

Vertically Integrated Partnerships

K-16

Report for Year 3 (Oct 2004 –Sept 2005)

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Section 1: Activities and Findings (abbreviated format)

A) Introduction

During Year 3, VIP K-16 witnessed much growth in the scale of implementation, in the interaction of partners, and in our efforts to evaluate our progress toward goals. In addition, this was the first year of our supplementary grant to evaluate sustainability of reforms in science education at the university level, Change And Sustainability in Higher Education. (A report on the specific progress of the CASHÉ supplemental grant is provided as Section 6.)

Alongside the Biology cohort of MCPS high school teachers, we began the cohort of teachers of Earth-Space Systems (ESS) and Matter & Energy (M&E), regularly taught courses in the district. Each cohort participated in four of its own cohort conferences during the year, and are combining for the Summer Institute. We also implemented our first Student Inquiry Conference. Many other activities for teachers of both cohorts also took place, including activities carried over from the first year of the Biology cohort and new or revised activities, as detailed below. In addition, we are continuing our development of curriculum guides and field tests in four content areas.

Project implementation on the Higher Education side has been increasing throughout Year 3, and looks to continue its increase into Year 4. Existing activities have been expanded at Towson, UMBI, and UMCP, while new project directors at MC and UMBC have already created many new activities there. Through many of these activities, our IHE partners are leading our efforts to increase K-16 partnerships beyond the cohort conferences and Summer Institute (which are largely aimed at the K-12 teachers and their curriculum). What's more, the IHE leadership team has developed significantly as a learning community itself, allowing partners to collaborate and support each other more than before.

The details our project implementation and evaluation can be seen in the tables that follow. You will find that although activity has increased significantly, it has not increased uniformly across all of our project's objectives. (For example, objective 3.5 on creating a "Maryland Science Faculty" or objective 4.3 on teaching portfolios have not been emphasized this year.) This is because it became clear to us that it wasn't realistic to do these things without first creating the opportunities for teachers, faculty, and students to become involved in learning communities. This was our focus for the year.

That said, we have made progress on objective 3.5 in the process of targeting other objectives. Although we haven't created a formal "Maryland Science Faculty" group, we have met some of the benchmarks we had set for Years 4 and 5, namely: pursue additional funding opportunities for K-16 science collaboration; provide consultation on statewide issues related to curriculum and student achievement in the sciences; coordinate efforts with existing faculty disciplinary groups in the sciences. We feel that these accomplishments have set the stage for the successful formation of a "Maryland Science Faculty."

Just as in last year's report, our implementation and findings reports are separated into reports for each partner institution, reflecting their individual contributions to the project's overall goals.

B) Implementation

Details of our implementation for Year 3 can be found below in Exhibits 1a-1f and the sections of narrative that some partners chose to include for the sake of clarity.

1) Montgomery County Public Schools (MCPS)

Exhibit 1 a: IMPLEMENTATION MATRIX FOR MCPS

Goal 1: Improve student learning outcomes, as measured by High School Assessments.

Objective	Activity	MSP Key Feature	Progress to date (check <u>one</u>)				Brief explanation for changes where an activity has not been carried out as planned
			Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	
			(a)	(b)	(c)	(d)	(e)
1.1 Participate in inquiry activities in the classroom	Activity 1a: Conduct after-school curriculum guide workshops (for ESS)	CCC	X				
	Activity 1b: Conduct four biology cohort conferences (sessions devoted to using 5E activities)	CCC	X				
	Activity 1c: Conduct four Matter & Energy/Earth Space Science cohort conferences (sessions devoted to using 5E activities)	CCC	X				

	Activity 1d: Conduct Summer Institute to provide professional development in using 5E activities	CCC	X		
1.2 Improve percentage of correct responses to HSA type selected response items measuring science process skills	Activity 2a: Conduct four biology cohort conferences (sessions devoted to assessment)	CCC, EBDO	X		
	Activity 2b: Conduct four Matter & Energy/Earth Space Science cohort conferences (sessions devoted to assessment)	CCC, EBDO	X		
	Activity 2c: Conduct monthly working seminars (student performance analysis done on items from semester exams)	CCC, EBDO, ICS	X		

	Activity 3a: Conduct four biology cohort conferences (sessions devoted to assessment)	CCC, EBDO X			
1.3 Improve percentage of correct responses to HSA type selected response items measuring science concepts	Activity 3b: Conduct four Matter & Energy/Earth Space Science cohort conferences (sessions devoted to assessment)	CCC, EBDO X			
	Activity 3c: Conduct monthly working seminars (student performance analysis done on items from semester exams)	CCC, EBDO, ICS X			
	Activity 3d: Produce field tests for ESS, M&E, Chemistry and Physics	CCC, EBDO X			
1.4 Improve student skills in reading	Activity 4a: Produce field tests for ESS, M&E, Chemistry and Physics	CCC, EBDO X			

science literature	Activity 4b: Conduct four Matter & Energy/Earth Space Science cohort conferences (sessions devoted to reading)	CCC X		
	Activity 4c: Conduct four biology cohort conferences (sessions devoted to reading)	CCC X		
	Activity 4d: Conduct Adaptive Strategies workshops	CCC	X	
	Activity 5a: Produce field tests for ESS, M&E, Chemistry and Physics (each assessment has BCR items)	CCC, EBDO X		
1.5 Improve student writing skills in science	Activity 5b: Conduct four biology cohort conferences (sessions devoted to improving student written responses to items)	CCC X		

Activity 5c: Conduct four Matter & Energy/Earth Space Science cohort conferences (sessions devoted to improving student written responses to items)	CCC X	Instructional guides were produced for Chemistry and ESS. Super Blueprints were produced for M&E and Physics. Curriculum guides will follow in 2005 - 06. X
Activity 5d: Refine draft curriculum guides for instructional units Earth Space Systems and Matter & Energy (all guides contain practiced BCR items and formative assessments)	CCC, EBDO, ICS	
1.6 Increase student participation in advanced science courses	Activity 6a: Met with Guidance Resource Councilors to discuss advance course options	CCC X
	Activity 6b: Presented course sequence flow chart to Science Resource Teachers	X

Goal 2: Improve teacher content knowledge in the sciences by providing high quality professional development to in-service high school teachers.

(a)	(b)	(c)	Progress to date (check <u>one</u>)				(e)
Objective	Activity	MSP Key Feature	Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	New activity substituted
2.1 Increase the number of inquiry activities in instruction	Activity 1a: Conduct four biology cohort conferences for approximately 150 teachers	TQQD, CCC, EBDO	X				
	Activity 1b: Conduct four Matter & Energy/Earth Space Science cohort conferences for approximately 100 teachers	TQQD, CCC, EBDO	X				
	Activity 1c: Conduct monthly working seminars organized in professional learning communities (six geographical clusters) for cohort participants	PD, TQQD, ICS					X

Brief explanation for changes where an activity has not been carried out as planned

Monthly seminars were held at each high school rather than in clusters of schools. The intent was to reduce travel time and improve attendance. Planning templates were provided to focus the agenda and provide an artifact of the seminar.

Activity 1d: Conduct after-school curriculum guide workshops	CCC	X	
Activity 1e: Recruit content experts (researchers, faculty, practitioners) in science to provide expertise for summer institutes and school-year workshops	PD, TQQD	X	
Activity 1f: Conduct Summer Institute to provide professional development for implementing strategies to achieve grant objectives	PD, TQQD	X	
Activity 1g: Refine draft curriculum guides for instructional units Earth Space Systems and Matter & Energy	CCC, ICS	X	Draft curriculum guides were provided to teachers of Earth Space Systems and Chemistry. The indicators for Matter & Energy were revised to better reflect expectations for our Grade 9 students. “Super Blueprints” were provided for instruction in Matter & Energy as well as Physics.
Activity 1h: Produce field tests for ESS, M&E, Chemistry and Physics	EBDO	X	

2.2 Increase the number of teachers using strategies to promote reading in science	Activity 2a: Conduct four Matter & Energy/Earth Space Science cohort conferences (specific sessions devoted to reading in science)	TQJD, EBDO X		
	Activity 2b: Conduct four biology cohort conferences (specific sessions devoted to reading in science)	TQJD, EBDO X		
	Activity 2c: Conduct monthly working seminars (some focused on reading strategies from the curriculum guides for Biology)	ICS X		
2.3 Increase the number of teachers using strategies to promote writing in science	Activity 3a: Conduct four Matter & Energy/Earth Space Science cohort conferences (specific sessions devoted to constructed response items)	TQJD, EBDO X		

	Activity 4d: document action research on project web site	EBDO		X	Template prepared on the web site for teachers to use to document and share their action research findings with project colleagues.
2.5 Implement curriculum guides and assessments into instruction	Activity 5a: Conduct four Matter & Energy/Earth Space Science cohort conferences (sessions devoted to ESS and M&E curricula)	TQOD, CCC	X		
	Activity 5b: Conduct after-school curriculum guide workshops (for ESS)	TQOD, CCC	X		
	Activity 5c: Produce and administer field tests during each semester for ESS, M&E, Chemistry and Physics	EBDO, ICS		X	M&E administered “pilot items” because of the adjustments made to the curriculum. Field tests are planned for 2005-06.
2.6 Utilize “Tuning Protocol” to steer instruction	Activity 6a: Conduct four biology cohort conferences (one session for all participants devoted to using the Tuning Protocol)	TQOD, EBDO	X		

Activity 6b: . Conduct monthly working seminars (agenda item for two schools)	EBDO, ICS	X	

2) Montgomery College (MC)

Exhibit 1 b: IMPLEMENTATION MATRIX FOR MONTGOMERY COLLEGE

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.

