Activities, Findings, and Dissemination
CI-STEP 2nd Annual Report
for 8/1/11 to 7/31/12

Stated Goals of CI-STEP

The *Central Indiana STEM Talent Expansion Program* at Indiana University-Purdue University Indianapolis (IUPUI) is creating a central Indiana pipeline to increase the number of students from the greater Indianapolis region (central Indiana) obtaining STEM degrees. The goals of this project are to increase the numbers of students of all demographic groups who:

- Pursue STEM academic and career pathways;
- Participate in STEM research, industry internships, and honors activities;
- Graduate with an undergraduate degree in STEM fields; and
- Transition into industry, graduate and professional programs.

The program has set a target of increasing the number of STEM graduates at IUPUI by 10% per year (an increase of an additional 782 STEM graduates by 2015).

Internal and External Advisory Board Meetings

The investigators of CI-STEP (coordinated by Charlie Feldhaus) held regularly scheduled advisory board meetings as planned in the proposal and required by NSF. During the fall 2010 semester, we recruited a diverse group of stakeholder: including business, industry, entrepreneurs, and educators for the advisory board positions. The dates of these meetings are:

Internal Advisory Board Meeting, September 30, 2010
External Advisory Board Meeting, December 1, 2010
Internal Advisory Board Meeting, July 22, 2011
External Advisory Board Meeting, December 5, 2011
Internal Advisory Board Meeting, July 25, 2012

ACTIVITIES AND FINDINGS

During year 2 of the project, we initiated a series of new programs and funded a series of STEP mini-grants to expand, extend, or develop new programs at IUPUI based on successful existing high-impact practices. These initiatives and activities fall under one of four broad categories:

(1) Articulation with 2-year Colleges
(2) Student Success
(3) Student Centered Pedagogies
(4) Career Services

The primary goal of these activities it to reach the set a target of increasing the number of STEM graduates at IUPUI by 10% per year (an increase of an additional 782 STEM graduates by 2015).

(1) ARTICULATION WITH 2-YEAR COLLEGES

A. MATH Articulation Agreement between IUPUI and IVYTech CC

During the first year of the grant (2010), the departments of mathematical sciences at IUPUI (Jeffrey Watt and James Shen) and IVYTech CC (Victor Roeske and Janet Dalzell) reviewed and aligned the content and learning outcome standards in five introductory math courses. IVYTech is the newly established community college of Indiana. The goal of this alignment is to improve the seamless transition of STEM students and future elementary school teachers (who will teach math to future generations) from community college to IUPUI. This work resulted in a signed Course Transfer Agreement between the two institutions. The courses are:

Calculus for Technology I	IUPUI MATH 22100	IVYTech MATH 221
Calculus for Technology II	IUPUI MATH 22200	IVYTech MATH 222
Math for Elementary Education I	IUPUI MATH 13000	IVYTech MATH 127
Math for Elementary Education II	IUPUI MATH 13100	IVYTech MATH 128
Math for Elementary Education III	IUPUI MATH 13200	IVYTech MATH 129

The number of students by year who have transferred from IVYTech to IUPUI with these courses in the Course Transfer Agreement are:

2008 we had 6 students transfer these courses – Baseline year of grant
2009 we had 11 students transfer these courses
2010 we had 10 students transfer these courses – Year 1 of grant, articulation implemented
2011 we had 85 students transfer these courses – Year 2 of grant

Major findings include: Data on the success of these students at IUPUI is being collected and analyzed, but not ready to report at this time. But as course articulations are formed, we see a sharp rise in students transferring the courses to IUPUI to continue their education.

B. Signed / Updated Articulation Agreements in Engineering + Technology with IVYTech

During the first year of the grant (2010–11), the engineering departments at IUPUI (Jie Chin, Yaobin Chin, and Nancy Lamm) and IVYTech CC (Mike deBourbon) reviewed and aligned program content and standards for learning outcomes; and then, signed program articulation agreements between IVYTech CC and IUPUI for pre-engineering AS degrees at CC to Computer, Energy, Electrical, and Mechanical Engineering four year programs. A parallel group of faculty (Hundley, Cooney, Fernandez, Bannatyne, and deBourbon) performed a review of technology courses and then revised existing program articulations among the technology programs.

The number of students by year who have transferred from IVYTech to IUPUI (in all majors) has increased every year. Although we have not yet extracted from the total the number that were STEM related majors, these articulation agreements do effect a significant number of the total.

Year	Number of Xfer Students	Number of Xfer Credits	Average Xfer Credits	One Year Retention at IUPUI
2008	2,683	29,517	21.5	61%
2009	2,803	31,519	23.5	68%
2010	3,267	36,839	26.0	70%
2011	3,635	41,300	28.6	na

During the fall semester 2011, the number of STEM students at IUPUI who transferred from IVYTech CC was 4,468. Twice as many transfer students went to engineering and technology majors than science or math majors.

IUPUI School	Number of Xfer Students	Total Number of Students at IUPUI	% of School's Enrollment
Science	235	2,032	11.6%
Engineering/Tech	498	2,436	20.4%

Major findings include: (1) we are starting to see more CC students transfer to IUPUI in STEM disciplines, and the articulation agreements in engineering and technology do affect the increase in the number of credits that the students transfer. The quality of the transfer courses from IVYTech CC continue to improve, which better prepares the students to succeed at IUPUI, as evidenced in the one-year retention rates.

