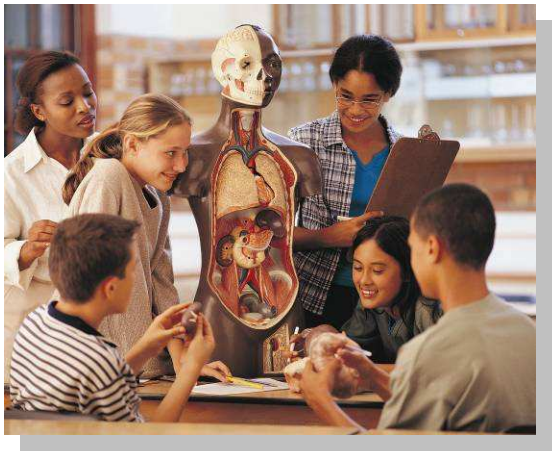
IX. Tasks for Model Curriculum



DRC has assembled an extraordinary team of people and organizations who are national and international leaders in curriculum and curriculum development. DRC oversight and coordination of the Model Curriculum work will be led by **Ms. Patricia Porter, Vice President of Large-Scale Assessment,** and **Dr. Ira Glick, Senior Director, Development**. Ms. Porter and Dr. Glick will ensure both the timely development of the model curricula and its alignment with the other major components of this initiative, the Graduation Competency Assessments and the Diagnostic Assessment Tool. The **Association for Supervision and Curriculum Development (ASCD)** will work directly with the Pennsylvania curriculum committees to train them in the elements of Understanding by Design, which will serve as the overarching framework for the Model Curriculum units. **Dr. Heidi Hayes Jacobs, President of Curriculum Designers, Inc.,** will serve as a technical advisor to the project.

DRC's Curriculum Experts

Ms. Patricia Porter has more than 39 years of experience in the field of education. Her impressive credentials include serving as Director of Accountability for the Texas State Board of Educator Certification, where she managed the development and implementation of more than 60 certification tests for Texas educators. For 20 years, Ms. Porter served as the Director of Programs II for the Texas Education Agency, where she oversaw the development and implementation of statewide assessments that tested approximately 2.5 million students annually. Ms. Porter is an expert in the No Child Left Behind legislation. In addition to this exceptional experience, Ms. Porter holds a Master's degree in Curriculum and Instruction and a Bachelor's degree in History and Social Sciences, both from the University of Delaware in Newark.

Dr. Ira Glick brings extensive experience to this project from his academic training as well as from his experiences in both the public and private sectors. Dr. Glick holds a doctorate in Instructional Research and Curriculum Development from the University of California, Berkeley. He was heavily involved in curriculum development and curriculum-related work as a practicing teacher, subject area supervisor, and administrator (principal and superintendent) while serving in the public schools. Most notably, his experience as a subject area supervisor with K–12 curriculum responsibilities and as a curriculum coordinator with district-wide curriculum responsibilities relate directly to the work required by this initiative. Dr. Glick has also served as the director of numerous large-scale state testing programs and brings that perspective and experience to this project. In addition to his work in large-scale testing, Dr. Glick recently directed a project

for the state of Louisiana that centered around the review and evaluation of the state promulgated comprehensive curricula.

Units for the Model Curriculum will be developed by a team of curriculum developers, working closely with DRC curriculum and content area specialists. Additional DRC support for the Model Curriculum work will be provided by a team of content experts and senior management staff who have expertise in the development of model curriculum units and instructional strategies, as well as curriculum-alignment experience. DRC's proposed Test Development staff who for the Model Curriculum have knowledge of Pennsylvania Academic Content Standards and have collaborated closely with Pennsylvania educators for many years. Members of this team have degrees in education, curriculum instruction, and/or other related fields. Many have served as curriculum and instruction department chairs or have served on curriculum development committees for school districts. Others have developed curriculum frameworks for statewide testing programs.

ASCD

DRC is pleased to name ASCD as the major subcontractor for the development of the Model Curriculum. ASCD enjoys a history and reputation in the world of curriculum that is unrivaled in the United States and that extends to 119 countries around the world. Among its many initiatives and foci, ASCD has developed and supports the Understanding by Design (UbD) Exchange, featuring the backward design method of curriculum development (promulgated by Grant Wiggins and Jay McTighe), which is a central component of this project. ASCD cadre will train the members of the Pennsylvania Model Curriculum committees on the central tenets of backward design. Training materials to be provided by ASCD will include UbD professional development workbooks and online courses.

Dr. Heidi Hayes Jacobs

Dr. Heidi Hayes Jacobs, President of Curriculum Designers, Inc., will serve as a technical advisor to the Model Curriculum project during the development and review of the Model Curriculum resources and materials. She is one of the most knowledgeable and respected educators specializing in the area of curriculum in the country. Dr. Jacobs has served as an education consultant to thousands of districts and schools nationally and internationally and has assisted them with K–12 initiatives related to a number of topics including, most notably, curriculum reform. She has published a number of resources, including the best-selling books *Interdisciplinary Curriculum: Design and Implementation* and *Mapping the Big Picture: Integrating Curriculum and Assessment K–12*, as well as her latest books, *Getting Results with Curriculum Mapping* and *Active Literacy Across the Curriculum: Strategies for Reading, Writing, Speaking, and Listening*.

Dr. Jacobs received her doctorate from Teachers College and has served as an adjunct associate professor there in the Department of Curriculum and Teaching since 1981, continuing to teach there every summer. Attesting to her wide-ranging appeal, Dr. Jacobs has served as a consultant to a wide variety of organizations,

including the College Board; NBC Sunday Today Show; Children's Television Workshop; CBS National Sunrise Semester; ASCD; IBM EduQuest; The Discovery Channel; Tapestry Productions; The Kennedy Center; Carnegie Hall; New York City Ballet Education Department at Lincoln Center; Peace Corps; National School Conference Institute; Disney Company; Prentice-Hall Publishing; Near East School Association based in Athens, Greece; International Baccalaureate; the European Council of International Schools; and numerous state education departments.

