Open Academic Analytics Initiative (OAAI)

Next Generation Learning Challenges Full Proposal

Overview
The Open Academic Analytics Initiative (OAAI) will develop, deploy and release an open-source ecosystem for academic analytics designed to increase student content mastery, semester-to-semester persistence and degree completion in postsecondary education. As a result, we expect to see increases in adoption of academic analytics, particularly among institutions using the open-source Sakai Collaboration and Learning Environment, in both the short- and long-term.

Academic or learner analytics has received significant attention within higher education, including being highlighted in the recently released 2011 Horizon Report (Johnson, Smith, Willis, Levine, & Haywood, 2011). This interest can, in part, be traced to the work at Purdue University which has moved the field of academic analytics from the domain of research to practical application through the implementation of Course Signals. Results from initial Course Signal pilots between fall 2007 and fall 2009 have demonstrated significant potential for improving academic achievement. Despite this early success, academic analytics remains an immature field that has yet to be implemented broadly across a range of institutional types, student populations and learning technologies (Baepler & Murdoch, 2010). It is also clear that analytics alone do little to help students succeed academically thus improving our understanding of best practices related to student interventions remains a critical issue (Arnold, 2010).

To further advance the field of academic analytics, the OAAI, through technical development efforts, analytical research, institutional pilots and exploratory studies will:

1. Release, under an open-license, a Sakai “Student Effort Data” (SED) API that will capture user activity data and expose it in a secure fashion for use by early alert analytics-based tools.
2. Research the “portability” of predictive models used in academic analytics to better understand how models developed for one academic context can be effectively deployed in another.
3. Release an “open-source” OAAI Predictive Model for academic success that can be deployed by other institutions and overtime, be enhanced through open-source community collaboration.
4. Advance our understanding of technology-mediated intervention strategies by investigating the impact that engagement in an “Online Academic Support Environment” has on student success.
5. Document best practices related to deploying academic analytics using Sakai and the Pentho open-source business intelligence suite, including models for collecting appropriate learner data from institutional student information systems.

Although focused on open-source solutions, the OAAI will also facilitate, through the release of the Sakai SED API and OAAI Predictive Model, broader use of proprietary early academic alert systems, such as IBM SPSS Decision Management for Student Performance and SunGard Higher Education Course Signals. This will further magnify our impact on adoption and ultimately student academic success.
Project Description

The Open Academic Analytics Initiative (OAAI) will address one of the most critical needs facing higher education and our nation today: increasing the number of students who complete postsecondary degrees. Even those of us who work in higher education are often shocked by the evidence of what has become a national tragedy. Across all types of four-year institutions, of those students starting bachelor degree programs in 2001, only 36% completed them within four years. If we look at graduation rates over six years for this same population the figure improves to 58% yet it leaves one to wonder what happened to the 42% who did not succeed. Even more alarming, the four-year degree completion rate drops to 21% and 25% for Black and Hispanic students respectively (U.S. Department of Education, 2009). Similarly, only 28% of all students pursuing certificates or associates degrees in 2004 from two-year institutions completed their programs within three years. As a result, the United States now ranks 12th in the world in the percentage of 25- to -34-year-olds with an associates degree or higher (College Board Advocacy & Policy Center, 2010). Given the importance that educational attainment now plays in our ability to compete in a global marketplace, it is not surprising that leaders from both the public and private sector are calling for new and innovative strategies to address this national crisis.

Academic analytics, which “combines select institutional data, statistical analysis, and predictive modeling to create intelligence upon which students, instructors, or administrators” (Baepler, et al., 2010) can act as a means to improve academic success, holds great potential to provide new and innovative technological tools for improving course and degree completion. Although still a developing field, initial work in this area has shown promising results. In 2005, researchers at the University System of Georgia were able to predict with up to 74% accuracy, based on high school GPA and SAT mathematics scores, the likelihood that a student would successfully complete an online course (Baepler, et al., 2010). More recently, Purdue University, based on the seminal work of Dr. John Campbell, whose dissertation investigated the correlations between student use of course management systems (CMS) and course grades, has moved the field of academic analytics from the domain of research to practical application through the implementation of Course Signals. Acting as an early academic warning system, Course Signals, now supported by SunGard Higher Education (SGHE), utilizes “data collected by instructional tools (such as the course management system) to determine in real time which students might be at risk” (Arnold, 2010) to not complete their course. Once identified, these students can receive “interventions” via notifications sent by their instructor which guide them to appropriate academic support resources, such as online practice exams or tutoring assistance, along with encouragement to use them.

Results from initial Course Signals pilots between fall 2007 and fall 2009 demonstrate the significant potential this type of early warning system holds for improving course completion, semester-to-semester persistence rates, and mastery of content learning outcomes. For example, in a “gateway” Biology course with 300 students there were 12% higher levels of B and C course grades in sections using Course Signals versus control sections and a corresponding 14% decrease in the number of Ds and Fs (Arnold, 2010). Although more longitudinal data will need to be collected to determine impacts on
six-year cohort graduation rates, data from the past several years has shown 6-10% improvements in freshman-to-sophomore and sophomore-to-junior year retention rates (Campbell, 2011). Shifts of this nature provide initial evidence that early warning systems coupled with interventions can improve content mastery, course completion, and persistence rates. As a result of these early successes, a number of institution-specific academic analytics projects have been started in the last few years, including University of Maryland - Baltimore County (“Check My Activities” project), Grand Rapids Community College (Project ASTRO), and Northern Arizona University (Grade Performance Status or GPS project) (Next Generation Learning Challenges, n.d.), demonstrating a growing interest in this technology.

Although there is clearly compelling evidence that academic analytics holds great potential to address some of our most significant challenges in higher education today, it remains an immature field that has yet to be implemented broadly across a range of institutional types, student populations, and learning technologies (Campbell, 2007). It is also clear that analytics alone does little to help students succeed academically and thus improving our understanding of best practices related to student interventions remains a critical issue (Arnold, 2010). The OAAI, through technical development efforts, analytical research, institutional pilots, and exploratory studies, will work to address these needs. As a result, we expect to see increases in adoption of academic analytics, particularly among institutions using the open-source Sakai Collaboration and Learning Environment (CLE), in both the short- and long-term. The following outlines the major outcomes of the OAAI which will facilitate broader adoption across a diverse set of academic contexts.

**Develop, Deploy, and Release an Open-Source Ecosystem for Academic Analytics**

The OAAI will focus on developing, testing, implementing, deploying, using, and disseminating an open-source ecosystem for teaching and learning activities that also produces learning analytics that can drive effective educational interventions designed to improve student engagement and degree completion. To support real-world adoption, OAAI will base its development on open-source technologies already in widespread use at educational institutions, and on established protocols and standards that will enable an even wider variety of existing open-source and proprietary technologies to make use of OAAI code and practices.

The Sakai CLE is an enterprise-level open-source teaching, learning, research, and collaboration software platform that began in 2004 through funding from the Andrew W. Mellon Foundation. This funding helped seed the initial development work by a core group of five institutions (Indiana University, MIT, Stanford University, University of Michigan, and UC Berkeley). Today, Sakai is in use in hundreds of institutions around the world and supported by a vibrant community of developers, designers, educators, and commercial support vendors. If funded, the OAAI, under the leadership of rSmart, a leading Sakai commercial support provider, will develop a “Student Effort Data” Application
Programming Interface (API) for Sakai, thereby facilitating use of a broad range of open-source and proprietary academic analytics tools at over 300 Sakai educational institutions.

The Sakai “Student Effort Data” (SED) API will capture the user activity data Sakai already records to its “event logs” and expose it through a secure standard interface for use by both open-source and proprietary external academic analytics tools. Sakai’s mature and sophisticated open-source codebase minimizes the work necessary to deliver this capability and will provide a transparent reference architecture for other teaching and learning platforms to duplicate. OAAI will contribute this work to the Sakai community codebase with appropriate documentation and risk assessment and assist participating OAAI institutions with deployment in their existing Sakai platforms.

To facilitate pilot implementation, the rSmart will establish and publish student information system (SIS) data collection models, enabling partners to collect appropriate, common “demographic and cognitive” (e.g., SAT scores, high school GPA, etc.) data in batch file format from their varied SIS platforms or other sources, and combine it with user activity data collected dynamically from their teaching and learning platforms. Given the relatively static nature of learner data that is required and the wide variety of SIS platforms in use, this approach will allow OAAI to demonstrate success within the time constraints of the funding program. Longer-term, SIS data extraction can be automated and enhanced for any SIS platform using, for example, the IMS Global Learning Information Services or LIS standard (which would likely need to be extended to support the necessary data exchanges).