(2) IUPUI students who previously attended IVYTech CC-Indianapolis is 18% of IUPUI's overall undergraduate enrollment. Most notably these students are 24% of IUPUI's overall undergraduate ethnic diversity in fall of 2011. For the IUPUI STEM majors who previously attended IVYTech CC, they make up 16% of the overall enrollment.

(3) IVYTech CC is without question IUPUI's largest transfer feeder institution. Transfer students from IVYTech as a group transferred more credits than any other external institutions. Moreover, as a result of articulation agreements between the two institutions, approximately 7.7 out of 10 credit hours transferred from the Indianapolis campus of IVYTech are articulated towards distributed credits, that is, credits that have been equated to a specific IUPUI course. In comparison, only about 60% of transferred credit hours are articulated toward specific course credits for students from IUPUI's other major feeder institutions.

C. MATH AS/AA Degree Program Development at IVYTech CC

During the second year of the grant (2011–12), the department of mathematical sciences at IVYTech CC (Janet Dalzell and Victor Roeske) have been developing and implementing a set of foundational level math courses that are aligned and parallel in rigor to IUPUI courses. This set of courses will form the new associates degree (math cluster) at the CC and will be equivalent to the MATH minor at IUPUI. IVYTech is the newly established community college of Indiana. The goal of this alignment is to improve the seamless transition of STEM students from the community college to IUPUI, and will allow math majors to move directly into the junior year of math BS degree programs (includes: pure, applied, math educ, and actuarial sciences). This work

will result in a signed Course Transfer Program Agreement between the two institutions by the end of 2012. The courses that will make up the cluster are:

Course Title	IVYTech AS Cluster	IUPUI MATH Minor
Calculus I	IVYTech MATH 211	IUPUI MATH 16500
Calculus II	IVYTech MATH 212	IUPUI MATH 16600
Multidimensional Math	IVYTech MATH 213	IUPUI MATH 17100
Multivariate Calculus	IVYTech MATH 261	IUPUI MATH 26100
Differential Equations	IVYTech MATH 264	IUPUI MATH 26600
Discrete Math	IVYTech MATH 235	IUPUI MATH 27600

The first three courses have now been implemented and students have been registering for the courses. It is expected that all courses in this cluster will be implemented by 2013, and the first associate degrees with this cluster should be awarded this same year with 3 expected students.

MATH 211 has had consistent enrollments for the past few years of 50 students.
MATH 212 has had growing enrollments for the past few semesters of 5 to 15 students.
MATH 213 was first offered in spring 2012 with 12 students.
MATH 261+264 will be offered in the next two semesters (2012–13) with 2 to 6 students.

The alignment of the IVYTech CC Math Cluster with the IUPUI Math Minor will allow students a seamless transition between the two institutions. It is expected that some students will split these courses between the two institutions, and this activity will be tracked by IUPUI.

Major findings include: The first cohort was expected to have 2 or 3 students, and there are actually 6. The second cohort has 12 students - double that of the first cohort. We expect to have the first cohort receive their AS/AA degrees with the math cluster in 2013, and then transfer to IUPUI as a math major (or other STEM related major).

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(2) STUDENT SUCCESS

A. STEM Summer Bridge and Resident Programs

During the first year (2010–11), the School of Engineering and Technology and the School of Science (Terri Talbert-Hatch and Melissa Pohlman) developed and implemented a summer residential STEM bridge program to be held during the two-week period before fall semester begins. The residential bridge program was designed for first-year students that would be housed in Purdue House 1 and 2, and the Women in Science House.

During the second year (summer 2011), 26 first-year students participated in the first STEM bridge program. The selected students had two things in common: 1) they would be living on campus during their first year, and 2) they were majoring in either science, engineering, or technology programs. The bridge program model used by other programs on campus was utilized with two minor changes: 1) we had two sessions with focused on housing and roommate issues, and 2) we extended the course into the semester for 12 weekly, one-hour sessions (typically the

classes would only meet for up to five weeks into the fall semester). There were several positives to the residential, multi-disciplinary STEM bridge program. Students living in the same buildings had an opportunity to get to know one another before the semester began and there was more interaction as the semester continued. Students in different schools had the opportunity to interact, which is typically difficult to do during the first year.

There were some issues that we need to work to overcome. Because new students see a variety of advisors when attending orientation (engineering/technology new student advising center, university college advising center, and various departmental advisors in Science), it was difficult to get the word out to students about this bridge option. Also, one of the mentors for the class was a senior student who was also living in one of the communities and there seemed to be some rapport conflicts between this mentor and students after the class ended. We also did little outreach to the participants of the class once the semester ended, but plan to do more outreach to these students as they enter their second year on campus. The students also did not appreciate the extended class sessions (12) into the fall semester, since they knew that the other bridge sections did not meet that long. A spinoff of the residential STEM bridge program was an overnight orientation for the next cohort of students that would be living in Purdue House in 2012.

