Report of Consultants John Brockman and Dick Whipple Resulting from their Preparation for Presentations at Coastal Bend College in Regards to the College's STEM Grant—the OASIS Project.

Review of Best Practices

Prior to our presentations in regards to with the Coastal Bend College STEM grant on February 24, 2012, John Brockman and Dick Whipple, consultants, met with Alma Adamez, STEM Director, and Mark Secord, Assistant STEM Director, via email and phone conversations. John Brockman met in person with the directors on several occasions. Both consultants were able to review the grand proposal in preparations for the presentations.

Based upon the information received via this extended communication process, it became apparent that the college approached the STEM proposal process then and now the implementation process in a systematic, data driven way. Colleges with new campuses or new sciences buildings that were designed based on current best practices and with considerable faculty and student input were contacted and campus visits were arranged. Likewise, the college investigated innovative curriculum redesigns that focused on active and collaborative learning models. Consequently, the college was able to develop a successful competitive STEM Grant proposal.

The college continues to follow a best practices procedure as it enters the implementation process. By doing this, the colleges is following a procedure to ensure the best possible results as the science labs are redesigned, the curriculum is rewritten to include active and collaborative learning styles, and the learning commons and other science student support systems are put in place.

Surveying Stakeholders for Input

During the site visit the consultants met with members of the science faculty from all college locations and with student services personnel. During this time we listened carefully to what the various stakeholders had to say and commented accordingly.

The impression received was that there was a general consensus of opinion that current practices and procedures in the delivery of science instruction were not working. There was agreement among the various parties that changes were needed to better serve today's students We detected that there was support for the proposed initiatives outlined in the STEM grant proposal and a eagerness to move forward on the various aspects of the OASIS proposal.

Review and Recommendations Related to Current CBC Practices

Prior to the STEM Grant, the Science Division had taken a few first steps toward the development of a Master Syllabus for certain courses. Often these first steps are the most difficult of all and it is good that these have been taken. Consequently, the college

appears to have been heading in the right direction even prior to the STEM proposal. The redesign of the science labs and the science curriculum and other planned activities, therefore, cannot be seen as a STEM mandate; rather the STEM grant becomes an enabler of Science Division goals that preceded the awarding of the grant.

Aside from the common course number, course title, and course description as found in the (THECB) Academic Course Guide Manual (ACGM), there was little in common in the various ways a particular same course might be taught by the various science instructors at various locations. Instructors have been pretty much left to their own devices as they taught their assigned courses and assessed the results of their teaching. There was very little, if any uniformity and comparative data, therefore, did not have much validity.

This practice began to change with the introduction of a Master Syllabus in BIOL 1408. Gradually, these old practices are expected to change with the implementation of the STEM grant.

The college appears to be on track with regard to the science lab redesign, rebuilding activity. We have no recommendations in this area.

With regard to the rewriting of curricula the recommendation of the consultants is that the following recommendations should be followed:

1. Perform a thorough review of the ACGM for all STEM courses. Pay particularly attention to the addition of course outcomes. Utilize a master syllabus system to ensure consistency and quality in the application of course content as defined by ACGM.

Rationale: In the past, the ACGM has been a rather static document. This is no longer the case. The THECB has taken a more active role in keeping the ACGM up-to-date with regular reviews by community college and university content experts. Modifications and additions are now common in the annually published ACGM. Currently, all ACGM courses are undergoing review and the addition of course outcomes. Many STEM courses have been reviewed and the results are in the most current version of the ACGM (Click Here). The THECB's expectation is that all Texas community colleges will include and assess these course outcomes whenever and wherever taught. By adopting use of a master syllabus system including ACGM course outcomes, CBC will be taking advantage of an excellent opportunity to bring consistency and quality to its STEM initiative.

2. Develop, deliver, and make use of assessments for course outcomes in all STEM course sections.

Rationale: College courses are taught in a variety of ways using different modes of instructions. This is an important advantage for students who learn in different ways and whose personal circumstances vary widely. The key question is not the way a course outcome is taught. Rather, it is whether it was learned or, more properly said, mastered by the student. This is the role assessment plays in the academic setting. While variety in teaching approaches and modes of instruction should be encouraged,

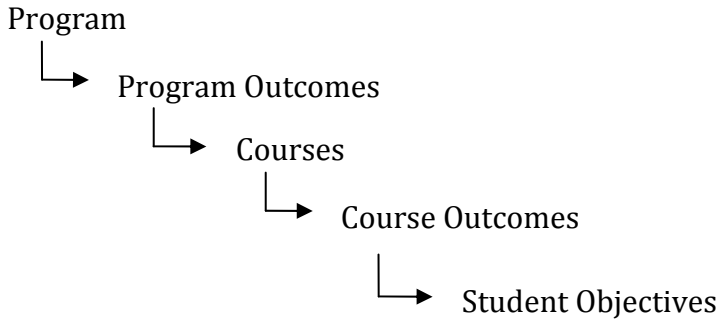
assessment must be done in a consistent way across all sections of a given course. This requires good cooperation by all instructors within the discipline and development of a written and widely disseminated assessment plan. The assessment plan should address the method of assessment, who will be assessed, and when the assessment will take place. A further requirement is that the assessment results be collected and aggregated in such a way that it can be useful in planning for improvement. Consideration should be given to technologies such as Blackboard and ScanTron Prosper that aid in collection, reporting, and dissemination of assessments.