To facilitate development of a predictive model for academic success, the OAAI will deploy the Pentaho open-source business intelligence suite, using its rich and flexible capabilities to gather, store, manipulate, statistically analyze, and report on core Sakai and SIS data. OAAI will ensure participating institutions have access to a suitable Pentaho instance where they can securely store learner data (student identities will be removed) from their SIS and that can connect, through the SED API, to their Sakai platform to capture dynamic user activity data. Pentaho will also provide a common platform for OAAI to develop and demonstrate a reference implementation of the learning analytics algorithms and reports used to generate educational interventions for participating, at-risk students. OAAI will publish technical components and practices developed in Pentaho in standard formats to enable their use in other implementations and learning analytics platforms.

Although this work will create an open-source academic analytics capability, it will also facilitate broader use of proprietary early academic alert systems which some institutions may prefer given existing business relationships, technology infrastructures, and system capabilities. Both IBM and SunGard Higher Education, who are also Sakai Commercial Affiliates and partners with both rSmart and Marist College, have agreed to provide the data module information needed to ensure that the SED API enables use of their academic analytics tools, IBM SPSS Decision Management for Student Performance and SunGard Higher Education Course Signals. This will help speed adoption by institutions that already

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1 See http://www.sakaiproject.org
have licenses for SPPS or use the Banner ERP system to which Course Signals already integrates.

**Publish Research on the “Portability” of Predictive Models used in Academic Analytics**

Academic analytics initiatives, particularly those which rely in part on CMS data, are driven by predictive models that are typically derived from data which represents one type of institution, student population, and CMS technology. As a result, questions remain as to the degree to which predictive models developed for one academic context can be effectively deployed in other contexts. For example, will a predictive model developed for use at a large research university be as effective at predicting student success or failure when used at a fully online institution or community college? Improving our understanding of the “portability” of these predictive models will allow us to create more powerful and flexible models that will lead to reduced implementation cost and more significant impacts on student academic success.

To accomplish this, the OAAI will build on the research conducted by Dr. John Campbell at Purdue University, whose dissertation, *Utilizing Student Data within the Course Management System to Determine Undergraduate Student Academic Success: An Exploratory Study* (2007), laid much of the foundation on which academic analytics is based. Leading this effort will be Dr. Eitel Lauria, Associate Professor of Computer Science and Director of the Information Systems Graduate Program at Marist College, whose areas of expertise include information decision systems, business intelligence, data mining, and statistical machine learning. Dr. Lauria, using the Pentaho open-source business intelligence suite, will develop, following Dr. Campbell’s methodology, a predictive model for academic success based on data from Marist College. Detailed analysis will then be conducted as a means to compare the “Marist Predictive Model” to the “Purdue Predictive Model” developed by Dr. Campbell. Dr. Lauria will further refine this research through analysis of data collected during pilots at partner institutions which represent three broad academic contexts: community colleges, institutions with predominately minority student populations, and distance education programs. The results of this work, which will be disseminated under a Creative Commons license, will provide valuable insights into the portability of predictive models. Additional details on Dr. Lauria’s research methodology can be found in the Assessment, Measurement, and Evaluation section of this document.

**Develop, Deploy, and Release an “Open-Source” Predictive Model for Academic Success**

As part of the research into predictive model portability, Dr. Lauria will be developing, based on a Marist dataset from fall 2010, a predictive model for academic success within the Pentaho open-source business intelligence suite following the general approach used by Dr. Campbell. This “OAAI Predictive Model” will be used during our pilots to predict which students are in “need of help” (defined as likely to receive a grade of C or lower) and should get some form of intervention (see below). Details on how the OAAI Predictive Model will be developed are in the Assessment, Measurement, and Evaluation section of this document.
Dr. Lauria, with support from several graduate students and as part of his overall research efforts, will also explore a number of additional analyses methods based on data mining and machine learning techniques, which use previously collected data to build, or train, a model that can be used for descriptive or predictive purposes. These more sophisticated approaches were not deployed in Dr. Campbell’s research but hold potential to further enhance his predictive models. These additional techniques will be considered:

- **Decision Tree Classification**: Decision trees are graphical representations of rules inferred from the input (training) data that constitute the basis for prediction. Decision tree models use a recursive procedure to progressively partition the training dataset into groups according to a division rule that maximizes the homogeneity of the dependent (class) variable in each of the obtained groups. Several decision tree algorithms have been developed, with C4.5 (Quinlan, 1993) and CART (Breiman et al., 1984) being among the most popular. Decision trees have proven to be extremely robust when dealing with data of poor quality (e.g., missing values).

- **Support Vector Machines**: Support vector machines (SVM), are powerful discriminative models initially proposed by Vapnik (1995) based on the idea of classifying data in two categories by finding an optimal hyperplane (decision boundary) that is as far away from the data of both classes as possible. SVM implementations have been extensively tested and are considered state of the art for their classification accuracy.

- **Bayesian Networks (BN)**: A key feature of BNs is that they enable us to model and reason about uncertainty, by providing a graphical representation that can help articulate expert beliefs about the dependencies between different variables and expose some of the common pitfalls in reasoning due to misunderstanding of probability. Also, they play an increasingly important role in the design and analysis of machine learning algorithms, constituting an innovative way of approaching problems related to Artificial Intelligence. The set of factors that lead to academic success or failure typically cover a wide spectrum of issues. With the purpose of being able to analyze the dependency among these variables and their mutual interplay from an integrated perspective, we should resort to techniques that associate a large number of variables. The direct graph in the Bayesian network provides the overall dependency structure among the variables, and the conditional probability distribution at each node quantifies the directed dependencies.

At the conclusion of the OAAI, we plan to release the predictive model for academic success under a Creative Commons license through the OpenEdPractices.org web site for other institutions to use. The model will be in a format compatible with the Pentaho open-source business intelligence suite but ultimately we will work towards publishing it using the vendor-agnostic XML-based standard Predictive Modeling Markup Language (PMML). Pentaho currently supports only importing of PMML but not exporting (PMML exports are on their development roadmap), which may limit our ability to release it in this format within the duration of the funding program. Although requiring more detailed review to assess its viability, the American Public University System, which has a team of analytics staff with SPSS knowledge, has expressed interest in replicating the predictive model for academic success within SPSS.
which would then allow for export in PMML. Over time this could lead to an open-source community effort to enhance the predictive model using new datasets from different academic contexts.

**Advance Our Understanding of Technology-Mediated Intervention Strategies**

The academic analytics work conducted at Purdue University over the past several years has focused primarily on the use of a notification system to alert students who have been identified as being at risk of not completing their course. This notification system allows faculty to craft specific messages which often contain an academic warning regarding their performance in the course as well as recommendations for how they might improve their chances of success (e.g., students who spend an hour or more taking practice exams online generally receive higher grades on the mid-term and final). At later stages, if student performance has not improved, the instructor or teaching assistant might request a meeting or refer the student to an academic advisor. The system can be configured to automatically send these messages via email to the student as well as have a “traffic light signal” graphic appear when the student signs into the course management system.

The work done at Purdue has shown that this use of relatively simple “notification interventions” can have a significant effect on student behavior. In one course with 220 students, 55% of those who were initially identified as being at “high risk” for not completing the course moved into the “moderate risk” category. More impressively, almost 25% moved from “high risk” to no or low risk, and of those who began at the “moderate risk” level almost 70% rose to the no/low risk category. This seems to indicate that simply making students aware that they are at risk to not complete a course motivates them to seek help and change their academic behavior. Interestingly, once the interventions stopped they found that the students who had received the “notification interventions” continued to seek help and at a frequency that was “30% more often than students in the control group (Arnold, 2010).”

The OAAI will add to the notification system concept used at Purdue by leveraging Sakai Project Sites to create an “Online Academic Support Environment” that will provide a unique opportunity to engage students identified as “needing help” in an online community designed to help them succeed academically. There is significant evidence from the past 20 years of research that high levels of student engagement or involvement with their institution is empirically linked to higher rates of student retention (Cuseo, n.d.). Although the correlation between support groups and academic success has not been as widely researched, recent studies have also shown compelling evidence that students who participate in support groups had significantly higher first- and second-semester and cumulative GPAs than their peers who did not participate. In addition, students who participated in such groups were much more likely to persist into their sophomore year (79% vs. 39%) (Folger, Carter, & Chase, 2004).