Objective	Activity	MSP Key Feature	Progress to date (check <u>one</u>)				Brief explanation for changes where an activity has not been carried out as planned
			Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	
3.1 Increase the number of faculty participants who use inquiry instruction in science and	Recruit new faculty fellow in physical sciences.		X				Recruited biology, physics, and chemistry participants.
3.2 Increase the number of inquiry activities used by faculty	Review/ revision of course/lab activities and outcomes in first-year courses in Biology and Physical Sciences.	TQOD, CCC, EBDO			X		Multiple smaller inquiry workshops held at each of MC's 3 campuses, and a college-wide focus group meeting held for grant participants, rather than the college-wide colloquium.

participants in science instruction and	Project Director provides individual professional development support to each participant.	TQQD	X		Nineteen separate meetings and/or classroom observations were held over the year, with twelve individual participants.
	Science Inquiry workshop offered.	TQQD, CCC, EBDO	X		Three workshops offered, one at each of the College campuses, with a total of 21 faculty and one administrator in attendance.
	Fellows and faculty participants attend monthly seminars with MCPS teachers.	PD, TQQD		X	Biology monthly seminars moved to school-based programs during this grant year, and earth space systems seminars focused on curriculum revisions.
	Fellows and faculty participants attend Summer Institute.	PD, TQQD	X		
	Fellow attends Earth/Space Science Cohort conferences.	PD, TQQD		X	Project director attended cohort conferences; faculty participants also attended one each of Bio cohort and ESS cohort conferences.
	Fellow and faculty participants attend monthly seminars with MCPS teachers.	PD, TQQD		X	Biology monthly seminars moved to school-based programs during this grant year, and earth space systems seminars focused on curriculum revisions.
3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers	Fellow and faculty participants attend Summer Institute.	PD, TQQD	X		

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

(a)	(b)	(c)	(d)	(e)
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Objective	Activity	MSP Key Feature	Progress to date (check <u>one</u>)				Brief explanation for changes where an activity has not been carried out as planned
			Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching	Field experience course for potential secondary science teachers is created.	PD, TQQD, CCC		X			Field experience course for elementary ed was modified to apply to all secondary level programs, including science, math, and Spanish. Course to be offered in AY 2005-2006.
	Recruit undergraduate students for participation in MCPS classroom observation/ assistance.	PD, TQQD, EBDO		X			AAT program did not appear in current catalog; publicity will begin this summer. Field experience course was not offered yet.
5.2 Increase the number of participating undergraduate students who consider science teaching as a career	Recruit undergraduate students for participation in MCPS classroom observation/ assistance.	PD, TQQD, EBDO		X			See above.
5.3 Increase the number of participating undergraduate students who enter teaching careers in MCPS	Recruit undergraduate students for participation in MCPS classroom observation/ assistance.	PD, TQQD, EBDO		X			See above.

3) Towson University (TU)

Improving Teaching in Higher Education by Teaching with Inquiry: Four of the six courses created or redesigned by the 12 faculty fellows at Towson to increase science inquiry activities in the classroom have been taught in Year 3. Our efforts were placed in general education courses because education majors take these courses, therefore, increasing our chances to recruit science teachers. A science inquiry self-survey developed from the MCPS High schools was modified by the Towson fellows and later by all IHE project directors (see Year 2 Annual Report). This survey was administered to all fellows. These surveys were given to Weststat to analyze and compare to surveys completed by the fellows prior to joining the program. Also, parallel student surveys were given to students who had taken the modified courses. Additionally, fellows were asked by the director to write a reflective statement on science inquiry, which was given along with other data to Weststat. Analysis of these evaluation data is not yet complete.

Two members of our faculty learning community are retiring from Towson, Dr. Leon Ukens and the director. Dr. Ukens will be replaced in the community by Dr. Joseph Topping, a professor of chemistry who has demonstrated extended and expert activities in science curricular reform and in interactions with K-12 science teachers. The director will continue in her role with VIP K-16, working on a part-time basis.

The course, “Introductory Biology for Health Science Majors”, designed by Carol Berkower in collaboration with Sarah Bruce, will be taught in academic year 2005- 2006. Brian Fath is collaborating with Brian Masters to create and teach “The Science of Connections,” also in Year 4. The course will fulfill students’ requirement for the Science, Technology and Society, a general education requirement. A biodiversity course, “Biodiversity”, created by Sarah Haines in collaboration with Roland Roberts will also be taught in academic year 2005- 2006.

Our original plan was to teach three biology courses, by Spring 2005. We are on target for two of the courses but have delayed the course “Biology for Health Science Majors” for one semester. Some of the delay was unavoidable: both Carol Berkower and Sarah Haines took a semester of maternity leave.

All faculty fellows have received and are completing “The Faculty Participation Form” and five have completed it. We can provide the collected forms on request when they are complete. The “Teaching with Inquiry Survey”, a modified version of the MCPS’s

survey to accommodate higher education culture (see Year 2 Annual Report) was completed by the fellows. As expected, there is a variability of responses: the experienced faculty and the science education faculty score higher than those faculty members who are starting to explore inquiry in the science classroom. The survey will be given again at the end of the program to assess their progress.

Preparing Faculty To Teach with Inquiry: In addition to the faculty learning community concept, as the primary mover for faculty involvement with science inquiry, we have incorporated four strategies to increase faculty's understanding of science inquiry.

1) Joe Topping as recipient of the Sloan Teaching Excellence Award gave a college-wide lecture on the importance of active learning. The lecture was attended by Towson fellows and other faculty members.

2) We continue our monthly reflective meetings where the fellows inform the group about progress in their plans for the targeted courses. Changes were suggested for strengthening activities and laboratories. Fellows also receive sample inquiry laboratory papers and books to guide them in their work.

3) Interaction with the MCPS teachers has been very rewarding for the few fellows who can attend the meetings. Scheduling conflicts prevent the majority for attending. Fellows are very interested in a greater communication with the teachers and will be presenting four sessions for the teachers (at Summer Institute) on the inquiry activities they have developed.

The Scholarship of Teaching: One of the important strategies in developing faculty members' skills is to ask them to present their work at a conference. The act of preparing a presentation allows them to reflect on their work. Nine fellows and our graduate presented papers or posters at the peer-reviewed Lilly Conference on College and University Teaching-East on April 1, 2005 or at the National Conference of Association of Biology Teachers (abstracts available upon request).

Graduate Fellow: Our Year 2 graduate student fellow, Giovanni Vincenti, taught one science course this academic year. He has developed a teaching portfolio and has also maintained a website that offers varied resources to support teaching. He is well acquainted with the literature, and teaching science with inquiry is high on his agenda.

Undergraduate Fellows: One of our Year 2 undergraduates, Loretta Kerchner (a Biology and Secondary Education major) is already teaching high school biology in Ann Arundel Public Schools. Our Year 3 Undergraduate, Sarah Stratman (a Chemistry major), is working as an observer with the MCPS teachers, and is maintaining a bulletin board for science students interested in teaching. A new

recruit, Sarah Manheim, will become an undergraduate fellow in September following the same program we designed for our other undergraduates.

Exhibit 1 c: IMPLEMENTATION MATRIX FOR TOWSON UNIVERSITY

Objective	Activity	MSP Key Feature	Progress to date (check <u>one</u>)				(e) Brief explanation for changes where an activity has not been carried out as planned
			Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	
3.1 Increase the number of faculty participants who use inquiry instruction in science	Recruit additional faculty for all cohorts		X				
	Participation in Cohort Conferences	PD, TQQD			X		Attendance less than planned because of scheduling conflicts. Lowering expectations in favor of Summer Institute participation.
	Participation in Summer Institute 05	PD, TQQD	X				
	Participation in monthly seminars with MCPS teachers	PD, TQQD			X		Attendance less than planned because of scheduling conflicts. Lowering expectations in favor of Summer Institute participation.
	Monthly meetings of faculty fellows to plan course designs and other grant activities	TQQD, CCC, EBDO, ICS					Monthly meetings are essential in providing ideas and support for faculty involved in the project. Faculty continue receiving and discussing inquiry materials and have found applications for their practice.

	Create or redesign inquiry-oriented courses	CCC, EBDO, ICS	X	Two biology courses have been postponed to academic year 2005-2006 due to scheduling conflicts, but other new or redesigned courses in biology, physics, chemistry, and geology were taught in Year 3.
	See activities for 3.1 above.			
3.2 Increase the number of inquiry activities used by faculty participants in science instruction				
3.3 Improve participating faculty's understanding of inquiry teaching practices	Monthly Faculty Learning Community meetings and readings	TQQD, CCC, EBDO, ICS	X	Monthly meetings are essential in providing ideas and support for faculty involved in the project. Faculty continue receiving and discussing inquiry materials and have found applications for their practice.
3.4 Increase the number of faculty	Scholarship of teaching presentations Classroom observations by peer faculty	TQQD, EBDO	X	By choice of the faculty in the community, classroom observations take place when the faculty member teaching a course invites fellows to observe their work. All observations have been carried out by at least 3 faculty members, including the director.
	Faculty participation and leadership in Summer Institute, and participation in	PD, TQQD, CCC		

participants who are involved in ongoing collaborative relationships with K-12 teachers	Cohort Conferences and MCPS monthly seminars (see 3.1 above)	Eight faculty will lead 4 workshops at Summer Institute

Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.

(a)	(b)	(c)	Progress to date (check <u>one</u>)			(e)	
Objective	Activity	MSP Key Feature	Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	New activity substituted
4.1 Increase the number of participating graduate students who use inquiry instruction in science	Redistribute recruitment poster Recruit graduate student fellow	X					
	Student participates in Cohort conferences	PD, TQOD			X		
	Student participates in Summer Institute	PD, TQOD	X				
	Develop understanding of science inquiry through literature review	TQOD, EBDO		X			
	Develop a practical understanding of science inquiry by teaching science inquiry lessons	TQOD, EBDO				X	X
							Incompatible with student's schedule with participation in inquiry workshops at Summer Institute.

build upon existing graduate teaching portfolios to demonstrate knowledge, skills, and competencies gained through involvement in the project, including research on teaching and learning	Faculty Fellows review portfolio according to guidelines developed in year 2	TQQD, EBDO	Guideline development has been delayed while we focus on inquiry teaching and K-16 partnership activities. Portfolio review will take place during next academic year.
			X

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

(a)	(b)	(c)	Progress to date (check <u>one</u>)			(e)	
Objective	Activity	MSP Key Feature	Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	New activity substituted
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching and	Redistribute student recruitment poster Select two undergraduate fellows		X				
5.2 Increase the number of	Students participate in Cohort Conferences Students participate in at least two working seminars each Students participate in Summer Institute	PD, TQJD	X			X	
	Participate in NSTA Conference and write reflective paper on experience	TQJD, EBDO	X			X	The logistics of sending students to the conference became too difficult to continue this activity.

