced assessments. Since 2004, the CDE has worked collaboratively with higher education (California State University and California Community College systems) to use assessment results for the Early Assessment Program to measure their readiness for college-level English and mathematics. Professional psychometric staff in the Assessment Development and Administration Office are available to assist in technical oversight of the project and to conduct reviews of project processes and products.

CRESST, led by Co-Directors Li Cai and Eva Baker, will provide intellectual and technical leadership for the project, and lead the design and analysis for all project components. CRESST has been an international leader in the fields of educational research, assessment, evaluation, and psychometrics/statistical methodology for over 40 years, and would bring to this project the extensive experience, expertise, and intellectual and practical resources needed for success. CRESST has led

numerous large-scale R&D projects in the areas of K-12 and post-secondary assessment over its history, including direct work with States and districts in the design and deployment of their assessment systems, projects supported by private funders (e.g., the Bill and Melinda Gates Foundation, Hewlett Foundation, Roddenberry Foundation, PBS Kids) focused on designing and implementing student assessment innovations, and numerous federally funded research endeavors, including multiple U.S. Department of Education-funded Centers dating back over 20 years (most recently the IES-funded National Center in Instructional Technology: The Center for Advanced Technology in Schools [CATS]). Most recently, CRESST has lent its expertise to leading validity, psychometrics, and IT studies for the Smarter Balanced Assessment Consortium.

In addition to running large-scale programs of assessment and research studies/complex data collection in school, district and State sites, CRESST has successfully managed high-profile outreach activities such as national conferences and webinars, and maintains a high-traffic website. CRESST employs approximately 70 people including experts in areas such as assessment, instruction, statistics, measurement, instructional technology, educational psychology, cognition, content domains, adult education/training, professional development, programming, and graphic design, and has ongoing relationships with a cadre of expert partners from institutions including USC, UC Berkeley, UC Santa Barbara, UC Davis, University of Chicago, Arizona State University, RAND, and University of North Carolina. CRESST also has access to a range of expertise from other schools and programs on the UCLA campus, ranging from computer science, to mathematics, to psychology, to linguistics. Housed on the UCLA campus, with a full suite of research and administrative office space on campus, CRESST also has access to the campus' entire intellectual, administrative, and technology resources including, but not limited to, the University's IT network and administration (for data storage, access and networking; virtual communication; and web-based dissemination), the University's contracts and grants (for administrative and contracting arrangements with prime and subs/vendors), and finance (for billing and purchasing needs). Both CRESST and the larger university have had extensive experience in successfully

managing to completion projects of this size (or larger), and have the intellectual, organizational, and practical resources available for the proposed work.

The SRM Evaluation Group at UCLA will serve as the external evaluators for the project. They are leading experts in the field of educational evaluation, promoting the use of carefully conducted evaluation studies designed to improve social conditions for a wide range of programs, projects, and initiatives. Led by UCLA Professor Christina Christie, the UCLA SRM Evaluation Group are experts in a range of rigorous social research methods and evaluation procedures, including experimental and quasi-experimental design, hierarchical linear modeling, causal inference, measurement theory, item response theory, structural equation modeling, ethnographic and case study methods, discourse and conversation analysis, and geographical information systems (GIS). The SRM Evaluation Group has extensive experience in large-scale evaluation efforts, with a focus on K-16 education. Recent evaluation projects led by the SRM Evaluation Group include evaluation of several State initiatives focused on improving K-12 teacher quality, evaluation of district-wide school reform efforts for Long Beach Unified School District, and evaluation of university-wide college readiness/preparation programs.

As described earlier in the proposal, our plan includes proposed pilot, small-scale data collection from community college and military participants. As noted above, College of the Canyons, San Bernardino Valley College, and SWOS have agreed to participate in this capacity (please see the support letters attached to this proposal), with the option to include additional sites who express interest if this proposal is funded.

Although not a formal partner in the proposal, the Smarter Balanced Assessment Consortium will be an important point of connection for the proposed work, serving as a conduit for sharing information from this project with the larger Consortium of States. As noted in the letters of support included with this submission, in addition to the Consortium's interest as a whole, several Smarter Balanced States have expressed specific interest in using the tools and methodologies that will come from this proposal.

## **7. Project Management Plan**

The overarching goal of our management plan is to use the combined expertise of the core project staff, partners, and advisors to meet or exceed the goals of the project, within the time and budget constraints, and at the highest possible quality. Experts in the fields of business and education have posited that successful organizational management involves maximizing of intellectual, social, and organizational capital towards the accomplishment of project goals (Hargreaves, 2001; Kelly, 2004; Putnam, 1995). As detailed throughout the proposal, we have assembled extensive expertise in terms of CDE and CRESST staff, evaluators, proposed advisors, and the outreach resources of the Smarter Balanced Assessment Consortium. We approach this work as an integrated overall plan where expertise is drawn at specific times to meet specific project goals, with ongoing feedback and quality control a key consideration.

### **Organization and Leadership**

The organizational plan for the project is composed both to maximize the intellectual capital available and to provide smooth coordination and tracking of the work. To allow for continued review and refinement of the project plans and goals throughout the project span, the work will be led by a Senior Management Team, headed by the project PI (CDE, Keric Ashley). The team will be responsible for finalizing and implementing design and analysis plans, work plans, and products; overseeing outreach and dissemination; and coordinating with the larger Smarter Balanced Assessment Consortium. The management team will also have responsibility for ongoing communication with the Department of Education and for fiscal management. The team will include Keric Ashley (PI), Project Director/Manager (TBN), Li Cai (CRESST team lead), Christina Christie (lead evaluator), and Ayesha Madni (CRESST team manager). The management team will have weekly teleconferences, with decisions, plans, and outcomes distributed to other project staff with opportunities for feedback. One phone conference per quarter will be dedicated exclusively to evaluator findings and feedback.

In addition to the lead management team, there are several targeted working groups who will manage and oversee different key aspects of the project. The constitution and focus of these working

groups may change over time as project needs evolve, but the initial set are included in Table 5, along with group leads. Each of these groups will meet at minimum bimonthly, and provide monthly status updates to the leadership team.

Table 5

## Project Working Groups

Working group	Areas of focus	Leads
Statistics and Methodology	All quantitative analysis and study design, data access, and data reporting	Keric Ashley, Li Cai, Kilchan Choi
Feature Analysis and Item Design	All career/college readiness content review, construct development, and new item design/testing	Keric Ashley, Eva Baker, Ayesha Madni
Resource Development	Design and testing of new resources/support materials for teachers, students, and/or parents	Keric Ashley, Noelle Griffin, Greg Chung
Outreach and Dissemination	Quality control and technical quality review of all publications and outreach materials; liaison with evaluation team, subawards, and advisory group	CDE, CRESST
Site Outreach and Coordination	Coordination and liaison with sites where data collection will occur (including pilot testing of new items and other resources)	CDE Project Coordinator, Ayesha Madni

As noted earlier in this proposal we will draw on technical advisors from the research, K-16 education, and business communities throughout the project lifetime to provide ongoing quality control, review, and feedback. This group will serve as a quality control checkpoint, and support communication with various professional communities. We plan for the group to have quarterly meetings with the advisory group, with one of those meetings each year being face-to-face in Sacramento. Additionally, we

will reach out to individual board members on an as-needed basis for review and input in their specific areas of expertise.

Drawing on our collective experiences in managing large-scale projects that involve partners and sites distributed across the country, we plan to utilize a number of technological resources to facilitate regular communication both among the project team and with outside groups and constituents. We will maintain a secure Web server for purposes such as weekly updates and sharing of draft materials, and resources, including opportunities for virtual collaboration on documents. Web-based conferencing will also be used for communication and collaboration among and between groups. Although we plan to rely on virtual communication as much as possible, we have also budgeted for a small number of trips per year for the CRESST and CDE teams to meet with each other face to face.

### **Tasks and Timeline**

In Table 6 we provide a task/timeline chart indicating activities by year/quarter. For purposes of tracking, we have organized the tasks into headings of the six major studies/components of the project: (1) career/college readiness feature analysis of existing State assessments; (2) psychometric modeling study of existing State data; (3) international benchmarking study; (4) supplemental validity studies; (5) new item development and testing; and (6) development and testing of digital resources for teachers, students, and parents. We have also included a section specific to administrative tasks (i.e., meetings and reporting), including updates to State leadership, Smarter Balanced Assessment Consortium, and our funders.

Table 6

## Tasks and Timeline

	Year 1				Year 2			
	(10/1/15 – 9/30/16)				(10/1/16 - 9/30/17)			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>Qualitative Feature Analysis</b>								
Task 1: Ontology development/and expert review	X							
Task 2: Review and finalization of features	X							
Task 3: Feature rating and step-by-step analysis		X						
Task 4: Finalize cognitive lab protocol	X	X						
Task 5: Conduct cognitive labs			X					
Task 6: Analyze and synthesize feature analysis cognitive lab data			X					
<b>Psychometric Modeling Study</b>								
Task 1: Acquisition and management of data	X	X						
Task 2: Feature-based model tryout			X	X	X			
Task 3: Final calibrations				X	X	X		
<b>International Benchmarking Study</b>								
Task 1: PISA analysis			X	X				
Task 2: Korean assessment analysis					X	X		
Task 3: Quantitative comparative study					X	X		
<b>Validity Studies</b>								
Task 1: Recruit participants				X				
Task 2: Select assessment forms/draft survey items			X	X				
Task 3: Collect data				X				

	Year 1				Year 2			
	(10/1/15 – 9/30/16)				(10/1/16 - 9/30/17)			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Task 4: Analyze and synthesize results					X			
<b>New Items</b>								
Task 1: Conduct gap analysis				X				
Task 2: Develop item specifications				X				
Task 3: Drafting and initial programming of items					X			
Task 4: Expert review of items						X		
Task 5: Small-scale testing of items (with students)						X		
Task 6: Analyze testing data							X	
Task 7: Refine items based on findings							X	
Task 8: Prepare items for wider distribution								X
<b>Digital Resources</b>								
Task 1: Develop detailed specifications				X				
Task 2: Develop content				X	X			
Task 3: Conduct expert review					X			
Task 4: Refinement and programming of materials					X	X		
Task 5: Usability testing and analysis of data						X		
Task 6: Refinement of materials and preparation for deployment							X	X
<b>Administrative</b>								
Leadership team meetings (weekly)	X	X	X	X	X	X	X	X
Advisory group meetings (quarterly)	X	X	X	X	X	X	X	X
Update reports to CDE leadership (monthly)	X	X	X	X	X	X	X	X

	Year 1				Year 2			
	(10/1/15 – 9/30/16)				(10/1/16 - 9/30/17)			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Update reports to Smarter Balanced (quarterly)	X	X	X	X	X	X	X	X
Report to funder (annual)				X				X

*Risks and mitigations.* A large, multi-faceted project such as this proposed work faces multiple risks to optimal completion. However, acknowledging, monitoring, and addressing these potential risks in an ongoing fashion, drawing on the extensive project management experience of both CDE and CRESST, will serve as effective mitigation to these risks. One important area of risk to consider is slippage in tasks and timeline. Although we cannot anticipate all potential causes of timeline shift, we have put the structures in place to identify and remedy any slippage that may occur. The Project Manager and CRESST team manager will provide ongoing tracking of tasks and timeline, and alert the leadership team to any potential threats and changes identified. The monthly reports from work teams will provide another opportunity to identify these risks. The biweekly Leadership Team meeting will provide the opportunity to review any threats to timeline and implement organizational changes, technical changes, or reallocation of resources needed to address these threats.

Another area of potential risk to this type of project is data access, sharing, and security. CRESST and CDE have an extensive history of collaboration and data sharing that will mitigate this risk, with both sides already having the structures in place to share, access, store, and receive data. Additionally, CRESST as part of its work with the Smarter Balanced Assessment Consortium has in place stringent data security and access protocols—vetted by CDE as part of their consortia membership—for student test data. The use of these existing data security protocols will further speed the access and transfer of the data from CDE to CRESST and facilitate project completion. In terms of project activities that require collection of new data, our communication with sites (e.g., community college) in the writing of the proposal, the lead time built into the timeline for coordination with these sites, and assignment of a work

team specifically focused on these coordination activities will serve to assure timely and well-coordinated site access.

A final area of risk to consider is quality control—that is, managing and maintaining the highest technical and practical quality of the work under time and resource constraints. An important mitigation for this risk is evident in the personnel and partnership plan for the project, which includes, in addition to CDE leadership, internationally known experts in the fields of educational research, assessment, and career/college readiness from CRESST and USC and an expert evaluation team led by Christina Christie. Beyond the high intellectual capital/quality of the partners involved, as noted above our project management strategy is designed to provide multiple opportunities and checkpoints for the leadership team to identify and address areas of concern in terms of the design, execution, and output of the project. Finally, the advisory group will serve as an ongoing resource to provide technical and quality review on project plans, execution, and outputs, both through structured quarterly meetings and less structured targeted review activities based on specific advisor expertise and project need.

### **8. Project Evaluation**

A rigorous evaluation of the proposed project will be conducted by the SRM Evaluation Group, under the direction of Christina Christie. The evaluation team will act as an integral friend who can be critical, collecting data related to the implementation of project activities and the achievement of study aims. The team will provide regular feedback in quarterly reports to the project's leadership team. These quarterly reports will summarize evaluation findings to date, identify any areas where action may be needed to ensure timely completion of planned activities, and provide suggestions for enhancing the use of the research beyond the grant period (including strategies for communicating study findings). At the conclusion of the project, the evaluation team will present a final report to the project leadership. In these ways, the proposed evaluation seeks to fulfill both summative and formative purposes—holding the project team accountable for the proposed activities, while also facilitating mid-course adjustments that ultimately improve the quality of work performed.

In keeping with these intentions, the evaluation team will focus on addressing the questions related to the various project activities or tasks. For each activity (shown in italics), we pose questions related to both process/implementation (“Process Questions”) and impact/outcome (“Outcome Questions”). We also identify the planned approach (“Approach”) for answering each question, including data sources.

*Activity 1: Development of ontology for the career-readiness domain.* The purpose of this activity is to generate a coherent and operationalizable graphical representation of the domain. Process Question: What sources of information were utilized in the development of the domain ontology? Outcome Question: To what extent is the ontology perceived by experts as an accurate and complete representative of the domain? Approach: The evaluation team will review the draft protocol for the ontology development and will review monthly reports from the ontology work team. The team will also solicit reviews of the protocol (including planned data sources) and of the domain ontology (both initial drafts and the final version) by domain experts.

*Activity 2: Qualitative review (feature analysis) of existing SBAC item pool.* The purpose of this activity is to identify item features, characteristics, and attributes (including stimulus and mode of response) that may influence cognitive requirements and item response/score. Process Questions: What kinds of features were described/identified? What methods (human judgments, automated feature extraction) were used to identify item features? Outcome Questions: To what extent do item features capture differences that are salient to item performance? Do features explain differences in item parameters (including difficulty)? Approach: The evaluation team will review draft protocols for the feature analysis and will review the final technical summary report (focusing, in particular, on descriptions of the distributions of features across the item pool and analyses of the extent to which features explain variability in item performance).

*Activity 3: Psychometric modeling of existing State test item response data.* The purposes of this activity are to examine relationships between item features and item response data and to generate scores/indices that support inferences about career readiness. Process Questions: In what ways do the psychometric models used resemble (and in what ways do they depart from) the models used in current

operational practice? What scores or indices do these models provide? At what level are the scores/indices interpreted (student, teacher/classroom, school, etc.)? Outcome Questions: To what extent might the proposed models be used in practice? Is there evidence of good model fit? What technical expertise, hardware, and software are needed to fit these models? Approach: The evaluation team will review the technical summary on the psychometric analyses and solicit reviews of this summary by assessment/measurement experts.

*Activity 4: Gap analysis.* The purpose of this activity is to characterize the extent to which the existing item pool spans the domain of career readiness (and identify any aspects of the domain not covered). Process Questions: What methods were used in conducting the gap analysis? What were the qualifications of raters? Outcome Questions: To what extent did gap analysis identify aspects of the domain with better and worse coverage in the existing pool? Did the gap analysis identify clear priorities for new item development? Approach: The evaluation team will review the draft and final protocols for this analysis, as well as the technical summary.

*Activity 5: New item development.* The purpose of this activity is to obtain items aligned to aspects of the career readiness domain not currently represented in the existing SBAC item pool. Process Question: What procedures were used in item development? Outcome Question: To what extent did the new item development address the identified gaps in domain coverage? Approach: The evaluation will review the summary report the gap analysis (Activity 4, above), monthly reports from the item development work team, and the final summary report on item development.

*Activity 6: Collection and evaluation of initial validity evidence.* The purpose of this activity is to examine the extent to which scores/indices support valid inferences about students' career readiness. Process Question: What evidence was collected related to the validity of score interpretations? Outcome Questions: To what extent did the project collect relevant, appropriate evidence concerning the validity of inferences supported by the assessments? Is the validity evidence (strengths and limitations) accurately described? Approach: The evaluation team will review planned data collection activities and will solicit feedback from assessment and measurement experts. Planned validation efforts will be compared against

the current test development standards (AERA, APA, & NCME, 2014), which describe various sources of validity-related evidence.

*Activity 7: International benchmarking.* The purpose of this activity is to facilitate comparisons of the performance of U.S. students (with respect to career readiness) and students in other educational systems around the world, to calibrate performance levels/expectations, and to offer insights on alternative assessment design. Process Question: Were the methods used in the benchmarking study appropriate and rigorous? Outcome Question: Does the benchmarking study provide a clear basis for comparisons across countries? Approach: The evaluation team will solicit review of the benchmarking study protocol summary report by assessment experts.

*Activity 8: Development of digital resources (for teachers, students, and parents).* The purposes of this activity are to provide instructional materials and supports related to career readiness that are closely tied to assessment results and to support formative uses of State assessments. Process Question: What materials were developed for each audience or stakeholder group? Outcome Questions: To what extent do the resources developed for the project match the intended uses? To what extent are resources clearly tied to assessment results? How do stakeholders rate the relevance, quality, and usability of resources? Approach: The evaluation team will review materials and resources produced through the project, as well as the delivery platform (digital library/website). The evaluation team will conduct one-on-one, face-to-face interviews with potential users of these resources (teachers, students, and parents) to solicit feedback concerning the quality and relevance of the materials and their accessibility/usability.

*Activity 9: Dissemination/communication of findings.* The purpose of this activity is to share study findings with stakeholders and encourage utilization of study products (domain ontology, innovative items, novel methods of item analysis and scoring, formative resources, etc.). Process Questions: What communications (reports, presentations, etc.) were created as part of the project? To what audiences were communications directed? Outcome Questions: To what extent were the modes of communication and dissemination appropriate/effective in reaching intended audiences? Are there additional strategies for dissemination that should be considered? Approach: The evaluation team will review technical reports,

presentations, and publications generated by the project team. The team will also review usage statistics related to resources made available online (through a digital library or the CRESST reports website), including the number of visits and the number of downloads. If available, visits to the digital library will be disaggregated by stakeholder group.

*Additional implementation/process questions.* In addition to addressing the questions tied to specific project activities described above, the evaluation will also seek to address the following overarching questions: To what extent are project activities progressing according to the proposed timeline? Are there any barriers to completing tasks in a timely manner? Are adjustments to tasks or timeline appropriate? To what extent do project partners perceive the study to be progressing to their satisfaction? To what extent are project partners satisfied with level of collaboration achieved? To what extent has the project team implemented suggested adjustments (including, for example, expert feedback shared with the project leadership team during quarterly meetings)? To address these questions, the evaluation team will review the project timeline and continuously monitor monthly reports from work teams. Quarterly meetings with the project leadership team will provide an opportunity to identify any slippage from the timeline and ensure that necessary adjustments can be made. As noted above, quarterly meetings with the leadership team will provide opportunities to review evaluation findings and suggest course corrections/adjustments to project activities and/or the project timeline. It is expected that accepting and implementing some of these adjustments could require input/approval from the U.S. Department of Education. In such cases, the evaluation team will document the proposed action and its justification (i.e., identifying the specific evaluation findings that motivate the change). If the action is approved, the evaluator will then examine the extent to which there is clear follow-up (monitoring monthly work team reports, etc.).

At the conclusion of the project, the evaluation team will provide a final evaluation report summarizing the data collected concerning each of the process and outcome questions described above, findings by research question, mid-project actions taken on the basis of findings, and recommendations for ongoing research dissemination efforts and future project enhancements. It is, of course, hoped that

many of the products of this research—the domain ontology, newly developed items, instructional resources, novel psychometric modeling strategies, etc.—will have use long after the completion of the proposed work. However, the value and utility of these products may require additional work. It is likely, for example, that adoption of score reports that include novel indices will require additional validation. The final evaluation report will include suggestions for how various future work might be prioritized. Finally, the evaluation team will also pay attention to cost issues associated with the project, its deliverables, and potential cost barriers to scaling up.

### **9. Strategies to Scale**

At the end of the grant, CDE will have available a framework for reporting information from the Smarter Balanced assessment in a new way. This is important infrastructure that can serve as a starting point for the development of changes to applications and reports. Because the work is investigatory and basic research, it is inherently scalable with the new indices providing more information for subsequent decisions related to its use and application. CDE will receive a report from CRESST that incorporates design information regarding new ways to interpret and use data from Smarter Balanced assessments as well as descriptions of early evidence of validity of inferences one can make from using the data. As the fiscal agent for the grant, California will help lead the work and will be able to ensure that new ways of looking at the data from the assessment better address the needs of California teachers and students.

*Capacity to scale.* As described above, this proposal is submitted by a team, CDE and CRESST, with extensive outreach and communication pathways to a wide range of stakeholders, including administrators, teachers, parents, students, and the research/academic community. The support of the Smarter Balanced Assessment Consortium and the Hispanic-serving community colleges that have agreed to be part of the project will serve as further information conduits for the work. The combined resources of these groups will be marshaled to achieve our goals.

*Scaling goals and desired outcomes.* The proximal goals of the project are to provide a set of indices, tools, and resources to California that will be used State-wide by educators, teachers, parents, and other stakeholders. However, in looking at the scale-up potential for this work, desired longer range

outcomes include (1) the widespread use of the improved assessments and analyses in high school and in transition environments to document students' career and college readiness; (2) the broad acceptance, credibility, and instructional application of the findings from such assessments; (3) the adoption by assessment developers of the strategies and procedures in the proposal—feature analysis and related quantitative analyses—as a way to improve the value proposition of assessments without adding time or substantial cost for American schools; and (4) the acceptance and adoption of innovative technology models for assessment design and delivery, where the technology models are applied across different domains, learners, and institutions.