Sakai Project Sites are designed to support a range of ad hoc online collaboration outside of structured teaching and learning activities and are easily set up within the Sakai CLE. A team consisting of an instructional designer, student support staff, and academic advising experts at Marist College will design a general framework for the Online Academic Support Environment (OASE), based on research and best practices on creating online support communities. Team members will then work with partner
institutions to apply this framework locally to create a customized OASE site that will leverage local support resources and meet the needs of their particular student population and academic context. Some of the core design elements for the OASE sites will include:

- **Promote Awareness of Academic Support Services** - The site would be facilitated by an institutional representative, possibly an academic advisor or support staff, who would answer questions and help direct students to campus-based or online resources provided by the institution (e.g., tutoring services, writing labs etc.). In addition to making students aware of these resources, such interactions would likely help students feel engaged with their institution.

- **Promote Peer-to-Peer Engagement** - The site will be co-facilitated by advanced students who can act as peer mentors and provide a more experienced student perspective on issues of campus and academic life. For example, they might manage an online “Student Lounge” discussion forum in which students would engage in discussions that were most relevant to them (e.g., how to deal with test anxiety). In other cases, student-developed videos on academic success issues (e.g. Cerritos College’s iFALCON program\(^2\)), would be made available.

- **Access to Students with Self-Assessment Tools** - Students would be given access to a range of self-assessment tools, such as the Learning and Study Strategies Inventory (LASSI), to help them become more aware of their strengths and weaknesses as a learner as well as their preferred learning style. Recommendations to either seek out in-person assistance or review educational materials could then be provided based on the results of these assessments.

- **Access to Educational Scaffolding Content** - Students would be provided with a range of open content as a means to improve study skills, refresh content knowledge, or engage in skill remediation. For example, students might be given access to Flat World Knowledge’s textbook, available for free online under a Creative Commons license, titled College Success\(^3\) to better understand how to take notes or improve their time management skills. In other cases, students might be directed to open-source tutoring software available through the Carnegie Mellon Open Learning Initiative for remediation purposes. The OAAI will also collaborate with other Open Educational Resource and related Next Generation Learning Challenge-funded projects to work to incorporate their content into the OASE.

The OAAI will explore the degree to which engaging at-risk students in an online academic support community impacts mastery of content, course completion and persistence rates. These results will be compared to the same outcome measures among students who only received notifications, as well as students who received no interventions (control groups).

**Short-Term Outcomes and Long-Term Impact**

The short-term outcomes of the OAAI will include technical resources, research findings, and best practices related to deploying academic analytics. As part of our technical work, the OAAI will release,

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\(^2\) See [http://cms.cerritos.edu/ifalcon/#panel-2](http://cms.cerritos.edu/ifalcon/#panel-2) for video example.

\(^3\) See [http://www.flatworldknowledge.com/pub/1.0/college-success/223362](http://www.flatworldknowledge.com/pub/1.0/college-success/223362)
under an open-source license, the Sakai SED API, and will contribute it to the Sakai community for use at other institutions. In addition, detailed documentation related to the use of Pentaho for academic analytics and the predictive model for academic success will be made available under a Creative Commons license. Research on the portability of such predictive models as well as the use of online academic support environments will be published, also under a Creative Commons license, to both the OpenEdPractices.org web site as well as open access journals. Finally, we will report on recommendations for larger scale efforts which will further expand on the OAAI’s work. All of this will be disseminated broadly through presentations at major national and international conferences (EDUCAUSE, International Sakai Conference, etc.).

We also hope to demonstrate a positive effect on student academic success in the short-term through our pilot activities in which we will be deploying a range of intervention strategies. More specifically, we expect to increase content mastery (as measured by course grades), course completion, and persistence rates with the largest gains taking place among students who engage in our Online Academic Support Environments. Based on the outcomes of the work at Purdue, our target outcomes in these areas are: a 14% increase in students receiving B/C grades and an 8% increase in course completion and persistence rates. Although we expect some impact on deeper learning to occur as a result of students who engage in the OASE because of potential improvements in metacognition, lack of prior research in this area and limited ability to measure such improvements within the scope of this funding program make predictions difficult.

Longer-term, the OAAI hopes to have a significant impact on the adoption of academic analytics, particularly among institutions that use Sakai. This will be facilitated by our technical work around the Sakai SED API, Pentaho open-source business suite, and an “open-source” predictive model for academic success. To better understand the impact that this work may have on adoption five years from today, we can turn to the just-released 2011 Horizon Report (Johnson, et al., 2011) that has identified the “time-to-adoption horizon” for learning or academic analytics as four to five years. The report indicates that this means that “about 20% of institutions” will adopt it within a defined period. Using this model, we would estimate that roughly 55 to 65 Sakai institutions will have deployed academic analytics solutions by 2016.

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4 See http://horizon.wiki.nmc.org/Methodology
Organizational Capacity

- Sakai leadership
- Open-source experience
- Existing relationships
- Ed tech knowledge
- Retention expertise

Academic Analytics Course Pilots

Diverse Academic Contexts

American Public University System

Project Resources

- Open Educational Resources (OER)
- TTP Sakai Instance hosted at Marist
- In-kind contributions (graduate students)
- Campbell’s research on CMS-based analytics
- Partnerships with IBM and SGHE
- Open-source CMS/LMS and BI tools suite

Human Capital

- Mr. Baron – Ed tech and Sakai community leadership
- Dr. Lauria – Data mining & business intelligence expert
- Dr. Regan – Educational technology research experience
- Ms. Ruiz-Grech – Minority student support expert
- Ms. Fiore – Tech supported learning services expert
- Ms. Cullen – academic advising expertise
- Mr. Dashew – instructional design and ed tech expert
- Mr. Harris – technology implementation at HBCUs
- Mr. Gillman – Sakai technical development expert

Open Academic Analytics Initiative (OAAI) Logic Model

Project Activities

- Develop and Release Sakai SED API
- Develop OAAI Predictive Model based on Marist Dataset
- Conduct Research on Predictive Model Portability
- Pilot and Research use of “Online Academic Support Environment”

Short-Term Outcomes

- Release Enhanced OAAI Predictive Model and Release Under Open License
- Publish Research Results on Portability and use of OASE
- Publish Best Practices for Using Sakai and Pentaho for Academic Analytics

Long-Term Impact

- Demonstrate a 14% Increase in Students Receiving a B/C Grade and an 8% Increase in Course Completion Rates Between Control and Treatments Groups.
- Four of the Six OAAI Institutions to Scale Academic Analytics

20% of Sakai Community (55-65 Schools) Deploy Academic Analytics by 2016
Assessment, Measurement, and Evaluation

The OAAI will engage in two distinctly different research activities: analytical research into the portability of predictive models for academic success and quasi-experimental research on the effects of different interventions on student academic success. In addition, we will be evaluating our own progress towards meeting our project goals and outcomes. The following two subsections describe this work in more detail.

Analytical Research on the “Portability” of Predictive Models for Academic Success

During the initial phase of the project (Period 1), Dr. Eitel Lauria will lead an effort to investigate how well the predictive model developed by Dr. Campbell performs when used within different academic contexts. This investigation will look at three primary questions: (a) To what degree does Dr. Campbell’s model accurately predict which students are in need of help (will likely receive a C or lower in the course) in a setting other than Purdue University; (b) Do the same correlations found at Purdue University between CMS usage and student success exist within other academic contexts; (c) Assuming the same correlations exist, are the strengths of the correlations equivalent within different contexts? Investigating these questions will provide an initial understanding of the “portability” of Purdue’s predictive model to other academic contexts which may vary in size, type, student population, delivery format (e.g., online), and CMS technology. The knowledge gained will lay the foundation for more comprehensive efforts to develop predictive models which will “adapt” to the academic context in which they are deployed.

Our investigation into the “portability” of Purdue’s model will mirror the process used by Dr. Campbell to validate the original predictive model developed through his dissertation research using a “data subgroup” extracted prior to development of his model to verify his findings (Campbell, 2007). In our case, Dr. Lauria will use two datasets from fall 2010 CMS data from the Sakai system in production at Marist College to perform a similar validation process. Although Marist College and Purdue University differ in obvious ways (e.g., institutional type, size, geographic location) they do share a number of similarities which are particularly pertinent to this study. These include (2010 data) percentage of students receiving federal Pell Grants (Marist 11%, Purdue 14%), percentage Asian/Black/African American/Hispanic students (Marist 11%, Purdue 11%), and ACT composite 25th/75th percentile (Marist 23/27, Purdue 23/29) (U.S. Department of Education, 2010). Given that key institutional characteristics are similar we believe that our work will provide a good initial test of the model’s portability.