IX.A. Development of K–12 Curricular Resources and Materials in Core Content Areas

The process for the development of the unit and lesson plans for the Model Curriculum starts with a mapping of the courses and units required (i.e., creating a plan for development). The RFP identifies the estimated units that will need to be developed to support the Model Curriculum. DRC's Test Development staff will perform a thorough analysis of the Pennsylvania Academic Standards and Assessment Anchors and will recommend to PDE the optimal number of units that should be developed to sufficiently represent the scope of Pennsylvania's standards-aligned system.

To ensure that all key players in the development of the Model Curriculum have a common understanding of UbD, DRC Model Curriculum developers will be trained on UbD (or retrained, since most will already be familiar with UbD). DRC will then create sample units for PDE to review and approve. After PDE approval of the plan and sample units, DRC Model Curriculum developers will begin to write the units. DRC will develop the following kinds/types of additional curriculum resources for each of the units:

- Rubrics
- Unit outline
- A variety of assessment types including formative, conceptual, and procedural
- End of unit assessments
- Intervention materials
- Student exemplars (as possible from classroom tryouts)
- Scope and sequence
- Other support materials such as graphs, organizers, unit vocabulary modules

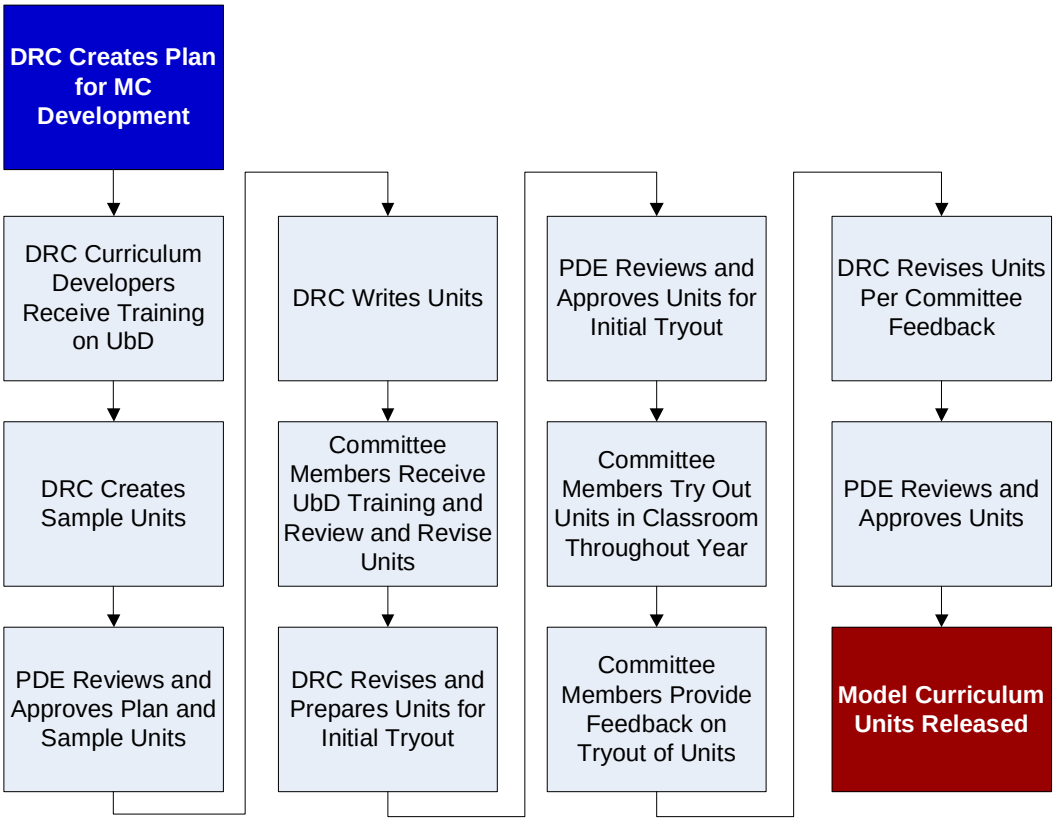
The format, structure, and content of all of the materials developed under the auspices of DRC will then be reviewed and evaluated by the committees. We understand that PDE will select the members of each of the four content-area model curriculum committees and that these committees will include teachers, administrators, and higher-education faculty members. These committee reviews

will focus on a number of criteria, including the need for consistency (e.g., within and across grade levels in a given content area), fidelity to foundational resources, alignment, practicality, and other pertinent considerations identified by PDE.

The committee members will meet to review and revise the units over a series of twelve two-day meetings. After each meeting, DRC will revise the units based on committee input and will prepare them for initial tryout. Before the units are tried out in the classroom by members of the committee, PDE will get a chance to review and provide approval.

The units will then be tried out by the committee members. This tryout will start in the fall of 2009. Committee members will be asked to collect information on how the units fared in the classroom. Feedback from the committees will be collected by DRC, who will use the feedback to make necessary revisions. After revisions are made by DRC, PDE will review and approve the final units. Once approved by PDE, the units will be released (i.e., rolled out into the field). The units will be released on Ed Hub in PDF format, with appropriate bookmarks to allow for efficient searching and navigation.

The development process is illustrated in the figure below.



Model Curriculum Development Process

IX.B. UTILIZING "UNDERSTANDING BY DESIGN" FORMAT

UbD teaches educators how to design curriculum frameworks, courses, units, and lessons that are standards-based, focus on rigorous content, and lead to deeper student understanding of content in any curricular area. The end result for students is a high level of attaining meaning and applying transfer-knowledge in all content areas. Professional development targets will include the following: (a) a focus on teaching for understanding: developing curricular units for acquisition, meaning-making, and transferring and integrating the six facets of understanding (application, interpretation, explanation, analysis of perspectives, empathy, self-knowledge); (b) designing conceptual schema and learning progressions that will support students' development of deep conceptual understanding across the curriculum (e.g., enduring understandings, essential questions, enabling knowledge objectives aligned with standards); (c) using a range of assessment tools to monitor and evaluate students' progress via classroom formative assessment (e.g., performance tasks, constructed-response assessments, reflective assessments, academic prompts, and culminating projects); (d) use of rubrics and related scoring tools to examine and evaluate students' work products; and (e) research-based instructional practices that include differentiated instruction, proven effective in promoting high levels of student understanding, including students' ability to demonstrate conceptual understanding and independent application.