In the most literal interpretation of the RFP, we emphasize the first scaling goal, that is, the acceptance and spread of the assessments in actual use. Unlike scaling models emerging from entrepreneurial or mature business models, the target audience of the first scaling goal is a limited set of gatekeepers that can open access to the career and college ready enhancement of current California and, by generalization, for use by Smarter Balanced Assessment Consortium members. Unlike trying to acquire a customer base student by student or school by school, decisions are made in adopted assessments by policy groups (such as the California Board of Education), the Technical Advisory Group guiding California's assessments, and to some degree the leadership, including K-12 and postsecondary committee members of the Smarter Balanced Assessment Consortium. These groups, in California as everywhere, are often subject to a rapidly changing political environment. Decisions are often influenced by groups that exemplify or shape public opinion. The various political actors include school district leaders, local boards, teacher and other professional groups, politicians, and advocates making their opinions known through face-to-face and media engagement. California has agreed to participate in the Smarter Balanced Assessment Consortium while at the same time seeking adaptations, for instance in reporting, that meet State needs. State leaders are anxious to find ways to demonstrate the value of assessments beyond the measurement of student performance on the adopted standards. Of particular interest is the desire to have additional indicators of career and college readiness to inform instruction and

the content of the curriculum. Leaders also wish to provide new approaches to engage teachers in innovative teaching practices.

To support the scaling up of the program, California will report findings and illustrate their utility in official websites, as well as use their website to disseminate developed tools and resource. CRESST's high traffic website will also be used as a source for these materials. CRESST and CDE will present their results at a range of national academic and practitioner-based conferences, such as AERA, CERA, and CCSSO. Similarly, CRESST will work with the California Community College System, entry-level hiring firms, and the military—California has the largest concentration of U.S. active duty and reserve military in the country—to further distribute the findings and tools. CRESST and CDE will develop use cases illustrative of how changes to instructional content and practices can flow from the findings. We will be aided in this process by engaging teachers who are expert in teaching students from various career/technical sectors in California.

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## References

- ACT. (2006). *Ready for college and ready for work: Same or different?* Retrieved from <http://www.act.org/research/policymakers/reports/workready.html>
- ACT. (2014). *The condition of college and career readiness 2014*. Retrieved from <http://www.act.org/research/policymakers/cccr14/>
- American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (AERA, APA, & NCME). (2014). *Standards for educational and psychological testing*. Washington, DC: Author.
- Baker, E. L. (2012). *Ontology-based educational design: Seeing is believing* (CRESST Resource Paper No. 13). Los Angeles: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Baker, E. L. (2015, April). *Transparency in design (and validity) of new assessments*. Paper presented at the annual meeting of the American Educational Research Association, The Robert L. Linn Distinguished Address, Chicago, IL.
- Baker, E. L., Aschbacher, P. R., Niemi, D., & Sato, E. (2005). *CRESST performance assessment models: Assessing content area explanations* (CSE Rep. No. 652). Los Angeles: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Baker, E. L., Chung, G. K. W. K., & Delacruz, G. C. (2008). Design and validation of technology-based performance assessments. In J. M. Spector, M. D. Merrill, J. J. G. van Merriënboer, & M. P. Driscoll (Eds.), *Handbook of research on educational communications and technology* (3rd ed., pp. 595-604). Mahwah, NJ: Erlbaum.
- Baker, E. L., Chung, G. K. W. K., & Delacruz, G. C. (2012). The best and future uses of assessment in games. In M. C Mayrath, J. Clarke-Midura, D. H. Robinson, & G. Schraw (Eds.), *Technology-based assessments for 21<sup>st</sup> century skills: Theoretical and practical implications from modern research* (pp. 227-246). Charlotte, NC: Information Age Publishing.

- Baker, E. L., & Delacruz, G. C. (2008). A framework for the assessment of learning games. In H. F. O'Neil & R. S. Perez (Eds.), *Computer games and team and individual learning* (pp. 21-37). Oxford, UK: Elsevier.
- Baker, E. L., & Delacruz, G. C. (2013, April). *Learning and assessment ontologies of cognitive processes: Step 1: Problem-solving*. Paper presented at the meeting of the American Educational Research Association Conference, Vancouver, Canada.
- Baker, E. L., & O'Neil, H. F., Jr. (2002). Measuring problem solving in computer environments: Current and future states. *Computers in Human Behavior, 18*, 609-622.
- Banks, D., Bader, P. K., Fleming, P. J., Zaccaro, S. J., & Barber, H. F. (2001, April). *Leader adaptability : The role of work experiences and individual differences* . Paper presented at the 16th Annual Conference of the Society for Industrial and Organizational Psychology, San Diego, CA.
- Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation, and Accountability, 21*, 5-31.
- Bock, R. D., Gibbons, R. D., & Muraki, E. (1988). Full-information item factor analysis. *Applied Psychological Measurement, 12*, 261-280.
- Bowers, C. A., Braun, C. C., & Morgan, B. B. (1997). Team workload: Its meaning and measurement. In M. T. Brannick, E. Salas, & C. Prince (Eds.), *Team performance assessment and measurement: Theory, methods, and applications* (pp. 85–108). Mahwah, NJ: Erlbaum.
- Bowers, C. A., & Cannon-Bowers, J. (2014). Cognitive readiness for complex team performance. In H. F. O'Neil, R. S. Perez, & E. L. Baker (Eds.), *Teaching and measuring cognitive readiness* (pp. 301-323). New York: Springer.
- Browne, M. W. (2001). An overview of analytic rotation in exploratory factor analysis. *Multivariate Behavioral Research, 36*, 111–150.
- Buschang, R. E., Chung, G. K. W. K., Delacruz, G. C., & Baker, E. L. (2012). *Validating measures of algebra teacher subject matter knowledge and pedagogical content knowledge* (CRESST Report

- 820). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Cai, L. (2010a). A two-tier full-information item factor analysis model with applications. *Psychometrika*, 75, 581-612.
- Cai, L. (2010b). High-dimensional exploratory item factor analysis by a Metropolis-Hastings Robbins-Monro algorithm. *Psychometrika*, 75, 33-57.
- Cai, L. (2010c). Metropolis-Hastings Robbins-Monro algorithm for confirmatory item factor analysis. *Journal of Educational and Behavioral Statistics*, 35, 307–335.
- Cai, L., Baker, E., Choi, K., & Buschang, R. (2014a, April). *CRESST functional validity model: Deriving formative and summative information from Common Core assessments*. Presentation at the annual meeting of the American Educational Research Association, symposium 46.010 “Innovative Validity Approaches for High-Quality Assessments: An Interaction,” Philadelphia, PA.
- Cai, L., Baker, E., Choi, K., & Buschang, R. (2014b, April). *Kentucky CRESST functional validity model* (draft slides). Slides prepared for the Kentucky Department of Education, Frankfort, KY.
- Cai, L., & Hansen, M. (2013). Limited-information goodness-of-fit testing of hierarchical item factor models. *British Journal of Mathematical and Statistical Psychology*, 66, 245–276.
- Cai, L., & Monroe, S. (2014). *A new statistic for evaluating item response theory models for ordinal data* (CRESST Report 839). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Cai, L., Yang, J. S., & Hansen, M. (2011). Generalized full-information item bifactor analysis. *Psychological Methods*, 16, 221–248.
- California Department of Education (CDE). (2015). *Standards for career reading practice*. Retrieved from <http://www.cde.ca.gov/ci/ct/sf/documents/ctescrpflyer.pdf>
- Casner-Lotto, J., & Barrington, L. (2006). Are they really ready to work?: *Employers' perspectives on the basic knowledge and applied skills of new entrants to the 21st century U.S. workforce*. New York:

The Conference Board. Retrieved from

[http://www.p21.org/storage/documents/FINAL\\_REPORT\\_PDF09-29-06.pdf](http://www.p21.org/storage/documents/FINAL_REPORT_PDF09-29-06.pdf)

- Chung, G. K. W. K. (in press). Guidelines for the design, implementation, and analysis of game telemetry. In C. S. Loh, Y. Sheng, & D. Ifenthaler (Eds.), *Serious Games Analytics: Methodologies for performance measurement, assessment, and improvement*. New York: Springer.
- Chung, G. K. W. K., Baker, E. L., Delacruz, G. C., Bewley, W. L., Elmore, J. J., & Seely, B. (2008). A computational approach to authoring problem-solving assessments. In E. L. Baker, J. Dickieson, W. Wulfeck, & H. F. O'Neil (Eds.), *Assessment of problem solving using simulations* (pp. 289-307). New York: Erlbaum.
- Chung, G. K. W. K., Choi, K., Baker, E. L., & Cai, L. (2014). *The effects of math video games on learning: A randomized evaluation study with innovative impact estimation techniques* (CRESST Report 841). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Chung, G. K. W. K., de Vries, L. F., Cheak, A. M., Stevens, R. H., & Bewley, W. L. (2002). Cognitive process validation of an online problem solving assessment. *Computers in Human Behavior, 18*, 669–684.
- Chung, G. K. W. K., Delacruz, G. C., & Bewley, W. L. (2006). *Performance assessment models and tools for complex tasks* (CSE Tech. Rep. No. 682). Los Angeles, CA: University of California, Center for the Study of Evaluation, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed. ). Hillsdale, NJ: Erlbaum.
- Conley, D. (2010). *College and career ready: Helping all students succeed beyond high school*. San Francisco: Jossey-Bass.
- Conley, D., & McGaughy, C. (2012). College and career readiness: Same or different? *Educational Leadership, 69*(7), 28-34.

- Council of Chief State School Officers (CCSSO). (2013). *Knowledge, skills, and dispositions: The Innovation Lab Network state framework for college, career, and citizenship readiness, and implications for state policy*. Washington, DC: Author.
- Council of Chief State School Officers (CCSSO). (2014). *Opportunities and options: Making career preparation work for students*. Washington, DC: Author.
- Cudeck, R., & Browne, M. W. (1983). Cross-validation of covariance structures. *Multivariate Behavioral Research, 18*, 147-167.
- de Boeck, P. (2008). Random item IRT models. *Psychometrika, 73*, 533-559.
- de Boeck, P., & Wilson, M. (2004). *Explanatory item response models: A generalized linear and nonlinear approach*. New York: Springer.
- Delacruz, G. C., Chung, G. W. K., & Baker, E. L., (2010, July). Validity Evidence for Games as Assessment Environments. In Gomez, K., Lyons, L., & Radinsky, J. (Eds.) *Learning in the Disciplines: Proceedings of the 9th International Conference of the Learning Sciences (ICLS 2010) - Volume 2, Short Papers, Symposia, and Selected Abstracts*. International Society of the Learning Sciences: Chicago IL.
- Dietel, R., Bewley, W. L., Chung, G. K. W. K., Vendlinski, T., & Lee, J. J. (2012). *Key findings from simulation and technology research* (CRESST Policy Brief No. 12). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Executive Office of the President of the United States of America. (2014). *Ready to work: Job-driven training and American opportunity*. Washington, DC: Author. Retrieved from [https://www.whitehouse.gov/sites/default/files/skills\\_report\\_072014\\_2.pdf](https://www.whitehouse.gov/sites/default/files/skills_report_072014_2.pdf)
- Fischer, G. H. (1973). The linear logistic test model as an instrument in educational research. *Acta Psychologica, 37*, 359-374.
- Fischer, G. H. (2005). Linear logistic test models. In K. Kempf-Leonard (Ed.), *Encyclopedia of Social Measurement* (Vol. 2, pp. 505-514). Amsterdam: Elsevier.

- Gibbons, R. D., & Hedeker, D. (1992). Full-information item bifactor analysis. *Psychometrika*, *57*, 423–436.
- Gordon, E. W. (1970). Toward a qualitative approach to assessment. *Report of the Commission on Tests, II. Briefs* (pp. 42-46). New York: College Entrance Examination Board.
- Hansen, M., Cai, L., Monroe, S., & Li, Z. (2014). *Limited-information goodness-of-fit testing of diagnostic classification item response theory models* (CRESST Report 840). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Hargreaves, A. (2001). Emotional geographies of teaching. *Teachers College Record*, *103*(6), 1056-1080.  
<http://www.tcrecord.org>
- Herl, H. E., Baker, E. L., & Niemi, D. (1996). Construct validation of an approach to modeling cognitive structure of U.S. history knowledge. *Journal of Educational Research*, *89*(4), 206-218.
- Herman, J. L. (2010). Impact of assessments on classroom practice. In E. L. Baker, B. McGaw, & P. Peterson (Eds.), *International encyclopedia of education* (3rd ed., pp. 506-511). Oxford, UK: Elsevier.
- Herman, J., L., Osmundson, E., & Silver, D. (2010). *Capturing quality in formative assessment practice: Measurement challenges* (CRESST Report 770). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Hong, E., & Milgram, R. M. (2008). *Preventing talent loss*. New York: Routledge.
- Houts, C. R., & Cai, L. (2013). *flexMIRT R user's manual version 2: Flexible multilevel multidimensional item analysis and test scoring*. Chapel Hill, NC: Vector Psychometric Group.
- Hussain, T. S., Bowers, C., & Blasko-Drabik, H. (2014). Impact of individual game-based training on team cognitive readiness. In H. F. O'Neil, R. S. Perez, & E. L. Baker (Eds.), *Teaching and measuring cognitive readiness* (pp. 325-353). New York: Springer.

- Iseli, M. R., Koenig, A. D., Lee, J. J., & Wainess, R. (2010). *Automatic assessment of complex task performance in games and simulations* (CRESST Report 775). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- James, M., McCormick, R., Black, P., Carmichael, P., Drummond, M., Fox, A., ... Wiliam, D. (2007). *Improving learning how to learn*. United Kingdom: Routledge.
- Johnson, J., & Rochkind, J. (2010). *Can I get a little advice here? How an overstretched high school guidance system is undermining students' college aspirations*. New York: Public Agenda.
- Jonassen, D.H. (2000). Toward a design theory of problem solving. *Educational Technology: Research & Development*, 48(4), 63-85.
- Kelly, A. (2004, September). The intellectual capital of schools: Analysing government policy statements on school improvement in light of a new theorization. *Journal of Education Policy*, 19(5), 609-629.
- Kerr, D., & Chung, G. K. W. K. (2011). The mediation effect of in-game performance between prior knowledge and posttest score. In J. Matuga (Eds.), *Proceedings of the IASTED International Conference on Technology for Education (TE 2011)* (pp. 122-128). Anaheim, CA: ACTA Press. doi: 10.2316/P.2011.754-046
- Kerr, D., & Chung, G. K. W. K. (2012). Identifying key features of student performance in educational video games and simulations through cluster analysis. *Journal of Educational Data Mining*, 4, 144–182.
- Kerr, D., & Chung, G. K. W. K. (2013). Identifying learning trajectories in an educational video game. In R. Almond & O. Mengshoel (Eds.), *Proceedings of the 2013 UAI Application Workshops: Big Data Meet Complex Models and Models for Spatial, Temporal and Network Data* (pp.20-28). Retrieved from <http://ceur-ws.org/Vol-1024/>
- Madni, A., Buschang, R. E., Michiuye, J. K., Griffin, N., Baker, E. L., Choi, K., & Cai, L. (2014). *CCSSO cognitive lab qualitative study results: Fourth grade* (Interim report to funder). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).

- Madni, A., Buschang, R. E., Michiuye, J. K., Griffin, N., Baker, E. L., Choi, K., & Cai, L. (2015). *CCSSO cognitive lab qualitative study results: Eighth and eleventh grades* (Interim report to funder). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Mayer, R. E. (2014). What problem solvers know: Cognitive readiness for adaptive problem solving. In H. F. O'Neil, R. S. Perez, & E. L. Baker (Eds.), *Teaching and measuring cognitive readiness* (pp. 149-160). New York: Springer.
- Milgram, R. M., & Hong, E. (2000). *Ariel real-life problem-solving*. Las Vegas, NV: Ariel University Center of Samaria, Ariel, Israel and University of Nevada, Las Vegas.
- Montanari, U. (1974). Networks of constraints: Fundamental properties and applications to picture processing. *Information Sciences*, 7, 95-132.
- O'Neil, H. F., Jr. (1999). Perspectives on computer-based performance assessment of problem solving: Editor's introduction. *Computers in Human Behavior*, 15, 255-268.
- O'Neil, H. F., Jr., Allred, K., & Baker, E. L. (1992). *Measurement of workforce readiness: Review of theoretical frameworks* (CSE Tech. Rep. No. 343). Los Angeles: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- O'Neil, H. F., Jr., Allred, K., & Dennis, R. A. (1997). Use of computer simulation for assessing the interpersonal skill of negotiation. In H. F. O'Neil, Jr. (Ed.), *Workforce readiness: Competencies and assessment* (pp. 205-228). Mahwah, NJ: Lawrence Erlbaum Associates.
- O'Neil, H. F., & Chuang, S.-H. (2008). Measuring collaborative problem solving in low-stakes tests. In E. L. Baker, J. Dickieson, W. Wulfeck, & H. F. O'Neil (Eds.), *Assessment of problem solving using simulations* (pp. 177-199). Mahwah, NJ: Lawrence Erlbaum Associates.
- O'Neil, H. F., Lang, J. Y.-C., Perez, R. S., Escalante, D., & Fox, F. S. (2014). What is cognitive readiness? In H. F. O'Neil, R. S. Perez, & E. L. Baker (Eds.), *Teaching and measuring cognitive readiness* (pp. 3-23). New York: Springer.

- O'Neil, H. F., Jr., Wang, S., Lee, C., Mulkey, J., & Baker, E. L. (2003). Assessment of teamwork skills via a teamwork questionnaire. In H. F. O'Neil Jr. & R. S. Perez (Eds.), *Technology applications in education: A learning view* (pp. 283–303). Mahwah, NJ: Erlbaum.
- OECD. (2013). *PISA 2015 draft collaborative problem solving framework*. Retrieved from <http://www.oecd.org/pisa/pisaproducts/Draft%20PISA%202015%20Collaborative%20Problem%20Solving%20Framework%20.pdf>
- Partnership for 21st Century Learning. (2015). *Framework for 21st century learning*. Washington, DC: Author. Retrieved from [http://www.p21.org/storage/documents/P21\\_framework\\_0515.pdf](http://www.p21.org/storage/documents/P21_framework_0515.pdf)
- Perry, J. C., & Wallace, E. W. (2012). What schools are doing around career development: Implications for policy and practice. *New Directions for Youth Development*, 2012, 33–44.
- Phelan, J., Choi, K., Vendlinski, T., Baker, E. L., & Herman, J. L. (2009). *The effects of POWERSOURCE© intervention on student understanding of basic mathematical principles* (CRESST Report 763). Los Angeles: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Phelan, J., Vendlinski, T., Choi, K., Dai, Y., Herman, J., & Baker, E.L. (2011). *The development and impact of POWERSOURCE©: Year 5* (CRESST Report 792). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Putnam, R. D. (1995, December). Tuning in, tuning out: The strange disappearance of social capital in America. *PS: Political Science and Politics*, 28(4), 664-683.
- Richards, E., & Terkanian, D. (2013). Occupational employment projections to 2022. *Monthly Labor Review*. Retrieved from <http://www.bls.gov/opub/mlr/2013/article/occupational-employment-projections-to-2022.htm>
- Smarter Balanced Assessment Consortium. (2013a). *Content specifications for the summative assessment of the Common Core State Standards for English language arts and literacy in history/social studies, science, and technical subjects*. Retrieved from [http://www.smarterbalanced.org/wordpress/wp-content/uploads/2015/03/ELA\\_Content\\_Specs.pdf](http://www.smarterbalanced.org/wordpress/wp-content/uploads/2015/03/ELA_Content_Specs.pdf)

- Smarter Balanced Assessment Consortium. (2013b). *Content specifications for the summative assessment of the Common Core State Standards for mathematics* (revised draft). Retrieved from <http://www.smarterbalanced.org/wordpress/wp-content/uploads/2011/12/Math-Content-Specifications.pdf>
- Southern Regional Education Board. (2015). *Credentials for all: An imperative for SREB states*. Atlanta, GA: Author. Available at [http://publications.sreb.org/2015/15V08\\_CTE\\_CommissionReport.pdf](http://publications.sreb.org/2015/15V08_CTE_CommissionReport.pdf)
- Stevens, R. H., Beal, C. R., & Sprang, M. (2013). Assessing students' problem solving ability and cognitive regulation with learning trajectories. R. Azevedo and V. Aleven (eds.), *International Handbook of Metacognition and Learning Technologies* (pp. 409–423). New York: Springer. doi: 10.1007/978-1-4419-5546-3\_27
- Stevens, R., Ikeda, J., Casillas, A., Palacio-Cayetano, J., & Clyman, S. (1999). Artificial neural network-based performance assessments. *Computers in Human Behavior*, 15, 295–313.
- Strom, P. S., Strom, R. D., Whitten, L. S., & Kraska, M. F. (2014). Adolescent identity and career exploration. *NASSP Bulletin*, 98, 163–179.
- Vendlinski, T., & Stevens, R. (2000). The use of artificial neural nets (ANN) to help evaluate student problem solving strategies. In B. Fishman & S. O'Connor-Divelbiss (Eds.), *Fourth International Conference of the Learning Sciences* (pp. 108–114). Mahwah, NJ: Erlbaum.
- Wainer, H., Bradlow, E. T., & Wang, X. (2007). *Testlet response theory and its applications*. New York, NY: Cambridge University Press.
- Webb, N. L. (1997). *Criteria for alignment of expectations and assessments in mathematics and science education* (Research Monograph No. 6). Washington, DC: Council of Chief State School Officers.
- Wilson, M., de Boeck, P., & Carstensen, C. H. (2008). Explanatory item response models: A brief introduction. In J. Hartig, E. Klieme, & D. Leutner (Eds.), *Assessment of competencies in educational contexts* (pp. 91-120). Göttingen: Hogrefe & Huber.
- Wolf, M. K., Herman, J. L., Kim, J., Abedi, A., Leon, S., Griffin, N., ... Shin, H. W. (2008). *Providing validity evidence to improve the assessment of English language learners* (CRESST Report 738).

Los Angeles: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).



Dr. CAI, Li  
Professor of Education and Psychology  
Co-Director, National Center for Research on Evaluation, Standards, and Student Testing (CRESST)  
300 Charles E. Young Drive North, Room 315, Mailbox 951522  
Los Angeles, CA 90095-1522  
Email: [lcai@ucla.edu](mailto:lcai@ucla.edu), Tel: +1 (310) 794-7136

June 24, 2015

Keric Ashley, Deputy Superintendent  
District, School, and Innovation Branch  
California Department of Education  
1430 N Street, Sacramento, CA 95814

Dear Keric

As Co-Director of CRESST, I am writing to indicate our commitment to participate in your proposed project, "Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments", to be reviewed for support by the United States Department of Education.

The UCLA Center for Research on Evaluation, Standards, and Student Testing (CRESST) is internationally known for its expertise and accomplishments in assessment and measurement research and conducting rigorous evaluations of games and simulations in authentic educational environments. CRESST will leverage its experience to provide assistance and complement the California Department of Education team in all stages of the proposed project in order to help fulfill the specific aims to enhance and improve career and college readiness inferences drawn from the Smarter Balanced Assessment Consortium's high school assessments.

As you know, CRESST is currently playing an active role in support of the Smarter Balanced Assessment Consortium in terms of ongoing psychometrics and validity studies. CRESST also works closely with the ELPA21 consortium as its validity studies partner. These ongoing large-scale assessment projects position CRESST as a unique partner to help advance the goals of the proposed project.