Dr. Lauria will begin by preparing the Marist fall 2010 CMS data, from which all identifiable student information (e.g., names, campus-wide ID, etc.) will first be removed and replaced with a unique identifier assigned by our Office of Institutional Research, following the same approach as outlined in Dr. Campbell’s dissertation. We expect our complete dataset to contain usage data from approximately 700 courses and 5000 undergraduate students (approximately 80% of Marist College undergraduate courses use Sakai). It will then be randomly distributed into a “model development subgroup” and “model verification subgroup” of approximately equal sizes. Based on our knowledge of the dataset collected from Purdue’s WebCT Vista CMS and “event log” data that is routinely recorded by the Sakai CMS, we have confidence that we will be able to collect the same usage data as was used by Dr. Campbell. Using the Pentaho open-source business intelligence suite we will, using the “model development subgroup” data, develop a “Marist Predictive Model” that correlates data elements from...
the Sakai CMS to academic success (i.e., course grades) and then analyze the degree of correlation between variables (Campbell, 2007). By comparing our results to those found by Dr. Campbell, we will provide an initial indication of the “portability” of Purdue’s predictive model to a different academic context.

The next phase of our initial investigation will be to expand the Marist Predictive Model to include the demographic and cognitive variables (e.g., high school ranking, aptitude test score) that Dr. Campbell’s study found were significantly correlated to success. The demographic and cognitive data will be extracted from our ERP system and all identifiable student information (e.g., names, campus-wide ID, etc.) will be removed and replaced with a unique identifier assigned by our Office of Institutional Research. Again, Pentaho will be used to create a new Marist “Main” Predictive Model that will now include data elements from both the Sakai CMS and ERP datasets.

This Marist Predictive “Main” Model will be validated using the “model verification subgroup” and results compared to accuracy of the Purdue Predictive “Main” Model. Depending on which student populations were examined (freshman vs. non-freshman), the Purdue study was able to predict student success with an accuracy of between 59% and 80%. The degree to which the accuracy of the Marist “Main” Predictive Model matches these results will be another indication of the portability of the model. If time allows, this work will be further expanded by creating a Marist Predictive “Reduced” Model, as was done by Dr. Campbell, which will combine only the most significant predictors into a single or composite measure as a means to reduce the complexity of implementing the model. A similar comparison would then be made between the Purdue and Marist Predictive “Reduced” Models to further research the issue of model “portability.”

The Marist “Main/Reduced” Predictive Model will be further enhanced by Dr. Lauria to create the OAAI Predictive Model that, during the 2011-2012 academic year, will be used in the pilots run by each institutional partner. These pilots will involve at least nine separate classes per semester per institution of which three will act as control groups (no student interventions will be deployed). CMS data, demographic/cognitive data, and course grades will be collected from each of the control group classes (identifiable student data will be removed) and will be used to further explore the portability of the OAAI Predictive Model in different academic contexts. In total, we will capture control group data from a total of 36 classes (approximately 900 students), with 12 classes (approximately 300 students) in each of the three academic contexts being studied: community colleges, institutions with predominately minority student populations, and distance education programs. In Period 4 (and possibly before then), Dr. Lauria will use the control group data to investigate, following the same methodology described earlier, the accuracy of the OAAI Predictive Model within each of the three study categories. Although the control group represents a relatively small sample size, we believe the outcomes of this analysis will provide initial knowledge regarding the accuracy of the OAAI Predictive Model within the academic contexts being studied.

Dr. Lauria will complete the analysis by identifying any significant correlations between the CMS data elements generated by the control groups and course grades. The CMS data elements which show correlations will be compared to those identified in the Purdue and Marist datasets as means to better understand what, if any, differences exist across the three academic contexts. For example, given the heavy reliance on the CMS in online courses, we might expect data elements from the control groups in the distance education category to show correlations to course grades which do not show up or do not show up as strongly in the other categories.
Ultimately, this work could lead to an “academic context-specific” OAAI Predictive Model which was tailored to specific contexts or even possibly one that would adapt to the context in which it was deployed.

**Research into the Effects of an Online Academic Support Environment on Academic Success**

Again building on the work of Dr. Campbell and Purdue University, which has focused primarily on interventions which notify students of existing campus-based academic support services, the OAAI will deploy an additional intervention strategy aimed at engaging students in an online community designed to help provide academic support. This “Online Academic Support Environment” (OASE), which will be facilitated through a Sakai Project Site at each institution, will foster interactions between students and academic support staff, provide access to a range of support materials (Open Educational Resources will be included), and provide opportunities for peer-to-peer engagement.

This exploratory study, led by Dr. James Regan, Associate Professor and Director of the Psychology Graduate Program, will follow a quasi-experimental design model in which each institutional partner will pilot academic analytics solutions in nine classes per semester (see Outcomes and Milestone section in this document for course details). To the extent possible, institutional partners have selected three courses that each have at least three sections or classes taught by the same instructor to reduce introduction of confounding variables. For each institution, six classes will receive interventions and three classes will not (although CMS and demographic and cognitive data will be captured for all nine classes). Of the six classes receiving interventions, three will rely solely on notification messages from the instructor, providing similar interventions as used by Purdue University in its pilot programs. In the other three “treatment” classes, students will receive notifications but will also be invited to join the Online Academic Support Environment Sakai Project Site on a voluntary basis. As a result, over the duration of the study, we will have 36 classes which will not receive any interventions (control group), 36 classes that will receive just “notification interventions,” and 36 that will receive both “notification” and “OASE” interventions. Overall, 108 classes will be involved, 72 of which will receive some type of intervention which will impact approximately 2,500 students.

At the end of the 2011-12 academic year we will compare course completion, semester-to-semester persistence rates, and the level of content mastery (course grades) across the two intervention groups as well as the control. This will allow us to look at what, if any, additional benefit engagement in the Online Academic Support Environment had on student academic success. As previously noted, based on the outcomes of the work at Purdue, our target outcomes in these areas are: 14% increase in students receiving B/C grades and an 8% increase in course completion and persistence rates.

Although the scope of this project will not allow us to control for differences across institutions, we will also compare outcomes between different student populations and academic contexts. This may allow us to draw some conclusions as to the impact of different interventions. For example, we may find that the “online engagement” interventions have a greater impact on academic success in online vs. face-to-face courses. Given the compressed nature of this study timeline, relatively small sample size, and possibly confounding variables that could be introduced, the result of this exploratory study may not be definitive but it will lay a rich foundation for future, larger scale studies.
Finally, instructors and students will be surveyed at the conclusion of each pilot to gather feedback and determine their satisfaction with academic analytics. If possible, we will attempt to implement the same survey instruments used by Purdue during their Course Signals pilots as a means to compare results. We are also considering using a modified version of the Distance Education Learning Environment Survey (DELES) with the “OASE intervention” group if time allows for validation of the modified questions. The DELES “considers post-secondary student and instructor perceptions of their learning environment in six psychosocial scales of: 1) instructor support, 2) student interaction and collaboration, 3) personal relevance, 4) authentic learning, 5) active learning, and 6) student autonomy” (Walker, 2003a) and would allow us to gather feedback on the OASE design.

OAAI Program Evaluation

Outside of the student impact objectives detailed in the above section, the OAAI will be evaluated primarily on timely achievement of program outcomes and goals which are documented in the Outcomes and Milestones spreadsheet. Briefly, these will include:

- Deployment of Sakai SED API by 9/1/2011 and inclusion in the Sakai 2.9 release by April 2012
- Release of “open-source” OAAI Predictive Model by 8/1/2012
- Publishing of OAAI Final Project Report by 8/1/2012 that will include:
  - Research results on portability of predictive models for academic success
  - Research results on impact of an OASE on student success
  - Information related to deployment of Pentaho for academic analytics
  - Lessons learned and recommendations for academic analytics best practices
  - Recommendations for large scale and/or longitudinal studies

Dr. James Regan (lead research), Associate Professor and Director of the Psychology Graduate Program, Mr. Josh Baron (co-PI), Senior Academic Technology Officer (Marist College), and Mr. Roman Harris (co-PI), Director of the Technology Transfer Project, will act as liaisons to the NGLC Wave 1 Grants external evaluation study.

Sustainability

Sustaining OAAI resources and achievements beyond the grant period centers on five distinct areas: the technical resources of the Sakai Effort Data API, the models for collecting appropriate learner data from institutional student information systems, the predictive models, analytics, and reporting developed in the Pentaho BI suite, the technology-mediated academic intervention strategies including the OASE, and last but not least, the larger set of integrated practices that bring these components together to directly impact student completion rates.

