Request for Economic Stimulus Funds

Concept Proposal

Submitted by:

The College Readiness Workgroup
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Project Title:

Common K-20 Academic Infrastructure for Distance Learning, Assessment, Professional development, and curriculum development and dissemination

Project Partners

Known: UK, KCTCS, NKU, EKU, The Appalachian Mathematics and Science Partnership (AMSP), and Lexmark International

Anticipated: All Kentucky colleges, schools, and academic agencies

Project Background & Purpose (Justification for Project):

Broadly speaking, "education" has historically been a process that required the moving of people to educational services. Prior to the development of printing, people also had to move to information. The *public* transportation systems of the 20th century made it possible to develop this model to one of universal educational access - even at the highest level. Every level of traditional education employs the same "free" transportation system as a fundamental component of its operations model. In the 20th century environment of cheap energy it worked extremely well. In the process it also concentrated access to academic services at centers of transportation; producing imbalances in distribution and making them less available and hence more costly for people in remote settings.

This project proposes the development of a public transportation system for the electronic transfer of academic services to people. The emphasis is on "public" and in that sense it differs significantly from the view of automated grading and "distance learning" as things complex and expensive that lie within the purview of colleges and universities and commercial

services. With this approach these are simply additional resources available *at no charge* to schools and individual teachers to help allocate and deliver the academic services of which they are the stewards. As such it is in no way a replacement for the traditional educational model but is rather an important approach to the management of growth and efficient allocation of instructional resources.

For lack of a better term we refer to the recommended system as a *network*. This is in the sense of a collaborating community and not in that of a computer network. The network does use the existing state academic computer communications environment.

Project Description (General Goals & Implementation Strategies):

We recommend the creation of a statewide academic network for distance learning, assessment, professional development, and curriculum development and dissemination. As envisioned, the network would, like roads and libraries, be operated as a component of its academic infrastructure. *Thus there would be no cost to schools or teachers for use of the network*[1]. Although we mention a number of applications of the network we emphasize that the recommendation is for the creation of a unique, common resource to which all Kentucky educators and educational institutions would have equal access and from which all have multiple opportunities to benefit.

The architecture of the network would be such that services (e.g. synchronous distance learning) could independently originate from and resources be freely accessed in any Kentucky classroom, or academic office. It would provide all Kentucky teachers with advanced local tools for automatically checking routine homework and managing the resulting information (e.g. homework scores). The same infrastructure would provide a common platform for securely and quickly administering and managing standards-based state (or local) accountability assessments, end-of-course assessments, college placement exams, workplace qualifications, etc. It would provide a major component of a longitudinal " pre-K through college and career data system to track progress and foster continuous improvement"

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[1] The impact of a freely available, common utility of this type can be seen in the explosion of creativity and innovation that followed the free availability of the technical infrastructure on www.mathclass.org . Among these is a large partnership among NKU and 18 Northern Kentucky school districts aimed directly at the reduction of remedial instruction. NKU has suggested that an adaptation of that program be part of the recommendations for the College Readiness subcommittee. Their document is at https://www.mathclass.org/WebPages/Pages/256/KYOTE_NKU_Proposal.pdf

as required in *Guidance on the State Fiscal and Stabilization Fund Program*[2] , (p.4). At the same time it would provide a common interface through which teachers, schools, parents, colleges, and employers could collaborate to actually implement the required continuous improvement infrastructure. . It would also provide, as a corollary, a vehicle for the rapid implementation of a Kentucky version of the California system Early Assessment Program[3] (EAP) through which CSU collaborated with the schools to achieve in one year (and maintain) a 20% reduction in the mathematics remediation rate for the entire state.

The distance learning tools and open access of the network allow the projection of instructional services from any point on the network to any other. In contrast to the very challenging problem of equitable distribution of scarce teachers, this provides a viable approach to the equitable distribution of scarce *teaching services* which can be implemented quickly and cheaply, even on a local basis.