One of the class participants from last year's residential STEM bridge program (2011) will be a student mentor for the 2012 STEM bridge class. A problem that faces bridge programs is finding faculty willing to teach the experience during the summer. Thus, the other STEM bridge programs (non-residential) will experiment with increasing the number of STEM majors served by increasing the students to faculty ratio, but lowering the students to student-mentor ratio in the third year (2012–13).

During the third year (summer 2012), it is expected that the number of student participating in STEM bridge programs will increase by 20% per year.

	Number of Students		
STEM Bridge Program	2010	2011	2112 (enrolled to date)
Residential STEM Bridge	0	26	23
Biology Bridge	19	24	29
Science Bridge	24	13	30
Engineering/Tech Bridge	22	23	23
Total	65	86	105

Major findings include: (1) there was a 32% growth in the number of STEM students taking a STEM bridge course after the first year of the grant, followed by a 22% in the second year.

(2) Although to early to report first year retention and graduation rates, it is expected that students taking bridge will have significantly higher rates than those who did not.

(3) Regarding study findings, the table below shows an extract of preliminary survey results based on the 26 students who participated in the residential STEM Bridge program in 2011. Overall, the favorable ratings (5 = strongly agree) reported in the table are quite promising and encouraging to faculty and students.

2011 IUPUI Bridge Program: Summary of the "Residential STEM Bridge" Results

Survey Item	Total		
	N	Mean	Std. Dev.
Participating in the STEM Living Learning Summer Bridge increased the degree to which *I understand the importance of pursuing a major in the STEM area.*	26	4.54	0.95
Participating in the STEM Living Learning Summer Bridge increased the degree to which *I will communicate with my roommates*.	26	4.23	0.95
Particpating in the STEM Living Learning Summer Bridge increased the degree to which *I understand the benefit of living on campus*.	26	4.62	0.85
Participating in the STEM Living Learning Summer Bridge *included beneficial interaction with other housing residents.*	26	4.62	0.90

(4) Recent study findings at IUPUI indicate that overall, bridge participants have higher levels of academic performance compared to non-participants, students participating in Summer Bridge also have lower DFW rates compared to non-participants, and minority students (especially African Americans) who participate in Summer Bridge obtained higher GPAs, lower DFW rates and higher Fall-to-Fall retention rates compared to non-participating African American students. (Detailed results are presented elsewhere in the 2011 Summer Bridge Program Report.)

B. Promoting the MATH Minor

During the first year (2010–11), the department of mathematical sciences (Jeffrey Watt) began actively promoting the math minor to students and advisors across campus as a way of setting a short-term goal on the path to completing a BS degree. The department will complete the paperwork and have the registrar post the minor on the transcript at the time of completion (usually at the end of the sophomore year). This documentation on the transcript provides motivation to the student that they have completed a component of their degree (much like an AS to BS degree). Many STEM majors will automatically have a minor in their plan of study, or will earn the minor by selecting one more MATH or STAT course as an elective. The number of minors awarded each year provides an indicator of the number of STEM majors passing through the midpoint of the pipeline for a STEM degree.

MATH Minors by S-T-E-M	2008	2009	2010	2011
Science	10	16	7	22
Technology	0	3	3	4
Engineering	27	31	47	81
Computer Science	5	5	8	15
Other	2	3	1	6
Total	44	58	66	128

Major findings include: The number of minors awarded each year have increased 32%, 14%, and 94%. This rapid growth is partly due to students becoming more aware of their eligibility to obtain the minor, but it is also due to 53 students (of the 128 awarded last year), who took one additional course above their requirement (as a free elective) to qualify for the minor - hence, an indicator of motivation.

C. Mini-Grants to Target DFW Rates in Specific Engineering and Technology Courses

During 2012, a call for STEM-oriented curriculum-and-instruction proposals seeking field-generated ideas that have potential to positively impacting the grant's scope and outcomes was made (Charlie Feldhaus and Jeffrey Watt) to faculty in the engineering and technology departments. Those proposals rated most highly of having promise were funded with mini-grants. The mini-grants funded faculty to work on their proposals during the summer of 2012, and then to implement the curricular and instruction changes in the fall semester.

Student Video STEM Projects, Andres Tovar and Randy Newbrough – Begin to develop video repository for students learning process to improve performance, retention and persistence to degree.

Summer Industrial Projects Program, Robert Durkin – Rekindle Soph/Jr. MET students' desire to become engineers, promote retention and persistence.

Using the Inductive Learning Methodology to Reduce Student Failure Rates in MET, Paul Yearling

From Studio to Student: e-Mentoring in Computer Graphics Technology, Jan Cowan and Dan Baldwin – Attract, retain new and existing students.

Improving the Retention of Freshman Engineering Students through Proactive Peer Mentoring, Stanley Chien – Increase freshman engineering retention by at least 12%

Promoting STEM Course via Introductory Videos, Sohel Anwar – Recruit students to major.

Transfer Student Recruit and Support, Terri Talbert-Hatch – develop a learning community for IVYTech CC engineering and technology students to take before they transfer to IUPUI, and a 1.5-day minority transfer orientation program at IUPUI.