The single most important strategy OAAI will use to ensure the sustainability of all these resources and practices is to develop and deploy them within the broader Sakai community, where there is both strong interest in OAAI’s underlying goals and a vibrant ecosystem to adopt and support OAAI work. In addition to the Sakai community member institutions participating directly in OAAI, we have clear statements of interest from a wide variety of core Sakai institutions, including Cambridge University, Charles Sturt University, Indiana University, New York University, Stanford University, UC Berkeley, and the University of Cape Town. This early interest from leading Sakai institutions signals far wider interest in the global Sakai community, which itself represents a
substantial cross-section of the entire higher education sector. Because OAAI will develop and disseminate all
the necessary resources to enact our proposed learning analytics strategies within established Sakai community
channels, we will enable our work to spread following the same principles Sakai has long used to sustain similar
interventions in educational technologies and practices. One step further, all OAAI work can be used either
directly by or as a model for institutions outside Sakai in other open-source and proprietary educational
technology communities.

While the bulk of Sakai community resources are currently dedicated to maintaining and enhancing the now
mature Sakai CLE (aka Sakai 2) platform, that community is also now devoting substantial resources toward the
development of a next-generation Sakai Open Academic Environment (OAE) platform. While NGLC funding will
build necessary technologies and practices in the Sakai CLE environment, much of the wider Sakai community
interest in OAAI’s work revolves around extending it to the Sakai OAE platform. Accordingly, there is strong
evidence that OAAI’s efforts will be incorporated and extended in both Sakai’s current and future platforms.

The code developed for the Sakai Effort Data API (SED API) will be designed following standard practices long
established in the Sakai open-source development community and contributed directly to that community
codebase. rSmart and Marist both have deep experience participating in Sakai development efforts and will
collaborate to maintain and enhance the SED API as both it and Sakai mature. rSmart specifically has a strong
financial interest in sustaining the SED API as it will be a significant feature of Sakai for rSmart’s current clients
and future prospects and supports rSmart’s recently established close partnership with SunGard Higher
Education that will rely on the SED API to connect its Course Signals learning analytics platform to Sakai-
Banner clients.

The models OAAI will develop to collect appropriate learner data from participating institution SISs will create a
common blueprint following well-established practices for SIS data integration. Published and freely available via
OAAI, this blueprint will enable any institution to build its own learner data collection process using common
data extraction procedures. This same blueprint will also lay the groundwork for open-source and proprietary
SIS products to develop and offer more direct, automated integration pathways between SISs and learning
analytics platforms. To further encourage the development and spread of SIS integration with learning analytics
platforms, OAAI will also work directly with appropriate standards bodies (e.g., IMS Global) and major SIS
vendors (e.g., SunGard Higher Education) to influence the formation and adoption of standards like Learning
Information Services (LIS) that are guiding the next generation of SIS integration technologies. All together,
these efforts will create a simple, practical, repeatable process for immediate, widespread use, as well as
establish the foundation for more sophisticated practices.

Outcomes and Milestones

As detailed in the Outcomes and Milestones spreadsheet (uploaded separately), the sequencing of our work will
be particularly important given that a number of outcomes and milestones will need to be completed before
pilots can begin in the fall 2011 semester. This will require that a number of project activities take place in
parallel including: researching the “portability” of predictive models for academic success, completing design of
exploratory studies, developing the initial OAAI Predictive Model, developing the Sakai SED API, and preparing
courses and faculty for pilot activities.
To successfully complete the work required in Period 1, a separate lead individual or organization will be responsible for each major milestone, with Marist College providing overall oversight and coordination across partners. These lead individuals/organizations for Period 1 will include:

- rSmart – lead on the Sakai SED API development and Pentaho deployment
- Dr. Eitel Lauria – lead on research on “portability” and development of OAAI Predictive Model
- Dr. James Regan – lead on design of exploratory studies and preparing for implementation
- Mr. Brian Dashew – lead on preparing faculty and courses for pilot activities
- Mr. Josh Baron and Mr. Ramon Harris – leads on project coordination and management

As each Period is reached, similar “leads” will be identified and take responsibility for specific project components. For example, in Period 2 and 3 local project coordinators will take on larger roles and be responsible for ensuring pilot activities remain on track.

A discussion of external factors and potential challenges and how we plan to mitigate them can be found in the Risks section of this document.

**Organizational Capacity**

In order to meet its intended outcomes, the OAAI will assemble a diverse group of individuals and organizations with expertise in business intelligence, educational research, student retention, minority student populations, instructional design, open-source technologies, and Sakai code development. The individuals and organizations involved will leverage their prior experience collaborating on Sakai-related projects which they have gained through their, in some cases long-term, involvement in the Sakai open-source community. The following summarizes key organizational capacity facts:

- Mr. Josh Baron, Senior Academic Technology Officer for Marist College, has served on the Sakai Foundation Board of Directors since 2008 and as Chair for the past two years.
- Mr. Ramon Harris, Director of the Technology Transfer Project, has over 10 years of experience working with Historically Black Colleges and Universities in building technology infrastructures and integrating technology into the teaching and learning process, including use of the Sakai CLE.
- Dr. Maggie McVay-Lynch, Dean of Information Technology and Distance Education at College of the Redwoods, has served on the Sakai Foundation Board of Directors since 2009 and as Vice Chair for the past two years.
- rSmart, which was a “founding member” of the Sakai community, currently provides support services to all of the OAAI institutional partners and is a valued and established contributor to the Sakai code base.

Note: Unless otherwise noted, all student data listed in this section is based on Fall 2009 enrollments (U.S. Department of Education, 2010).
Marist College - OAAI Lead Institution

Marist College, which has been active within the Sakai open-source community since 2005 and using Sakai in production since fall 2007, will act as the lead organization for the OAAI, working closely with the Technology Transfer Project (TTP) and rSmart on project coordination and management. As described in the Project Budget section, Marist will administer all grant funds, providing sub-grants to each of the OAAI partners.

Marist College, recognized for excellence by The Princeton Review, U.S. News & World Report, Kiplinger's Personal Finance Magazine, Barron's Best Buys in College Education, and Entrepreneur Magazine, is a highly selective comprehensive liberal arts institution noted for its leadership in the use of technology in and out of the classroom. Founded in 1929, Marist overlooks the Hudson River in Poughkeepsie, New York, midway between New York City and Albany, the state capital.

Mr. Josh Baron (OAAI Co-PI): As Senior Academic Technology Officer, Mr. Baron is responsible for overseeing a wide range of instructional technology initiatives, including distance learning, faculty professional development, learner support, and strategic planning. Mr. Baron was elected to the Sakai Foundation Board of Directors in 2008, where he is currently serving as Chair, and was reelected in 2011. Before coming to Marist, Mr. Baron helped lead a $10 million U.S. Department of Education technology initiative working both at the K-12 and college level. He holds a B.S. in Aerospace Engineering from the University of Michigan and an M.A. in Educational Technology Leadership from The George Washington University.

Dr. Eitel J.M. Lauría (OAAI Business Intelligence Lead): Dr. Lauría is an Associate Professor of Information Systems. Dr. Lauría also serves as Director of the Master of Science in Information Systems and co-Director of the Master of Science in Technology Management. Prof. Lauría holds a six-year Electrical Engineering degree from University of Buenos Aires, an M.B.A. from Universidad del Salvador (Argentina), and a Ph.D. in Information Science from University at Albany, SUNY. He has served as an information systems and technology consultant to IBM, Microsoft, Exxon Mobil, Reuters, GE Global Research, and other global corporations, advising on such topics as decision support systems, business intelligence, data management, and distributed applications.

Dr. James Regan (OAAI Research Lead): Dr. Regan received his Ph.D. degree in Clinical Psychology from St. John’s University in New York. He has served as the Chief Executive Officer of Hudson River Psychiatric Center for over 10 years. His previous positions have included Director of Education and Training, Chief of Alcoholism Services, and Director of Community Services for the Office of Mental Health. He is currently the Director of Graduate Psychology Programs at Marist and an Adjunct Professor of Psychology at New York Medical College.

Ms. Iris Ruiz-Grech (OAAI Minority Student Academic Support Lead): Ms. Ruiz-Grech has been Director of the Arthur O. Eve Higher Education Opportunity Program (HEOP) for the past 18 years. HEOP is a comprehensive academic support services program within the Center for Multicultural Affairs at Marist College designed for New York State residents who are capable of succeeding but who have not had the educational opportunities which prepared them for college and who come from adverse economic backgrounds meeting income

<table>
<thead>
<tr>
<th>% Undergrad.</th>
<th>% Receiving Aid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black non-Hispanic</td>
<td>3%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>6%</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>2%</td>
</tr>
<tr>
<td>American/Alaska Native</td>
<td>0%</td>
</tr>
<tr>
<td>Federal grant aid</td>
<td>11%</td>
</tr>
</tbody>
</table>
guidelines established by the Board of Regents. She holds an M.A. in Higher and Adult Education from Columbia University and a B.S. in Psychology from Tulane University.