The system technology is entirely of Kentucky origin, having been developed and implemented by the University of Kentucky (software) and Lexmark[4] (hardware) . The major components are employed "in production". The UK system has been fully operational and under constant development since 2000. Its major implementation is at www.mathclass.org where its services include daily instructional support for 5000 math and Spanish students, the KEMTP[5], and the KYOTE[6] placement system, distance learning instruction[7], and professional

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[2] http://www.ed.gov/programs/statestabilization/guidance.doc
It would also directly address each of the other three required commitments on page 4. We won't take the time to provide them but those details can be provided at any time.

[3] Jones, A. (2007, October). *The California State Early Assessment Program*. Presented at Achieve, ACE,NASH, SHEEO. Washington, D.C. Retrieved December 19, 2008 from

http://www.mathclass.org/WebPages/Pages/201/jonesACR07.pdf Jones also reports there on a website (http://www.csumathsuccess.org/mshome)which provides a support and planning system for future CSU students, their parents, teachers, and counselors.

[4] Lexmark's headquarters and primary development center are in Kentucky.

[5] http://www.mathclass.org/kemtp-info/ -> Goto KEMTP

[6] https://www.mathclass.org/WebPages/Pages/173/KYOT.pdf

[7] Roher, L. A. H. (2007, February 25). Access to algebra: Comparative study of high school math students using distance learning at readiness with college algebra classroom students. Presented at the 2007 Tenth Special Interest Group of the Mathematical Association of America on Research in Undergraduate Mathematics Education, San Diego, CA.

development for teachers[8] [9] [10]. The Lexmark Education Station[11] is a high-end printer/scanner with supporting software, first released in 2007, which also creates and checks multiple-choice answer forms . An interface, developed through a UK-Lexmark collaboration provides an interface between the two systems to create the infrastructure for the network.

Implementation:

There are two major implementation components which we will label "Network Systems" and "Local Systems".

Network Systems: This consists of a number (we suggest[12] five) of what would essentially be clones of the UK www.mathclass.org system.

These would be installed at Kentucky universities or educational agencies. UK and KCTCS have already initiated the establishment of such a system at KCTCS as part of a project for providing placement services and supporting school/IHE partnerships. At the IT "machine room" operations level the demands are comparable to operating something like a library catalog. A reasonable estimate for completion of all hardware and software implementation would be three months from initiation with full operation, including needed staff development, accomplished within six months of implementation.
Each site would need "Help Desk/Information[13]" services. Since the system is designed to provide a full operations platform for state assessments (accountability, end-of-course,

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[8] Eakin, P., & Roher, L. A. H., (2007, October 29). *A model for embedded PD for secondary mathematics teachers*. Presented at the 2007 Quality Teacher Summit, Frankfort, KY.

[9] https://www.mathclass.org/WebPages/Pages/196/talk_slidesLf.pdf

[10] Roher, L. (2009). *The relationship between the degree of participation in online embedded professional development for high school mathematics teachers and student achievement in college algebra*. Ph.D dissertation, University of Kentucky, spring 2009.

[11] http://www.lexmark.com/lexmark/product/home/393/0,6970,204816596_653399449_1020710281_en,00.html?tabId=1

[12] The marginal cost of establishing a node is quite small so it would be possible for any Kentucky college, university, or even school or district to operate a system of its own. The "five" was selected to afford ample capacity and adequate redundancy for near-term needs.

[13] We recommend that common "level 1" service be provided as part of a state agency with level 2 at local operations and level 3 at UK or Lexmark as determined at level 2.

professional credentials, etc.) we recommend a tiered common "Help Desk/Information" service.

Local Systems:
While the network systems support the purely "web-based" services (e.g. the KEMTP, and KYOTE exams, and most college-level web-based homework) it expects student input to be entered at a keyboard. However the logistics of tasks such as routine in-class assessments and large-scale, high-stakes state assessments require a convenient "hard copy" interface which can accept "paper and pencil" input and treat it as if it had been entered at a keyboard.