Alliance for Retention for Multicultural Students (ET-ARMS), Patrick Gee – develop and implement a first year seminar course for minority students designed to increase minority retention and accelerate time to graduation.

Major findings include: Too early to report any findings in this report; however, the faculty that received these mini-grants will attend a mid-fall semester meeting to discuss the progress they are making in developing and implementing their student success strategies into the classroom, followed by a presentation to our External Advisory Board in December.

D. Post Enrollment Requirement Checking (PERC) in MATH Courses

One situation that causes some STEM students to drop out of their intended major is the result of not being successful in the first math course, and then moving onto the next math course, and failing it. These students believe they can pass the next math courses without being successful in the prerequisite, but they end up digging a hole they cannot climb out. After a year of college, these students find that they are more than a year behind in math. This is a situation that the advisor and course instructor find difficult to catch before it is too late - and contributes to lowering the first year retention rate.

During the second year (2012–13), the math department (Kelly Matthews) has worked with the registrars office to develop an automatic withdrawal program that will remove enrolled students in math courses one week before the semester starts if they do not have the proper prerequisites (a prerequisite check). The proper prerequisite is a grade of C or better in the prerequisite math course or an appropriate placement exam score for the course. When the Post Enrollment Check (PREC) is run two weeks before classes start, the identified students are withdrawn from the math course, and the student and their advisor will be automatically notified by email of the situation and what actions need to be taken to register for the prerequisite course.

Major findings include: 47 students have been identified as enrolling for a fall 2012 math course without passing the prerequisite course in the spring or summer 2012 semester.

E. Reaffirm Existing 2+3 Relationship Dual Degree Program with Butler

During the second year (2011–12), we funded a half time advisor to work with other higher education partners to increase advising and promotion of 2+2 or 2+3 engineering and technology programs.

Major findings include: No data has been collected and analyzed at this time to measure the effectiveness of a specialized advisor to work with these partners. We will report on this activity in the third year report.

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(3) STUDENT-CENTERED PEDAGOGY

A. Genetics K322 Peer Recitation

The Department of Biology (Britt Reese, Mariah Judd, and Kathy Marrs) has long realized the benefit of undergraduate peer mentoring on success of students in Gateway Courses (typically large enrollment introductory courses for majors or non-majors). Peer mentoring is generously

supported in 5 such courses each semester in the department of Biology, reaching over 2,500 students each fall and spring semester. However, no corresponding peer mentoring exists for Genetics K322, the next required course for all 2,000 biology majors in the School of Science. Enrollment of this course has steadily increased over the last 5 years, with enrollments exceeding 130 students in a single lecture section now common for the fall semester and just over 100 in the spring. This past fall 2011 and spring 2012, a peer leader was hired to provide extra time and problem solving assistance to all genetics students, with up to 10 hours per week of time available for drop-in-mentoring hours.

Major findings include: During the fall semester, at least 48 students (36%) attended one or more mentoring sessions, similar to the attendance in the spring. There was a modest decrease in the DFW rate in Genetics in both the fall and spring (from an average rate of 16% in the previous 5 years before the introduction of mentoring to about 14% in the past two semesters with mentoring). It is difficult to say whether this modest benefit was a result of the peer mentoring, but due to the difficulty of the genetics course, student evaluations and focus group comments were overwhelmingly positive of the benefits of the extra support. The two faculty members teaching the course were also highly positive and have requested that the mentoring continue, both stating that they will promote the benefits of attending the peer mentored sessions to the Genetics students this coming fall and spring.

B. Chemistry C341: First Semester Organic Chemistry Workshop Series

During the first two years (2010–2012), the Department of Chemistry (Pratibha Varma-Nelson, Sarah Beth Wilson, and Robert Minto) continued their development and implementation of the workshop series into the first semester organic chemistry course in order to lower the DFW rate. The primary goal of implementing the Organic Chemistry Workshop Series is to facilitate students' collaborative development of Organic Chemistry problem-solving skills, as measured by performance on an ACS Organic Chemistry Exam and survey data. In order to achieve this, a modified Peer-Led Team Learning (PLTL) workshop series was instituted as a component of the first semester Organic Chemistry course. The peer leaders elicit the participation of all group members, challenge students to expand their conceptual understanding through Socratic dialogue, share insights from being reflective on their problem-solving processes, and encourage students to explain their new understanding of concepts to one another in their small group during these 75-minutes workshops. Answer keys are not provided to students since it would short-circuit the process of discussing the fundamental principles and nuances of each workshop problem.

Group Assignment: Eight to ten students of mixed ability are assigned a peer leader for the duration of the semester. Each peer leader, who divides their students into smaller groups of four to five students, facilitates each small group's discussion of the weekly problem sets.

Training of Leaders: Peer leaders are trained weekly in preparation for the workshops. These weekly training meetings consist of a discussion of helpful techniques to uncover and remediate common misconceptions pertaining to the weekly problem set concepts, ways to use graphic organizers or model kits to facilitate conceptual understanding, and methods to enhance student collaboration.