<p>participating undergraduate students who consider science teaching as a career</p> <p>and</p> <p>5.3 Increase the number of participating undergraduate students who enter teaching careers in MCPS</p>	<p>Reflect on science inquiry strategies through monthly meetings with the director and a mentor on the student's discipline</p> <p>Students write an end-of year report on science inquiry</p>	<p>TQQD, EBDO</p>	<p>X</p>	<p>The meetings have taken place, but we have added a faculty advisor from among the fellows to enrich the experience.</p>

4) University of Maryland – Baltimore County (UMBC)
Exhibit 1 d: IMPLEMENTATION MATRIX FOR UMBC

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.

Objective	Activity	MSP Key Feature	Progress to date (check <u>one</u>)				Brief explanation for changes where an activity has not been carried out as planned
			Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	
3.1 Increase the number of faculty participants who use inquiry instruction in science	Teach and begin evaluating 3 (2 courses Fall 04 and 1 courses Spring 05) First Year Inquiry Seminars with experiences in K-12 settings connected required for all students enrolled in the seminars.	PD, TQQD, CCC, EBDO, ICS		X			Delayed until Year Four, still evaluating to see if 3.1 will fit in the overall aims of the program. UMBC is currently in the process of selecting faculty for program. Recruiting will take place in June and July 2005, but those recruited will not begin until Year Four.
	Continue to recruit earth/space science faculty and other faculty for faculty fellow team and UMBC VIP K-16 Coordinating Council.			X			Change in personnel, new staff has taken over the Director position at UMBC.

			Change in focus of grant. Planning meeting was held 5.25.05 between UMBC and MCPS to discuss potential faculty & K-12 collaborative relationships for Fall 2005.
		X	
			X
Recruit faculty to develop and deliver Great Ideas in Science seminar series to be offered for Montgomery County high school teachers at Shady Grove campus. Promote series and recruit teachers to participate starting Fall 05.	PD, TQQD		

Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.

(a)	(b)	(c)	Progress to date (check <u>one</u>)				(e)
Objective	Activity	MSP Key Feature	Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	New activity substituted
4.1 Increase the number of participating graduate students who use inquiry instruction in science	Require all graduate science students enrolled in the UMBC Master of Arts (MAT) initial certification program to complete an electronic teaching portfolio to demonstrate their ability to implement inquiry instruction.	TQQD, EBDO			X		Redirected focus of UMBC's program is on undergraduate students and Faculty Fellows.
4.2 Increase exposure of participating graduate students to teaching in the sciences and perspectives on faculty careers both in the K-12 and higher education	Provide partial tuition scholarship stipends for graduate students interested in teaching science at high school levels.	TQQD			X		Redirected the focus to undergraduate students and Faculty Fellows.

sectors to encourage them to enter teaching			Redirected the focus to undergraduate students and Faculty Fellows.
		X	

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

Objective	Activity	MSP Key Feature	Progress to date (check <u>one</u>)				Brief explanation for changes where an activity has not been carried out as planned
			Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching	All students taking First Year (undergraduate) Seminars will be required to complete assignments based in K-12 settings. These K-12 experiences of students and faculty will be evaluated.	PD, TQOD, CCC, EBDO, ICS			X		New activity is to place undergraduate students in high school classrooms. Recruitment for those students will be in Fall 2005 and Spring 2006. Placements will begin in Fall 2005 and Spring 2006 in Year Four.

<p>5.2 Increase the number of participating undergraduate students who consider science teaching as a career</p> <p>All students taking First Year (undergraduate) Seminars will be required to complete assignments based in K-12 settings. These K-12 experiences of students and faculty will be evaluated.</p>	<p>PD, TQQD, CCC, EBDO, ICS</p>	<p>X</p>	<p>New activity will be to survey undergraduate students taking the First Year Seminars in Fall 2005 and Spring 2006.</p>
<p>5.3 Increase the number of participating undergraduate students who enter teaching careers in MCPS</p> <p>Create a special discussion group in BIO 100 for undergraduate students potentially interested in teaching science.</p>	<p>TQQD, CCC, EBDO, ICS</p>	<p>X</p>	<p>New activity is to place undergraduate students in high school classrooms. Recruitment for those students will be in Fall 2005 and Spring 2006. Placements will begin in Fall 2005 and Spring 2006 in Year Four.</p>
<p>5.3 Increase the number of participating undergraduate students who enter teaching careers in MCPS</p> <p>All students taking First Year (undergraduate) Seminars will be required to complete assignments based in K-12 settings. These K-12 experiences of students and faculty will be evaluated</p>	<p>PD, TQQD, CCC, EBDO, ICS</p>	<p>X</p>	<p>New activity is to place undergraduate students in high school classrooms. Recruitment for those students will be in Fall 2005 and Spring 2006. Placements will begin in Fall 2005 and Spring 2006 in Year Four.</p>

Create a special discussion group in BIO 100 for undergraduate students potentially interested in teaching science	TQQD, CCC, EBDO, ICS		X	X	New activity is to place undergraduate students in high school classrooms. Recruitment for those students will be in Fall 2005 and Spring 2006. Placements will begin in Fall 2005 and Spring 2006 in Year Four.
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5) University of Maryland Biotechnology Institute (UMBI)

2004-2005 Teacher Professional Learning Community

Beginning in October 2004, five of the 13 ExPERT summer program teachers voluntarily participated in the school-year professional learning community. Of the five teachers, three were regular participants. One barrier to recruitment was a commitment of many teachers to coach school sports.

2004-2005 Faculty consultations

Project director provided guidance to faculty involved in creating new initiatives to develop undergraduate biology and chemistry curricula in partnerships with other USM institutions. Guidance included teaching individual faculty about inquiry, infusing inquiry into the curriculum, and using the research experience as an authentic inquiry experience. In a similar manner, project director recruited one faculty member and one staff scientist to collaborate in the creation of a new teacher professional development program that uses content to enhance teacher understanding and implementation on inquiry and the nature of science.

Data Collection and Analysis

Post-program follow-up survey and group interview of 10 of the 13 previous summer (2004) ExPERT teachers will be conducted in Summer 2005. Data analysis will continue through Year 4.

Presentations and Publications

- Four teachers presented their summer research at the fall 2004 biology cohort conference.
- Two teachers presented at the 2005 national NSTA meeting.
- One presentation at the 2005 annual AERA conference by the PI and collaborators.

2005-2006 ExPERT Cohort Enrolled

Ten teachers will begin their four-week summer research experience with nine UMBI Center of Marine Biotechnology faculty in July. Of those 10, three are returning teachers from the first cohort of ExPERT participants. Compensation is at each teacher's school salary rate. Three RET supplements were secured for this purpose (six RET's were requested). For their participation, mentors receive an incentive of \$1,500 for supplies. Four teachers will participate in 2-5 days of pre-research training (compensation at professional development rate by the school partner). During the summer, teachers will meet as a group three times each week with the ExPERT facilitator. The purpose of the meetings is to enhance understanding of their research projects and the connection to inquiry and the

nature of science. Teachers are expected to journal throughout the summer and present their research projects to peers and faculty at the end of the summer program. For research and evaluative purposes, a pre- and post-program survey will be administered, teacher work will be collected and all facilitated working sessions with teachers will be videorecorded.

Exhibit 1 e: IMPLEMENTATION MATRIX FOR UMBI

Goal 2: Improve teacher content knowledge in the sciences by providing high quality professional development to in-service high school teachers.

Objective	Activity	MSP Key Feature	Progress to date (check <u>one</u>)				Brief explanation for changes where an activity has not been carried out as planned
			Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	
2.1 Increase the number of inquiry activities in instruction	2005 Summer ExPERT RET program	PD, TQQD	X				10 teachers enrolled for summer 2004.
	“Teacher-practitioner research group” (professional learning community) Twice-a-month meetings of EXPERT cohort with facilitator for peer discussion and analysis of teaching tapes	PD, TQQD, EBDO					5 (of 13 in the summer 2004 program) volunteered to participate in the professional learning community. Scheduling difficulties resulted in a total of 5 meetings during the 2004-05 school year.
2.4 Conduct	“Teacher-practitioner research	PD, TQQD,	X				5 (of 13 in the summer program) volunteered to participate in the professional learning

action research group” (professional learning community) Twice-a-month meetings of ExPERT cohort with facilitator for peer discussion and analysis of teaching tapes	EBDO	community. Scheduling difficulties resulted in a total of 5 meetings during the 2004-05 school year.
2.6 Utilize “Tuning Protocol” to steer instruction	“Teacher-practitioner research group” – (professional learning community)	Defer introduction of Tuning Protocol until second cohort because teachers within the professional learning community chose to spend all of their time focusing on analyzing student thinking from videotapes of their own classrooms. They used the analyses to reflect on their conceptions of inquiry and inquiry teaching practices.

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.

(a)	(b)	(c)	Progress to date (check <u>one</u>)				(e)
Objective	Activity	MSP Key Feature	Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	New activity substituted
3.1 Increase the number of faculty participants who use inquiry instruction in science	Teaching and mentoring inventory of faculty scientists	PD, TQOD, EBDO		X			Inventory to be annual and conducted in summer 2005 at faculty request
3.2 Increase the number of inquiry activities used by faculty participants in science instruction	Teaching and mentoring inventory of faculty scientists	PD, TQOD, EBDO		X			Inventory to be annual and conducted in summer 2005 at faculty request

3.3 Improve participating faculty's understanding of inquiry teaching practices	Center-wide seminar on implementing principles of "How People Learn" in college science teaching	TQQD, EBDO	X	Low faculty priority; budgeting constraints
	Faculty consultations with project director	PD, TQQD, EBDO	X	
3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers	ExPERT Summer 2004 follow-up survey and interview	PD, TQQD, CCC, EBDO	X	
	ExPERT summer 2005 RET-subsidized implementation	PD, TQQD, CCC, EBDO	X	

Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.