The local systems are Lexmark Education Station devices which, like the program software, is technology developed in Kentucky. The formal installation is identical to that of any other networked printer. In addition to routine printing/scanning/fax these provide an automated local "Scantron" –type service and act as nodes on the state network for things like distance learning and state assessments.

Component Integration:
The Network and Local Systems are integrated through a software interface jointly created by UK and Lexmark. The Network Systems handle the student/teacher personal computer interface to the homework , exams, automated and hand- grading, and record keeping and provide the communication interfaces for synchronous and asynchronous distance learning. The Local Systems expand the interface to allow efficient " paper and pencil" input and output to all of the same resources.

User Professional Development:
The nature of the Network System component is that user professional development is required only for primary initiators of system services. The most active current model is the use of the KYOTE system. There the local colleges have handled 100% of the user development[14].

Lexmark and its distributors would provide the local user professional development for the Education Station.

Project Team (Project Manager(s), Content Experts, Instructional Designers, etc.):

The project managers are Paul Eakin (UK) and Daniel Seevers (Lexmark). System designers and developers are Ken Kubota (UK), Jack Schmidt (UK), Lana Kaliko (UK), Tim Seevers

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[14] As an example, Susan Esters and the Western Kentucky University registrars' office staff set up and put their very active KYOTE math placement system in operation based in the information in a small number of emails from the UK staff.

(Lexmark) Patrick Brewer (Lexmark), Tim Speller (Lexmark), Tim Crabbe (Lexmark), and Rick Chlopan (KCTCS).

Project Budget & Amount of Economic Stimulus Funds Requested:

Network Systems: As with the KYOTE system which operates from www.mathclass.org , UK does not charge any licensing or usage fees.

a. The server hardware (servers, Microsoft server software, backup systems, etc), for a fully independent implementation of the www.mathclass.org would cost approximately $20,000. The host institution would be asked to provide machine room space and physical security.
b. Routine system operations[15] (including help desk, backup, security, etc.) for a single independent system would be approximately $75,000 per year of which $40,000 would be expected to be help desk.

c. Continuing research and development operations on the server system and system updates would cost about $150,000 per year. Beyond system improvement and expansion this would include system updates and upgrades and their distribution .

Thus the expected costs for a 5-site Network System would be approximately:

Startup:	$100,000
Operations:	$275,000/yr
Research and Development	$150,000/yr

Host institutions would be expected to assume the operations and replacement costs at the end of the stimulus funding.

Local Systems:

For these purposes of this estimate the cost of a local system is the installed cost of one of the Lexmark Education Workstations, complete with the UK-Lexmark interface. The unit cost is $4,000 which covers installation and setup and an extended warranty. For the purposes of discussion we assume 1500 units installed in Kentucky college academic departments, schools, and state academic agencies the total cost would be $6 million. Since the units provide standard duplication, scanning, and fax services as well as replacing the conventional "Scantron" systems , the expectation would be that local sites would assume responsibility for the maintenance and replacement of the units.

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[15] Here we are using UK as a reference. Other sites might require more or less.

Thus the expected costs for Local System Implementation would be approximately $6 million. In addition to the technical and educational benefits the people of the Commonwealth of Kentucky would receive, by deploying the local systems, support for technical jobs in the state will also be realized. These include the need for skilled people in the local regions or districts, who would be involved in the distribution and set-up of the devices.

Network Administration: We estimate the cost of central administration for the network at $100,000 per year. This is low because of its highly decentralized structure in which all nodes can function independently or in concert with others. Decisions on standards, rules of access, and scheduling of large-scale assessments would need to be made at the central level and implemented via software on the Network Systems . At this stage of development we do not propose a specific administrative model although one housed in a state university or public agency appears to be viable.

Total Stimulus funding requested:
$6,100,000 startup costs
$525,000/yr recurring costs
$100,000/yr administration

Aside from the advantages to schools and colleges for regular and distance instruction and the savings of teacher time through availability of systematic homework and quiz scoring and record keeping, the capacity of the system to host state assessments would more than offset the recurring costs.