Thank you for the opportunity to participate in this exciting project. I look forward to working with you and your colleagues

Sincerely,

(b)(6)

CAI, Li  
Professor  
UCLA



California Department of Education

# Intranet

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## State Education Agency Indirect Cost Rate Agreement 2014

DATE: June 30, 2014

ORGANIZATION:  
California Department of Education  
1430 N Street  
Sacramento, California 95814-5901

AGREEMENT NO. 2014-118  
FILING REFERENCE: This replaces previous Agreement No. 2013-101 dated May 31, 2013

The approved indirect cost rates herein are for use on grants, contracts, and other agreements with the Federal Government. The rates are subject to the conditions included in Section II of this Agreement and issued by the U.S. Department of Education pursuant to the authority in Attachment A of Office of Management and Budget Circular A-87

### Section I – Rates and Bases

Type	From	To	Rate	Base	Applicable To
Fixed	07/01/2014	06/30/2015	23.1%	MTDC	APwR

Distribution Base: Modified Total Direct Cost (MTDC) - Total direct costs excluding equipment, capital expenditures, participant support costs, pass-through funds and the portion of each subaward (subcontract or subgrant) above \$250,000 (each award; each year).

Applicable To: All Programs (APwR) - The rates herein are applicable to All Programs including those that require a restricted rate per 34 CFR 75.563 and 34 CFR 76.563.

Treatment of Fringe Benefits: Fringe benefits applicable to direct salaries and wages are treated as direct costs. Pursuant to OMB Circular A-87 – Attachment B Paragraph 8.d.(3), unused leave costs for all employees will be allocated as an indirect cost except for those employee salaries designated as a direct cost for the restricted rate calculation.

Capitalization Policy: Items of equipment are capitalized and depreciated if the initial acquisition cost is equal to or greater than \$5,000.

### Section II – Particulars

Limitations: Application of the rates contained in this Agreement is subject to all statutory or administrative limitations on the use of funds, and payments of costs hereunder are subject to the availability of appropriations applicable to a given grant or contract. Acceptance of the rates agreed to herein is predicted on the following conditions: (A) that no costs other than those incurred by the Organization were included in the indirect cost pools as finally accepted, and that such costs are legal obligations of the Organization and allowable under the governing cost principles; (B) the same costs that have been treated as indirect costs are not claimed as direct costs; (C) that similar types of information which are provided by the Organization, and which were used as a basis for acceptance of rates agreed to herein, are not subsequently found to be materially incomplete or inaccurate; and (D) that similar types of costs have been accorded consistent accounting treatment.

Accounting Changes: The rates contained in this agreement are based on the organizational structure and the accounting systems in effect at the time the proposal was submitted. Changes in organizational structure or changes in the method of accounting for costs which affect the amount of reimbursement resulting from use of the rates in this agreement, require the prior approval of the responsible negotiation agency. Failure to obtain such approval may result in subsequent audit disallowance.

Provisional/Final/Predetermined Rates: A proposal to establish a final rate must be submitted. The awarding office should be notified if the final rate is different from the provisional rate so that appropriate adjustments to billings and charges may be made. Predetermined rates are not subject to adjustment.

Fixed Rate: The negotiated fixed rate is based on an estimate of the costs that will be incurred during the period to which the rate applies. When the actual costs for such period have been determined, and adjustment will be made to subsequent rate calculation to compensate for the difference between the costs used to establish the fixed rate and the actual costs.

Notification to Other federal Agencies: Copies of this document may be provided to other Federal agencies as a means of notifying them of the agreement contained herein.

Audit: All costs (direct and indirect, federal and non-federal) are subject to audit. Adjustments to PR/Award # S368A150011

amounts resulting from audit of the cost allocation plan or indirect cost rate proposal upon which the negotiation of this agreement was based may be compensated for in a subsequent negotiation.

Reimbursement Ceilings/Limitations on Rates: Awards that include ceiling provisions and statutory/regulatory requirements on indirect cost rates or reimbursement amounts are subject to the stipulations in the grant or contract agreements. If a ceiling is higher than the negotiated rate in Section I of the agreement, the negotiated rate will be used to determine the maximum allowable indirect costs.

### Section III – Special Remarks

Alternative Reimbursement Methods: If any federal programs are reimbursing indirect costs by a methodology other than the approved rates in this agreement, such costs should be credited to the programs and the approved rates should be used to identify the maximum amount of indirect costs allocable.

Submission of Proposals: New indirect cost proposals are necessary to obtain approved indirect cost rates for future fiscal years. The next indirect cost rate proposal is due six months prior to the expiration dates of the rates in this agreement.

### Section IV – Approvals

For the State Education Agency:

California Department of Education  
1430 N Street  
Sacramento, California 95814-5901

[Original signed by]

Signature: Roxanne L. Eres  
Title: Director  
Date: July 11, 2014

For the Federal Government:

U.S. Department of Education  
OCFO / FIPAO / ICG  
550 12th Street, SW  
Washington, DC 20202-4450

[Original signed by]

Signature: Frances Outland  
Title: Director, Indirect Cost Group  
Date: June 30, 2014

Negotiator: Frances Outland  
Telephone Number: 202-245-8082

Questions: . Susan Essman | [SEssman@cde.ca.gov](mailto:SEssman@cde.ca.gov) | 916-322-5110

Last Modified: Wednesday, July 16, 2014

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Deborah Sigman  
Executive Committee Co-Chair  
California

June 19, 2015

Tony Alpert  
Chief Operating Officer

Professor Li Cai  
Co-Director, CSE/CRESST  
300 Charles E. Young Drive North  
Los Angeles, CA. 90095

Luci Willits  
Deputy Executive Director

Dear Dr. Cai:

We are extremely excited about your proposal, Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments, submitted in response to CFDA 84.368A.

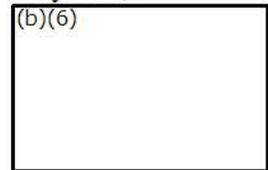
Your planned work will provide important information about the career and college ready aspects of the Smarter Balanced Assessments, with a wide range of applications to interpretation, reporting, and use of the Smarter Balanced Assessment results. The supplemental tools and resources you are proposing to develop, including innovative career ready assessment items and professional development resources, will also fill an important need for the consortium.

The Smarter Balanced Assessment Consortium is comprised of 18 states, one territory, and the Bureau of Indian Education. Together, our governing members administer Smarter Balanced assessment items to a diverse population of 7 million students

Smarter Balanced seeks to continually improve its offerings to its members. Should your project be funded, we would be interested in working with you to apply the findings and approach from your project to expand the utility of existing assessment items and provide information to guide development across all of our learning systems.

We wish you the best of luck with this endeavor, and look forward to working with you should this project be funded.

Very best,

(b)(6)  


Anthony Alpert  
Executive Director  
Smarter Balanced Assessment Consortium



## DEPARTMENT OF THE NAVY

SURFACE WARFARE OFFICERS SCHOOL COMMAND  
446 CUSHING ROAD  
NEWPORT RHODE ISLAND 02841-1209  
HTTP://WWW.SWOS.NAVY.MIL/

IN REPLY REFER TO:

5700  
Ser N02/383  
23 Jun 15

Professor Li Cai  
Co-Director, CSE / CRESST  
300 Charles E. Young Drive North  
Los Angeles, CA 90095

Dear Dr. Cai:

I am pleased to write this letter on behalf of the Surface Warfare Officers School Command (SWOS) in support of the National Center for Research on Evaluation, Standards, and Student Testing (CRESST) for your proposal, *Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments*, submitted in response to CFDA 84.368A, and would be pleased to participate in this project should it be funded.

Our mission at SWOS is to provide a continuum of professional education and training in support of Surface Navy requirements that prepares officers and enlisted engineers and navigators to serve at sea. Paramount to that mission is ensuring that our students not only acquire the necessary skills within the context of initial training environment in the schoolhouse, but that those skills successfully transfer to the operational environment and are retained for long periods of time. While your planned work is targeted towards important information about the career and college ready aspects of the Smarter Balanced Assessments, with a wide range of applications to interpretation, reporting, and use of the Smarter Balanced Assessment results in a community college context, some of these assessment applications will be useful in assessing skillsets and managing training requirements across a Navy career path.

If awarded, SWOS will support the proposed effort by providing subject matter expertise, feedback on strategies and tools developed at critical junctures of the project, and a sample of our students in academic and vocational programs for assessment surveys.

Sincerely,

(b)(6)

R. S. Callas  
Executive Director  
Surface Warfare Officers School  
Command



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## SUPERINTENDENT OF PUBLIC INSTRUCTION

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**Randy I. Dorn** Old Capitol Building · PO BOX 47200 · Olympia, WA 98504-7200 · <http://www.k12.wa.us>

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June 25, 2015

Professor Li Cai  
Co-Director, CSE/CRESST  
300 Charles E. Young Drive North  
Los Angeles, CA 90095

Dear Dr. Cai:

We are extremely excited about this proposal, Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments, submitted in response to CFDA 84.368A.

Your planned work will provide important information about the career and college ready aspects of the Smarter Balanced Assessments, with a wide range of applications to interpretation, reporting, and use of the Smarter Balanced Assessment results. The supplemental tools and resources you are proposing to develop, including innovative career ready assessment items and professional development resources, will also fill an important need for the Smarter Balanced Assessment Consortium.

Although the focus of the proposed work is in the state of California, should your project be funded we would be interested in working with you to apply the findings and approach from your project to our state data, to help provide a better understanding to our administrators, teachers, parents, and students of how the Smarter Balanced Assessments measure college and career readiness. We would also be pleased to implement the assessment and professional development resources developed as part of your project.

We look forward to working with you should this project be funded.

Sincerely,

Randy I. Dorn  
State Superintendent  
of Public Instruction



**STATE OF HAWAII**  
**DEPARTMENT OF EDUCATION**  
P.O. BOX 2360  
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

June 24, 2015

Dr. Li Cai, Co-Director  
CSE/CRESST  
300 Charles E. Young Drive North  
Los Angeles, CA 90095

Dear Dr. Cai:

We are extremely excited about your proposal, Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments, submitted in response to CFDA 84.368A.

Your planned work will provide important information about the career and college ready aspects of the Smarter Balanced Assessments, with a wide range of applications to interpretation, reporting, and use of the Smarter Balanced Assessment results. The supplemental tools and resources you are proposing to develop, including innovative career ready assessment items and professional development resources, will also fill an important need for the consortium.

Hawaii is a governing state of the Smarter Balanced Assessment Consortium. Staff actively participates in providing leadership to the Consortium. In addition, teachers are involved in item development, review and scoring. Educators also served on several review committees, such as alignment reviews, data, content and fairness review, and achievement level setting. Our educators have also been involved in creating and reviewing resources against quality criteria for the inclusion in the digital library. Hawaii administers the Smarter Balanced summative assessments to students in grades 3–8 and 11. Hawaii has also elected to make available to all K- 12 schools and students the Smarter Balanced interim assessments as well as the Digital Library of formative assessment resources and tools. The University of Hawaii System has agreed to a three-year pilot for use of the Smarter Balanced 11th grade scores for placement into non-remedial courses.

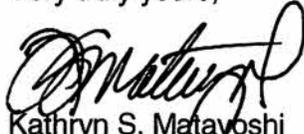
Although the focus of the proposed work is in the state of California, we would be interested in working with you to apply the findings and approach from your project to our state data. We feel the work will help provide a better understanding to our administrators, teachers, parents, and

Dr. Li Cai, Co-Director  
June 24, 2015  
Page 2

students of how the Smarter Balanced Assessments measure college and career readiness. We would also be pleased to implement the assessment and professional development resources developed as part of your project.

We wish you the best of luck with this endeavor and look forward to working with you should this project be funded.

Very truly yours,



Kathryn S. Matayoshi  
Superintendent

KSM:ja

c: Assessment & Accountability Branch

June 2015

Professor Li Cai  
Co-Director, CSE/CRESST  
300 Charles E. Young Drive North  
Los Angeles, CA 90095

Dear Dr. Cai,

Thank you for the opportunity to offer a letter of support for your proposal, Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments, submitted in response to CFDA 84.368A.

Vermont is eager for better information about the career and college ready aspects of the Smarter Balanced Assessments. One of our top priorities is improving the post-secondary attainment of our graduates. We anticipate that the supplemental tools and resources you are proposing to develop, including the innovative career ready assessment items and professional development resources, will fill an important need for the consortium.

Vermont has completed a very successful initial administration of the Smarter Balanced Assessment, and we look forward to learning as much as possible from the results. We know that our students have been more engaged in this new assessment and we believe that will result in more meaningful information about the proficiency of our students and schools. Tools that will help us to extract and better analyze that information will enable us to use this assessment constructively to support our goals.

We understand the focus of the proposed work is in the state of California. However, should your project be funded, we would be interested in working with you to apply



the findings and approach from your project to our state data, to help provide a better understanding for our administrators, teachers, parents, and students of how the Smarter Balanced Assessments do and don't measure college and career readiness. We would also be pleased to implement the assessment and professional development resources developed as part of your project.

Best of luck with this endeavor, and we look forward to working with you should this project be funded.

Very best,



Rebecca Holcombe  
Secretary of Education



Professor Li Cai  
Co-Director, CSE/CRESST  
300 Charles E. Young Drive North  
Los Angeles, CA. 90095

Dear Dr. Cai:

We are extremely excited about your proposal, *Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments*, submitted in response to CFDA 84.368A, and would be pleased to participate in this project should it be funded.

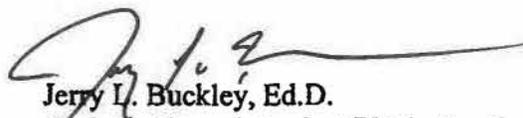
Your planned work will provide important information about the career and college ready aspects of the Smarter Balanced Assessments, with a wide range of applications to interpretation, reporting, and use of the Smarter Balanced Assessment results in a community college context. The results of this work will help to continue to support K-16 communication and coordination in the State in the area of assessment, as well as provide useful tools for practitioners.

College of the Canyons (COC) is a fully accredited California Community College and Hispanic Serving Institution located in Santa Clarita, CA in northern Los Angeles County. The College operates two campuses, which together enroll 18,500 students (Spring, 2015). COC offers 70 certificate and 73 AA/AS Degree programs in a variety of vocational, technical and academic disciplines. The College's programs articulate with the University of California, California State University, and private institutions. The student population has grown 128 percent in the past 10 years. Since 2000, COC has enjoyed striking increases in diversity with the non-white population tripling to over 50 percent of the student body, and Latino students nearly quadrupling to 43 percent of the student body.

We understand that our involvement in the project, should it be funded, would be on several levels. Key leadership from our college would in advisory/review capacity for the proposed work, providing feedback on strategies and tools developed and critical junctures in the project. Additionally, we understand that, as part of the project, a sample of our students in academic and vocational programs will be asked to complete and/or provide feedback on small sets of assessment items (with a focus on college and career ready constructs).

We wish you the best of luck with this endeavor, and look forward to working with you should this project be funded.

Very best,



Jerry L. Buckley, Ed.D.

Assistant Superintendent/VP Instruction

SANTA CLARITA COMMUNITY COLLEGE DISTRICT BOARD OF TRUSTEES

Michael D. Berger • Bruce D. Fortine • Michele R. Jenkins • Joan W. MacGregor • Steven D. Zimmer



San Bernardino  
Valley College

OFFICE OF THE PRESIDENT

June 23, 2015

Professor Li Cai  
Co-Director, CSE/CRESST  
300 Charles E. Young Drive North  
Los Angeles, CA. 90095

Dear Dr. Cai:

We at San Bernardino Valley College are extremely excited about your proposal, *Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments*, submitted in response to CFDA 84.368A, and would be pleased to participate in this project should it be funded.

Your planned work will provide important information about the career and college ready aspects of the Smarter Balanced Assessments, with a wide range of applications to interpretation, reporting, and use of the Smarter Balanced Assessment results in a community college context. The results of this work will help to continue to support K-16 communication and coordination in the State in the area of assessment, as well as provide useful tools for practitioners.

San Bernardino County is often characterized as lagging behind the rest of the state in standardized test scores and educational attainment. According to the 2013 report, *“Halve the Gap By 2030: Youth Disconnection in America’s Cities,”* the Riverside-San Bernardino metro area ranks dead last in a survey of 25 metro areas nationwide for youth disconnection, defined as young adults, ages 19-26, who are neither working nor in school. To reduce youth disconnection and strengthen the regional workforce, there is clearly a need for well-defined pathways linking high school students with community college programs that lead either to four-year degrees and/or well-paying jobs in strong industry sectors. Knowing the success of career pathways is critical to developing our Career and Technical Education (CTE) area.

We understand that our involvement in the project, should it be funded, will be on several levels. Key leadership from our college will act in an advisory/review capacity for the proposed work, providing feedback on strategies and tools developed at critical junctures in the project. Additionally, we understand that, as part of the project, a sample of our students in vocational programs will be asked to complete and/or provide feedback on small sets of assessment items (with a focus on college and career ready constructs). For this project with UCLA’s CRESST team, Dean Albert Maniaol will oversee the inclusion of CTE students from our college in the study, as well as provide access to faculty who may advise and offer feedback on the project.

We wish you the best of luck with this endeavor, and look forward to working with you should this project be funded.

Sincerely,

A handwritten signature in cursive script that reads "Gloria Fisher".

Gloria Fisher, J.D.  
President

# USC Rossier

School of Education

**Harry O'Neil**

**Professor of Educational Psychology**

**Waite-Phillips Hall 600, University Park**

**Los Angeles, CA 90089**

**(P) 818-648-0472**

**(F) 310-267-0152**

**(E) honeil@usc.edu**

Professor Li Cai  
Co-Director, CSE/CRESST  
300 Charles E. Young Drive North, UCLA  
Los Angeles, CA 90095

Dear Dr. Cai,

Thank you for the opportunity to participate in your research proposal, Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments, to be submitted in response to CFDA 84.368A.

Your planned work will provide important information about the career and college ready aspects of the Smarter Balanced Assessments, with a wide range of applications to interpretation, reporting, and use of the Smarter Balanced Assessment results. The supplemental tools and resources you are proposing to develop, including innovative career ready assessment items and professional development resources, will also fill an important need for the consortium.

If awarded, The Rossier School of Education will provide analytic services for the evaluation of Enhanced Assessment Instruments for Career Ready Knowledge, Skills, and Attributes (KSA). USC's Rossier School of Education will support CRESST with the review and synthesis of existing KSA literature, develop innovation item types for career ready constructs, support the pilot validity study to examine career ready features of SBAC items pool, and support the development and pilot testing of technology-based interactive resources.

We wish you the best of luck with this endeavor, and look forward to working with you should this project be funded.

Sincerely

(b)(6)

Harry O'Neil  
USC Rossier School of Education



Graduate School of Education &amp; Information Studies

P.O. Box 951521  
Los Angeles, CA 90095-1521

June 27, 2015

Professor Li Cai  
Co-Director, CSE/CRESST  
300 Charles E. Young Drive North, UCLA  
Los Angeles, CA 90095

Dear Dr. Cai,

Thank you for the opportunity to participate in your research proposal. I am extremely excited to participate in the proposal, Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments, to be submitted in response to CFDA 84.368A.

Your planned work will provide important information about the career and college ready aspects of the Smarter Balanced Assessments, with a wide range of applications to interpretation, reporting, and use of the Smarter Balanced Assessment results. The supplemental tools and resources you are proposing to develop, including innovative career ready assessment items and professional development resources, will also fill an important need for the consortium.

If awarded, I will serve as lead evaluator for the project. In collaboration with Dr. Cai, the Social Research Methodology Division (SRM) Evaluation Group will assess the evaluation practices of CRESST research methods.

Educational program evaluation is an instrumental tool for effective policy-shaping and decision-making. The SRM Evaluation Group promotes the use of carefully conducted evaluation studies designed to improve social conditions. We provide comprehensive, rigorous training in the theory, methods and practice of evaluation that encourages analytic thoughtfulness regardless of methodological orientation and consideration for the communities that are affected by decisions that result from applied studies.

We wish you the best of luck with this endeavor, and look forward to working with you should this project be funded.

Sincerely,

(b)(6)

Christina A. Christie  
Professor  
Division Head, Social Research Methodology

## **KERIC W. ASHLEY**

### **PROFESSIONAL PREPARATION**

Master of Science in Education, School Administration, 1983  
Administrative Services Credential, K-12, 1983  
Cultural and Methodology Training for LEP Students, 1982  
Multiple Subjects Teaching Credential, K-12

### **APPOINTMENTS**

2014-present Career Executive Assignment C; Deputy Superintendent; District, School and Innovation Branch; California Department of Education

2012-2014 Career Executive Assignment B; Division Director; Analysis, Measurement and Accountability Division

2004-2012 Career Executive Assignment B; Division Director; Data Management Division

2002-2004 Education Administrator I; Education Data Office; Data Management Division

1999-2002 Education Administrator I; Consolidated Programs Accountability Unit; School and District Accountability Division

Education Programs Consultant; Class Size Reduction Program; School Facilities Planning Division

Education Programs Consultant; Consolidated Programs Unit; School and District Accountability Division

Assistant Principal, Grades 7-8; Foothill Jr. High School; Grant Joint Union High School District

Principal, Grades 5-8; Spangdahlem Middle School; Spangdahlem Air Base, Germany

1987-1990 Assistant Principal, Grades 9-12; Munich American High School; Munich, Germany

Teacher, Grades 1-8; Anaheim City School District; Department of Defense Dependents Schools, Germany; and Democratic Republic of Congo, Africa

**DUTY STATEMENT**

**Project Director (TBN)**

California Department of Education

**Division:** Assessment Development and Administration

**Unit or Office Name:** Division Support

**Job Description:**

Under the direction of the Director of the Assessment Development and Administration Division (ADAD), the Project Director serves as a state project director for the 2015 Enhanced Assessment Grant (EAG): Enhanced Assessment Instruments CFDA Number 84.368AE. The purpose of the Enhanced Assessment Instruments Grant Program, is to enhance the quality of assessment instruments and systems used by States for measuring the academic achievement of elementary and secondary school students. Under the direction of ADAD Director, and working with staff throughout the Department, as well as the Smarter Balanced Offices, the EAG Project Director independently and collaboratively performs complex tasks that support California’s statewide student assessment system.