The alignment of the curricular materials to the content standards, frameworks, and other foundational and supporting documents will be a central task in both the initial training of the teams and in the ongoing development and review of the materials. As a result, an evidentiary document will be developed by DRC and submitted to PDE for approval, which will document the alignment of the materials with these critical foundational documents. In order to ensure the development of the desired number of units, the following will need to occur:

- ASCD will train DRC content staff on UbD concepts and practices on the creation of units and lessons, using UbD design standards and design checklist. DRC content staff will then train and manage the unit developers.
- ASCD's Understanding by Design Professional Development Workbook, *Integrating Differentiated Instruction and Understanding by Design: Connecting Content and Kids*, and the UbD template will be used to support the curriculum development work.

Unit Development will include three stages:

- **Stage 1—Identify Desired Results—**Big ideas/understanding, essential questions, concepts, and competencies already developed by PDE will be used. This stage will also include further unpacking of the PDE work to focus on cross-curricular and cross-grade-level unit development aligned with PDE Stage 1 work. In addition, learning progression "building blocks" will be identified, including knowledge and skills needed for

students to demonstrate deep understandings/big ideas and to be able to transfer understanding to new learning situations.

- **Stage 2—Determine Assessment Evidence—**This stage will include the development of classroom formative assessments to monitor and evaluate student progress toward the desired results. This will include at least one authentic performance task incorporating critical thinking and problem solving, constructed-response assessments, reflective assessments, academic prompts, and self-assessments. Classroom formative assessments will be aligned with learning progressions identified in Stage 1 and with identified summative assessments. Rubrics and related scoring tools will be developed in this stage to examine and evaluate students' work products as warranted by the assessment type. Stage 2 results will be used to inform changes needed in instructional practices, reteaching using different instructional approaches, or additional instructional support required to assure student understanding.
- **Stage 3—Development of Learning Plan—**This stage focuses on making sure students are provided with the learning experiences necessary to understand the big ideas and to successfully provide the assessment evidence that conveys that understanding. Lesson plans will be developed as part of Stage 3. The learning plan will make clear to students what they will be learning, what is expected of them, and how their work will be evaluated. Informal pre-assessments will be developed for use in this stage to check for potential misunderstandings and skill errors, informing instruction, and lesson plans. Ongoing informal assessment, feedback, and guidance will be included in the learning plan so that students can rethink and revise their work toward understandings. The learning plan will include engaged learning strategies and activities that are differentiated by unit content, process, and product to accommodate student abilities, interests, and learning preferences. Learning activities will be scaffolded in Stage 3, aligned with learning progressions, and organized to maximize student engagement and productivity. In addition, unit developers will be guided in developing support materials for use with units and lessons that will include Marzano's research-based instructional practices. Additionally, vocabulary-development materials aligned with each unit will be developed using Marzano's six-step process, *Building Academic Vocabulary (BAV)*. Professional learning materials for each committee member will include the ASCD books by Robert Marzano, *BAV Teacher's Manual, The Art and Science of Teaching* and the *DVD for the Six Step Process for Teaching Vocabulary*.

IX.B.1. Working with Teachers, Administrators and Faculty

It is understood that the curriculum committees, members of which will have been secured by PDE, will be working in collaborative fashion to **review and revise** the requisite materials. Where possible, a consensus model will be used to make final determinations regarding the materials developed; however, given the very tight timeline under which the committees will be working, it may be necessary to

move to a different and more expeditious decision-making model. DRC facilitators understand and welcome the notion that ideas, suggestions, reviews, and input for the curriculum materials will be derived from a cross-section of the educational community. Such diversity will enrich the quality of the final products.

IX.B.2. System of Feedback for Committees

The development of the curricular materials and resources is an iterative process that will rely heavily on the involvement of Pennsylvania educators. Information for the curriculum committees to consider as they review the curriculum materials will come from a number of sources, including:

- Formal work by the committees while they are in session.
- Information from tryouts of the units in committee members' classrooms/schools.
- Information from the committee members themselves, who, using a data collection website, will have an opportunity to continue to contribute to the Model Curriculum effort outside of the formal meetings.

Information from these various resources will be synthesized and framed in such a way that it is readily usable by the committees. This will be the responsibility of DRC staff. It is anticipated that the committees will best be able to make this determination once they have a better understanding of their specific requirements and how these requirements will relate to the availability of information. It is anticipated that a portion of each committee meeting will be dedicated to receipt and processing of all new information as it is made available. It will then be woven into the ongoing review and development of the curricular resources to ensure consistency and alignment.

IX.B.3. Meeting Arrangements

The Model Curriculum materials will be developed collaboratively with committees of Pennsylvania educators. DRC understands that PDE will establish all committees and that PDE will provide names and contact information for each participant. The Model Curriculum meetings will take place in Pennsylvania. The committees will be comprised of Pennsylvania educators, including teachers, administrators, and higher education faculty of the core content areas: Reading, Writing, Speaking, and Listening; Mathematics; Science; and Social Studies. Per the Official Questions and Answers (Official Q & A) document, DRC's proposal is based on 12 two-day, face-to-face meetings for each of the four content areas, with 15 participants per meeting. The schedule of meetings will vary according to the proposed implementation of the Model Curriculum for the Wave 1 subject area (Mathematics) in Fall 2010 and for the Wave 2 subject areas (English Language Arts, Science, and Social Studies) in Fall 2011.

DRC understands the challenges involved with recruiting meeting participants. DRC would like to discuss with PDE, upon contract award, the use of incentives (beyond ACT 48 credits) to bolster participation. Additionally, DRC proposes that a list of duties and time commitments for Model Curriculum Committee members be developed jointly by DRC and PDE and that this information be disseminated both to potential committee members and to their supervisors so that the time commitments are clearly understood by all committee members prior to their agreeing to serve.