**Ms. Jane Fiore (OAAI Learning Services Lead):** Ms. Jane Fiore has worked at Marist College for 18 years. She began as an adjunct instructor for the Academic Learning Center and has served as Coordinator and Acting Director and is presently the Director of the Center. Ms. Fiore was part of a team of educators who developed two programs for Marist, designed to assist incoming students in their transition from high school to college and in choosing their program of study.

**Ms. Kristine Cullen (OAAI Academic Advising Lead):** Ms. Cullen has served as Director of Advising and Academic Services at Marist College for the past six years. During this time she has led a number of technology-based initiatives including piloting the use of a Sakai Project Site to support academic advising between faculty and students as well as launching her department’s Facebook page.

**Mr. Brian Dashew (OAAI Instructional Design Leader):** Mr. Dashew is the Instructional Designer for Academic Technology and eLearning at Marist College. In this capacity, he helps faculty to integrate technology into their campus-based and distance pedagogy, trains faculty to use iLearn—the Marist College instance of the Sakai CLE—and other learning technologies, and pilots the use of new technology (including Open Source Portfolio tools) in the classroom. He holds an M.S.Ed. in Instructional Systems Technology from Indiana University and a B.S. in Organizational Communications from Ithaca College.

**Additional Organizational Capacity Pertinent to OAAI**
The Director of the Higher Education Opportunity Program, the Director of Advising and Academic Services, and the Director of the Academic Learning Center are collectively responsible for Marist’s freshman-to-sophomore retention rate of 90% (80% overall). In addition, students in the Marist HEOP program currently have a six-year Cohort Graduation rate of 75%, approximately 25 percentage points higher than the national average for this student population.

**Marist College will pilot academic analytics in three sections each of the following courses:**

1. *Principles of Macro/Micro Economics (ECON 103 or ECON 104)*
2. *Introduction to College Writing (ENG 001)*
3. *Information & Computer Literacy (CSIS 103)*

**OAAI Partner Organizations and Institutions**

The Technology Transfer Project is a 15-year initiative of The Executive Leadership Foundation that assists Historically Black Colleges and Universities (HBCUs) in preparing graduates to compete for leadership and management positions in a corporate environment that demands a high level of technological efficiency and sophistication. The Technology Transfer Project (TTP) offers HBCUs assistance with networking capacity and infrastructure building, information and communication technology (ICT) strategic planning, faculty and student ICT development, and help in integrating technology into the teaching and learning process.
Mr. Ramon Harris (OAAI Co-PI): As Director of the Executive Leadership Foundation’s Technology Transfer Project, Mr. Harris manages all aspects of a $10 million initiative by the Executive Leadership Foundation to assist HBCUs in building technology infrastructures and integrating information and telecommunication technology into the teaching and learning process. In addition, Mr. Harris was a consultant and advisor to an EDUCAUSE initiative, funded by the National Science Foundation, entitled Advanced Networking with Minority Serving Institutions (AN-MSI). Mr. Harris holds a BS degree in business from Pennsylvania State University and an MBA from the University of Pittsburgh.

Additional TTP Organizational Capacity Pertinent to OAAI
Marist College has been hosting, with support from rSmart, an instance of the Sakai CLE for the past four years for use by the TTP’s HBCU partner institutions. In addition, Marist has provided training to HBCU faculty on use of Sakai and provided technical assistance in migrating and creating course content for online delivery. This centrally hosted Sakai instance will be leveraged by the OAAI and be used by Howard University and Savannah State University in their academic analytic pilots.

rSmart develops, packages, certifies, deploys, hosts, and supports a suite of enterprise open-source applications for educational and corporate institutions. rSmart is a founding member of both the Sakai and Kuali communities and continues to play a substantial role in the development and governance of education’s most visible open-source projects. rSmart developed substantial portions of both the Sakai and Kuali codebases and its team continues to participate deeply in Sakai and Kuali activities, including active membership in functional, architectural, development, maintenance, and security workgroups, as well as service on both the Sakai and Kuali foundation boards of directors. rSmart also establishes and maintains active partnerships with other commercial firms serving the education market, including both IBM and SunGard Higher Education.

Mr. Duffy Gillman (OAAI Technical Lead): Duffy Gillman is a senior software engineer at rSmart, focused on its Sakai development practice. Mr. Gillman has over nine years of experience in educational technology software development and is a current member of the Sakai community’s maintenance team. His recent work includes integrating Google Docs and Sakai, and updating Sakai’s capabilities to meet the latest IMS LIS standards for integration with student information system platforms. Mr. Gillman holds an M.S. in Management Information Systems from the University of Arizona.

Additional rSmart Organizational Capacity Pertinent to OAAI
The rSmart Sakai CLE is a high-quality Sakai distribution built directly from the latest community release of Sakai and also offered free and open-source, under an OSI-approved open-source license5. The rSmart development team enhances the community release, adding functionality and third-party integrations, and including a range of community-developed tools that are not a part of the standard community release. All of the OAAI institutions will run their pilots with support from (under existing support agreements) and using the rSmart Sakai CLE.

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5 Educational Community License (ECL) information is at: http://www.opensource.org/licenses/ecl1.php
Howard University, a culturally diverse, comprehensive, research-intensive and historically Black private university, provides an educational experience of exceptional quality at the undergraduate, graduate, and professional levels to students of high academic standing and potential, with particular emphasis upon educational opportunities for Black students. With an abiding interest in both domestic and international affairs, the University is committed to continuing to produce leaders for America and the global community.

Dr. Ayodele O. Mobolurin (OAAI Local Coordination): Dr. Mobolurin served on the University’s Teaching Learning and Technology Committee between 2005 and 2008 and has developed alliances with major technology corporations (Oracle, Microsoft, Merant, Peoplesoft) for support of technology infrastructure. Dr. Mobolurin holds a Ph.D. in Industrial Engineering and Operations Research from the University of Massachusetts, a M. Eng. In Civil Engineering from Howard University, and a B.S.C.E. in Civil Engineering, magna cum laude, also from Howard University.

Howard University will pilot academic analytics in three sections each of the following courses:

1. **Computer Introduction** - computer literacy, problem solving and Office Automation course.
2. **Management Information Systems** - covering basic concepts of information systems and organizational uses of information technology.
3. **Quantitative Business Analysis** - a required course for business majors

For 121 years, Savannah State University has been an important part of higher education. As the oldest public HBCU in Georgia and the oldest institution of higher learning in the historic city of Savannah, SSU has served this community with distinction while meeting the educational needs of an increasingly diverse student population. Beneath the beauty and splendor is a vibrant residential campus bursting at the seams with the vim and vigor of quality collegiate life: relevant academic majors, engaging lectures, cutting-edge research, quality student-faculty engagement, and a nurturing environment.

Dr. Reginald Leseane (OAAI Local Coordination): Dr. Leseane currently serves as Associate Dean and Associate Professor of Computer Information Systems at Savannah State University and has research interests related to educational technology. He has published on the subject, including a recent article in the journal International Academy of Business Disciplines titled “Using Technology to Construct a Community of Learners: Engaging At-Risk Students at a HBCU.” Dr. Leseane holds an Ed.D. and M.B.A. from Georgia Southern University and a BBA in Information Systems from Savannah State University.
Savannah State University will pilot academic analytics in **three sections** each of the following courses:

1. *College Algebra (MATH 1111) or Pre-Calculus (MATH 1113)*
3. *Introduction to Business Statistics (BUSINESS STATISTICS 2182)*

College of the Redwoods is a public community college located on the north coast of California. Serving Del Norte and Humboldt counties, parts of western Trinity County, and coastal Mendocino County, CR has one the largest geographical service areas in California and covers some of the most rural areas of the state. With three campuses and five additional instructional sites, the Eureka main campus is the central hub for District operations. The District currently serves approximately 9,000 students with the majority being part-time, yielding an FTE number of 5,600 students.

**Dr. Maggie McVay Lynch (OAAI Local Coordinator):** Dr. Lynch is currently the Dean of Information Technology and Distance Education at College of the Redwoods. She provides strategic direction and support for administrators, faculty, and students engaged in using technology. Dr. Lynch has been a long-time participant in the Sakai Teaching and Learning community and is currently serving as Vice Chair of the Sakai Foundation Board of Directors. She holds an Ed.D. and M.S. in Instructional Technology and Distance Education from Nova Southeastern University.