(a)	(b)	(c)	(d)				(e)	
Objective	Activity	MSP Key Feature	Progress to date (check <u>one</u>)					
			Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	New activity substituted	
4.2 Increase exposure of participating graduate students to teaching in the sciences and perspectives on faculty careers both in the K-12 and higher education sectors to encourage them to enter teaching	Career development seminar series	TQOD		X				This is part of an institutional initiative that has been delayed.
	Teaching and classroom observation opportunities for undergraduate, graduate, postdoctoral students and research staff	PD, TQOD			X			This is part of an institutional initiative that has been delayed.
	UMCP Center for Teaching Excellence (CTE) online teaching and learning program (UTLP) course	TQOD, CCC				X		Not applicable to UMBI students.

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.							
(a)	(b)	(c)	(d)			(e)	
Objective	Activity	MSP Key Feature	Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	New activity substituted
5.2 Increase the number of participating undergraduate students who consider science teaching as a career	Career exploration summer seminar	TQOD		X			Activity (one seminar for REUs) rescheduled for Summer 2005

6) University of Maryland – College Park (UMCP)
Exhibit 1 f: IMPLEMENTATION MATRIX FOR UMCP

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.

Objective	Activity	MSP Key Feature	Progress to date (check <u>one</u>)				Brief explanation for changes where an activity has not been carried out as planned
			Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	
3.1 Increase the number of faculty participants who use inquiry instruction in science	Continue conversations with identified Earth and Space Science Systems (ESSS) faculty members to solicit their help in achieving goal 3.1	TQQD, CCC	X				
	Develop an electronic data base of interested ESSS faculty for dissemination of information about VIPK16.	TQQD, CCC, ICS		X			Target year has been revised to year 4.
	Identify 3-4 faculty teams for the development of inquiry-based instruction (IBI) for biology laboratory exercises	TQQD, CCC			X		Activity has been revised to include faculty in all sciences appropriate to the grant objectives

	Continue conversations with Chem-REACT leadership on campus	PD, TQQD, CCC, ICS	X				
	Develop connection between IHE and HS physics teachers	PD, TQQD, CCC, ICS		X		Activity initiated, to be continued in year 04	
	Develop 3-4 IIB laboratory exercises for lower level science courses in biology	CCC		X		Activity has been revised to include faculty in all sciences appropriate to the grant objectives	
	Support the chemistry REACTS initiative on campus	PD, TQQD, CCC, ICS	X				
	Work with UMCP ESSS faculty to explore the possibility of integration of new IBI exercises into lower level ESSS courses	TQQD, CCC, ICS		X			
	Develop and hold a workshop on inquiry based instruction	TQQD, CCC		X		Staffing and timing did not support success, postponed to year 04	
	Develop 3-4 IIB laboratory exercises for lower level science courses in biology	CCC		X		Activity has been revised to include faculty in all sciences appropriate to the grant objectives	
	Develop connection between IHE and HS physics teachers	PD, TQQD, CCC			X	Activity initiated, to be continued in year 04. See "Highlights" section of Activities and Findings narrative.	

3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers	Support the chemistry REACTS initiative on campus	PD, TQQD, CCC, ICS	X		
	Develop connection between IHE and HS physics teachers	PD, TQQD, CCC			Activity initiated, to be continued in year 04. See "Highlights" section of narrative.

Goal 4: Increase and improve inquiry, teaching practices by participating science graduate students.

(a)	(b)	(c)	Progress to date (check <u>one</u>)				(e)
Objective	Activity	MSP Key Feature	Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated	New activity substituted
4.1 Increase the number of participating graduate students who use inquiry instruction in science	Identified graduate students who will become members of the faculty teams for the development of a inquiry-based instruction (IBI) for biology laboratory exercises	TQOD, CCC		X			Activity has been revised to include graduate students in all sciences appropriate to the grant objectives
4.2 Increase	Develop an electronic data base of STEM graduate students and disseminate information about VIPK16 opportunities	TQOD, CCC, ICS		X			Moved to year four, to include all STEM disciplines
	Develop and hold a workshop on inquiry based instruction	TQOD, CCC		X			Staffing and timing did not support success, postponed to year 04

<p>exposure of participating graduate students to teaching in the sciences and perspectives on faculty careers both in the K-12 and higher education sectors to encourage them to enter teaching</p>	<p>Develop an electronic data base of STEM graduate students and disseminate information about VIPK16 opportunities</p>	<p>PD, TQQD, CCC, ICS</p> <p>X</p>	<p>Moved to year four, to include all STEM disciplines</p>
		<p>X</p>	<p>New activity added. Course developed and taught Spring 05.</p>
	<p>Develop graduate course on university teaching for STEM graduate students</p>	<p>TQQD, CCC, EBDO, ICS</p>	
	<p>Coordinate and direct information specifically to STEM graduate students regarding the Center for Teaching Excellence programs on teaching and learning and portfolios.</p>	<p>TQQD, CCC, EBDO, ICS</p> <p>X</p>	
	<p>4.3 Create or build upon existing graduate teaching portfolios to demonstrate knowledge, skills, and competencies gained through involvement in the project, including research on teaching and learning</p>	<p>Hold a workshop on teaching portfolios, and specifically target STEM graduate students</p>	<p>TQQD, CCC, EBDO, ICS</p> <p>X</p>

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.						
(a)	(b)	(c)	Progress to date (check <u>one</u>)			(e)
Objective	Activity	MSP Key Feature	Activity carried out as planned	Activity delayed	Activity revised	Activity eliminated New activity substituted
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching	Continue to partner with the Colleges in their presentations of sessions on careers in K12 teaching	PD, TQQD	X			Brief explanation for changes where an activity has not been carried out as planned
	Support Colleges in their efforts to connect undergraduates with HS teachers	PD, TQQD	X			
	UMCP UG student internships with MCPS HS science teachers	PD, TQQD, CCC, ICS	X			New connection activity, an expansion of an activity initiated in Year 2.
5.2 Increase the number of participating	Support Colleges in their efforts to connect undergraduates with HS teachers	PD, TQQD	X			

undergraduate students who consider science teaching as a career	Continue to partner with the Colleges in their presentations of sessions on careers in K12 teaching	PD, TQQD	X		
	Explore whether the various science based living-learning programs can be adapted to integrate service-learning with area HS teachers as part of the curriculum.	PD, TQQD, CCC, EBDO, ICS	X		
UMCP UG student internships with MCPS HS science teachers	UMCP UG student internships with MCPS HS science teachers	PD, TQQD, CCC, ICS	X	X	
Support Colleges in their efforts to connect undergraduates with HS teachers	Support Colleges in their efforts to connect undergraduates with HS teachers	PD, TQQD	X		
5.3 Increase the number of participating undergraduate students who enter teaching careers in MCPS	Continue to partner with the Colleges in their presentations of sessions on careers in K12 teaching	PD, TQQD	X		

Explore whether the various science based living-learning programs can be adapted to integrate service-learning with area HS teachers as part of the curriculum.	PD, TQOD, CCC, EBDO, ICS	X	
UMCP UG student internships with MCPS HS science teachers	PD, TQOD, CCC, ICS	X	New connection activity, an expansion of an activity initiated in Year 2

C) Outcomes and Benchmarks

Outcomes and benchmarks for Year 3 are detailed in Exhibits 2a-2f and in the associated narrative below.

1) Montgomery County Public Schools (MCPS)

Exhibit 2 a: GOAL MATRIX FOR MCPS

Goal 1: Improve student learning outcomes, as measured by High School Assessments.

Objective	(a) Benchmark	(b)	(c) Level of attainment (check <u>one</u>)			(d) Brief explanation for changes, new benchmarks, and target dates
			Benchmark met	Benchmark not met	Target year has been revised	
1.1 Participate in inquiry activities in the classroom	Benchmark 1a: Participate in one guided inquiry activity during each unit of instruction (biology)		X			It is impossible to determine the extent to which teachers are using inquiry activities from the MCPS curriculum guides for biology. Only 41 biology teachers reported, via the project web site, using at least one inquiry activity during both semesters. See comments about web site usage in the Evaluator's Report.
1.2 Improve percentage of correct responses to HSA type selected response	Benchmark 2a: 65% of students respond correctly to items measuring science process skills (Biology)	X ¹				¹ 66% Semester A Biology 80% Semester A Honors Biology See Table 18 in Evaluator's Report. This table also shows baseline data for MCPS Field Tests in other science content areas.

items measuring science process skills	Benchmark 2b: 75% pass rate on Biology H.S.A.	X		73.8% pass rate for all students See Table 17 in Evaluator's Report
	Benchmark 2c: 80% pass rate for MCPS Semester exams.	X		See Table 19 in Evaluator's Report for total and disaggregated data for biology. See Table 20 in Evaluator's Report for Field Test data for other science disciplines.
	Benchmark 2d: close gap between highest and lowest performing schools by 5%	X		Disaggregated data for semester A exams is unavailable at this time.
1.3 Improve percentage of correct responses to HSA type selected response items measuring science concepts	Benchmark 3a: 65% of students respond correctly to items measuring science concepts (Biology)	X ²		257% Biology 76% Honors Biology
	See other related benchmarks in 1.2			See Table 18 in Evaluator's Report. This table also shows baseline data for MCPS Field Tests in other science content areas.
1.4 Improve student skills in reading science literature	Benchmark 4a: 60% of biology students respond correctly to items associated with technical science passages	X		71% Biology 75% Honors Biology Note that the Biology Honors exam contains two science passages and three additional items. See Table 18 in Evaluator's Report. This table also shows baseline data for MCPS Field Tests in other science content areas.