DRC's proposal includes single occupancy lodging, all meals, and transportation costs for committee members. Additionally, DRC will:

- Coordinate all meeting logistics, including hotel procedures, meeting rooms, computers, copier capability, etc.
- Correspond with committee members, including travel arrangements, meeting announcements, etc., should PDE request. (Note: All written communication will be reviewed and approved by PDE prior to being sent to content review committee members.)
- Compile the information necessary for professional development hours.
- Obtain all supplies, including paper, pencils, flip charts, name tags, travel reimbursement forms, security/confidentiality documents, and other documents, as requested by PDE.
- Provide all meeting materials including UbD manuals and UbD supporting documentation, PowerPoint training presentation slides, unit materials (e.g., rubrics, end-of-unit assessments, lesson plans), etc.
- Compile committee feedback.

Costs for all relevant committee review meeting tasks and expenses as required by the RFP are included in our *Cost Submittal*, provided under separate cover.

IX.B.4. Ed Hub Posting with Committee Approval

Model Curriculum materials will not be posted to the Ed Hub until final recommendations from the appropriate curriculum committee and subsequent PDE approval. A review protocol will be developed and will include a formal document, which will bear the signatures of the committee members, indicating their recommendation that the materials have been finalized and may be posted to the Ed Hub. The curriculum materials and the sign-off document will be sent to PDE for review. Once PDE has formally signed off on the materials, they will then be posted on the Ed Hub.

IX.B.5. Developing K–12 Units and Lessons

Please see *Subheading IX.B.* for a description of the development of K–12 units and lessons. It is to be noted that the Official Q & A specified that three lessons, positioned at various points along an appropriate learning progression, will be developed for each of the units.

IX.B.6. Review of Curricular Resources and Materials

As they are being developed and before they are tried out, all curriculum materials and resources will be reviewed by DRC's Test Development staff for content alignment, grade-level appropriateness, difficulty, depth-of-knowledge, and bias, sensitivity, and fairness. To ensure system-wide consistency across all components of this initiative, DRC will adapt the materials and protocols that are used in the item development process for use with the review of the curricular materials by the curriculum committees. For a description of these review processes, please see *Subheading VII.B.7., Review Committees*. To further promote system-wide consistency across all components of the program, the review training will be provided by DRC Test Development specialists who are highly experienced in providing this type of training. Please see *Subheading VII.B., Item Development*, for a description of the training programs proposed by DRC Test Development staff.

IX.B.7. Ensuring Compatibility with PDE's Portal Requirements

DRC will develop all curricular resources and materials to ensure compatibility with PDE's portal requirements, as outlined in Appendix C of the RFP.

IX.B.8. Curriculum Tryout

The objective of curriculum tryout is to review, revise, and strengthen the curriculum resources and material via input from end-users (e.g., teachers, students, administrators). This input will provide feedback that enables PDE and those creating and revising the curriculum to make changes that will strengthen the curriculum and more closely align it with the needs and interests of the end-users.

It is critical to obtain input from direct users of the curriculum. Madaus and Kellaghan (1992) argued that teachers should be the key source in assessing a curriculum since they experience it first hand. Students can also be a useful source because they can report difficulties and inconsistencies they experience in the curriculum.

Tryout of the units and lesson plans will focus on how the curriculum is presented, in terms of the specific examples, materials, and resources provided to facilitate teaching the curriculum and the individual units within the organizational schema. The tryout will not focus on the curriculum content or the framework for the curriculum because these have already been determined by the standards and prior decisions by PDE.

Initial Tryout (Before Curriculum is Operational)

Given the timeframe involved in the creation of materials and resources for the Model Curriculum and the need to have the curriculum operational by the designated deadlines, an initial tryout will be necessarily brief and restricted to educators, many of whom will be serving on the Model Curriculum committees.

This initial tryout will occur in the 2009-2010 school year for Wave 1 subjects and in 2010-2011 for Wave 2 subjects.

DRC proposes that curricula units be presented to educators when they become available (via PDF files sent by email or made available on a designated website). The educators will be asked to review the materials and resources using several criteria, focusing on the suitability and usability of the materials and resources in the classroom. Feedback will be available for the content committee groups charged with reviewing and revising the materials and resources.

The aim of the initial tryout is to obtain timely review of curriculum materials from the perspective of educators, with an emphasis on the classroom teachers. The review will focus on the suitability and usability of the materials and resources in the classroom. This is analogous to a usability test.

If PDE desires input from educators in higher education, DRC will work with PDE to identify key resources and elicit their input.

IX.B.9. Curricular Item Review by Content Teams

One of the key overarching requirements of this initiative is to ensure that there is alignment and consistency among the three central components of the program—the GCAs, the Diagnostic Assessments, and the Model Curriculum. This is required to provide Pennsylvania students with the best opportunity for success on the GCAs. For this reason, DRC Test Development specialists and curriculum experts will analyze the content of all three components of this program to ensure continuity and alignment of content and focus.

We know that the workaday preparation for students on these assessments occurs in the classrooms of Pennsylvania. Using the Model Curriculum, teachers will have at their disposal an array of curricular and instructional resources that will be specifically designed to ensure student success on the GCAs. For this model to be successful, it is necessary for these resources to be aligned with the assessments. Using an integrated approach, DRC Test Development staff will actively participate in the creation of various components of the project (GCAs, Diagnostic Assessments, and Model Curriculum), especially item development, which is a feature of each component. This integrated process will ensure alignment among the GCA items, Diagnostic Assessments, and the Model Curriculum. DRC Pennsylvania-experienced staff will participate in the entire process, from monitoring the development of the Model Curriculum, to developing the end-of-unit items, and to crafting the Diagnostic Assessment Tool and GCA items, to ensure alignment with the approved Pennsylvania Assessment Anchors.