Evaluation:

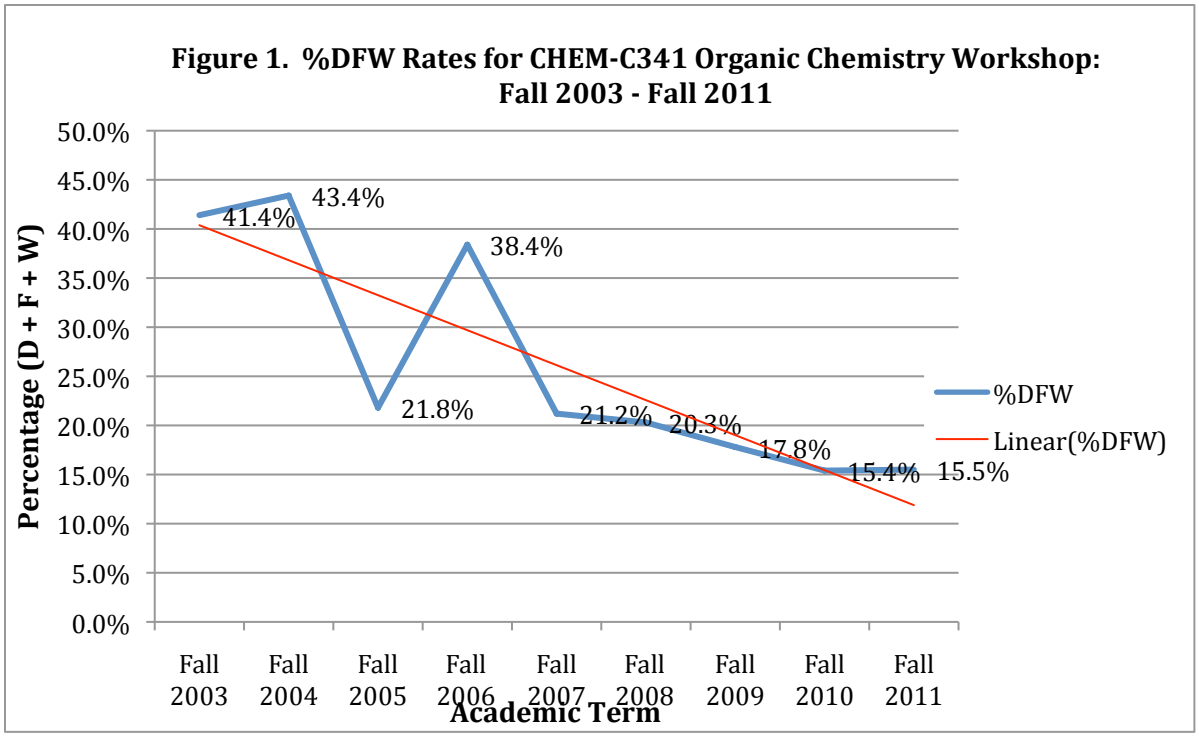
Timeframe	DFW Rate	N	Comments
Spring 2008	24.6%		
Fall 2008	29.7%		
Spring 2009	25.4%		
Fall 2009	23.1%	238	
Spring 2010	23.7%	243	
Fall 2010	15.3%	215	Workshops Implemented with 15:1 student to peer leader ratio
Spring 2011	16.3%	85	Workshops Implemented with 15:1 student to peer leader ratio
Fall 2011	15.50%	208	Workshops Implemented with 8-10:1 student to peer leader ratio
Spring 2012	18.64%	0.95	Workshops Implemented with 8-10:1 student to peer leader ratio

Note: Students who withdrew prior to the first exam are discluded from the calculation.

Three hundred three undergraduate first semester Organic Chemistry students were impacted during the 2011-2012 academic year from the previous I-STEM funding, with DFW rates of 15.5% (Fall) and 18.6% (Spring), as compared to DFW rates ranging from 23-30% prior to the workshops being implemented. Moreover, 50% (Fall) to 66% (Spring) of students state that the workshop discussions aided understanding, while forty (Fall) to sixty (Spring) percent of students perceived an increase in their problem-solving ability from involvement in the workshops. This I-STEM grant enabled smaller group sizes, thus better matching the PLTL model, increasing the student perceptions of the impact of the workshops on their learning, and bolstering performance on the ACS Organic Chemistry final exam. In addition to the benefits of workshop involvement for the students, each of the sixteen peer leaders cited an increase in their understanding of Organic Chemistry concepts and more than 25% of the peer leaders expressed an interest in teaching as a career or as part of their career as a result of their participation in the workshop series.

During the third year (2012–13), the funding will provide a means for the revision of workshop materials to align with the new textbook as well as consider feedback from students. Secondly, there will be further development of the peer leader training curriculum. Lastly, the pattern of lower attendance at the Friday 9am workshop sessions is motivating an exploration of new workshop times to better suit student needs.

Major findings include: (1) the DFW rates have decreased about 10% after workshops were implemented, (2) 6 to 10% increase in positive student perception of problem-solving ability, (3) 25% of the peer mentors expressed an interest in teaching after this experience, and (4) study findings to date suggest that faculty have been successful in using the PLTL approach to lower the failure rates in the workshops (see Figure 1 that provides a historical summary of DFW rates for fall semesters using workshops). Reduction of DFW rates for the chemistry course and training of additional discussion leaders (using the PLTL model) to decrease the number of students in each workshop are positive interventions for increasing the success and number of STEM graduates.