1.5 Improve student writing skills in science	Benchmark 5a: student average score on BCR items will increase to 2.0	X ³	³ Semester B 2004 Biology: 2.09 (Process item); 1.95 (Concept items) Honors Biology: 2.90 (Process item); 2.94 (Concept items) Item analysis was done on student written responses for assessment items in other science disciplines.
1.6 Increase student participation in advanced science courses	Benchmark 6a: participation in all advanced MCPS science courses will increase by 2%	X	2.3% increase for all advanced science courses See Table 24 in Evaluator's Report
	Benchmark 6b: participation in AP courses will increase by 2%	X	5.8% increase in AP participation See Table 24 in Evaluator's Report

Goal 2: Improve teacher content knowledge in the sciences by providing high quality professional development to in-service high school teachers.

(a)	(b)	(c)	(d)
Objective	Benchmark	Level of attainment (check <u>one</u>)	Brief explanation for changes, new benchmarks, and target dates
2.1 Increase the number of inquiry activities in instruction	Benchmark 1a: Implement 80%* of the Inquiry Activities within MCPS biology curriculum guides during each unit of instruction. *Year 2 = 80%, Year 3 = 85%, Years 4&5 = 90%	X	It is impossible to determine the extent to which teachers are using inquiry activities from the MCPS curriculum guides for biology because of incomplete reporting on the project web site. See comments about web site usage in the Evaluator's Report.
2.2 Increase the number of teachers using strategies to promote reading in science	Benchmark 2a: Utilize 3 science passages during instruction	X	It is impossible to determine the extent to which teachers are using science passages during instruction because of incomplete reporting on the project web site. Only 16 of 41 teachers reported using science passages. See comments about web site usage in the Evaluator's Report.
2.3 Increase the number of teachers using	Benchmark 3a: Utilize 2 BCR items during instruction. Revised Benchmark	X	It is impossible to determine the extent to which teachers are using strategies to promote writing, e.g. using BCR items, during instruction because of incomplete reporting on the project web site. Only 22

strategies to promote writing in science	3a: Year 2: Utilize 8 BCR Year 3: Utilize 9 BCR Year 4-5: 10 BCR		of 41 teachers reported using science passages. However, those reporting used multiple BCR items, with one teacher using one for every unit.
2.4 Conduct action research	Benchmark 4a: 50% of teachers in biology cohort will conduct action research	X	It is impossible to determine the extent to which teachers are conducting practitioner research because of incomplete reporting on the project web site. Twenty-one biology teachers “published” their practitioner research. However, some teachers worked in school teams (Whitman HS - 6, Department of Alternative Programs – 3). One teacher published two separate studies. 73 additional teachers began reports of their practitioner research projects on the website, but did not complete them.
2.5 Implement curriculum guides and assessments into instruction	Benchmark 5a: biology teachers will implement 80%* of the unit assessments within MCPS curriculum guides. Year 3 = 80% Years 4-5 = 90%	X	It is impossible to determine the extent to which teachers are implementing unit assessments because of incomplete reporting on the project web site. Twelve teachers reported using at least one unit assessment from the MCPS curriculum guides.
2.6 Utilize “Tuning Protocol” to steer instruction	Benchmark 6a: 50% of teachers will utilize the tuning protocol	X	85 biology teachers (60%) used the Tuning Protocol to analyze student work during the April, 2005 Cohort Conference. Two schools, ten teachers, reported using it during a seminar. These may be the same teachers included in the conference count.

2) Montgomery College (MC)

There were three important outcomes from the activities of the year at Montgomery College. First, we saw the development of a core professional learning community, a group of a dozen faculty from several disciplines and different campuses, who have agreed to meet on a regular basis to encourage each other in the use of inquiry in science teaching. Second, the project team has recruited (at least) four new faculty fellows from biology and chemistry who will work on specific course enhancements and development. Finally, there was the recognition of the value of having a former high school science teacher available to serve as a resource to faculty with content expertise but minimal pedagogical training. The MC site leaders, Debra Poese and William Krayer, have submitted a proposal to the NSTA for a presentation at the 2006 Annual Convention on this program feature and how it might be adapted.

One interesting trend was noted in reviewing pre- and post-surveys of faculty regarding their self-assessment of their teaching practices. (Only nine faculty have both pre- and post-, so the conclusions are merely general observations, not statistical results.) In particular, this observation refers to faculty who initially saw themselves as high-level users of inquiry methods. When these faculty attended workshops or had private professional development sessions around this topic, it was sometimes the case that the faculty actually lowered their self-assessments on the post survey, indicating that their understandings of what comprised inquiry teaching had changed, and they now saw the need for further development (i.e., "preaching to the choir" can still yield higher quality music!).

Exhibit 2 b: GOAL MATRIX FOR MONTGOMERY COLLEGE

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.

(a)	(b)	(c)	(d)			
Objective	Benchmark	Level of attainment (check one)			Brief explanation for changes, new benchmarks, and target dates	
		Benchmark not met	Target year has been revised	Benchmark has been revised	No longer a project benchmark	
	Fellow has participated in grant activities.	X				

number of faculty participants who use inquiry instruction in science	Three participants identified for each cohort.		X		Four participants identified for Biology cohort; two participants for chemistry, two for physics/geosciences.
	Colloquium held with minimum of twenty participants.		X		Decision made to revise colloquium concept to ongoing focus group meetings. First focus group meeting held 5/12/05 with twelve participants.
	At least one course has new activity integrated into syllabi for all sections.		X		Moved to 2005-2006 AY.
	3.2 Increase the number of inquiry activities used by faculty participants in science instruction	Each faculty participant has implemented at least one new inquiry activity. At least 50% of workshop participants report using one new inquiry activity.	X		Some faculty participants have done so. Insufficient return data to establish this benchmark. Some workshop participants report using new inquiry activity.
3.3 Improve participating faculty's understanding of inquiry teaching practices	Each faculty participant has implemented at least one new inquiry activity. At least one fellow or faculty participant attends a seminar each month. At least 50% of colloquium participants report increased understanding of inquiry teaching practices. At least three faculty attend the summer institute.		X		Six of the twelve faculty participants working directly with project director have implemented at least one new inquiry activity. Format of monthly seminars has changed. Colloquia not held; will be replaced with focus groups/workshops.

	At least 75% of workshop participants report increased understanding of inquiry teaching practices.	X		
	Fellow attends at least three cohort conferences.			Had participants at two cohort conferences.
	At least one fellow or faculty participant attends a seminar each month.	X		
	At least three faculty attend the Summer Institute.			Seminar format has been changed this year of the grant.
3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers		X		

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

Objective	(a)	(b)	Level of attainment (check <u>one</u>)			Brief explanation for changes, new benchmarks, and target dates
	Benchmark	Benchmark not met	Target year has been revised	Benchmark has been revised	No longer a project benchmark	
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching	Course approved by Spring 05; to be offered in next academic year. At least five students are recruited and complete at least one observation.	X				Moved to next year of grant, will implement with rollout of AAT programs for chemistry, physics and math.
5.2 Increase the number of participating undergraduate students who consider science teaching as a career	At least five students are recruited and complete at least one observation.		X			See above.
5.3 Increase the number of participating undergraduate students who enter teaching careers	At least five students are recruited and complete at least one observation.		X			See above.

in MCPS

3) Towson University (TU)

Exhibit 2 c: GOAL MATRIX FOR TOWSON UNIVERSITY

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.

(a)	(b)	(c)	(d)
Objective	Benchmark	Level of attainment (check <u>one</u>)	Brief explanation for changes, new benchmarks, and target dates
3.1 Increase the number of faculty participants who use inquiry instruction in science	An inquiry-based biology course will be taught in the Spring 2005	X	Dr. Sarah Bruce taught “Inquiry-based General Biology for non-science majors based on contemporary issues”. Inquiry-based activities are infrequent in lecture, with the exception of group-solving and think-pair-share activities. Laboratory exercises are mostly inquiry based. Drs. Sarah Bruce and Carol Berkower plan to create a lab manual in academic year 2006-2006.
	All chemistry faculty involved will design inquiry activities in existing courses or develop new courses that are inquiry-based	X	Dr. Boucher taught CHEM 111, General Chemistry II using six guided- inquiry experiments in the laboratory (this represents 70% of the lab. Four were 2-week experiments and two were 1-week experiments. All inquiry-based experiments were developed by Drs. Boucher and Ryzhkov. A few inquiry-based activities are used in class. Course evaluations are being analyzed by Westat.

	All geosciences faculty involved will design inquiry activities in existing courses or develop new courses that are inquiry-based	X	Inquiry-based activities are being used during class by Drs. Rachel Burks and Steven Lev. Course evaluations are being analyzed by Westat.
3.2 Increase the number of inquiry activities used by faculty participants in science instruction	At least one laboratory in biology will be redesigned for inquiry, taught and evaluated.	X	All but 2 of 14 introductory biology labs taught by Dr. Bruce in "Inquiry-based General Biology for non-science majors based on contemporary issues" are inquiry-based. Course evaluations are being analyzed by Westat.
	At least one laboratory in chemistry will be redesigned for inquiry, taught and evaluated.	X	Two of the guided-inquiry experiments were specifically developed on the VIP project: "What are the Characteristics of Solutions of Acids and Base" and "What Factors Influence the Rate of a Chemical Reaction." Course evaluations are being analyzed by Westat.
	At least one laboratory in physics will be redesigned for inquiry, taught and evaluated.	X	Physical Science for Teachers, PHSC 511 developed by Cody Sandifer and Leon Ukens is a physics content course for science teachers. The whole course is built around physical science concepts that are developed mostly (>90%) via guided inquiry. Course evaluations are being analyzed by Westat.
	At least one laboratory in geology will be redesigned for inquiry, taught and evaluated.	X	Drs. Burks and Lev taught three sections of Physical Geology (GEOL 121) in the spring semester. The course does not have a laboratory. Therefore, no inquiry-based laboratories were developed. Instead, seven inquiry-based activities were created for lecture and one field trip was completely modified to make it inquiry-based. Course evaluations are being analyzed by Westat.