To help ensure alignment, we propose that DRC Test Development staff facilitate the Model Curriculum committee meetings, thus gaining in-depth knowledge of the materials and resources that will be developed for the various curricula. This information will not only be used to craft end-of-unit assessments for each of the required curriculum units, but, it will help to ensure the alignment of the model

curriculum with the other major components of the program, as this staff will also be involved in developing the items in the other component areas.

One of the central tasks of the DRC's Test Development staff will be to ensure that all items, regardless of the program component (i.e., GCA items, Diagnostic Assessment items, Model Curriculum end-of-unit items), align with the Pennsylvania Assessment Anchors. By using a consistent item development process across all three components of the program, and one that aligns with common foundational resources (e.g., assessment anchors), there will be consistency across the components.

Per PDE approval, DRC recommends that a select number of teachers who will serve on the GCA item review committees also participate in some of the model curriculum meetings (knowing that these teachers may not be able to attend all of the model curriculum meetings). This continuity will help connect the GCA items with the Model Curriculum effort.

As a cost option, DRC is also pleased to offer to facilitate an independent third-party curriculum alignment study using Dr. Norman Webb's methodology. This curriculum alignment study will ensure the alignment between the GCA assessments and the model curriculum. To address this alignment, DRC recommends the following curriculum alignment study subject to PDE approval:

1. Four nationally known experts, along with four Pennsylvania teachers, for each content area will review the alignment of the Model Curriculum to the Pennsylvania Assessment Anchors, the GCAs, and the Diagnostic Assessments.

2. Selected teachers will represent the K–12 grade span in their respective content areas. External experts will have a national reputation in their content area. All participants will be subject to approval by PDE.

3. The alignment committee will be trained and facilitated by an experienced individual who has performed similar duties for other state programs. The facilitator will train the committee members on the underlying principles and process of the curriculum alignment study. The trainer will be subject to PDE approval.

4. In addition, DRC will provide an extensive report of the alignment of each content area's Model Curriculum units and items to the Pennsylvania Assessment Anchors. The report format will be approved by PDE.

5. All processes and materials to be used for the review will be submitted to PDE for approval.

DRC would be pleased to discuss this proposed independent third-party curriculum study with PDE subsequent to the award of contract and will adjust it as necessary based on feedback from PDE.

IX.B.10. Student and Teacher Evaluation Forms for Model Curriculum Tryout

Model curriculum evaluation forms will be used throughout the tryout and will be developed by DRC. Questions on the surveys will be developed to be appropriate for the target audience.

Works Cited

Madaus, G. F., & Kellaghan, T. (1992). Curriculum evaluation and assessment. In P. W. Jackson (Ed.), *Handbook of research on curriculum.* Washington, DC: American Educational Research Association.

X. Archive, Business Continuity and Disaster Recovery Requirements

X.A. Ensuring Availability of Data Files and Online Applications

DRC understands the responsibilities that come along with being the caretaker of customer data, as well as best practices for planning for business interruption or disaster. This section will describe the key aspects of our approach for managing system or business interruptions.

We have two large server complexes, each in separate facilities—our Maple Grove headquarters and our Brooklyn Park operations facilities. These server rooms are concrete bunkers, designed to be fire-resistant (4-hour fire rating) and crush-proof. The facilities are equipped with dry sprinkler systems, water detectors and sump pumps under the floor. To ensure continuous power, each server room has its own diesel generators to provide emergency power. In the case of a power outage or fluctuation, the Uninterruptible Power Supply (UPS) systems will engage, and provide power during the short time that is required for the generators to begin to power the building. The generator systems are tested on a weekly basis.

Our philosophy is to employ redundancy in the design and implementation of our computing infrastructure. This approach reduces the potential for serious downtime or interruption. We have multiple application servers, database servers, and web-based devices to allow for operations to continue, should one server fail. DRC maintains a supply of extra equipment that is available for immediate deployment. We have negotiated with our suppliers for expedited delivery of any other technology needed.

From a data backup perspective, we use a Storage Area Network (SAN) for maximum speed, flexibility, and redundancy in our data storage solution. DRC's solid data backup processes and procedures follow industry best practices, and comply with PDE's requirements.

DRC's computing environment and disaster recovery plans meet all of PDE's requirements and are described in more detail below.

X.A.1. Archive and Business Continuity Solutions and Plans

X.A.1.a. Archiving Data

DRC's data management approach ensures that GCAs data will be retained for the life of the contract plus one year. Two copies of this data will be stored; one copy in each of two secure locations. Upon request, specified data will be restored to disk for online access within three working days. DRC has employed this approach for many years, and currently maintains GCAs data from 1998 through today.

Archive Backups

Archiving the initial test document images occurs daily during scanning, allowing those tests that have been scanned to be migrated to tape media for archival and disaster recovery needs. Two copies of the archive tape are created with the second backup of the archived images created by copying the images from the initial backup media to another set of backup media for onsite and offsite storage. This process assures retention of the original image and that the backup tape is readable.

DRC understands the key data and files that must be backed up and archived. Archiving of this data is performed on a predefined schedule and/or by request. When requested, the data for archiving are backed up to media as a separate task, with the archived data backed up twice to allow for an onsite and offsite archive of the data. One set of the archived media is kept at the location where it was created, and the other set is moved to secure storage.

X.A.1.b. Recovery and Backup of Systems

DRC's system design and implementation approach incorporates the awareness that at any point in the software development cycle, or production operations, there may be a need to recover data. This ensures that whether we are in the process of developing and implementing solutions for PDE, or receiving and processing student and school information, we have incorporated the processes for safeguarding that data.

Data Backups: Data backups are defined to include servers and other network data stores containing non-database data. This includes data on file servers, SAN, NAS, and specified workstations. Data backups are performed using a full, two copy backup on weekends. Differential two copy backups are performed nightly, Monday thru Friday, to backup any changes that occur to the data between full weekend backups. The differential backup and one full backup are kept at the home location for rapid, onsite recovery if needed. The second set of full backups is moved to an off-site, secure location for disaster recovery purposes.