<b>% of Time Performing Duties</b>	<b>Duties:</b>
	<b>Essential Functions:</b> The Project Director is responsible for the Administration of the federally funded national educational project the Enhanced Assessment Instruments Grant Program.
50%	<b>Project Management &amp; Scope Management:</b> The incumbent is responsible for all aspects of the project, including formal project management and vendor

	<p>oversight. The incumbent shall do the following:</p> <ul style="list-style-type: none"> <li>• Work collaboratively with internal and external staff to oversee grant program</li> <li>• Conduct and facilitate project meetings, including but not limited to team, oversight, steering committee, and executive meetings.</li> <li>• Review all project deliverables to ensure contract compliance and manage the deliverable approval process.</li> <li>• Manage and coordinate project communication with internal and external stakeholders, COE executive management, and oversight agencies.</li> <li>• Review and oversee project contracts and procurement activities to ensure accuracy and appropriateness of statements of work, timeliness, and compliance with state and departmental rules and policies.</li> <li>• Provide leadership, continuity, and escalation path to resolve issues and ensure forward momentum of projects.</li> <li>• Collaborate with local and national workgroups responsible for local testing programs (school districts, county offices of education, Smarter Balanced Assessment Consortium workgroup, advisory groups, and nationally recognized assessment experts).</li> </ul>
45%	<p><b>Project Plans, Schedules and Reporting:</b> The incumbent is responsible for developing appropriate project plans, project schedules, and internal and external reporting documentation as necessary to support project operations. The incumbent shall do the following:</p> <ul style="list-style-type: none"> <li>• Develop, review, monitor, and manage project plans and schedules.</li> <li>• Decision making authority over broad range of issues related to the operational project activities.</li> <li>• Insure timely implementation of grant program components.</li> </ul>

	<ul style="list-style-type: none"> <li>• Oversee issues involving item and test development, alignment to standards, and validity, reliability and technical accuracy of the assessment.</li> <li>• Critically evaluate and provide feedback on deliverables, and make recommendations for improvement.</li> <li>• Develop subject matter presentations and deliver to intended audiences.</li> <li>• Communicate in writing and orally with members of the public, including phone calls, e-mails, preparing letters and memoranda, and reports.</li> <li>• Overall and day-to-day project operations management.</li> <li>• Travel, locally and nationally to meetings, trainings and conferences.</li> </ul>
5%	<b>Other duties as required.</b>

## Li Cai

### PROFESSIONAL PREPARATION

Nanjing University	Business Communication	B.A.	2001
The Ohio State University	Communication	M.A.	2003
University of North Carolina at Chapel Hill	Mathematical Statistics	M.S.	2006
University of North Carolina at Chapel Hill	Quantitative Psychology	Ph.D.	2008

### APPOINTMENTS

2014-Present	Professor, Quantitative Psychology, UCLA
2014-Present	Professor, Advanced Quantitative Methodology in Education, UCLA
2012-Present	Co-Director, CRESST, UCLA
2011-2014	Associate Professor, Quantitative Psychology, UCLA
2011-2014	Associate Professor, Advanced Quantitative Methodology in Education, UCLA
2009-2011	Assistant Professor, Quantitative Psychology, UCLA
2008-2011	Assistant Professor, Advanced Quantitative Methodology in Education, UCLA

### PROFESSIONAL AFFILIATION

American Educational Research Association  
National Council on measurement in Education  
Psychometric Society

### SELECTED FUNDED RESEARCH SUPPORT

2014-2017	Institute of Education Sciences, R305D140046. Title: Novel models and methods to address measurement error issues in educational assessment and evaluation studies Role: PI (\$895,108 total award)
2013-2014	Smarter Balanced Assessment Consortium, 20141186. Title: Mathematical Reasoning Project Role: PI (\$250,000 total award)
2013-2015	Bill and Melinda Gates Foundation, OPP1088937. Title: Toward Next Generation Assessments: Building Tools for Understanding Comparability in a General Validity Framework Role: Co-PI (Eva Baker, PI; \$942,527 total award)
2012-2015	William and Flora Hewlett Foundation, 2012-8075. Title: On the Road to Deeper Learning Role: Co-PI (Joan Herman, PI; \$796,712 total award)
2013-2014	National Science Foundation, SES-1260746. Title: Doctoral Dissertation Research: Hierarchical Item Response Models for Cognitive Diagnosis Role: PI (Mark Hansen, advisee; \$11,596 total award)
2013-2016	Institute of Education Sciences, S368A120002. Title: Enhanced Assessment Grant: The English Language Proficiency Assessment for the 21st Century (ELPA21) Role: PI of UCLA Sub (Prime: Oregon Department of Education; \$269,997 UCLA subaward)

- 2012-2013. UCLA Office of the Vice Chancellor for Research, Seed Grant.  
Title: Interactive Data Visualization Tools for Evidence-Based Decision Making:  
Training Health Practitioners in Essential Assessment Skills  
Role: PI (\$20,200 total award)
- 2010-2014. Institute of Education Sciences, R305D100039.  
Title: Nonlinear Multilevel Latent Variable Modeling with a Metropolis-Hastings  
Robbins-Monro Algorithm  
Role: PI (\$994,000 total award)

## SELECTED PUBLICATIONS

- Falk, C. F., & Cai, L. (in press). A flexible full-information approach to the modeling of response styles. *Psychological Methods*.
- Monroe, S., & Cai, L. (in press). Evaluating structural equation models for categorical outcomes: A new test statistic and a practical challenge of interpretation. *Multivariate Behavioral Research*.
- Falk, C. F., & Cai, L. (in press). Maximum marginal likelihood estimation of a monotonic polynomial generalized partial credit model with applications to multiple group analysis. *Psychometrika*.
- Cai, L. (in press). Lord-Wingsky algorithm version 2.0 for hierarchical item factor models with applications in test scoring, scale alignment, and model fit testing. *Psychometrika*.
- Lee, T., Cai, L., & Kuhfeld, M. (in press). A poor person's posterior predictive checking of structural equation models. *Structural Equation Modeling*.
- Hansen, M., Cai, L., Stucky, B. D., Tucker, J. S., Shadel, W. G., & Edelen, M. O. (2014). Methodology for developing and evaluating the PROMIS smoking item banks. *Nicotine and Tobacco Research*, 16, S175-S189.
- Yang, J. S., & Cai, L. (2014). Estimation of contextual effects through nonlinear multilevel latent variable modeling with a Metropolis-Hastings Robbins-Monro algorithm. *Journal of Educational and Behavioral Statistics*, 39, 550-582.
- Paek, I., & Cai, L. (2014). A comparison of item parameter standard error estimation procedures for unidimensional and multidimensional IRT modeling. *Educational and Psychological Measurement*, 74, 58-76.
- Monroe, S., & Cai, L. (2014). Estimation of a Ramsay-curve item response theory model by the Metropolis-Hastings Robbins-Monro algorithm. *Educational and Psychological Measurement*, 74, 343-369.
- Cai, L., & Monroe, S. (2013). Commentary: IRT model fit evaluation from theory to practice: Progress and some unanswered questions. *Measurement: Interdisciplinary Research and Perspective*, 11, 102-106.
- Cai, L. (2013). Potential applications of latent variable modeling for the psychometrics of medical simulation. *Military Medicine*, 178, 115-120.
- Tian, W., Cai, L., Thissen, D., & Xin, T. (2013). Numerical differentiation methods for computing error covariance matrices in item response theory modeling: An evaluation and a new proposal. *Educational and Psychological Measurement*, 73, 412-439.
- Woods, C. M., Cai, L., & Wang, M. (2013). The Langer-improved Wald test for DIF testing with multiple groups: Evaluation and comparison to two-group IRT. *Educational and Psychological Measurement*, 73, 532-547.

- Cai, L., & Hansen, M. (2013). Limited-information goodness-of-fit testing of hierarchical item factor models. *British Journal of Mathematical and Statistical Psychology*, 66, 245–276.
- Yang, J. S., Hansen, M., & Cai, L. (2012). Characterizing sources of uncertainty in IRT scale scores. *Educational and Psychological Measurement*, 72, 264–290.
- Cai, L., Yang, J. S. & Hansen, M. (2011). Generalized full-information item bifactor analysis. *Psychological Methods*, 16, 221–248.
- Cai, L. (2010). A two-tier full-information item factor analysis model with applications. *Psychometrika*, 75, 581-612.
- Cai, L. (2010). High-dimensional exploratory item factor analysis by a Metropolis-Hastings Robbins-Monro algorithm. *Psychometrika*, 75, 33-57.
- Cai, L. (2010). Metropolis-Hastings Robbins-Monro algorithm for confirmatory item factor analysis. *Journal of Educational and Behavioral Statistics*, 35, 307–335.
- Bauer, D. J., & Cai, L. (2009). Consequences of unmodeled nonlinear effects in multilevel models. *Journal of Educational and Behavioral Statistics*, 34, 97–114.
- Cai, L., & Lee, T. (2009). Covariance structure model fit testing under missing data: An application of the supplemented EM algorithm. *Multivariate Behavioral Research*, 44, 281–304.
- Cai, L., & Hayes, A. F. (2008). A new test of linear hypotheses in OLS regression under heteroscedasticity of unknown form. *Journal of Educational and Behavioral Statistics*, 33, 21–40.
- Hayes, A. F., & Cai, L. (2008). Using heteroscedasticity-consistent standard error estimators in OLS regression: An introduction and software implementation. *Behavior Research Methods*, 39, 709–722.
- Cai, L. (2008). SEM of another flavour: Two new applications of the supplemented EM algorithm. *British Journal of Mathematical and Statistical Psychology*, 61, 309-329.
- Cai, L., Maydeu-Olivares, A., Coffman, D. L., & Thissen, D. (2006). Limited-information goodness-of-fit testing of item response theory models for sparse  $2^p$  tables. *British Journal of Mathematical and Statistical Psychology*, 59, 173–194.
- MacCallum, R. C., Browne, M. W., & Cai, L. (2006). Testing differences between nested covariance structure models: Power analysis and null hypotheses. *Psychological Methods*, 11, 19–35.

## **EVA L. BAKER**

### **PROFESSIONAL PREPARATION**

University of California, Los Angeles, Education, Ed.D., 1967

University of California, Los Angeles, Education, M.A., 1965

University of California, Los Angeles, English, B.A., 1963

### **APPOINTMENTS**

2013-present Distinguished Research Professor of Education, UCLA

2004-2012 Distinguished Professor of Education, UCLA

1995-1997 Acting Dean, Graduate School of Education & Information Studies, UCLA

1985-present Co-Director, national Center for Research on Evaluation, Standards, and Student Testing (CRESST), UCLA

2008-present Co-Director, Center for Advanced Technology in Schools (CATS), UCLA

1978-2004 Professor of Education, UCLA

1975-present Director, Center for the Study of Evaluation (CSE), UCLA

1973-1978 Associate Professor of Education, UCLA

1968-1972 Assistant Professor of Education, UCLA

1967-1968 Member of Professional Staff, Southwest Regional Laboratory

1967 Assistant Professor, California State College, Long Beach

1965-1967 Peace Corps Instructor, UCLA

### **SELECTED PUBLICATIONS**

Baker, E. L. (In press). A framework to teach and assess STEM skills using games and simulations. In H. F. O'Neil, R. S. Perez, & E. L. Baker (Eds.), *Using games and simulations for teaching and assessment: Key issues* (pp. xx-xx). New York: Routledge/Taylor & Francis.

Baker, E. L. (2014). Securing support for high-quality scientific research and development in educational sciences. In R. Sternberg (Ed.), *Writing successful grant proposals from the top down and bottom up* (pp. 233-254). Thousand Oaks, CA: SAGE.

Baker, E. L. (2014). Learning and assessment: 21<sup>st</sup> century skills and cognitive readiness. In H. F. O'Neil, R. S. Perez, & E. L. Baker (Eds.), *Teaching and measuring cognitive readiness* (pp. 53-70). New York: Springer.

O'Neil, H. F., Perez, R. S., & Baker, E. L. (Eds.). (2014). *Teaching and measuring cognitive readiness*. New York: Springer.

Baker, E. L. (2013). Critical moments in research and use of assessment. *Theory into Practice (TIP)*. 52(1), 83-92.

Baker, E. L. (2013, September). The chimera of validity. *Teachers College Record*, 115(9), 1-26.

Baker, E. L. (2013). The importance of afterschool programs in education reform worldwide: Making it essential in America. In T. K. Peterson (Ed.), *Expanding minds and opportunities: Leveraging the power of afterschool and summer learning for student success* (pp. 171-176). Washington, DC: Collaborative Communications Group.

Baker, E. L. (2012). Assessment in learning. In N. M. Seel (Ed.), *Encyclopedia of the sciences of learning* (Vol. 1, pp. 316-321). New York: Springer.

Baker, E. L. (2012). Bias, testing, and assessment. In J. A. Banks (Ed.), *Encyclopedia of diversity in education* (Vol. 1, pp. 208-211). Thousand Oaks, CA: SAGE.

Baker, E. L. (2012). Standards for educational and psychological testing. In J. A. Banks (Ed.), *Encyclopedia of diversity in education* (Vol. 4, pp. 2076-2081). Thousand Oaks, CA: SAGE.

- Baker, E. L., Chung, G. K. W. K., & Delacruz, G. C. (2012). The best and future uses of assessment in games. In M. C. Mayrath, J. Clarke-Midura, D. H. Robinson, & G. Schraw (Eds.), *Technology-based assessments for 21<sup>st</sup> century skills: Theoretical and practical implications from modern research* (pp. 229-248). Charlotte, NC: Information Age Publishing Inc.
- Baker, E. L., Griffin, N. C., & Choi, K. (2012). The achievement gap in California and beyond: Context, status, and approaches for improvement. In T. B. Timar & J. Maxwell-Jolly (Eds.), *Narrowing the achievement gap: Perspectives and strategies for challenging times* (pp. 77-94). Cambridge, MA: Harvard Education Press.
- Peterson, P., Baker, E., & McGaw, B. (Editors-in-Chief). (2010). *International encyclopedia of education, 3<sup>rd</sup> edition*. Kidlington, Oxford, UK: Elsevier, Academic Press.
- Baker, E. L. (2010). *Better tests: The need to connect and improve measurements of both learning and teaching*. Paper presented at the Senate Presidents' Forum, K-12 Education Policy, Boston, MA.
- Baker, E. L. (2010). *Building 21<sup>st</sup> assessments of 21<sup>st</sup> standards: Verifying learning of advanced skills and knowledge: Towards standards and assessments 3.0*. Paper presented at the Korean Educational Research Association "Educational Innovation for the 21<sup>st</sup> Century: Sharing Visions and Experiences," Hanyang University, Seoul.
- Baker, E. L. (2010). *Learning in the future education*. Paper presented at the Global HR Forum "Emerging schooling issues for 21<sup>st</sup> century demands," Seoul.
- Baker, E. L. (2009, August). The appropriate federal role in developing better tests: The need to improve measurements of both learning and teaching. *Congressional Program*, 24(4), 29-33, Improving "No Child Left Behind": Linking world-class education standards to American's economic recovery. Washington, DC: The Aspen Institute.
- Baker, E. L. (2009, Enero-Abril). Consideraciones de validez prioritaria para la evaluación formative y de rendición de cuentas (Priority validity considerations for formative and accountability assessment). *Revista de Educación*, 348, 91-109.
- Baker, E. L. (2009, Junio). From usable to useful assessment knowledge and evaluation. *Estudios Sobre Educación* (Special Issue), 16, 37-54.
- Baker, E. L. (2009). The influence of learning research on the design and use of assessment. In K. A. Ericsson (Ed.), *Development of professional expertise: Toward measurement of expert performance and design of optimal learning environments* (pp. 333-355). New York: Cambridge University Press.
- Baker, E. L. (2008). Learning and assessment in an accountability context. In K. E. Ryan & L. A. Shepard (Eds.), *The future of test-based educational accountability* (pp. 277-291). New York: Routledge.
- Baker, E. L., Chung, G. K. W. K., & Delacruz, G. C. (2008). Design and validation of technology-based performance assessments. In J. M. Spector, M. D. Merrill, J. J. G. van Merriënboer, & M. P. Driscoll (Eds.), *Handbook of research on educational communications and technology* (3rd Ed., pp. 595-604). Mahwah, NJ: Erlbaum.
- Baker, E. L., & Delacruz, G. C. (2008). A framework for the assessment of learning games. In H. F. O'Neil & R. S. Perez (Eds.), *Computer games and team and individual learning* (pp. 21-37). Oxford, UK: Elsevier.
- Baker, E., Dickieson, J., Wulfbeck, W., & O'Neil, H. F. (Eds.). (2008). *Assessment of problem solving using simulations*. New York: Erlbaum.

- Baker, E. L., Niemi, D., & Chung, G. K. W. K. (2008). Simulations and the transfer of problem-solving knowledge and skills. In E. L. Baker, J. Dickieson, W. Wulfeck, & H. F. O'Neil (Eds.), *Assessment of problem solving using simulations* (pp. 1-17). New York: Erlbaum.
- Baker, E. L. (2007, August/September). The end(s) of testing (2007 AERA Presidential Address). *Educational Researcher*, 36(6), 309-317.
- Baker, E. L. (2007). Model-based assessments to support learning and accountability: The evolution of CRESST's research on multiple-purpose measures. *Educational Assessment* (Special Issue), 12(3&4), 179-194.
- Baker, E. L. (2007). Principles for scaling up: Choosing, measuring effects, and promoting the widespread use of educational innovation. In B. Schneider & S.-K. McDonald (Eds.), *Scale-up in education: Ideas in principle* (Vol. 1, pp. 37-54). Lanham, MD: Rowman & Littlefield.
- Baker, E. L. (2007). Teacher use of formal assessment in the classroom. In W. D. Hawley with D. L. Rollie (Eds.), *The keys to effective schools: Educational reform as continuous improvement* (2<sup>nd</sup> ed., pp. 67-84). Thousand Oaks, CA: Corwin.
- Baker, E. L., & O'Neil, H. F. (2006). Evaluating Web-based learning environments. In H. F. O'Neil & R. Perez (Eds.), *Web-based learning: Theory, research, and practice* (pp. 3-20). Mahwah, NJ: Erlbaum.
- Baker, E. L. (2005). Aligning curriculum, standards, and assessments: Fulfilling the promise of school reform. In C. A. Dwyer (Ed.), *Measurement and research in the accountability era* (pp. 315-335). Mahwah, NJ: Erlbaum.
- Baker, E. L. (2005). Technology and effective assessment systems. In J. L. Herman & E. H. Haertel (Eds.), *Uses and misuses of data for educational accountability and improvement* (NSSE Yearbook, Vol. 104, Part 2, pp. 358-378). Chicago: National Society for the Study of Education. Distributed by Blackwell Publishing, Malden, MA.
- Baker, E. L., & Linn, R. L. (2004). Validity issues for accountability systems. In S. H. Fuhrman & R. F. Elmore (Eds.), *Redesigning accountability systems for education* (pp. 47-72). New York: Teachers College Press.
- Baker, E. L., & Herman, J. L. (2003). A distributed evaluation model. In G. Haertel & B. Means (Eds.), *Evaluating educational technology: Effective research designs for improving learning* (pp. 95-119). New York: Teachers College Press.
- Baker, E. L. (2003, Summer). Multiple measures: Toward tiered systems. *Educational Measurement: Issues & Practice*, 22(2), 13-17.
- Baker, E. L. (2003, November). Reflections on technology-enhanced assessment. *Assessment in Education*, 10(3), 421-424.
- Baker, E. L., & O'Neil, H. F., Jr. (2003). Evaluation and research for technology: Not just playing around. *Evaluation and Program Planning*, 26(2), 169-176.
- Baker, E. L., & O'Neil, H. F., Jr. (2003). Standards for student learning. In J. W. Guthrie (Ed.), *Encyclopedia of Education* (2<sup>nd</sup> ed., Vol. 6, pp. 2315-2318). New York: Macmillan Reference USA.
- Baker, E. L., & O'Neil, H. F., Jr. (2003). Technological fluency: Needed skills for the future. In H. F. O'Neil, Jr. & R. Perez (Eds.), *Technology applications in education: A learning view* (pp. 245-265). Mahwah, NJ: Erlbaum.
- Linn, R. L., Baker, E. L., & Betebenner, D. W. (2002). Accountability systems: Implications of requirements of the No Child Left Behind Act of 2001. *Educational Researcher*, 31(6), 3-16.

- Baker, E. L., & Mayer, R. E. (1999, May/July). Computer-based assessment of problem solving. *Computers in Human Behavior*, 15(3/4), 269-282.
- Baker, E. L. (1997, Autumn). Model-based performance assessment. *Theory Into Practice*, 36(4), 247-254.
- Baker, E. L. (1995). Computer technology futures for the improvement of assessment. Special Issue *Journal of Science Education and Technology*, 4(1), 37-45.
- Baker, E. L. (1994). Learning-based assessments of history understanding. Special Issue *Educational Psychologist*, 29(2), 97-106.
- Baker, E. L., & O'Neil, H. F., Jr. (Eds.). (1994). *Technology assessment in education and training*. Hillsdale, NJ: Lawrence Erlbaum.
- O'Neil, H. F., Jr., & Baker, E. L. (Eds.). (1994). *Technology assessment in software applications*. Hillsdale, NJ: Lawrence Erlbaum.

### **PROFESSIONAL ASSOCIATIONS**

- American Educational Research Association, President, 2006-2007
- American Psychological Association
- American Psychological Society (Fellow)
- Board on Testing and Assessment, National Research Council, The National Academies
- Council of Chief State School Officers
- Edmund W. Gordon Commission on the Future of Assessment in K-12 Education, Member, 2011-2013
- GlassLab Advisory Board, Institute of Play, 2013-
- Joint Committee on the Revision of the Standards for Educational and Psychological Testing, Co-Chair, 1992-1999, AERA, APA, NCME
- National Academy of Education, elected member, April 2007.
- National Council for Measurement in Education
- National Governor's Association
- World Education Research Association, President, 2010-2012

### **HONORS AND SPECIAL RECOGNITION**

- American Educational Research Association 2014 Award Recipient, Robert L. Linn Distinguished Address Award, AERA Division D, Vice Chair
- American Educational Research Association and American College Testing Program, E. F. Lindquist Award, 2013 (Outstanding Applied or Theoretical Research in the Field of Testing and Measurement)
- American Educational Research Association, Honored as a Fellow, 2008
- American Psychological Association, Educational Psychology, President 1985-1986
- California Educational Research Association Lifetime Achievement Award in Educational Research and Measurement, 1998
- Edward F. Reidy Interactive Lecture Series, 2000
- Henry Chauncey Award for Distinguished Service to Assessment and Educational Science, Educational Testing Service, 2007
- Samuel J. Messick Memorial Lecture Award, Educational Testing Service, 2004
- UCLA Alumni Award for Excellence, Professional Achievement Award, 2001
- UCLA GSE Harold and Lois Haytin Award for Applied Research, 1989
- University of Chicago Joyce Lecture Series, 1992
- William E. Coffman Distinguished Lecturer, 2000
- William H. Angoff Memorial Lecture, 1998

**Christina A. Christie**

**PROFESSIONAL PREPARATION**

State University of New York, Oneonta	Psychology	B.A.	08/90
Teachers College, Columbia University	Counseling Psychology	M.A.	05/92
Teachers College, Columbia University	Counseling Psychology	Ed.M.	05/93
University of California, Los Angeles	Social Research Methodology	Ph.D.	09/01

**APPOINTMENTS**

2010 -2013	Associate Professor, University of California, Los Angeles
2007-2009	Associate Professor, Claremont Graduate University
2002-2007	Assistant Professor, Claremont Graduate University
2001-2002	Visiting Assistant Professor, Claremont Graduate University
2001-2002	Visiting Assistant Professor, Whittier College
2001	Lecturer, University of California, Los Angeles
2000-2001	Lecturer, California State University, Los Angeles
1997-2001	Special Reader-Teaching Assistant, UCLA

**PROFESSIONAL AFFILIATION**

2011-Present	Editorial Board, Studies in Educational Evaluation
2014-Present	Associate Editor, American Journal of Evaluation
2011-2013	American Evaluation Association, Board of Directors, Member at Large
2007-Present	American Evaluation Association, Research on Evaluation Division Co-Chair
2005-2007	American Evaluation Association, Publications Committee Chair
2004-2010	Editorial Board, New Directions for Evaluation
2004-2009	Section Editor, Exemplars Section, American Journal of Evaluation
2003-2005	Southern California Evaluation Association, Co-Principal Organizer
2003	Southern California Evaluation Association, Founder (with S. Donaldson)
2001-2003	American Evaluation Association, Theories of Evaluation Division Chair

**SELECTED FUNDED RESEARCH SUPPORT**

09/26/2014 - 06/30/2019	Title: The NIH Diversity Program Consortium Coordination and Evaluation Center at UCLA (CEC), U54 MD009508 Agency: NIH/NIMHD PI: Norris, Davidson, Seeman
08/01/2009 – 06/30/2015	Title: Best Start Demonstration Project - LA Metro – Evaluation, 08465000 00 Agency: First 5 LA PI: Franke, T.