3. Develop student objectives at the course level further refining the learning process.

Rational: The use of course outcomes extends well beyond students to those interested in understanding the basic intent of a course and how it may serve some wider purpose such as preparation for a certificate, degree, or career. Student objectives, on the other hand, speak directly to students, express clearly and concisely what is to be learn, suggest the sequence in which it should be learned, and create the a pathway that leads to mastery of the course outcomes. Student objectives avoid generalities and educational jargon. Each student objective is written with a present tense, action verb and a direct object so that both the student and instructor can easily agree on whether it has been achieved. The list of student objectives may vary in substance, sequence, and length from one instructor to the next. This should generally be allowed and even encouraged. Not only does it adhere to the time honored principle of academic freedom, but also allows experimentation in teaching approaches that adjust for the wide variation in student abilities and behaviors. For this reason, student objectives should not appear in the master syllabus, but rather be documented in the class syllabus developed individually by the instructor and given to each student the first week of class.

4. Use curriculum mapping to document the choice of courses and their sequence prepares students at the STEM program level.

Rationale: The lower division (first two years) of the typical STEM curriculum plan should prepare the student for continuing study at the upper division to complete a bachelor's degree. The goal for lower division instruction is as seamless as possible matriculation of the student from lower to upper division study. A good curriculum design approach is to develop a set of two-year program level outcomes that meet the entry level knowledge and skills requirement of the upper division major. The chart below illustrated the resulting learning hierarchy.



Once program outcomes are determined, courses can be chosen and sequenced to prepare students for mastery of the outcomes. Curriculum mapping is a standard technique that shows the relationship between courses and the program outcomes. In its most sophisticated form, a curriculum map shows in a matrix format, which courses introduce, reinforce, and apply each program outcome. Because community college associate degree course plans must be somewhat general to meet the widely different transfer plans of its students, settling on a set STEM program outcomes at the community college level is not an exacting science. Nevertheless, it is possible to agree on a curriculum plan that works for most students and then document it using a curriculum map.[1] With the curriculum map in hand, instructors can create class syllabi that carry the required learning to the course outcome and eventually the student objective level.

5. Use curriculum map information to foster learning communities.

One advantage of a carefully crafted curriculum is that the curriculum map can be used to identify points in the course of study where cross-course planning can be used. Themes and activities can be introduced among courses with common learning outcomes that involve students in learning communities. This works particularly well when support courses like math are paired with discipline specific. Term-to-term course taking patterns among busy and working students can wreak havoc with creating such learning community opportunities. Nevertheless, learning connections made between courses has been shown to increase student success.

6. Perform regular program reviews that consider transfer success and upper division graduation of STEM students.

Rationale: The validity of programs and their outcomes must be calibrated on a regular basis to ensure that students are being adequately prepared for university study. One or more courses may be doing a fantastic job in preparing students while at the program level the finishing student might ill prepared for the rigors of university. A simple example of such a situation might be a curriculum consisting of the wrong selection or sequencing of otherwise excellent courses. Instructors are doing a good job, but the plan itself is ill conceived. In such a case, mere course level assessment and review would not identify the problem. A program level review would! The "bottom line" is determining how STEM completers perform at university. In addition to this, the program review process should be connected to a good planning model that corrects identified problems by introducing appropriate improvement strategies.

7. Use the student data base (Estudias) not only to study student cohort data, but use it also to track and study students on an individual basis.

Rationale: The STEM grant requires a variety of data analyses related to student cohort tracking. Estudias, the student database product chosen by CBC, does an excellent job in

this regard. However, it also provides for tracking and studying students individually. Much can be learned using this feature and, if used properly, it can enhance the "human connection" that studies show correlates strongly with student success. Imagine for example, greeting a student one morning with "Happy birthday" or "Congratulations on making the Dean's List". Using Estudias' Student Navigator gives instructors a chance to know their students better.

8. Include in the course manual a Model Class Syllabus specific to the course. Use a syllabus design that includes documentation of program outcomes, course outcomes, and student objectives covered in the course.

Rationale: Students need to know how the course they are about to take fits into their major preparation. The program and course outcomes should be the same across all class syllabi. Student objective may vary reflecting the knowledge and experience of individual instructors. Nevertheless, a sample syllabus with student objectives should be included in the manual to provide a "starting point" for beginning instructors. In addition, a good approach would be to connect student objectives to specific teaching strategies covered in the manual.

All of this should be included in the Common or Standard or Model Course Syllabi, the course manuals and lab manuals. Instructors should be able to turn from page to page as they go through each course on a set weekly schedule. [I will believe it when I see it!]

The key to success is the ease of use, especially the ease of assessing and measuring each student learning outcome in a standardized way. Instructors should have input into the courses they teach and how they present various objectives, but the assessments of the student learning outcomes should be uniform.

The tracking of student learning outcome assessments, the changes made as a result of these assessments, and general science program reviews should be included in an easy to use and understand software package.

Making Site Visit(s)

The planned site visit was completed on February 24, 2011, and the visit followed the prepared agenda.

Review and Recommendations to CBC and related External Data

I think the two main keys to success are these:

The imbedding of assessments in such a way so that they are so easy to use as a grading tool for the instructors in their classes. Using anything else would be reinventing the wheel and generally a waste of their time. Then, using the results of assessments to make changes and improvements should be made routine. Plus the results should linked

to the course and program review process as well as to STEM reporting. Data driven decision-making and the development of a cultural of evidence should be a direct result of the imbedding of assessments.

STEM grant measures involve science program outcomes and individual science course student learning outcomes. Therefore college data will be the primary source of data for the STEM grant.

Professional Development Presentations

These were part of the site visit on February 24, 2012. Copies of the PowerPoint presentations have been emailed to the college.