C. Calculus Course Redesign with Recitations

Calculus recitations were developed and implemented into the large lecture section of MATH 16500 (fall semesters) and 16600 (spring semesters). Recitations became a required component of the course and graduate students were trained on how to facilitate discussions using peer-mentoring techniques used in the Mathematics Assistance Center. Students in all sections of the course (with or without required recitations) are required to take a departmental final exam with fixed grading curve. The following data compares the DFW rate of students in sections of the course that have recitations to those that do not.

		2009-10	2010–11	2011-12
MATH 16500 (fall semester only)				
No Rec	# Students (Sections)	281 (6)	289 (5)	283(5)
No Rec	DFW Rate	33%	32%	39%
Rec	# Students (Sections)	101 (1)	98 (1)	100 (1)
Rec	DFW Rate	25%	26%	21%
MATH 16600 (spring semester only)				
No Rec	# Students (Sections)	175 (4)	185 (3)	172 (4)
No Rec	DFW Rate	40%	41%	33%
Rec	# Students (Sections)	95 (1)	106 (1)	97 (1)
Rec	DFW Rate	23%	20%	20%

The following data compares the performance of students in sections of calculus with and without recitations in MATH 16500 on the departmental final exam during the fall 2011 semester. The departmental final exam is commonly administered and commonly graded.

Fall 2011 MATH 16500	With Recitations	No Recitations	Combined
Number of Sections	1	5	6
Number Enrolled	100	283	383
Number Taking Final	82	183	265
Mean Score	72.2	61.7	65.6
Median Score	78	65	67
% of Students No Show	18%	35%	31%

Major findings include: (1) despite the larger class size, sections of calculus with recitation sections have a significantly lower DFW rate, ~20%, than other sections of the course.

(2) Students in sections of calculus with recitations perform 10 percentage points better on the departmental final exam.

D. PhyLS - the Physics Learning Space

The Department of Physics is committed to advancing student success in all of our introductory courses. To this end, we will implement a new effort to provide mentoring services to all students taking these courses. These courses are required by many majors, and are considered to be difficult by many students. As a result, these courses often create barriers to retention and graduation. There are six relevant courses organized into three two-semester sequences (PHYS 218/219, P201/P202, and 152/251). Combined, these courses serve almost 1500 students during each academic year. The enrollments for 2010–11 are shown in Table I as an illustration.

Table I: Representative enrollment and student success in introductory physics classes

	2010-11 Enrollment							
Course	**Fall day**	**Fall night**	**Spring day**	**Spring night**	**Summer day**	**Course totals**	**Credit Hours**	**DFW Rate***
218	N	95	N	72	47	214	856	21%
219	N	33	N	36	25	94	376	22%
P201	139	N	N	105	99	343	1715	30%
P202	N	71	81	N	68	220	1100	11%
152	117	N	140	35	53	345	1380	35%
251	108	34	70	N	55	267	1335	22%
Semester totals	364	254	309	276	347	**1483**	**6762**	**25.1%**

*DFW rates represent the percentage of students who withdraw from a class, or receive a grade of D or F. The figures given are averages for the period Fall 2004 through Fall 2008. The final entry in this column is the average of the figures above, weighted by total enrollment.

In order to reduce our DFW rates, the Physics Department will adopt the "assistance center" model that has proven successful in Mathematics, Psychology, Chemistry and Biology. In this center, students will be able to interact with mentors and faculty in small groups or one-on-one.

They will be able to focus specifically on the areas that cause them the most trouble, and receive individual support. They will also have guided access to computer simulations, video analysis software, and other online tools that support learning in physics.

Completed Work: Mentoring will occur in the newly established Physics Learning Space, "PhyLS" for short. During spring 2012, the physics department (Andy Gavrin and other physics faculty) renovated a small space (~225 square feet) for this purpose, and the PhyLS will open with the beginning of the fall semester, 2012. We have also established an assessment plan, in collaboration with Dr. Howard Mzumara of the IUPUI Testing Center. Under this plan we will track usage of the PhyLS by students in each of the affected courses using a sign-in sheet. We will also use the sign in data to identify random samples of students who will be asked to participate in a survey, and a smaller sample of students who will be asked to participate in a focus group. Both of these methods will be used to provide formative assessment of the PhyLS and its services during the first year of operation. A summative review will be undertaken after two years.

Major findings include: None to report at this time. The learning center will open fall of 2012, and will report first year findings in year three report.

E. Faculty Development Workshops

During the first and second years (2010–12), the School of Engineering and Technology (Charlie Feldhaus and Stephen Hundley) have disseminated results and best practices in STEM education on-campus through faculty development workshops, called E&T Lunch-n-Learn Series on STEM Best Practices. These workshops are well attended and held twice a semester.