Database Backups: Full database backups are performed nightly for specified databases. Log files for specified databases are backed up to tape on scheduled intervals, typically once per hour, throughout active hours. Two copies of a full backup are created on weekends with one copy retained at the home site and the

other stored in a secure facility offsite. This is in addition to database replication employing two copies of the database, each in a separate facility.

After completions of backups, one set of full backups, along with the log backups for the week, are kept at the home location. The second set of full backups is moved to a secure, offsite facility.

Tape Rotation: Backups are run in an eight-week media rotation. Weekly backups of data are kept for eight weeks before the media are either archived or reused. Tapes that are not from the first weekend of a month are reused for future backup needs, being erased and used for backups after their eight weeks have lapsed.

X.A.1.c. System Redundancy and Fault Tolerance

DRC designs systems and infrastructure to be as fault tolerant as technically possible. Web systems are designed in three tiers with load balancing and clustered servers providing a very high degree of fault tolerance. DRC will provide 99% availability between the hours of 6:00 a.m. and midnight Eastern Time, seven days per week for the web-based applications. Non-web applications are designed around clustered file servers and clustered database servers as necessary to maintain service levels.

The clustered environment also permits a controlled application of critical security patches during production cycles without impacting production service levels. The fail-over facility is used to remove from production and patch one server at a time assuring proper functionality before putting the production server back into the production configuration. This process further assures the failover function is working properly in case of an emergency situation.

Data are stored in storage area network (SAN) devices using appropriate levels of RAID to protect against data loss caused by disk failure while maintaining required performance levels. DRC will be employing passive database replication for specified databases. Each request will be processed on a single instance and then its state is transferred to the other instance. The replicated databases will be physically located in different DRC facilities.

X.A.1.d. Consistency with Commonwealth Continuity of Government (COG) Initiative and Business Continuity Requirements

DRC will design the assessment system to be consistent with the Commonwealth Continuity of Government (COG) initiative and Business Continuity Requirements. DRC's Business Continuity framework will address all relevant technology components and platforms.

The basic requirement is to design the system and the disaster recovery plan to:

- Maintain critical business functions;
- Fulfill emergency support functions; and

- Sustain critical infrastructure.

Interruptions are classified into three general classifications:

Class 1: Single, replaceable component with all other infrastructure intact and functioning.

- Server, switch, router, or disk interruption that can be repaired or replaced in 24 hours or fewer.

Class 2: Catastrophic event with the server room temporarily out of operation.

- Power interruption or communication link interruption with repair in 48 hours or fewer.

Class 3: Local or regional interruption, including pandemic, so that further operation within DRC facilities is not possible in the short term.

- Fire, tornado, or other physical damage preventing restoration of service in the existing facility in less than two (2) weeks.
- Influenza pandemic with infrastructure fully functional, but without key personnel or access to key facilities prohibited.

The steps taken in any emergency situation will vary, but the core functions remain the same for all types of emergencies. These core functions are:

- Identify essential functions per the plan
- Identify critical resources
- Execute the Emergency Management Response Plan
- Determine if alternate locations are necessary
- Execute the employee notification/communication plan
- Identify recovery priorities
- Execute appropriate recovery plan

Please see *Appendix 14* for more information regarding DRC's Emergency Response Management/Business Continuity Plan.

X.A.1.e. Tape Backup/Restore Plan

DRC has designed and uses a tape backup/restore process that meets PDE's and DRC's business continuity requirements. This process is currently in use at DRC for the PSSA. Data are backed up to tape on a schedule designed to minimize lost data in case of an interruption. Two copies of the tape are created to further reduce the risk of tape failure. The copies are stored in physically separate facilities. Restoring data is accomplished through a documented process that identifies the exact data to be restored, where it is to be restored, and has management approval.

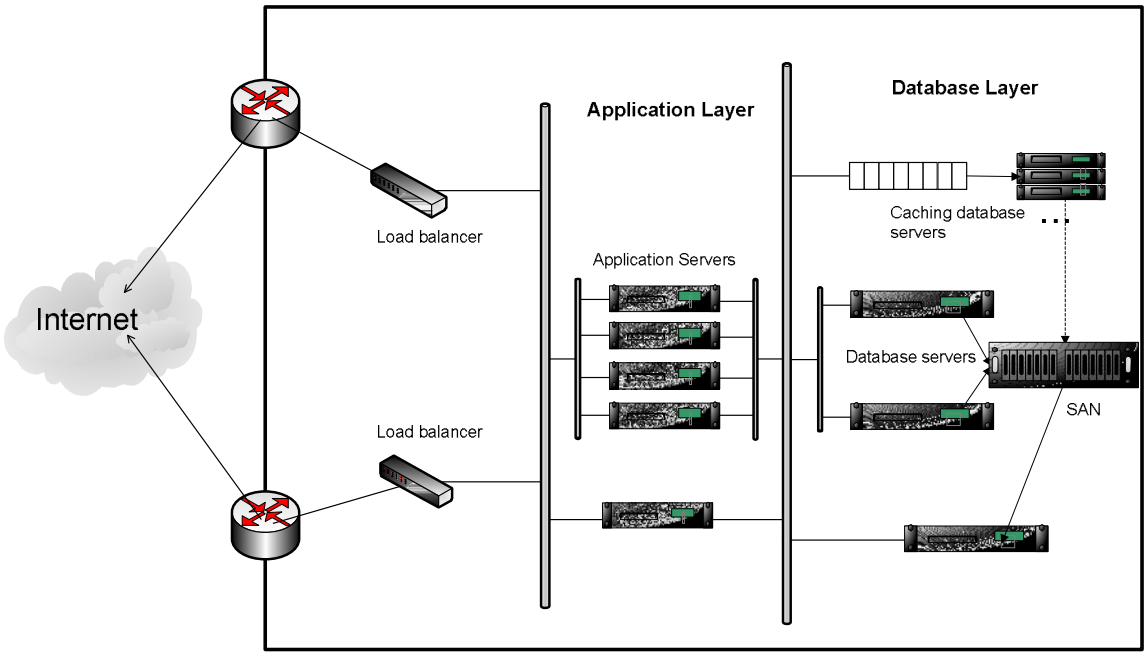
CAL Business Continuity Plan

Every element of CAL's central server architecture has been carefully designed with full redundancy to guarantee that unexpected hardware failures have no impact on system performance and availability. The image below is an example of a cluster of servers designed by CAL to support online testing for one of its state programs. The diagram shows the redundant paths to the Internet, the redundant set of core routers and load balancers, the cluster of multiple application servers, and the redundant database servers.