3.3 Improve participating faculty's understanding of inquiry teaching practices	Faculty take Inquiry Teaching Survey a second time (first time was when they joined or when survey was created).	X		Data are being analyzed by Westat.
	Student version of Inquiry Teaching Survey given to students in revised classes.	X		Data are being analyzed by Westat.
	"Inquiry statements" written by faculty.	X		Data are being analyzed by Westat.
3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers	Faculty fellows participate in 7-9 face-to-face or online learning community meetings per academic year (with K-12 teachers)		X	Several faculty have interacted with teachers at conferences and all of them will at Summer Institute (several times), but 7-9 meetings/year/fellow is not realistic. Faculty want more communication with the teachers, but distance and schedule logistics interfere. Revised goal is at least 3 meetings for each fellow with an average of 5 or more for the entire group.
	Faculty attend at least one cohort conference or Summer Institute	X		One faculty member has attended four cohort meetings. Five fellows have attended three, three have attended two meetings, and four have not been able to attend because of teaching obligations. 10-12 are expected at Summer Institute.
	Faculty attend at least 5 working seminars with high school teachers		X	Attendance less than planned because of scheduling conflicts. Lowering expectations in favor of Summer Institute participation.

	Some faculty attend at least one conference organizing meeting	X		Lev Ryzhkov participated on the External Advisory Board meeting and the director has participated in several conference planning meetings.
3.5 Develop cadre of college and university science leaders (“Maryland Science Faculty”) to provide institutional and statewide leadership in undergraduate science education reform	At least one faculty member becomes a facilitator of a K-16 faculty learning community	X		Eight Towson fellows are leading sessions on scientific inquiry for teachers at the Summer Institute.
				Leon Utkens, Larry Boucher, Rachel Burks, Cody Sandifer, Sarah Haines, Sarah Bruce and Luz Mangurian have college-wide recognition for curricular reform. Sarah Haines has been appointed Director for Center for Science and Mathematics Education at our college.

Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.

Objective	Benchmark	Level of attainment (check <u>one</u>)			Brief explanation for changes, new benchmarks, and target dates
		Benchmark met	Benchmark not met	Target year has been revised	
4.1 Increase the number of participating graduate students who use inquiry instruction in science	Our graduate student will teach a science course using inquiry	X			Giovanni Vincenti has finished teaching his first class.
4.2 Increase exposure of participating	Student participates in Cohort conferences		X		Incompatible with student's schedule.

graduate students to teaching in the sciences and perspectives on faculty careers both in the K-12 and higher education sectors to encourage them to enter teaching	Student participates in Summer Institute X	Giovanni Vincenti has prepared a teaching portfolio.
4.3 Create or build upon existing graduate teaching portfolios to demonstrate knowledge, skills, and competencies gained through involvement in the project, including research on teaching and learning	Our graduate student will work with the director to complete a teaching portfolio X	

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

(a)	(b)	(c)	(d)
Objective	Benchmark	Level of attainment (check <u>one</u>)	Brief explanation for changes, new benchmarks, and target dates
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching	At least 2 students recruited Students participate in Summer Institute	<input checked="" type="checkbox"/> Benchmark met <input checked="" type="checkbox"/> Benchmark not met	Target year has been revised Benchmark has been revised
5.2 Increase the number of participating undergraduate students who consider science	Have one student start a teaching position	<input checked="" type="checkbox"/>	Loretta Kitchner, our Year 1 undergraduate has a position as a high school biology teacher in Ann Arundel county.

teaching as a career		
5.3 Increase the number of participating undergraduate students who enter teaching careers in MCPS	At least one of our students starts a teaching career at MCPS	X

4) University of Maryland – Baltimore County (UMBC)
Exhibit 2 d: GOAL MATRIX FOR UMBC

Objective	Benchmark	Level of attainment (check <u>one</u>)				Brief explanation for changes, new benchmarks, and target dates
		Benchmark met	Benchmark not met	Target year has been revised	Benchmark has been revised	
3.1 Increase the number of faculty participants who use inquiry instruction in science	Teach and evaluate 3 (2 in Fall 04 and 1 in Spring 05) First Year Seminars in Science and Mathematics.			X		Target date is Year Four.
	Recruit 2 earth space science faculty fellows and appoint 1-2 new members to the UMBC VIP Coordinating Council.			X		Target date is Year Four.
3.2 Increase the number of inquiry activities used by faculty participants in science	Teach and evaluate 3 (2 in Fall 04 and 1 in Spring 05) First Year Seminars in Science and Mathematics.			X		Target date is Year Four.

instruction				
3.3 Improve participating faculty's understanding of inquiry teaching practices	Teach 2 First Year Seminars and complete first phases of ongoing evaluation.	X	The newly revised activity is workshops instead of evaluations. The target date is Year Four.	
3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers	Each faculty fellow attends at least one event. Teach and evaluate 3 (2 in Fall 04 and 1 in Spring 05) First Year Seminars in Science and Mathematics. 3 faculty recruited to lead seminars. 15-20 teachers enrolled.	X X X	Target date is Year Four. Planning meeting was held 5.25.05 between UMBC and MCPS to discuss potential faculty & K-12 collaborative relationships for Fall 2005.	X

Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.

Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.

Objective	(a)	(b)	(c)	(d)
	Benchmark		Level of attainment (check <u>one</u>)	Brief explanation for changes, new benchmarks, and target dates
4.1 Increase the number of participating graduate students who use inquiry instruction in science	Evaluate 3-5 inquiry sections of electronic portfolios.	Benchmark met	Benchmark not met	Target year has been revised
4.2 Increase exposure of participating graduate students to teaching in the sciences and perspectives on faculty careers both in the K-12 and higher education sectors to encourage them to enter	Awarding 3-5 tuition scholarship stipends.		Benchmark has been revised	No longer a project benchmark

		X
teaching	4.3 Create or build upon existing graduate teaching portfolios to demonstrate knowledge, skills, and competencies gained through involvement in the project, including research on teaching and learning	Evaluate 3-5 inquiry sections of electronic portfolios using teaching portfolio review process developed Years 1 and 2.

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

(a)	(b)	(c)	(d)			
Objective	Benchmark	Level of attainment (check <u>one</u>)			Brief explanation for changes, new benchmarks, and target dates	
		Benchmark met	Benchmark not met	Target year has been revised	Benchmark has been revised	No longer a project benchmark
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching	Evaluation of 5-10 completed assignments Analysis of surveys from 1 study group				X	
5.2 Increase the number of	Evaluation of 5-10 completed assignments				X	Target date is Year Four in Fall 2005 and Spring 2006. Evaluation for the First Year Seminars being held in Year Three will be at the end of Year Four.

participating undergraduate students who consider science teaching as a career	Analysis of surveys from 1 study group	X
5.3 Increase the number of participating undergraduate students who enter teaching careers in MCPS	Evaluation of 5-10 completed assignments	X
	Analysis of surveys from 1 study group	X

5) University of Maryland Biotechnology Institute (UMBI)
Exhibit 2 e: GOAL MATRIX FOR UMBI

Goal 2: Improve teacher content knowledge in the sciences by providing high quality professional development to in-service high school teachers.

Objective	Benchmark	Level of attainment (check <u>one</u>)				Brief explanation for changes, new benchmarks, and target dates
		Benchmark met	Benchmark not met	Target year has been revised	Benchmark has been revised	
2.1 Increase the number of inquiry activities in instruction	Improvement in teacher understanding of inquiry	X			X	Post-program survey indicated a small improvement in understanding of inquiry and inquiry teaching by most summer program participants; three of the four teachers who were members of the year-long professional learning community demonstrated incremental improvements in understanding. Year 4 benchmarks will include evaluation through curriculum development projects and implementation of these projects in the classroom.
	Improvement in teacher implementation of inquiry					Case study with single teacher from professional learning community. More classroom observations/videotapes are needed to improve assessment of this benchmark; will increase number of observations and meetings with teachers for coming year.

2.4 Conduct action research	Improvement in teacher self-efficacy in metacognitive processing	X		Assessed among teacher professional learning community members. For this self-selected population, reflection on student thinking seems to improve teacher awareness of student thinking.
	Improvement in teacher ability to conduct action /practitioner research	X		Year 3 professional learning community meetings were student-centered and largely facilitator-led. Teacher-led sessions are a goal for Year 4.
	Increase in use of tuning protocol by MCPS teachers	X	X	Use of Tuning Protocol not addressed in this year's learning community. Although we can encourage the use of this protocol, we cannot dictate its use as per best practices for professional learning communities.
2.6 Utilize "Tuning Protocol" to steer instruction				

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.

(a)	(b)	(c)	(d)
Objective	Benchmark	Level of attainment (check <u>one</u>)	Brief explanation for changes, new benchmarks, and target dates
3.1 Increase the number of faculty participants who use inquiry instruction in science	Survey shows increase in number of faculty using inquiry	<input checked="" type="checkbox"/> Benchmark met <input type="checkbox"/> Benchmark not met	Survey to be completed in Year 4. Target year has been revised Benchmark has been revised No longer a project benchmark
3.2 Increase the number of inquiry activities used by faculty participants in science instruction	Survey shows increase in the number of inquiry activities used by faculty	<input checked="" type="checkbox"/>	Survey to be completed in Year 4.
3.3 Improve participating faculty's understanding of inquiry teaching	Increase in number of faculty actively participating in regular dialogue about teaching and learning	<input checked="" type="checkbox"/>	Three faculty have participated in projects to develop teacher understanding of scientific inquiry and of undergraduate curriculum that incorporates research experiences as early as possible in the curriculum and inquiry teaching and learning in course design.

practices			
3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers	Increase in number of interactions between faculty and MCPS teachers	X	Prior to EXPERT, UMBI COMB faculty recruited teachers primarily from the Baltimore area. This is a first extensive collaboration with MCPS.

Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.