College of the Redwoods will pilot academic analytics **three sections** each of the following courses:

1. *College Algebra (MATH-30-E6941)*
2. *Analytical Reading & Writing (ENGL-1A-E7085)*
3. *General Biology (BIOL-1-E6746)*

Cerritos College is a public comprehensive community college located in southeastern Los Angeles County. It is one of the five largest community colleges in Los Angeles County, with an average enrollment of nearly 20,000 credited students annually. The college offers degrees and certificates in 87 areas of study in nine divisions. In 1993, Cerritos College became one of the first colleges to offer online courses to students. To support ongoing innovation, Cerritos built a solid technology infrastructure including adopting the open-source Sakai CLE.

**Dr. M.L. Bettino (OAAI Local Coordinator):** Dr. Bettino is currently Dean of Academic Affairs at Cerritos College in Southern California. He is a frequent presenter at national as well as international conferences such as TechEd, League of Innovation, NISOD, SEPP, CAPED, eLearning, and JA-SIG. He has presented in Bolivia, Canada, Puerto Rico, and India. Most recently he spoke in Amsterdam at the 7th International Sakai Conference. He has been the lead on a number of grants over the years which include a Global Education FSS grant and a Distance Education FII grant.
Cerritos College will pilot academic analytics in three sections each of the following courses:
1. Business Administration (General Education) – Leadership for Women in Business (BA233)
2. Accounting 101 – Fundamentals of Accounting
3. Psychology 101 – General Introductory Psychology

American Public University System

American Public University System, winner of the Sloan Consortium’s 2009 Ralph E. Gomory Award for Quality Online Education and two-time recipient of Sloan’s Effective Practices Award, offers 79 online degree programs through American Public University and American Military University. APUS’s relevant curriculum, affordability, and flexibility help more than 77,000 working adults worldwide pursue degrees in subjects ranging from homeland security to management and liberal arts.

Dr. Frank McCluskey (OAAI Local Coordinator): Dr. McCluskey, Provost of American Public University System (APUS), leads the Academic team for its two institutions of higher learning: American Military University and American Public University. Prior to joining APUS, Dr. McCluskey served as the Dean of Online Learning at Mercy College in Dobbs Ferry, New York, where he helped create and develop the distance learning program beginning in 1990 with a grant from IBM. He holds an M.A. in Philosophy and a Ph.D. in German Philosophy.

American Public University System will pilot academic analytics three sections each of the following courses:
1. Pre-Algebra (Math 100)
2. Introduction to Psychology (PSYC 101)
3. The Processes & Principles of Composition (ENGL 100)

Project Budget

The OAAI will leverage internally supported technology platforms (all institutions have access to a production Sakai instance), open-source systems), and open educational resources. As such, the funds outlined in our budget request spreadsheet are primarily focused on supporting the staff whose knowledge and expertise is essential to our success.

The OAAI’s primary objectives, scaling adoption of academic analytics (Outcome #5) and improving course completion rates, semester-to-semester persistence, and content mastery (Outcome #4) both rely on the development and release of a “Student Effort Data” (SED) API for the Sakai Collaboration and Learning Environment (Outcome #1). To meet this cornerstone objective within the first four months of the project (Period 1) will require technical experts with knowledge and experience developing code for Sakai. This expertise will be provided by rSmart, one of the leading Sakai Commercial Affiliates, which has long-standing relationships with Marist and the other institutional and organizational partners. Based on a technical scoping review of the proposed API development effort, rSmart has provided “level of effort” and related cost data which accounts for 15% of its total subgrantee budget request (see rSmart worksheet in Budget Spreadsheet for detailed account of effort required). The remaining 54% of rSmart budget funds will be used
to deploy, host, and connect the Pentaho open-source business intelligence suite to each partner’s Sakai instance. This work will facilitate our investigations into the “portability” of academic success predictive models (Outcome #2) and exploratory studies on use of online environments to provide academic support to students (Outcome #3).

In support of our goal to scale adoption of academic analytics, the OAAI will engage in a preliminary investigation into the “portability” of academic success predictive models from one academic context to another (e.g., face-to-face classes to fully online) (Outcome #2). This work will be led by Dr. Eitel Lauria, Associate Professor of Computer Science at Marist College, and a group of three information systems graduate students. Dr. Lauria has extensive experience in the field of business intelligence, including data mining, statistical machine learning, and Bayesian networks, which will be critical knowledge needed to complete our “portability” investigation. We are requesting $6,000, plus benefits, to cover the time Dr. Lauria will dedicate to the OAAI initiative which will be more significant in Period 1 and 4 when the majority of his work will need to take place. Marist’s Office of Academic Technology and eLearning, which employs 10 to 15 graduate computer science students each year, will provide budget support for the three graduate students as an “in-kind” contribution.

As a means to meet our other primary objective, improving student academic success (Outcome #4), the OAAI will be conducting an exploratory study on student intervention strategies (Outcome #3). The design and implementation of this study will require expertise in student retention, advising, and academic interventions, including working with minority populations, as well as educational research methodology and instructional design. This need will be met by assembling a diverse team of Marist academic support staff and faculty members which will include: Dr. James Regan (Associate Professor of Psychology), Ms. Iris Ruiz-Grech (Director of the Center for Multicultural Affairs and Higher Education Opportunity Program), Ms. Jane Fiore (Director of the Academic Learning Center), Ms. Kristine Cullen (Director of Advising and Academic Services), and Mr. Brian Dashew (Instructional Designer). We are requesting $6,000 (not including benefits) to cover the time of this team. In addition, Marist College will be supporting the involvement of Mr. Dashew, who is employed in the Office of Academic Technology and eLearning, as an “in-kind” contribution as engaging in this type of special project is part of his regular responsibilities. In addition, Dr. Regan will be involving two graduate psychology students to assist him with data collection, preparation, and analysis as “in-kind” contributions.

In order to complete our investigation into the portability of predictive models (Outcome #2) and explore the impact online engagement has on academic success (Outcome #3), we will need to pilot academic analytics within diverse academic contexts. This work will require a certain level of local coordination at each partner institution (e.g., ensuring pilots begin on time), facilitating interactions in each institution’s Online Academic Support Environment, and faculty effort to engage in the use of academic analytics. To meet these needs, we are requesting a total of $6,000 for each partner institution to fund project coordination and facilitation work related to the Online Academic Support Environment. This includes $1,000 per site to support an advanced undergraduate student who will help facilitate peer-to-peer interactions. In addition, we are requesting $6,000 for faculty stipends ($1,000 per pilot class excluding “control” classes) to cover the additional time they may need.

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6 Monthly FTE salaries in budget spreadsheet are pro-rated based on contract length and account for estimated salary increases which would occur on July 1st.
to spend per class to implement the pilot activities. Finally, we are providing each institution (excluding Marist), with [REDACTED] to cover printing costs [REDACTED] to cover cost of hands-outs.

Although we expect to rely on communication technology heavily for overall project coordination, we believe meeting in person will be important as the project pilots first begin. To reduce costs associated with travel, we will hold a one-day Project Coordination Meeting for project leads from each organization at the 2011 EDUCAUSE conference in Philadelphia, Pennsylvania. In addition, we expect to invite several lead Sakai institutions who are not involved in OAAI but who have expressed interest in our proposed work as a means to provide an early project update and encourage their participation at the conclusion of the funded project. We are requesting a total of [REDACTED] to support this meeting. Given that many who would be involved in the project work in the higher education IT field, most of the meeting attendees will fund their own travel and conference registrations as in-kind contributions. This said, we are requesting [REDACTED] in budget support for Dr. Lauria who would not normally attend. In addition, due to budget reductions and travel restrictions that are affecting state-funded institutions in California, we expect to need to fund travel and conference registrations for a representative from College of the Redwoods and Cerritos College. This budget request totals [REDACTED] for each institution.

Overall project oversight and coordination will be provided by Mr. Josh Baron, Senior Academic Technology Officer for Marist College and Chair of the Sakai Foundation Board of Directors, and Mr. Ramon Harris, Director of the Executive Leadership Foundation’s Technology Transfer Project (TTP), both of whom are co-principal investigators for OAAI. Mr. Baron will lead coordination with American Public University System, College of the Redwoods, Cerritos College, and Marist College. Mr. Harris will lead coordination with Howard University and Savannah State University. Given that these two institutions will have the least experience with the Sakai CLE (the other institutions will have had Sakai in full production for at least the past year), Mr. Harris will conduct one site visit to each of these two institutions during Period 1. This will allow us to ensure that the institutions are receiving the assistance they need to prepare to use Sakai and that pilot activities will begin smoothly in Period 2. In addition to this coordination and oversight role, Mr. Harris will work to disseminate the work of the OAAI, particularly during Period 3 and 4, to Historically Black Colleges and Universities (HBCUs) and Predominately Black Institutions (PBI) through his existing networks as well as presentations at events such as the National Association for Equal Opportunity in Higher Education’s National Dialogue events.