03/01/2014 - 06/30/2015      Title: Preschool Instructional Network Evaluation, CN130416  
Agency: CA. Dept. of Education  
PI: Christie, C.

## SELECTED PUBLICATIONS

- Franke T, Christie CA, Ho J, Du L. (2013). Item response theory analysis of the Family Assessment Form. *Child Youth Serv Rev* 35(10) 1780-88.
- Christie CA, Fierro L. (2012). Evaluation policy to implementation: An examination of scientifically based research in practice. *Studies Educ Eval*. 38(2) 65-72.
- Blazer K, Christie CA, Uman G, Weitzel J. (2012). Impact of web-based conferencing on cancer genetics training outcomes for community-based clinicians. *J Cancer Educ* 61(5), 327-59. PMID: PMC3857095.
- Christie, CA, Vo A. (2011). Promoting diversity in the field of evaluation: Reflections on the first year of the Robert Wood Johnson Foundation evaluation fellowship program. *Am J Eval*, 32(4) 547-64.
- Franke TM, Ho T, Christie CA. (2012). The chi-square test: Often used and more often misinterpreted. *Am J Eval*, 33(3) 448-58.
- Christie CA. (2007). Reported influence of evaluation data on decision-makers' actions: An empirical examination. *Am J Eval*, 28(3), 8-25.
- Christie CA, Barela E. (2005). The Delphi Technique as a method for increasing inclusion in the evaluation process. *Canadian J Prog Eval*, 20(1), 105-22.
- Christie CA, Ross R, Klein BM. (2004). Moving toward collaboration by creating an internal-external evaluation team: A case study. *Stud Educ Eval*, 30, 125-34.

## **Kilchan Choi**

### **PROFESSIONAL PREPARATION**

Seoul National University, South Korea Education	BA 1992
Seoul National University, South Korea Educational Measurement and Evaluation	MA 1995
University of California, Los Angeles Advanced Quantitative Methodology	PhD 2002

### **APPOINTMENTS**

2013-Present	Assistant Director and Principal Scientist in Statistical and Methodological Innovations, National Center for Research on Evaluation, Standards, and Student Testing, University of California, Los Angeles
2010-2013	Principal Research Analyst, American Institutes for Research
2002-2010	Senior Research, National Center for Research on Evaluation, Standards and Student Testing (CRESST), University of California, Los Angeles
1996-2002	Graduate Student Researcher, National Center for Research on Evaluation, Standards, and Student Testing, University of California, Los Angeles
1998-1998	Teaching Assistant, Graduate School of Education and Information Studies, University of California, Los Angeles
1995-1996	Researcher, Seoul National University, South Korea.
1992-1995	Graduate Student Researcher, Seoul National University

### **SELECTED FUNDED RESEARCH SUPPORT**

2006 – 2007	Korean Presidential Educational Innovation Committee Title: Accountability in supporting student learning: scaling up use of educational innovations, and simulations and transfer for problem solving knowledge and skills PI (total award \$ 30,000)
2007 – 2009	Institute of Education Sciences,(IES). Title: 4-Level/5-Level Hierarchical Model for Experimental, Quasi-Experimental Studies and Teacher and/or School Accountability Co-PI (Eva Baker, PI, \$720,000 total award)
2014 – 2015	Institute of Education Sciences,(IES). Title: Novel models and methods to address measurement error issues in educational assessment and evaluation studies Co-PI (Li Cai, PI, total award \$895,108)

### **SELECTED PUBLICATIONS**

Cai, L., Choi, K., & Kuhfeld, M. (in press). On the role of multilevel item response models in multi-site evaluation studies for serious games. In H. F. O’Neil, E. L. Baker, R. Perez. (Eds.), Issues regarding the use of games and simulations for teaching and assessment. New York, NY: Taylor & Francis.

Monroe, S., Cai, L., & Choi, K. (2014). *Student growth percentiles based on MIRT: Implications of calibrated projection*. (CRESST Report 842). Los Angeles, CA: University of

California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).

- Chung, G. K. W. K., Choi, K., Baker, E. L., & Cai, L. (2014). *The effects of math video games on learning: A randomized evaluation study with innovative impact estimation techniques* (CRESST Report 841). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Herman, J. & Choi, K. (2012). Validation of ELA and mathematics assessment: A general approach. CSE Policy Brief, July, 2012. Los Angeles: University of California, Center for Research on Evaluation, Standards, and Student Testing.
- Phelan, J., Choi, K., Herman, J., & Baker, E. (2012). The effect of Powersource assessment on middle school students' math performance. *Assessment in Education: Principles, Policy, & Practice*, 19(2), 211-230.
- Choi, K., & Goldschmidt, P. (2012). A multilevel growth curve approach to predicting student proficiency. *Asia Pacific Education Review*, 13(2), 199-208.
- Goldschmidt, P., Choi, K., & Beaudoin, J. P. (2012). *Growth model comparison study: Practical implications of alternative models for evaluating school performance*. Washington, DC: The Council of Chief State School Officers (CCSSO).
- Baker, E., Griffin, N., & Choi, K. (2012). The achievement gap in California and beyond context, status, and approaches for improvement. In T. B. Timar & J. Maxwell-Jolly (Eds.), *Closing the achievement gap* (pp. 77–94). Cambridge: Harvard Education Press.
- Phelan, J., Choi, K., Herman, J., & Baker, E. (2011). Differential improvement in student understanding of mathematical principles following formative assessment intervention. *Journal of Educational Research*, 104(5), 330–339.
- Choi, K., & Kim, S. (2010). Monitoring school performance based on national level achievement test. *Journal of Education Evaluation and Curriculum*, 13(2), 175–195.
- Choi, K., & Seltzer, M. (2010). Modeling heterogeneity in relationships between initial status and rates of change: Treating latent variable regression coefficients as random coefficients in a three-level hierarchical model. *Journal of Educational and Behavioral Statistics*, 35(1), 54–91.
- Goldschmidt, P., Choi, K., Martinez, F., & Novak, J. (2010). Using growth models to monitor school performance: Comparing the effect of the metric and the assessment. *School Effectiveness and School Improvement*, 21(3), 337–357.
- Kim, J., & Choi, K. (2008). Closing the gap: modeling within school heterogeneity in school effect study. *Asia Pacific Education Review*, 9(2), 206-220.
- Choi, K., Seltzer, M., Herman, J., & Yamashiro, K. (2007). Children Left Behind in AYP and Non-AYP Schools: Using Student Progress and the Distribution of Student Gains to Validate AYP. *Educational Measurement: Issues and Practice*, 26(3), 21-32.
- Choi, K. (2005). Monitoring school improvement over years using a 3-level hierarchical model under a multiple-cohorts design: comparing scale score to NCE results. *Asian Journal of Education*, 6(1), 59-81.

- Choi, K., Goldschmidt, P., & Yamashiro, K. (2005). Exploring models of school performance: from theory to practice. In J. Herman & E. Haertel (Eds.), *Data use and misuse*. The 104<sup>th</sup> Yearbook of the National Society for the Study of Education.
- Seltzer, M., & Choi, K. (2003). Sensitivity analysis for multilevel models. In N. Duan, & S. Reise (Eds.), *Multilevel modeling: Methodological advances, issues, and applications*. Mahwah, NJ: Lawrence Erlbaum.
- Seltzer, M., Choi, K., & Thum, Y. M. (2003). Examining relationships between where students start and how rapidly they progress: Using new developments in growth modeling to gain insight into the distribution of achievement within schools. *Educational Evaluation and Policy Analysis*, 25(3), 263-286.
- Seltzer, M., Novak, J., Choi, K., & Lim, N. (2002). Sensitivity analysis for hierarchical models employing *t* level-1 assumptions. *Journal of Educational and Behavioral Statistics*, 27, 181-222.
- Choi, K. (2001). Latent variable modeling in the hierarchical modeling framework in longitudinal studies: A fully Bayesian approach. *Asia Pacific Education Review*, 2(1), 44-55.
- Svartberg, M., Seltzer, M., Choi, K., & Stiles, T. (2001). Cognitive change before, during, and after short-term dynamic and nondirective psychotherapies: A preliminary growth modeling study. *Psychotherapy Research*, 11(2), 201-219.
- Choi, K. (1998). Two different approaches to growth modeling: Hierarchical modeling and structural equation modeling. In Whang, J. (Ed.). *New Perspectives of Educational Evaluation and Measurement*. (pp. 357-417). Seoul: Educational Scientific Press.

## **SERVICE**

### **Membership in Professional Organizations:**

American Educational Research Association (AERA)  
 Measurement and Research Methodology (AERA Division D)  
 National Council on Measurement in Education (NCME)

### **Grant Proposal Review Service:**

Institute of Education Sciences (Principal member of Cognitive and Learning Basic Process II Panel member, 2009 – present)  
 Institute of Education Sciences (Statistics/ Modeling Grant Review Panel member. 2008)  
 Institute of Education Sciences (grant proposal reviewer, 2007, 2008)

### **Editorial Services:**

Editorial Board Member, American Educational Research Journal (2013 – present)  
 Editorial Board Member, Educational Assessment (2014 – present)  
 Editorial Board Member, Journal of Educational and Behavioral Statistics (2015 – present)  
 Reviewer for Journal of Educational Psychology (1998),  
 British Journal of Educational Psychology (1999),  
 Educational Assessment (2002, 2003, 2005, 2006, 2013),

Psychological Methods (2007, 2008),  
Journal of Developmental Psychology (2008),  
American Journal of Evaluation (2008),  
Educational Evaluation and Policy Analysis (2008),  
Educational Measurement: Issues and Practice (2008),  
American Educational Research Journal (2009),  
Multivariate Behavioral Research (2013, 2014)  
Journal of Research on Educational Effectiveness (2013, 2014)

## Mark Hansen

### PROFESSIONAL PREPARATION

Boston University	Biology	B.A.	05/99
Boston University	Public Health	M.P.H.	09/05
University of California, Los Angeles	Education	Ph.D.	09/13

### APPOINTMENTS

2014-	Assistant Professor-in-Residence, GSE&IS, UCLA
2013-	Senior Researcher, CRESST, UCLA
2013	Visiting Assistant Professor, GSE&IS, UCLA
2007-2013	Graduate Student Researcher, GSE&IS and CRESST, UCLA
2008-2009	Special Reader/Teaching Assistant, GSE&IS, UCLA
2004-2007	Director of Evaluation and Research, National Center for Medical-Legal Partnership, Boston University Medical Center
2005-2007	Instructor/Teaching Associate/Teaching Assistant, Boston University School of Public Health

### PROFESSIONAL AFFILIATION

Editorial Board Member, Educational Assessment  
ad hoc Reviewer, American Journal of Evaluation  
ad hoc Reviewer, Journal of Educational and Behavioral Statistics  
ad hoc Reviewer, Multivariate Behavioral Research  
ad hoc Reviewer, Review of Research in Education

### SELECTED FUNDED RESEARCH SUPPORT

08/2014 – 07/2019	Title: Training Institutes for mobile health (mHealth) methodologies, 1R25DA038167 PI: Vivek Shetty, Role: Project director/co-PI for CRESST subaward
04/2013 – 03/2014	Title: Doctoral Dissertation Research: Hierarchical Item Response Models for Cognitive Diagnosis, SES-1260746 PI: Li Cai, Role: Co-PI

### SELECTED PUBLICATIONS

Cai, L., Yang, J., & Hansen, M. (2011). Generalized full information bifactor analysis. *Psychological Methods, 16*, 221-248.

Hansen, M., & Cai, L. (2013). A hierarchical item response model for cognitive diagnosis. *Multivariate Behavioral Research, 48*, 158 (Abstract).

Yang, J., Hansen, M., & Cai, L. (2012). Characterizing sources of uncertainty in IRT scale scores. *Educational and Psychological Measurement, 72*, 264-290.

Hansen, M. (2013). *Hierarchical item response models for cognitive diagnosis*. Unpublished doctoral dissertation, Department of Education, University of California, Los Angeles.

Edelen, M. O., Stucky, B. D., Hansen, M., Tucker, J. S., Shadel, W. G., & Cai, L. (2014). The PROMIS Smoking Initiative: Initial validity evidence for six new smoking item banks. *Nicotine and Tobacco Research, 16*, Supplement 3, S250-S260.

- Cai, L., & Hansen, M. (2013). Limited-information goodness-of-fit testing of hierarchical item factor models. *British Journal of Mathematical and Statistical Psychology*, 66, 245-276.
- Hansen, M., Cai, L., Monroe, S., & Li, Z. (2014). *Limited-information goodness-of-fit testing of diagnostic classification item response theory models* (CRESST Report 840). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Hansen, M., & Cai, L. (April 2012). The potential of local dependence diagnostics to inform or mislead. Paper presented at the Annual Meeting of the National Council on Measurement in Education. Vancouver, BC.
- Hansen, M., Cai, L., Stucky, B. D., Tucker, J. S., Shadel, W. S., & Edelen, M. O. (2014). Methodology for developing and evaluating the PROMIS smoking item banks. *Nicotine and Tobacco Research*, 16, Supplement 3, S175-S189.
- Shadel, W. G., Edelen, M. O., Tucker, J. S., Stucky, B. D., Hansen, M., & Cai, L. (2014). Development of the PROMIS Nicotine Dependence item banks. *Nicotine and Tobacco Research*, 16, Supplement 3, S190-S201.
- Tucker, J. S., Shadel, W. G., Edelen, M. O., Stucky, B. D., Kuhfeld, M., Hansen, M., & Cai, L. (2014). Development of the PROMIS Social Motivations for Smoking item banks. *Nicotine and Tobacco Research*, 16, Supplement 3, S241-S249.

## NOELLE C. GRIFFIN

### PROFESSIONAL PREPARATION

University of Southern California, Educational Psychology, Ph.D., 2000  
University of Southern California, Counseling Psychology, M.S.Ed., 1994  
University of California, Los Angeles, Psychology, B.A., 1990

### APPOINTMENTS

2006-Present Assistant Director, National Center for Research on Evaluation, Standards, and Student Testing, University of California, Los Angeles  
2004-2006 Director of Assessment, Loyola Marymount University  
2001-2006 Senior Research Analyst, National Center for Research on Evaluation, Standards, and Student Testing, University of California, Los Angeles  
1998-2001 Associate Director of the Center for Educational Governance at the University of Southern California (USC)  
1996-1998 Research Associate, Center for Educational Governance, USC  
1997-1998 Consultant, Evaluation of Los Angeles Area Charter Schools  
1996-1998 Research Associate, School Violence Project, USC  
1992-1995 Research Assistant, Department of Counseling Psychology, USC

### SELECTED PUBLICATIONS

Aguirre-Munoz, Z., Griffin, N., Amoo-Adare, E., & Amabisca, A. (May 2003). *Don't pass the buck to pass the CHSEE: Preparing content area teachers to support English Learners*. Paper presented at the Linguistic Minority Research Institute Annual Conference. San Diego, CA.

Baker, E. L., Griffin, N. C., & Choi, K. (2008). *The achievement gap in California: Context, status, and approaches for improvement*. Paper prepared for the California Department of Education, P-16 Closing the Gap Research Council "Connecting the Dots and Closing the Gap." Davis, CA: California Department of Education (CDE), University of California, School of Education, Center for Applied Policy in Education (CAP-Ed). Retrieved April 18, 2008 from [http://www.closingtheachievementgap.org/cs/ctag/download/resources/93/Baker\\_Paper.pdf?x-r=pcfile\\_d](http://www.closingtheachievementgap.org/cs/ctag/download/resources/93/Baker_Paper.pdf?x-r=pcfile_d). To be reprinted as a book chapter by Harvard Education Press with minor modifications.

Griffin, N.C, Kim, J., So, Y., & Hsu, V. (2009). *Evaluation of the WebPlay Arts Education Program: Findings from the 2006-07 School Year*. National Center for Research on Evaluation, Standards, and Student Testing.

Griffin, N., & Trusela, L. (April 2003). *Joining the team: Literacy professional development for secondary school content area teachers*. Paper Presented at the Annual Meeting of the American Educational Research Association. Chicago, IL.

Griffin, N. C., & Wohlstetter, P. W. (2001). Building a plane while flying it: Early lessons from charter schools. *Teachers College Record*, 103 (2), 336-365.

Griffin, N. C., Wohlstetter, P. W., & Barhadwaja, L. (2001). Teacher coaching: A tool for retention. *School Administrator*, 58 (1), 38-40.

Griffin, N., Wohlstetter, P., & Bharadwaja, L. (1999). *The DELTA Initiative: Reforming Pre-Service, Induction, and In-Service Professional Development*. Education Brief. Los Angeles: LACE, University of Southern California.

- Griffin, N. C., Aguirre-Munoz, Z., Miyoshi, J., Roberson, I., & Ambascia, A. (2002). *Evaluation of the California Professional Development Institutes in English Language Arts: Grades prek-6*. National Center for Research on Evaluation, Standards, and Student Testing.
- Griffin, N. C., Hammersley, D., Ambascia, A., & Aguirre-Munoz, Z. (2002). *Evaluation of the Secondary School California Professional Development Institutes in English Language Arts: Preliminary Report*. National Center for Research on Evaluation, Standards, and Student Testing.
- Wohlstetter, P., Griffin, N.C., & Chau, D. (2002). Charter Schools in California: A Bruising Campaign for Public Choice. In S. Veragi (ed.), *The charter school landscape*. Pittsburgh, PA: University of Pittsburgh Press.
- Wohlstetter, P. & Griffin, N.C. (1998). *Creating and Sustaining Learning Communities: Early Lessons From Charter Schools*. (Research Report OP03). Consortium for Policy Research in Education: University of Pennsylvania.
- Wolf, K.M., Herman, J.L., Bachman, L.F., Bailey, A., & Griffin, N.C. (2008). *Recommendations for Assessing English Learners: English Language Proficiency Measures and Accommodation Uses*. National Center for Research on Evaluation, Standards, and Student Testing.
- Wolf, K.M., Herman, J.L., Kim, J., Abedi, J., Leon, S., Griffin, N.C., Bachman, P.L., Chang, S.M., Farnsworth, T., Jung, H., Nollner, J., & Shin, H.W. (2008). *Providing Validity Evidence to Improve the Assessment of English Language Learners*. National Center for Research on Evaluation, Standards, and Student Testing.
- Wolf, M.K., Kao, J., Griffin, N.C., Herman, J.L., Bachman, P.L., Chang, S.M., & Farnsworth, T. (2008). *Issues in Assessing English Language Learners: English Language Proficiency Measures and Accommodation Uses*. National Center for Research on Evaluation, Standards, and Student Testing.

## **RECENT SYNERGISTIC ACTIVITIES**

Directed large-scale evaluations and research projects that incorporated instruction and assessment issues, including the evaluations of the California Teacher Professional Development Institutes, professional development component of the Annenberg reforms in Los Angeles, evaluation of 21<sup>st</sup> Century Learning Community After school Programs, literacy/science integrated instruction, charter school programs, and national arts-based education models.

Directed University wide assessment and evaluation efforts for Loyola Marymount University: including extensive involvement in campus-wide diversity and outreach projects addressing the needs of Second Language Learner students.

Provides management leadership to CRESST National Assessment Center Grant.

Directed and designed student, teacher and school-level instrumentation for multiple school-level reform evaluation and research projects, including national charter schools research and school violence research.