(a)	(b)	(c)	(d)
Objective	Benchmark	Level of attainment (check <u>one</u>)	Brief explanation for changes, new benchmarks, and target dates
4.2 Increase exposure of participating graduate students to teaching careers in the sciences and perspectives on faculty careers both in the K-12 and higher education sectors to encourage them to enter teaching	Benchmark met	Benchmark not met	Target year has been revised Benchmark has been revised No longer a project benchmark

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

(a)	(b)	(c)	(d)
Objective	Benchmark	Level of attainment (check <u>one</u>)	Brief explanation for changes, new benchmarks, and target dates
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching	Career exploration summer seminar series Teaching and classroom observation opportunities for undergraduate, graduate, postdoctoral students and research staff	<input checked="" type="checkbox"/> Benchmark met <input checked="" type="checkbox"/> Benchmark not met <input checked="" type="checkbox"/> Target year has been revised <input checked="" type="checkbox"/> Benchmark has been revised <input checked="" type="checkbox"/> No longer a project benchmark	Moved to Year 4; single seminar for REUs in Summer 2005 Not applicable to our summer REUs as no classrooms are available for observation in the summer

6) University of Maryland – College Park (UMCP)
Exhibit 2 f: GOAL MATRIX FOR UMCP

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.

Objective	Benchmark	Level of attainment (check <u>one</u>)			Brief explanation for changes, new benchmarks, and target dates
		Benchmark met	Benchmark not met	Target year has been revised	
3.1 Increase the number of faculty participants who use inquiry instruction in science	Have developed an action plan	X			
	Have electronic list operational			X	Benchmark has been revised to include faculty in all sciences appropriate to the grant objectives
	Have 2-4 new IBI laboratory exercises written for Fall semester 2005			X	Due to faculty recruitment challenges year as been revised to year 04.
	The 2005 REACTS conference occurred	X			
	Have 2-4 new IBI laboratory exercises written for Fall semester 2005			X	Due to faculty recruitment challenges year as been revised to year 04.
3.2 Increase the number of inquiry activities used by faculty participants in science instruction	The 2005 REACTS conference occurs	X			
	Have identified specific courses and developed action plan	X			

<p>3.3 Improve participating faculty's understanding of inquiry teaching practices</p>	<p>At least 6 faculty attend workshop on inquiry teaching Have 2-4 new IBI laboratory exercises written for Fall semester 2005</p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>Due to staffing limitation workshop was not held, moved to target year 04. Due to faculty recruitment challenges year as been revised to year 04.</p>
<p>3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers</p>	<p>At least 4 faculty attend REACTS Conference</p>				<input type="checkbox"/>	

Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.

Objective	(a)	(b)	Level of attainment (check <u>one</u>)				(d) Brief explanation for changes, new benchmarks, and target dates
			Benchmark met	Benchmark not met	Target year has been revised	Benchmark has been revised	
4.1 Increase the number of participating graduate students who use inquiry instruction in science	Have 2-4 new IBI laboratory exercises written for Fall semester 2005 Listserv is established and functional			X			Due to faculty recruitment challenges year as been revised to year 04.
4.2 Increase	At least 4 STEM graduates students attend the workshop				X		Benchmark has been revised to include graduate students in all sciences appropriate to the grant objectives Due to staffing limitation workshop was not held, moved to target year 04

exposure of participating graduate students to teaching in the sciences and perspectives on faculty careers both in the K-12 and higher education sectors to encourage them to enter teaching	Listserv is established and functional X				Benchmark has been revised to include graduate students in all sciences appropriate to the grant objectives
4.3 Create or build upon existing graduate teaching portfolios to demonstrate knowledge, skills, and competencies gained through involvement in the project, including research on teaching and learning	At least 3 graduate students contact CTE seeking information At least 3 graduate students attend portfolio workshop X				

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

(a)	(b)	(c)	(d)
Objective	Benchmark	Level of attainment (check <u>one</u>)	Brief explanation for changes, new benchmarks, and target dates
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching	<p>The number of undergraduates working with area HS science teacher increases to at least 4</p> <p>Have supported at least one undergraduate career session on K12 teaching; at least 6 undergraduates attend</p> <p>Have one or more of the service learning programs integrate this options as part of the programs curriculum.</p>	<p>Benchmark met</p> <p>Benchmark not met</p> <p>Target year has been revised</p> <p>Benchmark has been revised</p>	<p>No longer a project benchmark</p>
5.2 Increase the number of participating	<p>The number of undergraduates working with area HS science teacher increases.</p>	<p>X</p> <p>X</p> <p>X</p>	<p>Discussion of this option with various living-learning communities is continuing</p>

undergraduate students who consider teaching as a career	Have supported at least one undergraduate career session on K12 teaching	X			
	Have one or more of the service learning programs integrate this options as part of the programs curriculum.		X		

D) Highlights and Lessons Learned

1) Student Inquiry Conference

The first High School Student Inquiry Conference was held in April 2005. Seventy-five students from five MCPS high schools participated in the one-day conference. Students presented their inquiry projects to their peers and their teachers using PowerPoint software and posters. Dr. Carey Liss, a scientist and former MCPS student, presented the keynote address featuring his work on NASA's Deep Impact Project. All students were recognized for their projects with a certificate of accomplishment. The conference was planned and facilitated by VIP K-16 Master Science Teachers from the five participating schools as well as MCPS grant staff.

2) IHE Partners' Monthly Meetings

Because our IHE partners were lagging behind MCPS in the first two years of the grant, we decided to have special monthly meetings just for each campus's project directors and primary faculty fellows. Through these meetings, the IHE leaders are able to share ideas and experiences with each other on a regular basis. Joint activities and tools have been envisioned and implemented, such as our revised version of the Inquiry Teaching Survey (which is now online and includes a version for faculty's students). We regularly talk through each campus's specific activities, learning from each other's successes and failures and adjusting our implementation (and expectations) accordingly. The result is a team that has gelled and that we expect will continue to work well together.

One lesson we have learned well because of these monthly meetings is something that is true for all of our IHE partners: the development of learner-centered, inquiry-based science teaching must come from the faculty themselves, and not from the top down. This is one reason that UMBC changed its plans to have "Great Ideas in Science" seminars at Shady Grove because they were too top-down - faculty would be giving talks to HS teachers. At the same time, it is clear that unless tenure/promotion/evaluation/reward systems at many institutions are changed to value quality teaching and support its development, it will remain difficult to encourage faculty to commit the time and research needed to develop truly high quality curricula.

3) Physics Teacher Discussion Group

One idea that was developed in the IHE Partner meetings described above was to create a group of teachers from MCPS high schools and from IHE's that would meet regularly to talk about issues of teaching and learning. The motivation was our project's clear challenge to find ways to partner K-12 and IHE teachers so that they would learn from each other about better ways to teach science. Since the physics cohort hadn't come online yet, and because we had connections with physics educators at UMCP, we decided to try a pilot group of 8-10 physics teachers and see how it went. After a few very difficult months of recruiting participants and trying to get them together for an initial meeting, we decided to postpone the group until the Fall semester.

We learned two important lessons from this attempted activity. First, you can't start something with faculty and teachers in the middle of a semester; they already are too busy (or feel too busy) to commit to a new project. This is why we had to delay the start of our internship program for undergraduates at UMBC as well.

Second, you can't use "edu-speak" with science faculty. Our initial solicitation was geared toward helping faculty figure out ways to implement inquiry in their classrooms. One physics faculty member told us later that his colleagues probably saw the solicitation and thought, "Inquiry is in the name of that one class for preservice teachers – it doesn't have anything to do with me!" We eventually got some interest by drastically modifying our solicitation to refer only to more commonly understood terms like "teaching."

Section 2: Management report

One of our partners, the University of Maryland – Baltimore County (UMBC), has changed its leadership team. is no longer project director, but has been replaced (as of April 2005) by Michele Wolff and Mark Terranova. They are Director and Associate Director, respectively, of the Shriver Center at UMBC, a quasi-department that focuses on faculty development and service learning.

At another partner institution, Montgomery College, project director Bill Krayer has been working with us since the end of summer 2004.

Section 3: Financial report

The financial report, including budget spreadsheets and justification for changes and carryover spending, is being sent by our AOR.

Section 4: Evaluator's report and project response

The Evaluator's Report, completed by our external evaluator, Joy Frechtling of Westat, is also attached via Fastlane.

Here is our project's response to the report.

As we have been in continuous contact with the evaluator, the contents of the report are not new to us. In fact, on the MCPS side (Goals 1-3), we have been collaborating closely with Westat on all aspects of evaluation design, data collection, and analysis, to the extent that the evaluator's report in many ways reflects a joint report by the evaluator and by the project leadership.

Since the evaluation began with the public school component, those elements are more complete than the more recently initiated higher education component of the evaluation report, although both have seen a significant increase. The emphasis on MCPS evaluation can be seen in the evaluator's report, and can be explained by three factors.

First, MCPS is a single school system, with existing mechanisms for collecting many of the kinds of data required for our evaluation efforts. The activities of our five IHE's are each aimed at different sets of objectives. All require individually tailored evaluation plans and data collection mechanisms, which are currently under development.

A second and related factor in the evaluation of the project is that Westat has been able to draw on its prior experience with K-12 school systems. Developing the evaluation elements for higher education poses new challenges. The questions of what data to collect and how to analyze them were already known for MCPS's goals, but not for the IHE goals – and all partners agreed that what was relevant for one partner was not necessarily the same for different kinds of schools or institutions. Nevertheless, Joy

Frechtling was able to help the project partners place needed attention on our IHE goals, and to focus on evaluating a few objectives that emerged as the most important in our current stage of implementation. As a result, we feel that Dr. Frechtling and her colleagues have learned a great deal about higher education in the last year, and about USM institutions in particular.

Third, a large part of the development of the higher education component of the evaluation has included IHE partners in decisions about what questions to ask, what data to collect, how to analyze it. This development process is more time consuming than the more straightforward evaluation of public school components. Westat has been able to draw on their broad experience in education research in K-12, which expedited the development of that part of the plan. As Westat has drawn our attention to the IHE goals, we have implemented monthly IHE partner meetings (see Section 1). Because our higher education leadership team is not uniformly experienced with educational research and evaluation, Westat continues to guide us through the evaluation process by participating in our higher education steering committee meetings, and making recommendations for specific types of data collection activities. We anticipate that Westat will provide more of that type of guidance, and in the process, will gain a deeper appreciation of the different characteristics, limitations, and opportunities for data collection and analysis in assessing VIP Project's effect on change and sustainability in higher education.