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(4) CAREER SERVICES

A. School of Science Career Development Services (CDS) Center

During the first year of the grant (2010–11), the School of Science Career Development Services (CDS) Center was planned, space on campus was secured (located adjacent to the Math Assistance Center), and the first Director was hired (Willow King Locke) to begin implementing the center. One of the primary goals for 2011–12 for the CDS was to increase the awareness of the center, its location, and services provided. The new director promoted the center through various programs and methods. Though only two employees staff the center, outreach to hundreds of undergraduate, graduate, and pre-professional students, including some enrolled in gateway and learning community courses, has been successful. School administrators have also allowed for increase contact with departmental faculty. What follows are the results of increased promotion and awareness of the center, as well as other notable initiatives and outcomes.

Career Counseling and Advising: The number of students utilizing career services increased from 95 students in the first year to 327 students in 2011–12. This dramatic increase is most likely due to several factors including a growing awareness of the office by students, faculty and

staff. This notable increase is made even more remarkable due to the physical location of the CDS [located in Taylor Hall (University College) versus the LD/SL building].

One-on-one advising (including appointments and walk-ins)
- 95 students in 2010–11
- 327 students in 2011–12 (includes 59 who attended a resume critique clinic)

Email advising
- 202 students in 2011–12

Educational Programs: These programs facilitate student learning regarding specific topics of career development and include presentations made to classes and presentation workshops. Educational program topics range from resume development to social media and networking. The increase from Fall to Spring can be attributed to the spring series being sponsored by the School of Science Undergraduate Student Council for advertising and lunch.

Classroom presentations
- Windows on Science – 11 presentations to 210 first year students
- Other classroom presentations – 4 presentations to ~189 students
- Women in Science House pre-professional panel – ~15 students

Fall Programs 2011 – 3 programs to ~14 students
Spring Programs 2012 – 4 programs to 64 students

Faculty and Advisor Relationships: Strategic and intentional efforts were undertaken in order to acquaint faculty with CDS staff and services. These included individual meetings with department and program chairs. These meetings resulted in several invitations to present in classrooms and other future ideas to be explored. CDS staff also attended bi-weekly advising meetings in order to stay informed and aware of current policies and issues students face and to stay connected to departmental advisors. In the coming year, CDS will explore ways to formalize communication with faculty members and advisors.

Outreach Efforts: Outreach is defined as the marketing and publicizing of CDS to students, faculty and staff. This includes services, resources, and events. A major goal for this year was to increase awareness of CDS for students, faculty and staff. Major initiatives include: Fall outreach where CDS pens and career information was distributed, CDS staffed table at the School of Science picnic, Presentations to Student Council clubs, Announcements made during BIOL K101 classes, Resume clinic held prior to the Just-in-Time Job Fair, Table staffed at Science Scholars celebration, Attended 7 Jag Days and Spring Previews, and Presentations during Summer Orientation for first year and transfer students.

Graduation Survey and Employment Data: 86 students filled out the Graduating Student survey administered in late Spring 2012. This survey will be repeated every spring, and compared to this baseline data:

Students' plans following graduation:

Accepted a position – 17%
Currently searching for a job – 27%
Attending graduate school – 24%
Attending professional school – 19%
Other – 13%

Completed an internship during school:

Yes – 43%
No – 52%

ScienceCareers (powered by CSO): This is a comprehensive site that provides web access for employers to post positions including part-time, full-time, volunteer, internship, and other opportunities for science majors. Students can view these postings, upload their resume, and apply within the system.

First year postings (2010–11)

- 722 new job postings

Second year postings (2011–12)

- 850 new job postings
- 605 employers in system

Notable Employer Relationships and Community Partnerships: Employer relationship building and development is an on-going process. Building quality relationships and partnerships will enhance the opportunities for STEM students for both internships and full-time work. The following are companies and organizations that have built relationships with the CDS: Roche, Theoris Scientific, Indy Partnership, Develop Indy, Appriss, ChaCha Inc, WorkOne Indianapolis, and Biostorage.

Major findings include: Career Development Services in the School of Science has initiated and expanded its reach over the past year and is expected to continue its growth each semester for the near future. As this year's priority was focused on outreach and internal relationship development, the upcoming year will focus on expanding employer development with especial regard to internship growth while maintaining and expanding internal visibility among students, faculty, and staff.

Progress to Date: Number of STEM BS/BA Graduates at IUPUI

The program has set a target of increasing the number of STEM graduates at IUPUI by 10% per year (an increase of an additional 782 STEM graduates by 2015). Each year represents students graduating in May, August or December of that year. Our preliminary data indicate:

2008 we had 457 STEM graduates – Baseline year of grant
2009 we had 441 STEM graduates
2010 we had 498 STEM graduates – Year 1 of grant – represents a 12.9% yearly increase
2011 we had 549 STEM graduates – Year 2 of grant – represents a 10.2% yearly increase

DISSEMINATION

Website: http://step.iupui.edu/

The CI-STEP public website was launched in the spring of 2012. The site is hosted on the Indiana University Purdue University Indianapolis (IUPUI) server at http://step.iupui.edu/. The main purpose of the site is to serve as a centralized location for individuals to visit and learn about what the CI-STEP grant is doing, the impact it is making and how they can get involved.