Failure of one of the Internet paths has no impact on the system performance since the second path will start delivering services immediately. A failure on the core routers or on one of the load balancers is immediately recovered from by the spare unit automatically taking control. Failure of one of the application servers is also accounted for since all its requests are automatically redirected to the other application servers by the load balancer. Extra capacity on the cluster of application servers is always included so that the extra demands due to the failed unit have no negative impact on performance.

Database servers are configured in an active/passive mode so that in case of failure on one of the units, the passive unit automatically and instantly takes over and starts delivering services. Both database units are connected to a fully redundant Storage Area Network.

Additionally, all servers have multiple power supplies with each plugged into separate electrical circuits that are backed up by separate data center uninterruptible power supply (UPS) units. A failure of any single circuit will not disrupt the servers' operation.



Example of CAL's System Architecture to Support the GCA Program

In case of major catastrophic events that could potentially make the primary CAL data center unavailable to users, CAL will provide a secondary backup site located in a different geographic location (450 miles apart from the primary location). This backup site will have the capacity to take over the testing system within hours of the system failure.

X.A.2. Disaster Recovery

X.A.2.a. Development of Disaster Recovery Plan

Disaster prevention and recovery are an integral part of the way DRC develops and operates systems, including the physical structures, server rooms, computing infrastructure, and application design and development.

Access to DRC buildings is controlled by card access with access to buildings and areas within buildings restricted to those areas necessary to perform one's job. Server rooms are further restricted allowing access only to those individuals who need access.

The server rooms are fire rated for four (4) hours with steel reinforced concrete walls, ceilings and floors. Fire suppression systems are installed with alarms, automatic power cut off, and sprinkler systems. Each server room is equipped with full uninterruptible power supplies (UPS) including battery backup and automatic switch to generator if utility power is lost.

Application systems are designed to work with the hardware and network infrastructure using redundancy, load balancing, and security. Servers are configured in clusters with automatic failover. Data are stored on SANs (Storage Area Networks) utilizing the appropriate level of RAID (Redundant Array of Independent Disks) to assure data protection with necessary performance (typically RAID 5 or RAID 10).

Employee access to client data is tightly restricted. All server consoles are locked with tightly controlled passwords. All workstations require dual network authentication and password protected screen savers. DRC denies all access to sensitive data and then grants access to only selected staff. Network accounts are audited quarterly and require unique passwords that change every 60 days. Accounts are immediately disabled whenever an employee leaves DRC. There is a high level of security awareness throughout all areas of DRC.

DRC has secured the internal network through the use of fault tolerant firewalls, protecting company resources from unauthorized access. Intrusion prevention allows DRC to detect possible infiltration or denial of service attacks and takes appropriate actions before a security breach occurs. DRC's web servers are segregated from both the Internet and the internal network through the use of a demilitarized zone (DMZ). Available security updates and patches are reviewed on a daily basis and implemented on all servers when applicable. Websites containing sensitive material require public-key cryptography security through Secure Sockets Layer (SSL) connections.

DRC has an aggressive anti-malware solution. All emails are scanned upon arrival. SPAM and emails with malware are deleted or quarantined as necessary. DRC has virus scanning software on all PCs, workstations, and servers to add a second layer of protection. All anti-malware software packages automatically update definitions daily and protect the following systems:

- **Email:** Two different virus engines double-scan all incoming and outgoing email.
- **Servers:** Server operating systems and network storage systems are scanned daily.
- **Workstations:** All workstations are protected with memory resident virus software.
- **Removable Media:** Removable media is scanned upon receiving and prior to shipping.
- **Web:** All Internet file transfers are scanned during transmission.

Data Backup processes are designed to minimize lost data should a failure occur:

- All data is fully archived two times each weekend.
- One copy is maintained on-site in a fire-resistant vault.
- Second copy is taken off-site to a data storage facility.
- Incremental backups are created each night.

Please refer to *Subheading VII.K.3* for information about eMetric's disaster recovery plan.

Recovery

For Class 1 and some Class 2 interruptions, DRC is prepared to make emergency component changes. Key components, such as servers, switches, and dedicated disk drives are maintained on-site for quick replacement. Every server's configuration is documented, in the event a rebuild is required.

For a site destruction situation, servers would be recovered from the server room or replaced by vendors. DRC has arranged for expedited shipment of technology from our vendors, for special assistance in emergency situations. DRC would take advantage of our multiple locations to restore production capability and then apply data backup tapes from the secured storage.

X.A.2.b. Plan for Testing the Tape Backup/Restore Functions

DRC will perform annual tests of the backup/restore process for critical components. This test will be performed on servers other than those normally used for production and will be tested for completeness and functionality. The systems restored, the steps used to perform the restores, and the results will all be documented as defined in the disaster recovery plan. This will ensure that, should

the system need to be restored in a remote location, the process and backup tapes will work as designed.

X.A.2.c. Inclusion of Tape Backup/Restore Function in Disaster Recovery Plan

The tape backup/restore process described above is part of DRC's Emergency Response Management Plan. Please see Exhibit B of *Appendix 14*, which provides a working outline of DRC's Computing Infrastructure Major Disaster Recovery Plan.