## GREGORY K.W.K. CHUNG

### PROFESSIONAL PREPARATION

University of California, Los Angeles, Educational Psychology, Ph.D., 1999  
Pepperdine University, Educational Computing, M.S., 1989  
University of Hawaii, Manoa, Electrical Engineering, B.S., 1987

### APPOINTMENTS

2012-present Assistant Director for Research Innovation, Center for Research on Evaluation, Standards and Student Testing, University of California, Los Angeles  
1998-2012 Senior Research Associate, Center for Research on Evaluation, Standards and Student Testing, University of California, Los Angeles  
2009 Algebra Readiness Instructor, UCLA Extension  
1994-1998 Graduate Student Researcher, Center for Research on Evaluation, Standards and Student Testing, University of California, Los Angeles  
1996-1998 Contract Programmer, Graduate School of Education & Information Studies, University of California, Los Angeles  
09/87-12/93 Member of the Technical Staff, TRW, Redondo Beach, CA

### SELECTED PUBLICATIONS

#### Refereed Research Articles and Book Chapters

- Chung, G. K. W. K. (in press). Guidelines for the design, implementation, and analysis of game telemetry. In C. S. Loh, Y. Sheng, & D. Ifenthaler (Eds.), *Serious Games Analytics: Methodologies for performance measurement, assessment, and improvement*. New York: Springer.
- Chung, G. K. W. K. (2014). Toward the relational management of educational measurement data. *Teachers College Record*, 116(11).
- O'Neil, H. F., Chung, G. K. W. K., Kerr, D., Vendlinski, T. P., Buschang, R. E., & Mayer, R. E. (2014). Adding self-explanation prompts to an educational computer game. *Computers in Human Behavior*, 30, 23–28.
- Chung, G. K. W. K., & Delacruz, G. C. (2014). Cognitive readiness for solving equations. In H. F. O'Neil, R. S. Perez, & E. L. Baker (Eds.), *Teaching and measuring cognitive readiness* (pp. 135–148). New York, NY: Springer.
- Chung, G. K. W. K., Gyllenhammer, R. G., Baker, E. L., & Savitsky, E. (2013). The effects of practicing with a virtual ultrasound trainer on FAST window identification, acquisition, and diagnosis. *Military Medicine*, 178(10S), 87–97.
- Kerr, D., & Chung, G. K.W.K. (2012). Identifying key features of student performance in educational video games and simulations through cluster analysis. *Journal of Educational Data Mining*, 4, 144–182.
- Baker, E. L., Chung, G. K. W. K., & Delacruz, G. C. (2012). The best and future uses of assessment in games. In M. Mayrath, J. Clarke-Midura, D. H. Robinson, & G. Schraw (Eds.). *Technology-based assessments for 21st Century skills: Theoretical and practical implications from modern research* (pp. 229–248). Charlotte, NC: Information Age Publishing.
- Buschang, R. E., Chung, G. K. W. K., Delacruz, G. C., & Baker, E. L. (2012). Validating measures of algebra teacher subject matter knowledge and pedagogical content knowledge. *Educational Assessment*, 17, 1–21. doi: 10.1080/10627197.2012.697847/

- Delacruz, G. C., Chung, G. K. W. K., & Baker, E. L. (2009). Finding its place: Developments of location-based mobile gaming in learning and assessment environments. In A. A. de Souza e Silva & D. M. Sutko (Eds.), *Digital cityscapes: Merging digital and urban playspaces* (pp. 251–268). Bern, Switzerland: Peter Lang Publishing.
- Bewley, W. L., Chung, G. K. W. K., Delacruz, G. C., & Baker, E. L. (2009). Assessment models and tools for virtual environment training. In D. Schmorrow, J. Cohn, & D. Nicholson (Eds.), *The PSI handbook of virtual environments for training and education: Developments for the military and beyond* (pp. 300–313). Westport, CT: Praeger Security International.
- Baker, E. L., Chung, G. K. W. K., & Delacruz, G. C. (2008). Design and validation of technology-based performance assessments. In J. M. Spector, M. D. Merrill, J. J. G. van Merriënboer, & M. P. Driscoll (Eds.), *Handbook of research on educational communications and technology* (3rd ed., pp. 595–604). Mahwah, NJ: Erlbaum.
- Chung, G. K. W. K., O’Neil, H. F., Bewley, W. L., & Baker, E. L. (2008). Computer-based assessments to support distance learning. In E. Klieme, J. Hartig, & A. Jurecka (Eds.), *Assessment of competencies in educational contexts* (pp. 253–276). Göttingen, Germany: Hogrefe & Huber.
- Chung, G. K. W. K., Baker, E. L., Delacruz, G. C., Bewley, W. L., Elmore, J., & Seely, B. (2008). A computational approach to authoring problem-solving assessments. In E. L. Baker, J. Dickieson, W. Wulfeck, & H. F. O’Neil (Eds.), *Assessment of problem solving using simulations* (pp. 289–307). New York: Routledge.
- Baker, E. L., Niemi, D., & Chung, G. K. W. K. (2008). Simulations and the transfer of problem solving knowledge and skills. In E. L. Baker, J. Dickieson, W. Wulfeck, & H. F. O’Neil (Eds.), *Assessment of problem solving using simulations* (pp. 1–17). New York: Routledge.
- Chung, G. K. W. K., Shel, T. C., & Kaiser, W. J. (2006). An exploratory study of a novel online formative assessment and instructional tool to promote students’ circuit problem solving. *Journal of Technology, Learning, and Assessment*, 5(6). Available from <http://jtla.org>
- Chung, G. K. W. K., Delacruz, G. C., de Vries, L. F., Bewley, W. L., & Baker, E. L. (2006). New directions in rifle marksmanship research. *Military Psychology*, 18, 161–179.
- Chung, G. K. W. K., O’Neil, H. F., Delacruz, G. C., & Bewley, W. L. (2005). The role of affect on novices’ rifle marksmanship performance. *Educational Assessment*, 10, 257–275.
- Chung, G. K. W. K., Delacruz, G. C., & Bewley, W. L. (2004). Performance assessment models and tools for complex tasks. *International Test and Evaluation Association (ITEA) Journal*, 25(1), 47–52.
- Chung, G. K. W. K., & Baker, E. L. (2003). An exploratory study to examine the feasibility of measuring problem-solving processes using a click-through interface. *Journal of Technology, Learning, and Assessment*, 2(2). Available from <http://jtla.org>
- O’Neil, H. F., Chuang, S., & Chung, G. K. W. K. (2003). Issues in the computer-based assessment of collaborative problem solving. *Assessment in Education*, 10, 361–373.
- Chung, G. K. W. K., & Baker, E. L. (2003). Issues in the reliability and validity of automated scoring of constructed responses. In M. D. Shermis & J. E. Burstein (Eds.), *Automated essay grading: A cross-disciplinary approach* (pp. 23–40). Mahwah, NJ: Erlbaum.
- Chung, G. K. W. K., de Vries, L. F., Cheak, A. M., Stevens, R. H., & Bewley, W. L. (2002). Cognitive process validation of an online problem solving assessment. *Computers in Human Behavior*, 18, 669–684.

- Harmon, T. C., Burks, G. A., Giron, J. J., Wong, W., Chung, G. K. W. K., & Baker, E. L. (2002). An interactive database supporting virtual fieldwork in an environmental engineering design project. *Journal of Engineering Education*, 92, 167–176.
- Chung, G. K. W. K., Harmon, T. C., & Baker, E. L. (2001). The impact of a simulation-based learning design project on student learning. *IEEE Transactions on Education*, 44, 390–398.
- O’Neil, H. F., Wang, S.-L., Chung, G. K. W. K., & Herl, H. E. (2000). Assessment of teamwork skills using computer-based teamwork simulations. In H. F. O’Neil & D. H. Andrews (Eds.), *Aircrew training and assessment* (pp. 245–276). Mahwah, NJ: Erlbaum.
- Chung, G. K. W. K., O’Neil, H. F., & Herl, H. E. (1999). The use of computer-based collaborative knowledge mapping to measure team processes and team outcomes. *Computers in Human Behavior*, 15, 463–494.
- O’Neil, H. F., Jr., Chung, G. K. W. K., & Brown, R. (1997). Use of networked simulations as a context to measure team competencies. In H. F. O’Neil Jr., (Ed.), *Workforce readiness: Competencies and assessment* (pp. 411–452). Mahwah, NJ: Erlbaum.
- Refereed Conference Proceedings**
- Kerr, D. & Chung, G. K. W. K. (2013, July). *Identifying learning trajectories in an educational video game*. Presentation at the Big Data Meet Complex Models Application Workshop at the 2013 Uncertainty in Artificial Intelligence Conference, July 11-15, 2013, Bellevue, WA.
- Borgstrom, P. H., Kaiser, W. J., Chung, G. K. W. K., Nelson, Z., Paul, M., Mr. Stoytchev, S. M., & Ding, J. T. K. (2012). Science and engineering active learning (SEAL) system: A novel approach to controls laboratories. *Proceedings of the Annual Meeting of the American Society of Engineering Education (Session T623-Outstanding Contributions to Student Learning through Laboratory Experiences: One of Four Best Papers for the Division of Experimentation and Laboratory Oriented Studies)*, San Antonio, TX.
- Kerr, D. & Chung, G. K. W. K. (2011). The mediation effect of in-game performance between prior knowledge and posttest score. In J. Matuga (Eds.), *Proceedings of the IASTED International Conference on Technology for Education (TE 2011)* (pp. 122-128). Anaheim, CA: ACTA Press. doi: 10.2316/P.2011.754-046
- Chung, G. K. W. K., & Vendlinski, T. P. (2011, September). *National Center for Research on Evaluation, Standards, and Student Testing (CRESST), Center for Advanced Technology in Schools (CATS): Technology applications to advance assessment and evaluation practice* (University Lab Showcase). Poster presentation at the 55th Annual Human Factors and Ergonomics Society, Las Vegas, NV.
- Delacruz, G. C., Chung, G. W. K., & Baker, E. L. (2010, July). Validity evidence for games as assessment environments. In K. Gomez, K., L. Lyons, & J. Radinsky (Eds.), *Learning in the Disciplines: Proceedings of the 9th International Conference of the Learning Sciences (ICLS 2010) - Volume 2, Short Papers, Symposia, and Selected Abstracts*, Chicago IL.
- Nagashima, S. O., Chung, G. K. W. K., Espinosa, P. D., & Berka, C. (2009). Sensor-based assessment of basic rifle marksmanship. *Proceedings of the IITSEC*, Orlando, FL.
- Nagashima, S. O., Chung, G. K. W. K., Espinosa, P. D., & Berka, C. (2009). Validity evidence for a model of rifle marksmanship skill performance using sensor-based measures. *Proceedings of the 53rd Annual Meeting of the Human Factors and Ergonomics Society*, San Antonio, TX.
- Encarnacao, A., Espinosa, P. D., Au, L., Chung, G. K. W. K., Johnson, L., & Kaiser, W. J. (2008). Individualized, interactive instruction (3I): An online formative assessment and

instructional tool. *Proceedings of the Annual Meeting of the American Society of Engineering Education (Session AC 2007-1524)*, Honolulu, HI.

- Bewley, W. L., Chung, G. K. W. K., Kim, J.-O., Lee, J. J., & Saadat, F. (2004). A distance learning testbed. *Proceedings of the IITSEC*, Orlando, FL.
- Vendlinski, T. P. J. F., Munro, A., Pizzini, Q. A., Bewley, W. L., Chung, G. K. W. K., Stuart, G., & Delacruz, G. C. (2004). Learning complex cognitive skills with an interactive job aid. *Proceedings of the IITSEC*, 26, 761–772.
- Chung, G. K. W. K., Baker, E. L., Brill, D. G., Sinha, R., Saadat, F., & Bewley, W. L. (2003). Automated assessment of domain knowledge with online knowledge mapping. *Proceedings of the IITSEC*, 25, 1168–1179.
- Chung, G. K. W. K., Delacruz, G. C., Dionne, G. B., & Bewley, W. L. (2003). Linking assessment and instruction using ontologies. *Proceedings of the IITSEC*, 25, 1811–1822.
- Chung, G. K. W. K., de Vries, L. F., Cheak, A. M., Stevens, R. H., & Bewley, W. L. (2002, June). Computer-based assessment with IMMEX: Linking cognitive and on-line problem solving processes. *Proceedings of the Annual Meeting of the American Society of Engineering Education*, Montreal, Canada.
- Chung, G. K. W. K., Harmon, T. C., & Baker, E. L. (2001, June). Potential uses of on-line performance assessments in engineering education: Measuring complex learning outcomes and processes. *Proceedings of the Annual Meeting of the American Society of Engineering Education*, Albuquerque, NM.

### **Technical Reports**

- Chung, G. K. W. K., Choi, K.-C., Baker, E. L., & Cai, L. (2014). *The effects of math video games on learning: A randomized evaluation study with innovative impact estimation techniques* (CRESST Report 841). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Kerr, D. & Chung, G. K. W. K. (2013). *The effect of in-game errors on learning outcomes* (CRESST Report 835). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).
- Kerr, D., Chung, G. K. W. K., & Iseli, M. R. (2012). *The feasibility of using cluster analysis to examine log data from educational video games* (CRESST Report 816). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing.
- Chung, G. K. W. K., Kerr, D. S. (2012). *A primer on data logging to support extraction of meaningful information from educational games: An example from Save Patch* (CRESST Report 814). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing.

### **PROFESSIONAL ASSOCIATIONS**

American Educational Research Association (AERA), American Psychological Association (APA), American Society of Engineering Education (ASEE), Human Factors and Ergonomics Society (HFES), Institute for Electrical and Electronic Engineers (IEEE), National Council on Measurement in Education (NCME), National Council of Teachers of Mathematics (NCTM)

## **AYESHA MADNI**

### **PROFESSIONAL PREPARATION**

University of Southern California	Education	Ed.D.	2008
California State University Long Beach	Communication	M.A.	2003
California State University Long Beach	Communication	B.A.	2001

### **APPOINTMENTS**

2012-present	Senior Researcher, Center for Research on Evaluation, Standards and Student Testing, University of California, Los Angeles
2009-present	Adjunct Assistant Professor of Educational Psychology, University of Southern California, Los Angeles
2009-2012	Senior Researcher and Proposal Writer, Intelligent Systems Technology Inc., Los Angeles

### **SELECTED PUBLICATIONS**

- Madni, A., Baker, E. L., Chow, K. A., Delacruz, G. C., & Griffin, N. C. (in press). Assessment of Teachers From a Social Psychological Perspective. *Review of Research in Education*, XX, 1-33.
- Madni, A. & Delacruz, G. C. (2014, September). *Games for Learning and Assessment*. Presentation at the Mobility and Modern Web Conference, Los Angeles, CA, September, 17, 2014.
- Madni, A., Griffin, N. C., & Delacruz, G. C. (July, 2013). *Social and Emotional Learning in Games*. Presentation at the annual meeting of the American Psychological Association, July 2013, Honolulu, Hawaii.
- Griffin, N. C. & Madni, A. (April, 2013). *Integrating Assessment of Social and Emotional Learning into an Early Childhood Science Learning Context*. Presentation at the annual American Educational Research Association Conference, San Francisco, California.
- Madni, A. (2012). *Instructor's Resource Manual for Motivation and Learning Strategies for College Success* (4<sup>th</sup> Ed.). New York: Taylor & Francis. (web-based)
- Madni, A. (2009). *Do the Perceptions of the Usefulness of Academic Support Services Influence Ethnically Diverse Students' Help-seeking Attitudes and Behaviors?* Presented at the Annual American Educational Research Association Conference, March 2009, San Diego, California.
- Madni, A. (2008). *Instructor's Resource Manual for Motivation and Learning Strategies for College Success* (3<sup>rd</sup> Ed.). New York: Taylor & Francis.
- Madni, A. Maximizing Student Learning in Class Through Personal Response Systems ("clickers.") Presented at the 41<sup>st</sup> Annual College Reading and Learning Association Conference, October 2008, Cleveland, Ohio.

### **PROFESSIONAL ASSOCIATIONS**

American Educational Research Association  
American Psychological Association  
Phi Kappa Phi National Honor Society

## HARROLD O'NEIL

### PROFESSIONAL PREPARATION

Florida State University, Tallahassee, FL. Psychology, Ph.D. 1969  
Hollins College, VA. Psychology, M.S. 1966  
Boston College, Chestnut Hill, MA. Psychology, A.B. 1965, cum laude

### APPOINTMENTS

1985-Present Professor of Educational Psychology and Technology, Rossier School of Education, University of Southern California  
1978-1985 Team Chief, Chief, Director, Training Research Laboratory, U.S. Army Research Institute for the Behavioral and Social Sciences. (Pay Grade SES-4)  
1975-1978 Program Manager of Advanced Training Technology, Defense Advanced Research Projects Agency (DARPA). (Pay Grade GS-15)  
1971-1976 (on leave 1975-76)  
Assistant/Associate Professor (Tenured), Educational Psychology, University of Texas at Austin. Co-Director of Computer-Assisted Instruction Laboratory, University of Texas at Austin; Chair, Learning and Motivation (one year), Department of Educational Psychology, University of Texas at Austin

### SELECTED PUBLICATIONS

- O'Neil, H. F., Chung, G. K.W.K., Kerr, D., Vendlinski, T. P., Buschang, R. E., Mayer, R. E. (2014). *Adding self-explanation prompts to an educational computer game*. *Computers in Human Behavior*, 30, 23-28.
- O'Neil, H. F., Jr., Lang, J., Perez, R. S., Ayala, D., & Fox, F. S. (2014). *What is cognitive readiness?* In H. F. O'Neil, Jr., R. S. Perez, & E. Baker (Eds.), *Teaching and measuring cognitive readiness*. New York, NY: Springer Publishing Company.
- O'Neil, H. F., Jr., Kunkler, K., Friedl, K., & Perez, R. S. (Eds.). (2013). *Designing and using effective medical simulations in military medicine education*. *Military Medicine* (supplement).
- Rueda, R., Lim, H. J., O'Neil, H. F., Griffin, N., Bockman, S., & Sirotnik, B. (2010). *Ethnic differences on students' approaches to learning: Self-regulatory cognitive and motivational predictors of academic achievement for Latino/a and white college students*. In I. Saleh & M. S. Khine (Eds.), *New science of learning: Computers, cognition and collaboration in education*. New York, NY: Springer.
- O'Neil, H. F., Chuang, S. H., & Baker, E. L. (2009). *Computer-based feedback for computer-based collaborative problem-solving*. In D. Ifenthaler, P. Pirnay-Dummer, & N. M. Seel (Eds.), *Computer-based diagnostics and systematic analysis of knowledge*, New York, NY: Springer-Verlag.
- Baker, E. L., Dickieson, J., Wulfeck, W., & O'Neil, H. F. (Eds.). (2008). *Assessment of problem solving using simulations*. Mahwah, NJ: Lawrence Erlbaum Associates.

- Chen, H.-H. C., & O'Neil, H. F. (2008). *A formative evaluation of the training effectiveness of a computer game*. In H. F. O'Neil & R. S. Perez (Eds.), *Computer games and team and individual learning* (pp. 39-54). Oxford, UK: Elsevier.
- O'Neil, H. F., & Perez, R. S. (Eds.). (2008). *Computer games and team and individual learning*. Oxford, UK: Elsevier.
- O'Neil, H. F. (Ed.). (2008). *What works in distance learning: Sample lessons based on guidelines*. Greenwich, CT: Information Age Publishing Inc.
- O'Neil, H. F., & Perez, R. (Eds.). (2006). *Web-based learning: Theory, research, and practice*. Mahwah, NJ: Lawrence Erlbaum Associates.

## **PROFESSIONAL ASSOCIATIONS**

- Editor, American Educational Research Journal-Teaching, Learning, and Human Development, 2013-Present.
- Fellow, American Educational Research Association, 2008-Present
- Fellow, Association for Psychological Science, 1989-Present
- Fellow, Division 21—Applied Experimental and Engineering Psychology, American Psychological Association, 1984-Present
- Fellow, Division 19—Military Psychology, American Psychological Association, 1981-Present
- Fellow, Division 15—Educational Psychology, American Psychological Association, 1979-Present
- Fellow, Division 5 – Evaluation, Measurement and Statistics; Fellow, American Psychological Association, 1979-Present

## Budget Narrative File(s)

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\* **Mandatory Budget Narrative Filename:**

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To add more Budget Narrative attachments, please use the attachment buttons below.

**Section C – Budget Narrative**

**California Department of Education Budget**

**Title: *Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments***

**U.S. DEPARTMENT OF EDUCATION FUNDS**

**Personnel**

Salary rates are based on current salaries of named staff members augmented by estimated increases.

<b>Personnel: The following proposed personnel will all be hired as employees of the project.</b>	<b>% Time</b>	<b>Annual Base Salary</b>	<b>Total</b>
<b>Senior Staff</b>			
<b>Ashley, Keric</b> - Keric Ashley will serve as PI for the project. He will provide overall conceptual and implementation leadership for the project, with an emphasis on the application of the project activities and findings to CDE’s assessment system. He will serve as the conduit of the project’s work and findings to the larger CDE leadership and constituents. His qualifications are described in the Quality of Project Personnel section of the application narrative. His salary costs are covered by existing CDE resources and will be provided as voluntary cost-sharing for this project. See Section B – Non-Federal Funds for specific contribution details.	Y1 - 15% Y2 – 15%	Y1-\$0 Y2 -\$0	Y1 – \$0 Y2 - \$0 TOTAL: \$0

<b>TBN Project Director</b> – Keric Ashley will be supported by a full-time project director/manager housed at CDE. S/he will be hired at time of award should the project be funded. S/he will provide day-to-day management and oversight of the project activities, manage budget and timelines, serve as logistical point of contact with the subaward - UCLA and CDE departments, oversee production and execution of all deliverables and products, and assure communication and coordination between all partners.	Y1 -	Y1 -	Y1 - \$97,500
	100%	\$97,500	Y2 - \$97,500
	Y2 –	Y2 –	TOTAL: \$195,000
	100%	\$97,500	

The salary estimate for the Project Director to be hired is based on the current salary range of an Education Administrator I according to the state of California civil service pay scale. Personnel charges to the project will be strictly monitored, routinely documented and approved, and will reflect only project-specific services. The salary for the TBN Project Director is not duplicated in the facilities and administrative costs or in any other charge presented to the CDE.

Salary Costs: Year 1 - \$97,500; Year 2 - \$97,500. TOTAL: \$195,000

**Fringe Benefits**

Rates are calculated as a percentage of salary.

<b>Personnel: The following proposed personnel will all be hired as employees of the project.</b>	<b>Fringe Benefit %</b>	<b>Base</b>	<b>Total</b>
<b>Senior Staff</b>			
Ashley, Keric	Y1 –	Y1 - \$0	Y1 - \$0
	0%	Y2 –	Y2 - \$0
	Y2 –	\$0	TOTAL: \$0
	0%		

TBN Project Director	Y1 –	Y1 -	Y1 - \$40,755
	41.8%	\$40,755	Y2 - \$40,755
	Y2 –	Y2 –	TOTAL: \$81,510
	41.8%	\$40,755	

Fringe Benefit costs per year: Year 1 - \$40,755; Year 2 – \$40,755. TOTAL: \$81,510

**Travel**

<b>Purpose of Travel</b>	<b>Basis for Cost Estimate</b>	<b># People Traveling</b>	<b>\$ per Person for Trip</b>	<b>Total</b>
PI/Project Director meeting in Washington DC to meet with U.S. Department of Education lead, yearly meeting for status and progress reporting. 1 trip per year, 2 travelers per trip	Average airfare of \$700	2	Airfare: \$700	Y1 –
	per person		Lodging (2 days):	\$2,964
	Lodging of up to		\$440	Y2 –
	\$220/night per person		Subsistence (2 days):	\$2,964
	Subsistence allowance of		\$142	
	\$71/day per person		Other expenses: \$200	
Ground Transportation & travel related expenses	TOTAL:	\$1,482/person		
	- \$100/day per person			
PI/Project Director travel to Washington D.C. to attend American Educational Research Association Annual meeting for dissemination of research findings 1 trip per year, 2 travelers per trip	Average airfare of \$700	2	Airfare: \$700	Y1 –
	per person		Lodging (2 days):	\$2,964
	Lodging of up to		\$440	Y2 –
	\$220/night per person		Subsistence (2 days):	\$2,964
	Subsistence allowance of		\$142	
	\$71/day per person		Other expenses: \$200	
Ground Transportation & travel related expenses	TOTAL:	\$1,482/person		

	- \$100/day per person			
PI/Project Director travel to Los Angeles, CA to meet with subcontractor UCLA 4 trip per year, 2 travelers per trip	Average airfare of \$300 per person Lodging of up to \$220/night per person Subsistence allowance of \$71/day per person Ground Transportation & travel related expenses - \$100/day per person	2	Airfare: \$300 Lodging (1 day): \$220 Subsistence (2 days): \$71 Other expenses: \$100 TOTAL: \$691/person	Y1 – \$5,528 Y2 – \$5,528
Travel for mileage	\$0.575 /mile	200	Mileage reimb. \$115/year	Y1 – \$115 Y2 – \$115

Estimates are for travel costs of CDE personnel while on project travel status and include airfare, subsistence, reasonable lodging, and vehicle rental or taxi fare. Airfare estimates are based on an average of current coach rates relative to the point of origin/destination. Airfare costs of \$700 per flight from Sacramento, CA to Washington D.C. and costs of \$300 per flight from Sacramento, CA to Los Angeles, CA, ground transportation costs and related costs are based on historical data and fare quotes obtained at the time of estimate. Subsistence is based on the CDE's subsistence allowance following rates set by the State of California and accepted by federal granting agencies currently set at up to \$71/day. All estimates are based on amounts provided by carriers/vendors and/or historical. The current mileage reimbursement rate is 57.5 cents per mile for 2015.

Travel costs per year: Year 1 - \$11,571; Year 2 - \$11,571. TOTAL: \$23,142

## Supplies

Supplies estimates are based on historical data and CDE vendor costs for project core office supplies. Expenses in this category pertain only to what is needed to accomplish the management and oversight of this project. There will be partial telecommunications charges, photocopy, ink cartridge, data storage and project related supplies as applicable. Other supplies that may be needed for the project include pens, folders, paper, and other routine project supplies used for various analysis activities and report preparation. Other costs also will be incurred such as software/hardware upgrades, tablets/laptops, and other technology-based supplies that may be required to replace/repair current supplies to accommodate the need of massive data storage, analyses, and reporting. Procurement methods are in accordance with CDE procedures using approved vendors and negotiated rates. FedEx is normally used at a state negotiated discounted price to secure and track mailing of data and/or reports. Per OMB A-21 requirements, projected Core Supply Costs are project-specific (i.e., costs are for supplies purchased for this project only, not for general CDE use.)