Although both Mr. Baron’s and Mr. Harris’s time related to the OAAI project will be provided as in-kind contributions as much of the project work relates directly to their regular responsibilities, we are requesting $4,980 for the TTP to support Mr. Harris’s site visits, dissemination work, and attendance at the Project Coordination Meeting. This includes one site visit to Howard University [REDACTED] and one to Savannah State University [REDACTED], travel and registration for the EDUCAUSE meeting [REDACTED] and [REDACTED] to cover travel and registration at one

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7 Flight and hotel costs were estimated based on pricing from Orbitz.com
8 Mr. Harris it based out of Washington, DC
conference/event related to dissemination (event to be determined later). TTP will also receive in budget support for printing and publications related to Mr. Harris’s dissemination work.

**Risks**

There are several factors or obstacles that could impact short- and long-term adoption rates of academic analytics, particularly among Sakai institutions. We will briefly review these and discuss the likelihood of them occurring and our approach to mitigate them:

1. **Limited Sakai Community Involvement** – In open-source development efforts it is vital to have a diverse group of institutions and individuals working to maintain and enhance the product. For OAAI to have a long-term impact on adoption, we will need to sustain our work over time which will require involvement from Sakai community members outside of the OAAI partners. As detailed in the Sustainability section of this document, we have already received strong interest from a broad range of additional Sakai institutions, including several who are leading the Sakai OAE effort to create a next generation of the software. Thus, we have confidence that community support will not be a problem. If we are wrong and it is, we could engage a range of Sakai Commercial Affiliates, in addition to rSmart, to support the initiative given the likelihood of broad institutional interest (Johnson, et al., 2011).

2. **Limited Ability to Share OAAI Predictive Model** – As previously discussed, releasing the OAAI Predictive Model in the Predictive Model Markup Language (PMML) would allow it to be used in other business intelligence analytic tools, such as SPSS. Although Pentaho supports import of PMML, they do not yet (but plan to) support export of PMML that could limit our ability to share the model with institutions now using Pentaho. We may be able to address this by leveraging the American Public University System’s expertise in SPSS and analytics and rebuilding the model in SPSS that can export PMML. Alternatively, we could engage with the Pentaho community to assist in developing PMML export.

3. **Predictive Models for Academic Success are Not Easily “Portable”** – We may find that a predictive model developed for use in one academic context becomes much less accurate when applied in a new context. This could affect the outcomes of our pilot activities as well as the use of the OAAI Predictive Model at other institutions. Based on Dr. Lauria’s initial review of Dr. Campbell’s research, we believe that if our initial findings early in Period 1 indicate portability challenges, we can mitigate these through the use of more sophisticated analytical techniques to help ensure effectiveness during our pilots. Following our pilots, we may also be able to use the diverse dataset we collect for the different academic institutions involved to further improve the OAAI Predictive Model and make it more portable. Finally, there are techniques possible within the Pentaho suite that allow for near real-time improving of predictive models based on new datasets. This, in theory, could allow an institution to deploy the OAAI Predictive Model and have it “learn” from the new data that the institution collected. (Pentaho 2009)

Finally, we are aware that we will need to meet a number of critical milestones within Period 1 to be prepared for our pilots in fall 2011. We have dedicate significant time in preparing this proposal to assessing the feasibility of this work plan and feel confident that it is achievable. It is also important to note that, if funded, we have listed an official start date of May 1, 2011, but would be able to begin sooner without incurring additional project costs if allowed. This said, if we do encounter unexpected delays during Period 1 we would be prepared to double the number of courses being piloted in spring 2012 and thus only run one semester of pilots.
Lead Organizations Financial and Board Information
Marist College

Operating Budget – Fiscal Year Ending June 30, 2011

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<th>Revenues</th>
<th>Budget FY 2011</th>
<th>Expenses</th>
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Most Recent Financial Statements (with auditor’s report)
http://www.marist.edu/about/pdfs/financialstatements.pdf

Current List of Marist Board of Trustees
http://www.marist.edu/about/board.html
References

Arnold, Kimberly E. “Signals: Applying Academic Analytics”, *EDUCAUSE Quarterly*, Volume 33, Number 1, 2010


Campbell, J. P. (2007). Utilizing Student Data within the Course Management System to Determine Undergraduate Student Academic Success: An Exploratory Study (Doctoral dissertation, Purdue University, 2007). (UMI No. 3287222)


Memorandums of Understanding

Note to Reviewers: We are working on getting formal MOUs signed by each partner organization and will submit these prior to March 14, 2011. Below are general Letters of Support and the MOUs we have collected to date.

Technology Transfer Project
Open Academic Analytics Initiative
Letter of Support

The Technology Transfer Project (TTP) is excited to partner with Marist College on the Open Academic Analytics Initiative (OAAI). This Initiative has tremendous potential to have a positive impact on underserved educational communities and the TTP is in a prime position to help realize that potential.

The TTP collaborates with thirteen Historically Black Colleges and Universities to effectively use information and communication technology to drive enhanced learning outcomes. A critical aspect of achieving enhanced outcomes is early intervention with students who experience difficulty in understanding concepts, processes, and information being presented in the classroom. This is especially important in the areas of science, technology, engineering and mathematics (STEM). African Americans and other underserved populations have demonstrated significantly greater difficulty in achieving successful outcomes in STEM courses. The development of tools and processes that provide early identification of students who may be at risk and the creation of effective interventions that can strengthen skills in the areas identified will significantly improve the probability of achieving enhanced educational outcomes for underserved students in STEM and other subject matter courses.

The proposed development and investigation of the OAAI will leverage existing research and available tools as well as expand our body of knowledge of how academic analytics can positively impact learning outcomes in diverse populations. The knowledge and understanding gained by the OAAI will be disseminated extensively throughout the HBCU community for appropriate use and integration into the teaching and learning process.
Josh,

I am writing to provide my full support for the Next Generation Learning Challenge "Open Academic Analytics Initiative" grant proposal. I, and the rest of us at rSmart believe that, if funded, this grant will facilitate significant increases in the use of academic analytics among institutions using the Sakai Collaborative Learning Environment as well as increase our understanding of how to best leverage the tremendous wealth of data being generated by learning technology to improve student course completion, retention, and success. We have also reviewed the grant guidelines and are comfortable with the requirements of the funding program.

We value our partnership with Marist College and are confident that through our collaboration, and work with other grant partners, we will be able to successfully meet the objectives of the grant. rSmart is prepared to provide the technical knowledge and assistance, in collaboration with Marist, needed to develop the necessary Sakai API and agree in principle to the objectives that have been established. We also understand that we will need to sign a more specific Memorandum of Understanding before receiving funding.

Sincerely,

Chris Coppola, CEO

coppola.rsmart.com | 602-492-8931
February 15, 2011

Mr. Joshua Baron
Senior Academic Technology Officer
Marist College
Poughkeepsie, NY 12601

RE: NGLC Open Academic Analytics Initiative

Dear Mr. Baron:

On behalf of the College of Business Administration (COBA) at Savannah State University (SSU), I am pleased to write this letter of support for the NGLC Open Academic Analytics Initiative proposal. As an HBCU with enrollment of over 4000 students (primarily undergraduate and 94% African-American), SSU is deeply committed to improving not only the intellectual capacity of our students, but also their service skills and competencies. In particular, we are committed to implementing best practices and innovative programs which will motivate and inspire young men and women to persist with their college education and either pursue challenging professional occupations or advance to graduate programs. Using academic analytics will greatly increase our ability to design intervention systems that will enhance the academic success of our students. In addition, a cornerstone of our institutional mission is to add-value to our region and local communities by serving in leadership and service roles in community research, service, and academic initiatives.

Therefore, we are excited to participate in this effort. This initiative will be an ideal vehicle to strengthen our academic programs as well as increase retention and recruitment. Specifically, we commit to support the initiative by making COBA faculty and students available for activities needed to ensure the program’s success. We also commit to supporting those faculty/student members involved in the program.

I am committed to supporting this program in every way possible. Thank you for including SSU in this initiative.

Sincerely,

Mostafa H. Sarhan, Ph.D., CMA
Dean