The home page features our custom logo (Fig. 1), a Flash interrogated panel with scrolling pictures specific to IUPUI, a link to the CI-STEP Facebook page, a "Happenings" section which highlights upcoming events and announcements, and 4 hyperlinked information panels that represent the 4 different areas of activity the grant is involved with. As a visitor navigates the site, they will find detailed information on the CI-STEP's mission, each initiative the grant is involved in, the assessment approach, the progress and impact the grant is making, helpful resources, a list of grant publications and presentation, as well as a list of mini grant recipients, their grant goals and a link to a dedicated site for data deposit and information dissemination.

In addition to being a site for the general public, it also serves as a place for colleagues to come and connect with others who share the mission. In the spring of 2012, CI-STEP presented at the Moore Symposium at IUPUI. The site was used as a resource to post and distribute information to the symposium attendees, allowing the grant to reach across campus to a breath of faculty from the IU Medical School to the School of Science.

The site was created specifically to reflect the IUPUI color theme while still infusing a modern and colorful aesthetic. In addition to the website, the new CI-STEP graphics have been used in fliers, handouts, and presentations, making CI-STEP recognizable across the IUPUI and Ivy Tech campuses and beyond.

Figure 1. CI-STEP Logo

Internal Dissemination:

Internal CI-STEP Advisory Board Meetings on Thursday, October 7, 2010, and Friday, July 22, 2011.

External CI-STEP Advisory Board Meeting on Wednesday, December 1, 2010.

Presentation "Incorporating STEM Best Practices into Courses and Programs" by Charles Feldhaus at E&T Lunch-n-Learn on Wednesday, April 6, 2011.

Presentation "Teaching and Learning Initiatives in E&T" by Stephen Hundley at E&T Undergraduate Programs Summit on Thursday, July 28, 2011.

Presentation "How E&T Can Compete at the Highest Levels in Teaching and Learning" by Pratibha Varma-Nelson at E&T Faculty Fall 2011 Faculty and Staff Convocation on Thursday, August 18, 2011.

Presentation "Funding Opportunities for E&T Faculty: Resources Available from the Central Indiana STEM Talent Expansion Program Grant" by Jeff Watt and Charles Feldhaus at the E&T Lunch-n-Learn on Wednesday, September 14, 2011.

External CI-STEP Advisory Board Meeting on Wednesday, December 5, 2011.

Internal CI-STEP Advisory Board Meetings on Wednesday July 25, 2012.

External Dissemination:

J. X. Watt and K. Marrs (2010) *The Central Indiana STEM Talent Expansion Program,* Indiana Regional Mathematics Consortium. Indianapolis, IN (October 22).

Hundley, S.P., Watt, J.X., Marrs, K.A., Gavrin, A.D., and Feldhaus, C.R. (2011) *A Talent Expansion Program for STEM Majors: Needs, Activities, and Outcomes-to-Date*. American Association for Behavioral and Social Sciences, Las Vegas, NV (February 9-11).

Hundley, S.P., Feldhaus, C., Watt, J.X., Marrs, K., and Gavrin, A. (2011). Developing a STEM talent expansion pipeline in higher education: A work-in-progress. *Proceedings of the 2011 Conference of the Portland International Center on the Management of Engineering and Technology*, Portland, OR (July 31-August 4).

Varma-Nelson, P., Robert Minto R., Denton R., and Wilson S. (2011) *C341 Organic Chemistry Peer-Led Team Learning Workshop Series*. American Chemical Society Annual Meeting, Denver CO (Aug 28-Sept 1).

Marrs, K., Judd, M., Hundley, S.P., Feldhaus, C., Mzumara, H., Gavrin, A., and Watt, J.X (2011) *Central Indiana STEM Talent Expansion Program (CI-STEP): Creating research-based educational innovations in undergraduate STEM education at IUPUI*. Transforming Education: From Innovation to Implementation Conference. Purdue University, West Lafayette, IN (October 10-12).

Watt J.X., Marrs K., Feldhaus C., Gavrin A., Hundley S., and Mzumara H. (2011) *Central Indi ana STEM Talent Expansion Program: First Year Report,* Indiana Section of the Mathematics Association of America. University of Indianapolis. Indianapolis, IN (October 22).

Watt J., Marrs K., Judd M., Feldhaus C., Gavrin A., Hundley S. and Mzumara H. (February 2012) Central Indiana STEM Talent Expansion Program (CI-STEP): Transforming Education , Moore Symposium, IUPUI.

Watt J.X., Marrs K., Feldhaus C., Judd M., Hundley S., Gavrin A., and Mzumara H (March 2012) IUPUI Central Indiana STEM Talent Expansion Program (CI-STEP) NSF STEP Program Annual meeting, March 14-16, 2012, Washington

Future Dissemination:

Assessment Institute, October 28-30, 2012, Indianapolis, IN.

Association of American Colleges and Universities' Next Generation STEM Learning Conference, November 8-10, 2012, Kansas City, MO.

Academy for Creative Teaching, January 3-6, 2013, Casablanca, Morocco.

American Association for Behavioral and Social Sciences, February 14-15, 2013, Las Vegas, NV.

NSF STEP Program Annual Meeting, March 2013, Washington, D.C.

American Society for Engineering Education, June 23-26, 2013, Atlanta, GA.

Assessment Institute, October 2013, Indianapolis, IN