<b>Supplies-Description</b>	<b>No.</b>	<b>Unit Price</b>	<b>Tax 9.75%</b>	<b>Cost per item</b>	<b>Cost</b>
Mailing cost (FEDEX)	10	9.72	0.95	10.67	106.70
Xerox Copying Services (per sheet)	4000	0.10		0.10	400.00
Papers per ream for copy machine	400	3.37	0.33	3.70	740.00
Laserjet Toner Cartridge B/W	8	113.62	11.08	124.70	498.80
Laserjet Toner Cartridge CYMK	8	178.07	17.36	195.43	781.82
Super Sticky Notes (5/pack)	4	9.35	0.91	10.26	41.04
USB 16gb secure encryption	2	90.00	8.77	98.77	197.54
White Pad paper (dz)	20	4.29	0.42	4.71	94.17
Pens dozen/box	10	14.29	1.39	15.68	156.83
Manila Folders (bx)	10	5.34	0.52	5.86	58.61

Office supplies - Paperclips/staples	10	3.00	0.29	3.29	32.93
Desktop computer	1	1,200.00	117.00	1,317.00	1,317.00
Monitors	2	150.00	29.25	179.25	358.50
Microsoft Office software license	1	200.00	19.50	219.50	219.50
SAS software license	1	1,000.00	97.50	1,097.50	1,097.50
Misc. software (encryption, winzip, Adobe)	3	100.00	29.25	129.25	387.75
Laptop	1	1,500.00	146.25	1,646.25	1,646.25
Miscellaneous ergonomic services & office supplies	1	800.00	48.75	848.75	848.75

Core project supplies cost per year: Year 1- \$9,375; Year 2- \$3,500. TOTAL: \$12,875

### **Contractual**

UCLA will serve as a subaward for the proposed project. UCLA's proposed work includes two main groups that will collaborate with CDE for the two year project period: CSE/CRESST (led by Li Cai) and the SRM Evaluation Group (led by Christina Christie).

UCLA will fill a critical void in the large-scale K-12 assessments by providing innovative interpretations of the Smarter Balanced Assessments that support career readiness. The project will also enhance and improve career and college readiness inferences drawn from the Smarter Balanced Assessment Consortium's high school assessments that cut across multiple currently reported outcomes (math and ELA and the multiple claims under each). Combining qualitative and quantitative approaches, the project will develop a coherent and scalable means of reusing the current item pool, as well as undertake new development of items of richer and technology-enhanced type. Finally, the project will gather preliminary validity evidence in support of new and improved inferences.

UCLA-CSE/CRESST will undertake the following during this two-year project.

- Defining and operationalizing career readiness to support inferences from the Smarter Balanced assessment. Through feature analysis, including ontology development building on existing models, review of past research by CRESST and others, qualitative content review and a range of psychometric analyses of existing Smarter Balanced items and data, the project will contribute to an improved and operationalizable definition of the target construct, i.e., claims of career and college readiness. A distinguishing aspect of the approach is that the qualitative feature extraction of items and tasks will be augmented and validated by psychometric modeling using the features as predictive attributes. As such, the resulting scaling and reporting will have built-in criterion-referenced qualities and a potentially richer, more reliable set of scores that can be provided. This work will primarily occur during the first year of the project, although follow up analyses and refinement may be warranted in Year 2.
- Conducting additional content and psychometric analysis using international career and college ready benchmarks. CRESST will use existing international benchmarks, in addition to the PISA linkage that the current Smarter Balanced scale provides, to examine the relationship of CDE assessments to international assessment results that approach similar career and college readiness. CRESST will collaborate with CDE to determine the appropriate international benchmarks to include in the analysis, although preliminary suggestions include China and Korea. This work will begin during the first year of the project, and be completed in the second year.
- Collecting small-scale pilot validity information. This information will be used to further examine career and college ready features of the CDE items from groups such as the high school students, community college students, and people in the world of work. This work will begin during the first year of the project, and be completed in the second year.
- Developing a small number (e.g., 5-10) new assessment items. These items will focus on career ready constructs not fully addressed in the current CDE data set, and will use innovative approaches (e.g., simulations, collaborative problem solving, non-cognitive variables such as grit/persistence, etc.). This work will occur during the second year of the proposed project.

- Developing resources for stakeholders. CSE/CRESST will develop and usability test a set technology-based interactive resources for teachers, learners, and parents to use in understanding and implementing improvement strategies based on career and college ready information from the assessments. This work will occur during the second year of the proposed project.

In addition to the work conducted by CSE/CRESST, the SRM Evaluation Group will serve as evaluator for the project, reviewing project plans, results, and reports, interviewing key stakeholders, and coordinating feedback and review from the advisory group.

CDE has followed the procedures for procurement under 34 CFR Parts 74.40 – 74.48 and Part 80.36. UCLA’s detailed budget is attached.

Contractual costs per year: Year 1 - \$1,175,626, Year 2 - \$1,208,011. TOTAL: \$2,383,637

**Total Direct Costs**

Total Direct Costs per year: Year 1- \$1,334,827; Year 2- \$1,361,337. TOTAL: \$2,696,164

**Indirect Costs**

Rates are based on current facilities and administrative cost rates negotiated with the Federal government for CDE. CDE will assess an Indirect Cost rate of 23.1% on total operating costs and on the first \$25,000 of subcontractor costs.

Total Indirect Costs per year: Year 1- \$42,551; Year 2- \$35,418. TOTAL: \$77,969.

**Total Costs**

Total Costs per year: Year 1- \$1,377,378; Year 2- \$1,396,755. TOTAL: \$2,774,133.

**NON-FEDERAL FUNDS**

(b)(4)

(b)(4)



OFFICE OF CONTRACT AND GRANT ADMINISTRATION  
BOX 951406  
11000 KINROSS AVENUE, SUITE 211  
LOS ANGELES, CALIFORNIA 90095-1406

PHONE: (310) 794-0102  
FAX: (310) 794-0631

[www.research.ucla.edu/ocga](http://www.research.ucla.edu/ocga)

June 26, 2015

Michael Wimberly  
California Department of Education

Dear Mr. Wimberly:

The Regents of the University California, UCLA Office of Contract and Grant Administration approves the proposed collaboration with your institution on the U.S. Department of Education application titled "Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments". We request funds in the amount of \$2,383,637.00 for the period of September 1, 2015 to August 31, 2017. Professor Li Cai will be the responsible investigator at the University of California – Los Angeles.

Any questions related to the technical aspects of this proposal should be directed to Professor Cai at (310) 206-0583, or via email at [lcail@ucla.edu](mailto:lcail@ucla.edu). Administrative questions should be directed to me at 310-794-0259 or via email at [mbailey@research.ucla.edu](mailto:mbailey@research.ucla.edu).

Sincerely,

(b)(6)

Miesha Bailey  
Contracts and Grants Officer

Ecc: Professor Li Cai  
Ms. Joena Mandanici

Internal Ref. #20155200



**U.S. DEPARTMENT OF EDUCATION  
BUDGET INFORMATION  
NON-CONSTRUCTION PROGRAMS**

OMB Control Number: 1894-0008  
Expiration Date: 06/30/2017.

Name of Institution/Organization  
Regents of the University of California, Los Angeles

Applicants requesting funding for only one year should complete the column under "Project Year 1.". Applicants requesting funding for multi-year grants should complete all applicable columns. Please read all instructions before completing form.

**SECTION A - BUDGET SUMMARY  
U.S. DEPARTMENT OF EDUCATION FUNDS**

Budget Categories	Project Year 1 (a)	Project Year 2 (b)	Project Year 3 (c)	Project Year 4 (d)	Project Year 5 (e)	Total (f)
1. Personnel	\$464,515	\$493,910				\$958,425
2. Fringe Benefits	\$178,207	\$198,370				\$376,577
3. Travel	\$19,186	\$19,857				\$39,043
4. Equipment	\$8,000	\$0				\$8,000
5. Supplies	\$90,579	\$72,765				\$163,344
6. Contractual	\$110,788	\$114,228				\$225,016
7. Construction	\$0	\$0				\$0
8. Other	\$32,230	\$34,164				\$66,394
9. Total Direct Costs (lines 1-8)	\$903,505	\$933,294				\$1,836,799
10. Indirect Costs*	\$272,121	\$274,717				\$546,838
11. Training Stipends	\$0	\$0				\$0
12. Total Costs (lines 9-11)	\$1,175,626	\$1,208,011				\$2,383,637

**\*Indirect Cost Information (To Be Completed by Your Business Office):**

If you are requesting reimbursement for indirect costs on line 10, please answer the following questions:

(1) Do you have an Indirect Cost Rate Agreement approved by the Federal government?  Yes  No

(2) If yes, please provide the following information:

Period Covered by the Indirect Cost Rate Agreement: From: 07/01/2010 To: 06/30/2016 (mm/dd/yyyy)

Approving Federal agency:  ED  Other (please specify): Department of Health and Human Sciences The Indirect Cost Rate is 35%

(3) For Restricted Rate Programs (check one) -- Are you using a restricted indirect cost rate that:

Is included in your approved Indirect Cost Rate Agreement? or  Complies with 34 CFR 76.564(c)(2)? The Restricted Indirect Cost Rate is \_\_\_\_\_%

Name of Institution/Organization Regents of the University of California, Los Angeles	Applicants requesting funding for only one year should complete the column under "Project Year 1." Applicants requesting funding for multi-year grants should complete all applicable columns. Please read all instructions before completing form.
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**SECTION B - BUDGET SUMMARY  
NON-FEDERAL FUNDS**

Budget Categories	Project Year 1 (a)	Project Year 2 (b)	Project Year 3 (c)	Project Year 4 (d)	Project Year 5 (e)	Total (f)
1. Personnel						
2. Fringe Benefits						
3. Travel						
4. Equipment						
5. Supplies						
6. Contractual						
7. Construction						
8. Other						
9. Total Direct Costs (Lines 1-8)						
10. Indirect Costs						
11. Training Stipends						
12. Total Costs (Lines 9-11)						\$0

**SECTION C – BUDGET NARRATIVE** (see instructions)

**UCLA BUDGET NARRATIVE**

**PI: Li Cai**

**Sub-Proposal to CDE in response to EAG CFDA 84.368A**

**Title: *Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments***

**Personnel**

Salary rates are based on current salaries of named staff members augmented by estimated increases. Estimates are based on scheduled merit and cost of living increases for named staff/faculty in accordance with policy for the same provided system wide for the University of California. Separate salary escalation projections are applied based on the employee’s category of staff personnel at 3% escalation at the beginning of the fiscal year, July 1, 2015. Personnel charges to the project are strictly monitored, routinely documented and approved, and reflect only project-specific services. These salaries are not duplicated in the facilities and administrative costs or in any other charge presented to the agency. The Center for Research on Evaluation, Standards and Student Testing (CRESST) is an organized research center and therefore not supported by F&A costs.

<b>Personnel: The following proposed personnel will all be hired as employees of the project.</b>	<b>% Time</b>	<b>Annual Base Salary</b>	<b>Total</b>
<b>Senior Staff</b>			
<b>Cai, Li</b> - Dr. Cai will serve as the CSE/CRESST team lead, providing intellectual leadership and oversight for all technical aspects of the project as well as provide technical quality control for all project publications and documents. His qualifications are described in the Quality of Project Personnel section of the application narrative.	Y1 - 4.2%	Y1- \$190,365	Y1 – \$7,932
	Y2 – 4.2%	Y2 – \$199,883	Y2 - \$8,328
			TOTAL: \$16,200

<p><b>Baker, Eva</b> – Dr. Baker will lead the qualitative feature analysis aspects of the work as well as the new item development. Her qualifications are described in the Quality of Project Personnel section of the application narrative.</p>	<p>Y1 - 8% Y2 – 8%</p>	<p>Y1 - \$304,914 Y2 – \$304,914</p>	<p>Y1 - \$24,393 Y2 - \$24,393 TOTAL: \$48,786</p>
<p><b>Christie, Christina</b> - Dr. Christie will serve as lead evaluator for the project. In collaboration with Dr. Cai, she will assess the evaluation practices of CRESST research methods. Her qualifications are described in the Quality of Project Personnel section of the application narrative.</p>	<p>Y1 - 8.3% Y2 – 8.3%</p>	<p>Y1 - \$158,466 Y2 – \$166,389</p>	<p>Y1 – \$13,206 Y2 - \$13,866 TOTAL: \$27,071</p>
<p><b>Choi, Kilchan</b> – Dr. Choi, Principal Scientist, will, along with Mark Hansen, lead the statistical and analytic aspects of the project, as well as coordinate data access and data reporting. His qualifications are described in the Quality of Project Personnel section of the application narrative.</p>	<p>Y1 - 25% Y2 – 25%</p>	<p>Y1 - \$138,608 Y2 – \$142,764</p>	<p>Y1 – \$34,652 Y2 – \$35,691 TOTAL: \$70,343</p>
<p><b>Hansen, Mark</b> – Dr. Hansen, along with Dr. Choi, will lead the statistical and analytic aspects of the project. His qualifications are described in the Quality of Project Personnel section of the application narrative.</p>	<p>Y1 - 40% Y2 – 40%</p>	<p>Y1 - \$72,100 Y2 - \$75,705</p>	<p>Y1 – \$28,840 Y2 – \$30,282 TOTAL: \$59,123</p>

<p><b>Griffin, Noelle</b> – Dr. Griffin will lead the development of digital tools and learning support for teachers, students, parents, and other stakeholders. Her qualifications are described in the Quality of Project Personnel section of the application narrative.</p>	<p>Y1 - 20% Y2 – 25%</p>	<p>Y1 - \$131,300 Y2 - \$135,240</p>	<p>Y1 – \$26,260 Y2 - \$33,810 TOTAL: \$60,070</p>
<p><b>Chung, Gregory</b> – Dr. Chung will collaborate with Noelle Griffin on the development of technology-based resources as well as provide overall support and advisement to all technological aspects of the project. His qualifications are described in the Quality of Project Personnel section of the application narrative.</p>	<p>Y1 - 20% Y2 – 25%</p>	<p>Y1 - \$118,180 Y2 - \$121,724</p>	<p>Y1 - \$23,636 Y2 - \$30,431 TOTAL: \$54,066</p>
<p><b>Madni, Ayesha</b> – Project Manager Dr. Madni will manage all day-to-day project activities, coordinate and oversee pilot study, and manage all project timelines, reporting demands, and schedules. She will assist the PI and Co-PI with project design and instrumentation. Her qualifications are described in the Quality of Project Personnel section of the application narrative.</p>	<p>Y1 - 100% Y2 – 100%</p>	<p>Y1 - \$79,070 Y2 - \$81,442</p>	<p>Y1 - \$79,070 Y2 - \$81,442 TOTAL: \$160,512</p>
<p><b>Kim, Jinok</b> – Statistician, Dr. Kim will provide statistical and analytic support for the project. His qualifications are described in the Quality of Project Personnel section of the application narrative.</p>	<p>Y1 - 60% Y2 – 69%</p>	<p>Y1 - \$107,138 Y2 - \$110,352</p>	<p>Y1 - \$64,283 Y2 - \$66,211 TOTAL: \$130,494</p>

<p><b>Carrol, Patricia</b> – Dr. Carrol will provide content support in the areas of English Learning Instruction and Assessment throughout all project strands. Her qualifications are described in the Quality of Project Personnel section of the application narrative.</p>	<p>Y1 - 40% Y2 – 30%</p>	<p>Y1 - \$82,030 Y2 - \$84,490</p>	<p>Y1 - \$32,812 Y2 - \$25,347 TOTAL: \$58,160</p>
<p><b>Supporting Staff</b></p>			
<p><b>Abedi, Ali</b> – Programmer – Mr. Abedi will assist with the programming needs across all aspects of the project, including database set up, feature analytics, development of digital resources and programming of new assessment items.</p>	<p>Y1 - 10% Y2 – 25%</p>	<p>Y1 - \$72,800 Y2 - \$74,980</p>	<p>Y1 - \$7,280 Y2 - \$18,745 TOTAL: \$26,024</p>
<p><b>Rivera, Nichole</b> - A research assistant will provide general research support for data collection, data entry, data cleaning, and basic data analysis. She will assist researchers in pilot study and analysis.</p>	<p>Y1 - 100% Y2 – 100%</p>	<p>Y1 - \$56,888 Y2 - \$58,594</p>	<p>Y1 - \$56,888 Y2 - \$58,594 TOTAL: \$115,482</p>

<p><b>Mandanici, Joena</b> – Ms. Mandanici will facilitate coordination between P.I. and senior personnel, including communication and meetings with CDE and other constituents, provide verification of monthly internal financial reporting from the university ledger system to the P.I., and support overall project data management, which are not provided by the department. The coordinator will also provide project’s document control; editing of deliverables, as needed; and other general project-based tasks. The employee will also partly assist the study personnel in coordinating transactions with California Department of Education.</p>	<p>Y1 - 10% Y2 – 10%</p>	<p>Y1 - \$97,080 Y2 - \$100,000</p>	<p>Y1 - \$9,708 Y2 - \$10,000 TOTAL: \$19,708</p>
<p><b>Flores, Francisco</b> - Mr. Flores will coordinate for the transfer of data with sponsor, the California Department of Education. The administrative assistant will also provide administrative support across the project, including procurement of supplies, travel booking and expense reimbursements, and will be logistical point of contact for advisory group meetings. The support costs included in the detailed budget are for time dedicated to this project only. CRESST is an organized research unit and is not supported by F&amp;A/Indirect Costs.</p>	<p>Y1 - 20% Y2 – 20%</p>	<p>Y1 - \$50,620 Y2 - \$52,140</p>	<p>Y1 - \$10,124 Y2 - \$10,428 TOTAL: \$20,552</p>

<p><b>GSR #1</b> - The Graduate Student Researcher will be an advanced doctoral student in research methodology and will assist the project team in reviewing literature on statistical modeling that this study will employ and conduct a portion of necessary qualitative and statistical analyses to accomplish the study aims, under the supervision of the PI and Statistician.</p>	<p>Y1 - 49% Y2 – 49%</p>	<p>Y1 - \$46,359 Y2 - \$47,288</p>	<p>Y1 - \$22,716 Y2 - \$23,171 TOTAL: \$45,887</p>
<p><b>GSR #2</b> – The Graduate Student Researcher will assist Christina Christie in evaluation and assessment efforts of CRESST methodology.</p>	<p>Y1 - 49% Y2 – 49%</p>	<p>Y1 - \$46,359 Y2 - \$47,288</p>	<p>Y1 - \$22,716 Y2 - \$23,171 TOTAL: \$45,887</p>

Salary Costs: Year 1 - \$464,515; Year 2 - \$493,910. TOTAL: \$958,425

**Fringe Benefits**

Actual rates for named personnel are calculated as a percentage of salary. An annual increase of 1.5% in the University of California Retirement Plan is added to the benefit rate of each employee at the beginning of the new fiscal year (July 1, 2015). Faculty summer month benefits are calculated at 12.7% and Graduate Student Researcher are calculated at an average benefit rate of 1.8%.

<p><b>Personnel: The following proposed personnel will all be hired as employees of the project.</b></p>	<p><b>Fringe Benefit %.</b></p>	<p><b>Base</b></p>	<p><b>Total</b></p>
<p><b>Senior Staff</b></p>			
<p>Cai, Li</p>	<p>Y1 – 12.7% Y2 – 12.7%</p>	<p>Y1 - \$7,932 Y2 – \$8,328</p>	<p>Y1 - \$1,007 Y2 - \$1,058 TOTAL: \$2,065</p>

Baker, Eva	Y1 – 3% Y2 – 3%	Y1 - \$24,393 Y2 – \$24,393	Y1 - \$732 Y2 - \$732 TOTAL: \$1,464
Christie, Christina	Y1 – 12.7% Y2 – 12.7%	Y1 -\$13,206 Y2 – \$13,866	Y1 – \$1,677 Y2 - \$1,761 TOTAL: \$3,438
Choi, Kilchan	Y1 - 51.5% Y2 – 53.0%	Y1 -\$34,652 Y2 – \$35,691	Y1 – \$17,841 Y2 – \$18,911 TOTAL: \$36,752
Hansen, Mark	Y1 - 56.8% Y2 – 58.3%	Y1 - \$28,840 Y2 - \$30,282	Y1 – \$16,370 Y2 – \$17,643 TOTAL: \$34,012
Griffin, Noelle	Y1 – 45.1% Y2 – 46.6%	Y1 - \$26,260 Y2 - \$33,810	Y1 – \$11,832 Y2 - \$15,740 TOTAL: \$27,572
Chung, Gregory	Y1 – 57.1% Y2 – 58.6%	Y1 - \$23,636 Y2 - \$30,431	Y1 - \$13,486 Y2 - \$17,819 TOTAL: \$31,305

Madni, Ayesha	Y1 - 51.2% Y2 – 52.7%	Y1 - \$79,070 Y2 - \$81,442	Y1 - \$40,449 Y2 - \$42,884 TOTAL: \$83,333
Kim, Jinook	Y1 - 35.4% Y2 – 36.9%	Y1 - \$64,283 Y2 - \$66,211	Y1 - \$22,728 Y2 - \$24,403 TOTAL: \$47,131
Carrol, Patricia	Y1 – 45.8% Y2 – 47.3%	Y1 - \$32,812 Y2 - \$25,347	Y1 - \$15,014. Y2 - \$11,978 TOTAL: \$26,992
<b>Supporting Staff</b>			
Abedi, Ali	Y1 – 51.6% Y2 – 53.1%	Y1 - \$7,280 Y2 - \$18,745	Y1 - \$3,753 Y2 - \$9,945 TOTAL: \$13,698
Rivera, Nichole	Y1 - 38.2% Y2 – 39.7%	Y1 - \$56,888 Y2 - \$58,594	Y1 - \$21,729 Y2 - \$23,260 TOTAL: \$44,989
Mandanici, Joena	Y1 - 62.4% Y2 – 63.9%	Y1 - \$9,708 Y2 - \$10,000	Y1 - \$6,054 Y2 - \$6,385 TOTAL: \$12,439

Flores, Francisco	Y1 – 46.7% Y2 – 48.2%	Y1 - \$10,124 Y2 - \$10,428	Y1 - \$4,718 Y2 - \$5,016 TOTAL: \$9,735
GSR #1	Y1 - 1.8% Y2 – 1.8%	Y1 - \$22,716 Y2 - \$23,171	Y1 - \$409 Y2 - \$417 TOTAL: \$826
GSR #2	Y1 - 1.8% Y2 – 1.8%	Y1 - \$22,716 Y2 - \$23,171	Y1 - \$409 Y2 - \$417 TOTAL: \$826

Fringe Benefit costs per year: Year 1 - \$178,207; Year 2 – \$198,370. TOTAL: \$376,577

**Travel**

Purpose of Travel	Basis for Cost Estimate	# People Traveling	\$ per Person for Trip	Total
PI meeting in Washington DC to meet with U.S. Department of Education lead, yearly meeting for status and progress reporting.  1 trip per year, 1 traveler per trip	Average airfare of \$700 per person	1	Airfare: \$700	Y1 –
	Lodging of up to \$220/night per person		Lodging (2 days): \$440	\$1,482
	Subsistence allowance of \$71/day per person		Subsistence (2 days): \$142	Y2 –
			Other expenses: \$200	\$1,534

	Ground Transportation & travel related expenses - \$100/day per person		TOTAL: \$1,482/person	
PI/key personnel travel to Washington D.C. to attend American Educational Research Association Annual meeting for dissemination of research findings. 1 trip per year, 1 traveler per trip	Average airfare of \$700 per person Lodging of up to \$220/night per person Subsistence allowance of \$71/day per person Ground Transportation & travel related expenses - \$100/day per person	1	Airfare: \$700 Lodging (2 days): \$440 Subsistence (2 days): \$142 Other expenses: \$200 TOTAL: \$1,482/person	Y1 – \$1,482 Y2 – \$1,534
PI/key personnel travel to Sacramento, CA to attend Advisory Board Meeting with sponsor, California Department of Education. 4 trips per year, 2 travelers per trip	Average airfare of \$300 per person Lodging of up to \$220/night per person Subsistence allowance of \$71/day per person Ground Transportation & travel related expenses - \$100/day per person	2	Airfare: \$300 Lodging (2 days): \$440 Subsistence (2 days): \$142 Other expenses: \$200 TOTAL: \$1,082/person	Y1 – \$8,656 Y2 – \$8,959
Advisory Board Members will travel to Sacramento, CA to attend Advisory Board Meeting with sponsor, California Department of Education.	Average airfare of \$300 per person Lodging of up to \$220/night per person	8	Airfare: \$300 Lodging (1 day): \$220 Subsistence (1 day): \$71	Y1 – \$6,128 Y2 – \$6,342

1 trip per year, 8 travelers per trip	Subsistence allowance of \$71/day per person Ground Transportation & travel related expenses - \$175/day per person		Other expenses: \$200 TOTAL: \$766/person	
Travel for mileage	\$0.575 /mile	2500	Mileage reimb. \$1,438/year	Y1 – \$1,438 Y2 – \$1,488

Estimates are for travel costs of UCLA personnel while on project travel status include airfare, subsistence, reasonable lodging, and vehicle rental or taxi fare. Airfare estimates are based on an average of current coach rates relative to the point of origin/destination when identifiable. Airfare costs of \$700 per flight from Los Angeles, CA to Washington D.C. and costs of \$300 per flight from Los Angeles, CA to Sacramento, CA, ground transportation costs and related costs are based on historical data and fare quotes obtained at the time of estimate. Subsistence is based on the University's subsistence allowance following rates set by the State of California and accepted by federal granting agencies currently set at up to \$71/day. All estimates are based on amounts provided by carriers/vendors and/or historical data and include an anticipated 3.5% inflationary increase for the out years. The current mileage reimbursement rate is 57.5 cents per mile for 2015.