XI. Reports and Project Control

XI.A. TASK PLAN

XI.A.1. Work Plan for Each Task

DRC will ensure that GCA Program deliverables are:

- **On time**
- **Within budget**
- **Aligned to PDE specifications**
- **Of the highest quality**

DRC will perform all work within the timeline outlined in the RFP. Preliminary GCA Program schedules are provided in *Appendix 11*. These schedules specify all activities, tasks, and work elements of each task, as well as the resource(s) assigned to each task, that lead up to quality products and services delivered to PDE and/or Pennsylvania LEAs. On the schedule, each deliverable and service has been clearly identified and accompanied by start and finish dates. During the initial planning meetings, the Pennsylvania Project Management Team, led by the **GCA Program Manager, Dr. Adisack Nhouyvanisvong**, will review the schedule in detail with PDE to ensure that all timelines are approved and that the schedule reflects the desired level of detail for each facet of development, administration, and scoring and reporting of the GCA Program.

DRC utilizes Microsoft Project software company-wide to ensure all client timeline requirements are met. DRC's standard scheduling template requires that all handoffs between internal resource areas, the client, and subcontractors be specified in the schedule. The software enables DRC to track key milestones and deliverables, as well as to identify schedule risks early so that adjustments can be made before delivery dates are in jeopardy.

For the GCA Program, this approach means unparalleled internal and external communication regarding program scope, tasks, and requirements. It also means enhancement of the Pennsylvania Project Management team's ability to accurately track progress toward the completion of each GCA Program task and activity.

Using Microsoft Project, GCA Component Lead, Mr. Christian Schiller, will be responsible for maintaining the schedule and ensuring management of the following:

- Correctly identifying and communicating the tasks and deliverables.
- Tracking and communicating progress.
- Evaluating the status and availability of resources.
- Identifying project managers, resource managers, team members, and executives.

XI.B. STATUS REPORT

XI.B.1. Developing Agendas for Weekly Conferencing and Providing Weekly Status Reports

For the GCA Program, the Program Manager, Dr. Adisack Nhouyvanisvong, will work with PDE to schedule, coordinate, and participate in weekly status meetings with PDE staff. With the exception of up to two annual face-to-face meetings (one held at PDE headquarters in Harrisburg, Pennsylvania, and the other held at DRC's corporate headquarters in Maple Grove, Minnesota), the weekly status meetings will be held via teleconference or WebEx, depending on which method is preferred by PDE and will be most conducive to a successful meeting. We understand that the weekly status meetings will continue for as long as PDE desires. Dr. Nhouyvanisvong will work with PDE to ensure the focus of each meeting is appropriate given where the project is in its yearly cycle and that the necessary DRC and subcontractor team members are prepared to participate.

Early meetings will focus on ensuring all activities associated with this new contract are clearly understood by all parties, and PDE preferences for conducting and documenting meetings are established. Subsequent meetings will focus on the progress of tasks and activities relevant to the assessment cycle at those points in time. Prior to each meeting, Dr. Nhouyvanisvong will collaborate with PDE to identify topics and draft a meeting agenda for PDE review and approval. The weekly Problem Identification Report will be included as a permanent item on the agenda (please see *Subheading XI.E.* for more information regarding the Problem Identification Report). Agendas will be distributed to meeting participants no later than 24 hours prior to each meeting. Detailed notes and lists of participants for all meetings will be recorded and distributed to PDE and all DRC and subcontractor project team members.

Weekly status reports will include action items and will summarize the weekly conference calls. The weekly status reports will detail agreements and decisions made and pending, the status of relevant tasks and activities, timelines for scheduled activities, and any unforeseen outcomes or problems. These reports will be provided in a format approved by PDE and will be submitted to PDE, and meeting participants if directed by PDE, within 48 hours after each status meeting.

XI.C. TECHNICAL REPORT FOR THE GCAS

XI.D. TECHNICAL REPORT FOR THE DIAGNOSTIC ASSESSMENT TOOL

Detailed information on DRC's plan for providing technical reports for both the GCAs and the Diagnostic Assessment Tool is provided under *Subheading VII.J.10*.

XI.E. PROBLEM IDENTIFICATION REPORT

Meeting the dynamically changing needs of our clients is at the heart of our business. DRC is confident our proven processes, procedures, and quality standards will mitigate risks and issues that might arise during the length of the contract. Essential components to meeting these challenges are a comprehensive communication plan and a detailed project schedule. However, issue management must always play a critical part of any solid project management organization.

DRC's issue management process enables us to organize, maintain, and track any issues that cannot be resolved at the individual level. Our well-defined process enables the project team to identify, address, prioritize, escalate, and resolve problems and issues. The GCA Program Manager, Dr. Nhouyvanisvong, will escalate unresolved issues to the Senior Management Team, who will review them at DRC's internal weekly issues meeting. The team will evaluate each issue based on how it affects the program schedule, scope, budget, and resource allocations, and will determine a priority level and propose a solution. If an issue warrants immediate action, the Senior Management Team can meet outside of the weekly issues meeting to resolve an issue.

Dr. Nhouyvanisvong will oversee the creation of a Problem Identification Report on an as-needed basis. This report will describe any problems or areas that should be improved and that require special attention, as well as any discrepancies from established procedures and the causes for those discrepancies. The impact on the overall project and each affected task will also be discussed. The report will also list possible corrective actions with advantages and disadvantages delineated and will provide DRC's recommendations for solutions, including supporting rationale. The Problem Identification Report will be based on information gathered by the DRC GCA Program Team and PDE as the program moves forward. The Problem Identification Report will be included as a permanent item on the agenda of the weekly status meeting as necessary. Please see *Subheading XI.B* for more information regarding weekly status meetings.

XII. Information Technology Bulletin (ITB) Compliance Requirement

DRC will comply with all IT standards and policies regarding the delivery of services and systems to PDE.

XIII. Electronic Commerce Security Assessment (ECSA) Requirement

DRC will comply with all policies and requirements regarding Internet and/or Intranet e-government applications or sites.

XIV. Contract Background Checks (Feb. 2008)

DRC will comply with all requirements, policies, and procedures regarding employee background checks and access to Commonwealth facilities (either through on-site access or via remote access).

XV. Miscellaneous

DRC acknowledges the website address change regarding the website for accessing the database for BWMBO-certified minority- and women-owned businesses.