Travel costs per year: Year 1 - \$19,186; Year 2 - \$19,857. TOTAL: \$39,043

### **Equipment**

Dedicated data server will be purchased to facilitate transfer of massive data to be used for analyses from the California Department of Education.

Equipment Costs per year: Year 1 - \$8,000. TOTAL \$8,000

## Supplies

### *Core project supplies*

Core project supplies estimates are based on historical data and university vendor costs for project core office supplies, books, and publications. Expenses in this category pertain only to what is needed to accomplish the research goals of this project. There will be partial telecommunications charges, photocopy, ink cartridge, data storage and project related supplies as applicable. No new phone lines will be installed, but actual usage and equipment rental will be charged to facilitate communication between CRESST and collaborators. Other supplies that may be needed for the project include pens, folders, paper, and other routine project supplies used for various analysis activities and report preparation. Other costs also will be incurred such as software/hardware upgrades for the CRESST team, tablets/laptops, and other technology-based supplies that may be required to replace/repair current equipment to accommodate the need of massive data storage, analyses, and reporting. Procurement methods are in accordance with University procedures using approved vendors and negotiated rates. FedEx is normally used at a university negotiated discounted price to secure and track mailing of data and/or reports. Per OMB A-21 requirements, projected Core Supply Costs are project-specific (i.e., costs are for supplies purchased for this project only, not for general Center use.) CRESST is an organized research unit and is not supported by F&A costs.

<b>Supplies-Description</b>	<b>No.</b>	<b>Unit Price</b>	<b>Tax 9.75%</b>	<b>Cost per item</b>	<b>Cost</b>
27-inch Apple iMac to for exclusive use for data analysis of CDE data	2	2,299.00	224.15	2,539.15	5,078.31
Lenovo Y70-70 Touch 80DU for data analysis and data collections for Pilot Study	1	1403.45	136.84	1,556.29	1,556.29
Mailing cost (FEDEX)	40	9.72	0.95	10.67	426.71

Telephone service (Unit price is yearly per person)	13	116.75		116.75	1,517.75
Xerox Copying Services (per sheet)	8,000	0.10		0.10	800.00
Papers per ream for copy machine	360	3.37	0.33	3.70	1,331.49
White labels - 1000/box	20	16.72	1.63	18.35	367.00
Envelopes 12x15". (box of 50)	20	60.52	5.90	66.42	1,328.41
Laserjet Toner Cartridge B/W	2	113.62	11.08	124.70	249.40
Laserjet Toner Cartridge CYMK	2	178.07	17.36	195.43	390.86
Super Sticky Notes (5/pack)	10	9.35	0.91	10.26	102.62
USB 16gb	15	14.74	1.44	16.18	242.66
White Pad paper (dz)	20	4.29	0.42	4.71	94.17
Pens dozen/box	10	14.29	1.39	15.68	156.83
Manila Folders (bx)	10	5.34	0.52	5.86	58.61
Office supplies - Paperclips/staples	10	3.00	0.29	3.29	32.93

Core project supplies cost per year: Year 1- \$33,748; Year 2- \$36,321. TOTAL: \$70,069

*Technology Infrastructure Fee (TIF)*

The Technology Infrastructure Fee is budgeted for services provided for all campus activities and is based on usage by personnel directly charged to the project, regardless of fund source. The billing model for the TIF is currently assessed at \$34.46 per Full-Time Equivalent (FTE) employee per month with an estimated escalation rate of 2% at the beginning of the new fiscal year (July 1, 2015). Sponsored awards are charged monthly based on the actual FTE derived from payroll for employees directly working on the project. These costs are not duplicated in the facilities and administrative costs or in any other charge presented to the sponsor. The FTE-based model was reviewed by the University of California Office of the President's Office of Costing Policy and Analysis for compliance.

TIF costs per year: Year 1 - \$2,332; Year 2 - \$2,443. TOTAL: \$4,775

### *Advisory Group*

As noted earlier in this proposal we will draw on technical advisors from the research, K-12 education, and business communities throughout the project lifetime to provide ongoing quality control, review, and feedback. This group will serve as a quality control checkpoint, and support communication with various professional communities. The final membership of this group will be selected at the outset of the project in collaboration between CDE and CRESST, and with feedback from DoE (exemplar members are presented in the “Personnel” section of this proposal). We plan for the group to have quarterly meetings with the advisory group, with three being virtual meetings and one of those meetings each year being face-to-face in Sacramento. Additionally, we will reach out to individual board members on an as-needed basis for review and input in their specific areas of expertise. 8 advisors for 4 days each at \$1,000 a day.

Advisory Group costs per year: Year 1 - \$32,000, Year 2 - \$32,000. TOTAL: \$64,000

### *Participant Costs*

Stipends (small incentive amount) of \$75 for 300 participants in validity study in year 1 and stipends of \$50 for 40 participants in item try-outs in year 2 are budgeted for the pilot study to be conducted as part of the proposed scope of work.

Participant costs per year: Year 1 - \$22,500; Year 2 - \$2,000. TOTAL: \$24,500

### **Contractual**

Harold O’Neill is tenured Full Professor of Educational Psychology and Technology in the Rossier School of Education at the University of Southern California. He has conducted extensive research in career- and college-ready constructs. Dr. O’Neil will use his expertise to provide support services and collaborate on the feature analysis and ontology development in the area of career readiness, and will collaborate on the design and testing of innovative item formats. Dr. O’Neil will be contracted through the University of Southern California at a University rate that equals 2 course buyouts @ 20% of FTE, plus other expenses. UCLA will assess a Facilities and Administrative costs of 35% Modified Total Direct Cost for the first \$25,000 of this contract only as per F&A policy.

*USC's detailed budget is attached.*

Contractual costs per year: Year 1 - \$110,788, Year 2 - \$114,228. TOTAL: \$225,016

**Other**

Graduate student fee remissions are charged for each Graduate Student Researcher employed at 25% time or greater (\$15,203 in 2014-2015 with an estimated 6.0% increase per academic year). The fee remission covers the cost of health insurance and partial registration fees, as required by UCLA Graduate Division policies. Graduate student fee remissions are not subject to facilities and administrative costs.

Total Graduate Student Fee Remissions per year: Year 1 – \$32,230; Year 2 – \$34,164. TOTAL: \$66,394

**Total Direct Costs**

Total Direct Costs per year: Year 1- \$903,505; Year 2- \$933,294. TOTAL: \$1,836,799

**Indirect Costs**

Rates are based on current facilities and administrative cost rates negotiated with the Federal government for UCLA and its subcontractors. GSE&IS is located in an on-campus, and the appropriate facilities and administrative cost rate is applied based on the university's federally negotiated rates or the sponsoring agency's written policy. UCLA will assess an Indirect Cost rate of 35% of Modified Total Direct Cost. Modified total direct costs exclude GSR student remission and the portion of each subaward in excess of \$25,000. The Center for Research on Evaluation, Standards and Student Testing (CRESST) is an independent research center and therefore not supported by F&A costs.

Total Indirect Costs per year: Year 1- \$272,121; Year 2- \$274,717. TOTAL: \$546,838

**Total Costs**

Total Costs per year: Year 1- \$1,175,626; Year 2- \$1,208,011. TOTAL: \$2,383,637.

University of California, Los Angeles  
Los Angeles, CA 90095

June 19, 2015

To the University of California, Los Angeles:

**SUBJECT:** Proposal entitled, "Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments"

Principal Investigator:	Harry O'Neil, Ph. D.
Total Funds Requested:	\$225,016.00
Period of Performance:	09/01/2015 – 08/31/2017

We are pleased to forward the subject proposal, which has been approved by the University, for your review and consideration. Should an award be made, acceptance will be based on mutually agreeable terms.

If you have any questions or require further information that is administrative in nature, please contact me at 213-740-6058 or [levien@usc.edu](mailto:levien@usc.edu). Please address all technical inquiries to our Principal Investigator.

Sincerely,

(b)(6)

Nancy Levien  
Senior Contract and Grant Officer  
[levien@usc.edu](mailto:levien@usc.edu)

Enclosure: Proposal

cc: PI/file



**U.S. DEPARTMENT OF EDUCATION  
BUDGET INFORMATION  
NON-CONSTRUCTION PROGRAMS**

OMB Control Number: 1894-0008  
Expiration Date: 06/30/2017

Name of Institution/Organization  
University of Southern California

Applicants requesting funding for only one year should complete the column under "Project Year 1.". Applicants requesting funding for multi-year grants should complete all applicable columns. Please read all instructions before completing form.

**SECTION A - BUDGET SUMMARY  
U.S. DEPARTMENT OF EDUCATION FUNDS**

Budget Categories	Project Year 1 (a)	Project Year 2 (b)	Project Year 3 (c)	Project Year 4 (d)	Project Year 5 (e)	Total (f)
1. Personnel	61,615	57,214				118,828
2. Fringe Benefits	19,162	17,793				36,956
3. Travel	2,850	2,850				5,700
4. Equipment	0	0				0
5. Supplies	300	300				600
6. Contractual	4,000	12,500				16,500
7. Construction	0	0				0
8. Other	0	0				0
9. Total Direct Costs (lines 1-8)	87,927	90,657				178,584
10. Indirect Costs*	22,861	23,571				46,432
11. Training Stipends	0	0				0
12. Total Costs (lines 9-11)	110,788	114,228				225,016

**\*Indirect Cost Information (To Be Completed by Your Business Office):**

If you are requesting reimbursement for indirect costs on line 10, please answer the following questions:

(1) Do you have an Indirect Cost Rate Agreement approved by the Federal government?  Yes  No

(2) If yes, please provide the following information:

Period Covered by the Indirect Cost Rate Agreement: From: 07/01/2013 To: 06/30/2016

Approving Federal agency:  ED  Other (please specify):  DHHS \_\_\_\_\_ The Indirect Cost Rate is 26%

(3) For Restricted Rate Programs (check one) -- Are you using a restricted indirect cost rate that:

Is included in your approved Indirect Cost Rate Agreement? or  Complies with 34 CFR 76.564(c)(2)? The Restricted Indirect Cost Rate is \_\_\_\_\_%

## **Budget Narrative**

### **Development of Enhanced Career and College Readiness Indices for Smarter Balanced High School Assessments**

**Personnel Costs: \$155,784 including fringe benefits.** The personnel costs cover salary for the PI, Dr. Harold O'Neil . Dr. O'Neil will be funded for 2 buyouts in year 1 and 2 buyouts in year 2. Salaries are calculated based on Institutional Base Salary (IBS) identified in university work contracts with fringe benefits rates calculated at 31.1% for government federal, state, county or city grants.

**Material and Supplies: \$600.** Materials and supplies cover printing, and general office supplies necessary to complete the research project.

**Professional Services: \$16,500.** Consultant costs to review and edit the career readiness framework.

**Travel: \$5,700.** The travel budget covers 1 trip per year for the PI to attend the required annual trip to Washington D.C. .

**Indirect Costs: \$46,432.** The federally negotiated University of Southern California indirect cost rate for off-campus research on modified direct costs is 26%

**U.S. DEPARTMENT OF EDUCATION  
BUDGET INFORMATION  
NON-CONSTRUCTION PROGRAMS**

OMB Number: 1894-0008  
Expiration Date: 04/30/2014

Name of Institution/Organization

CA Department of Education for the State Board of Education

Applicants requesting funding for only one year should complete the column under "Project Year 1." Applicants requesting funding for multi-year grants should complete all applicable columns. Please read all instructions before completing form.

**SECTION A - BUDGET SUMMARY  
U.S. DEPARTMENT OF EDUCATION FUNDS**

Budget Categories	Project Year 1 (a)	Project Year 2 (b)	Project Year 3 (c)	Project Year 4 (d)	Project Year 5 (e)	Total (f)
1. Personnel	97,500.00	97,500.00				195,000.00
2. Fringe Benefits	40,755.00	40,755.00				81,510.00
3. Travel	11,571.00	11,571.00				23,142.00
4. Equipment	0.00	0.00				0.00
5. Supplies	9,375.00	3,500.00				12,875.00
6. Contractual	1,175,626.00	1,208,011.00				2,383,637.00
7. Construction	0.00	0.00				0.00
8. Other	0.00	0.00				0.00
9. Total Direct Costs (lines 1-8)	1,334,827.00	1,361,337.00				2,696,164.00
10. Indirect Costs*	42,551.00	35,418.00				77,969.00
11. Training Stipends	0.00	0.00				0.00
12. Total Costs (lines 9-11)	1,377,378.00	1,396,755.00				2,774,133.00

**\*Indirect Cost Information (To Be Completed by Your Business Office):**

If you are requesting reimbursement for indirect costs on line 10, please answer the following questions:

(1) Do you have an Indirect Cost Rate Agreement approved by the Federal government?  Yes  No

(2) If yes, please provide the following information:

Period Covered by the Indirect Cost Rate Agreement: From:  To:  (mm/dd/yyyy)

Approving Federal agency:  ED  Other (please specify):

The Indirect Cost Rate is  %.

(3) For Restricted Rate Programs (check one) -- Are you using a restricted indirect cost rate that:

Is included in your approved Indirect Cost Rate Agreement? or,  Complies with 34 CFR 76.564(c)(2)? The Restricted Indirect Cost Rate is  %.

Name of Institution/Organization CA. Department. of. Education. for. the. State. Board. of. Education	Applicants requesting funding for only one year should complete the column under "Project Year 1.". Applicants requesting funding for multi-year grants should complete all applicable columns. Please read all instructions before completing form.	
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**SECTION B - BUDGET SUMMARY  
NON-FEDERAL FUNDS**

Budget Categories	Project Year 1 (a)	Project Year 2 (b)	Project Year 3 (c)	Project Year 4 (d)	Project Year 5 (e)	Total (f)
1. Personnel	(b)(4)					
2. Fringe Benefits						
3. Travel						
4. Equipment						
5. Supplies						
6. Contractual						
7. Construction						
8. Other						
9. Total Direct Costs (lines 1-8)						
10. Indirect Costs						
11. Training Stipends						
12. Total Costs (lines 9-11)						

**SECTION C - BUDGET NARRATIVE (see instructions)**

U.S. DEPARTMENT OF EDUCATION  
SUPPLEMENTAL INFORMATION  
FOR THE SF-424

OMB Number: 1894-0007  
Expiration Date: 07/31/2014

**1. Project Director:**

Prefix:	First Name:	Middle Name:	Last Name:	Suffix:
Mr.	Keric		Ashley	

Address:

Street1:	1430 N Street, Suite 5617
Street2:	
City:	Sacramento
County:	Sacramento
State:	CA: California
Zip Code:	95814
Country:	USA: UNITED STATES

Phone Number (give area code)	Fax Number (give area code)
916-319-0637	916-319-0100

Email Address:

kashley@cde.ca.gov

**2. Novice Applicant:**

Are you a novice applicant as defined in the regulations in 34 CFR 75.225 (and included in the definitions page in the attached instructions)?

Yes  No  Not applicable to this program

**3. Human Subjects Research:**

a. Are any research activities involving human subjects planned at any time during the proposed project Period?

Yes  No

b. Are ALL the research activities proposed designated to be exempt from the regulations?

Yes Provide Exemption(s) #:

No Provide Assurance #, if available:

c. If applicable, please attach your "Exempt Research" or "Nonexempt Research" narrative to this form as indicated in the definitions page in the attached instructions.

EAGHUMANSUBJECTS.pdf	Add Attachment	Delete Attachment	View Attachment
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## **Human Subjects Narrative (Non-exempt Research)**

### **1. Human Subjects Involvement and Characteristics**

This project involves multiple levels of human subjects. On the broadest level, as part of our feature analysis statistical modeling work, we will draw on the data in the California Department of Education K-12 pre-existing state test database, which includes student assessment data and background demographics from the approximately 6 million K-12 students (and approximately 477,000 11<sup>th</sup> graders) enrolled in California schools. We also will collect cognitive lab/thinkaloud data (short structured interviews) from approximately 75 students. As part of our validation study, we plan to have several groups complete assessment packets and complete associated surveys of background information (e.g., prior training, vocational interests) including 11<sup>th</sup> grade students, community college students, and individuals in the world of work (there will be @ 100 participants from each of those groups, or @ 300-400 individuals total). As part of our innovative item formats development, we will have small numbers of students try out items and provide feedback on usability (approximately 25-50). As part of our digital resources development, we will have small numbers of potential users (teachers, students, parents) review and provide feedback (approximately 30-40 each). The evaluation plan will include conducting interviews with small numbers of project stakeholders (administrators, teachers, students, others) at various points in the project timeline as a check on the quality of project outputs and products.

### **2. Sources of Materials**

Data will include raw student item response on CDE state K-12 tests and other data specifically collected for this project. Sources for data specifically collected for this project will include a range of surveys (including usability and feedback surveys for developed items and digital resources, background survey items for validation studies) collected from students, teachers, and potentially parents, as noted above. We will conduct interviews with stakeholders as part of both our cognitive labs/thinkalouds (students) and the evaluation activities (e.g., administrators, teachers, students, parents). All data will be treated as confidential. Paper copies containing personal information will be kept in locked filing

cabinets, and electronic data files containing such information will be maintained on secure computer networks with adequate password protection to allow only authorized users of the data to have access. Students will be assigned a unique identification number so that researchers working with the data will not know the identities of the participants. For student state test data, as possible data will be stripped of any direct student identifiers before CDE shares with CRESST; indirect identifiers may be needed for some data linking purposes.

### **3. Recruitment and Informed Consent**

For the new data collection activities described above we will recruit K-12 students, teachers, and administrators in the State of California. With the guidance of the state, districts will be selected for participation in these data collection activities. As noted above, our validation studies will also include data collection from adult students at community college (San Bernardino Valley College) and in the world of work (including the Surface Warfare Officers School ). We will receive appropriate state, district, community college, and SWOS approval before undertaking any recruitment. For validation studies and digital resources review involving adults, we will send request for participation and surveys themselves via email; any items or surveys will be completed online, and consent check-off forms will be included in the surveys. For interviews, with adults we will send information about the study to potential participants statewide, in coordination between CDE and CRESST, to recruit participants. Those who agree will have a chance to review consent forms and ask questions prior to data collection. Consent forms will specify expected data collection dates, study activities, information about potential risks and benefits, and contact information for reporting problems and/or withdrawing from the study.

For collection of student data (thinkalouds/cognitive labs, new item try outs, validation study, review of digital resources), CDE and CRESST will contact schools statewide requesting participation. Sampled classrooms and their parents will receive information about the study at least two weeks in advance of data collection. Informed consent forms for parents and student assent forms will specify

expected data collection dates, study activities, information about potential risks and benefits, and contact information for reporting problems and/or withdrawing from the study.

All research instruments and procedures will be submitted to UCLA's Institutional Review Board (IRB) for review and approval prior to contact with human subjects.

#### **4. Potential Risks**

There are no serious risks associated with study participation.

#### **5. Protection Against Risk**

Participants and student parents (for minors) will be advised of study requirements, risks, and benefits and will have time to consider these before granting consent to participate. All data will be stored securely using password-protected servers kept in a locked office and any indirect identifiers stripped at completion of analyses.

#### **6. Importance of the Knowledge to be Gained**

We aim to fill a critical void in K-12 assessments by providing innovative indices of the Smarter Balanced high school assessments that can support improved career readiness inferences. The project will enhance and improve career and college readiness inferences by performing analyses that cut across multiple currently reported outcomes (math and ELA and the multiple sub-constructs under each). In other words, the analyses proposed here will result in substantial added value and interpretations out of the current high school assessments without adding more testing time. Combining qualitative and quantitative approaches, the project will develop a coherent and scalable means of reusing the current item pool, as well as undertake development of new items of richer and technology-enhanced item types and supporting digital resources. The information and tools gained will be used to improve and enhance assessment implementation, reporting, and use across the state of California, and will also inform and support the work of the larger Smarter Balanced Assessment Consortium of states across the country.

Ultimately, this proposed project will, using the most modern psychometric and statistical techniques, improve the quality of assessments, of instructional materials, professional development, and teaching practices.

#### **7. Collaborating Site(s)**

CDE (coordinate recruiting), UCLA (CRESST and SRM Evaluation Group – conduct data collection), San Bernardino Valley College (site we will recruit participants for validity study from), SWOS (Surface Warfare Officers School in Newport, RI, potential site for recruiting participants for validity study).