Section 5: Implementation Plan for Year 4

In Year 4 we begin the Physics and Chemistry cohort of MCPS teachers, and we cease regular contact with the Biology cohort. This situation creates some challenges for us. In particular, we will have even more science disciplines represented among the high school teachers (Physics, Chemistry, Earth/Space Systems, and Matter & Energy). Fortunately, there is much overlap in the content areas covered by these courses. Also, the Biology cohort may be ending, but we are already exploring ways to keep Biology teachers involved in the project, some of which involve continued use of the project website.

Activity led by our IHE partners will move into higher gear. The activities that are now taking place will continue, and others will begin soon (including our second attempt at the physics teacher discussion group and the UMBC undergraduate internships).

In addition, we plan to hold a retreat in Fall 2005 for MST's, fellows, and project staff. This will largely serve as a mid-grant opportunity to regroup as a team and discuss our vision for the last two years of the grant and beyond. It will also provide an important opportunity to integrate the many new MST's and faculty fellows into the leadership of the project. Part of the retreat will be spent planning new projects that will expand on our current efforts to involve teachers and faculty in meaningful partnerships; some of these new projects may begin implementation in Year 4.

Details of the currently-planned activities for Year 4 are given for each partner in the following tables and text.

1) Montgomery County Public Schools (MCPS)

IMPLEMENTATION TARGETS for MCPS
(10/1/05-9/30/06)

Goal 1: Improve student learning outcomes, as measured by High School Assessments.

Goal 2: Improve teacher content knowledge in the sciences by providing high quality professional development to in-service high school teachers.

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Assessments of Progress	Measures/Assessments of Progress	Benchmarks for end of Year 4
1.1 Participate in inquiry activities in the classroom	Cohort Conference (4 for Matter & Energy teachers and Earth Space Systems teachers) sessions devoted to inquiry in MCPS curriculum guides	Grant staff and MSTs to plan and facilitate sessions	April 30, 2006	MSTs, Science Office Staff	Increased use of MCPS curriculum guides in Earth Space Systems. Production of curriculum guides for Matter & Energy	Use of MCPS curriculum guides in Chemistry, Production of curriculum guides for Physics	Students experience one inquiry lesson sequence from Earth Space Systems and Matter & Energy guides
	Cohort Conference (4 for Chemistry and Physics teachers) session devoted to inquiry in MCPS curriculum guides	Grant staff and MSTs to plan and facilitate sessions	April 30, 2006	MSTs, Science Office Staff	Use of MCPS curriculum guides in Chemistry, Production of curriculum guides for Physics	Use of MCPS curriculum guides in Chemistry, Production of curriculum guides for Physics	Students experience one inquiry lesson sequence from Chemistry and Physics guides
1.2 Improve percentage of correct responses to HIS type selected response items measuring science	Seminars (7 total held monthly at each high school) with part of the agenda devoted to incorporating inquiry activities into instruction	MSTs to plan and facilitate the seminars	May 30, 2006	MSTs	Submission of planning templates and evaluations to Science Office after each seminar	Submission of planning templates and evaluations to Science Office after each seminar	Each school will hold 5 seminars
	Cohort Conference (4 for Matter & Energy teachers and Earth Space Systems teachers) sessions devoted to use of science process skill items in instruction	Grant staff and assessment expert to plan and facilitate sessions; consultant costs	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Matter & Energy and Earth Space Systems	Collect data from MCPS semester field tests in Matter & Energy and Earth Space Systems	Collect baseline data for Matter & Energy; Compare 2005-06 field test data for Earth Space Systems with 2004-05

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
process skills	Cohort Conference (4 for Chemistry and Physics teachers) sessions devoted to use of science process skill items in instruction	Grant staff and assessment expert to plan and facilitate sessions; consultant costs; OSA assessment specialists	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Chemistry and Physics	Compare 2005-06 data with baseline collected in 2004-05.
	Seminars (7 total held monthly at each high school) with part of the agenda devoted to formative assessment	MSTs to plan and facilitate the seminars	May 30, 2006	MSTs	Submission of planning templates and evaluations to Science Office after each seminar	Each school will hold 5 seminars
1.3 Improve percentage of correct responses to HISAT type selected response items measuring science concepts	Cohort Conference (4 for Matter & Energy teachers and Earth Space Systems teachers) sessions devoted to use of science concept items in instruction	Grant staff and assessment expert to plan and facilitate sessions; consultant costs	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Matter & Energy and Earth Space Systems	Collect baseline data for Matter & Energy; Compare 2005-06 field test data for Earth Space Systems with 2004-05
	Cohort Conference (4 for Chemistry and Physics teachers) sessions devoted to use of science cooncept items in instruction	Grant staff and assessment expert to plan and facilitate sessions; consultant costs; OSA assessment specialists	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Chemistry and Physics	Compare 2005-06 data with baseline collected in 2004-05.
	Seminars (7 total held monthly at each high school) with part of the agenda devoted to formative assessment	MSTs to plan and facilitate the seminars	May 30, 2006	MSTs	Submission of planning templates and evaluations to Science Office after each seminar	Each school will hold 5 seminars
1.4 Improve student skills in reading science literature	Cohort Conference (4 for Matter & Energy teachers and Earth Space Systems teachers) sessions devoted to improving science reading skills	Grant staff and assessment expert to plan and facilitate sessions; consultant costs	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Matter & Energy and Earth Space Systems	Collect baseline data for Matter & Energy; Compare 2005-06 field test data for Earth Space Systems with 2004-05

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
	Cohort Conference (4 for Chemistry and Physics teachers) sessions devoted to use of science concept items in instruction	Grant staff and assessment expert to plan and facilitate sessions; consultant costs; OSA assessment specialists	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Chemistry and Physics	Compare 2005-06 data with baseline collected in 2004-05.
	Seminars (7 total held monthly at each high school) with part of the agenda devoted to formative assessment	MSTs to plan and facilitate the seminars	May 30, 2006	MSTs	Submission of planning templates and evaluations to Science Office after each seminar	Each school will hold 5 seminars
1.5 Improve student writing skills in science	Cohort Conference (4 for Matter & Energy teachers and Earth Space Systems teachers) sessions devoted to improving student writing skills	Grant staff and assessment expert to plan and facilitate sessions; consultant costs	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Matter & Energy and Earth Space Systems	Collect 2005-06 baseline data for Matter & Energy and Earth Space Systems
	Cohort Conference (4 for Chemistry and Physics teachers) sessions devoted to improving student writing skills	Grant staff and assessment expert to plan and facilitate sessions; consultant costs; OSA assessment specialists	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Chemistry and Physics	Collect 2005-06 baseline data for Chemistry and Physics
1.6 Increase student participation in advanced science courses	Cohort Conference (4 for Chemistry and Physics teachers) session devoted to devising strategies to increase enrollment in Chemistry and Physics	Grant staff, MSTs, teachers	April 30, 2006	Science Office staff, teachers	Collect data on student enrollment	Collect baseline data on enrollment in Chemistry and Physics
2.1 Increase the number of inquiry activities in instruction	Cohort Conference (4 for Matter & Energy teachers and Earth Space Systems teachers) sessions devoted to inquiry in MCPS curriculum guides	Grant staff and MSTs to plan and facilitate sessions	April 30, 2006	MSTs, Science Office Staff	Increased use of MCPS curriculum guides in Earth Space Systems, Production of curriculum guides for Matter & Energy	Students experience one inquiry lesson sequence from Earth Space Systems and Matter & Energy guides

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
	Cohort Conference (4 for Chemistry and Physics teachers) session devoted to inquiry in MCPS curriculum guides	Grant staff and MSTs to plan and facilitate sessions	April 30, 2006	MSTs, Science Office Staff	Use of MCPS curriculum guides in Chemistry, Production of curriculum guides for Physics	Students experience one inquiry lesson sequence from Chemistry and Physics guides
2.2 Increase the number of teachers using strategies to promote reading in science	Cohort Conference (4 for Matter & Energy teachers and Earth Space Systems teachers) sessions devoted to improving science reading skills	Grant staff and assessment expert to plan and facilitate sessions; consultant costs	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Matter & Energy and Earth Space Systems	Collect baseline data for Matter & Energy; Compare 2005-06 field test data for Earth Space Systems with 2004-05
2.3 Increase the number of teachers using strategies to promote writing in science	Cohort Conference (4 for Chemistry and Physics teachers) sessions devoted to use of science concept items in instruction	Grant staff and assessment expert to plan and facilitate sessions; consultant costs; OSA assessment specialists	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Chemistry and Physics	Compare 2005-06 data with baseline collected in 2004-05.
	Seminars (7 total held monthly at each high school) with part of the agenda devoted to formative assessment	MSTs to plan and facilitate the seminars	May 30, 2006	MSTs	Submission of planning templates and evaluations to Science Office after each seminar	Each school will hold 5 seminars
	Cohort Conference (4 for Matter & Energy teachers and Earth Space Systems teachers) sessions devoted to improving student writing skills	Grant staff and assessment expert to plan and facilitate sessions; consultant costs	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Matter & Energy and Earth Space Systems	Collect 2005-06 baseline data for Matter & Energy and Earth Space Systems
	Cohort Conference (4 for Chemistry and Physics teachers) sessions devoted to improving student writing skills	Grant staff and assessment expert to plan and facilitate sessions; consultant costs; OSA assessment specialists	April 30, 2006	Science Office staff	Collect data from MCPS semester field tests in Chemistry and Physics	Collect 2005-06 baseline data for Chemistry and Physics

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
2.4 Conduct action research	Seminars (7 total held monthly at each high school) with part of the agenda devoted to action research	MSTs to plan and facilitate the seminars	June 30, 2006	MSTs	Submission of planning templates and evaluations to Science Office after each seminar	50% of Matter & Energy and Earth Space Systems teachers will post their research on the project web site
	Cohort Conference (4 for Chemistry and Physics teachers) sessions devoted to action research	Grant staff and assessment expert to plan and facilitate sessions; consultant costs	April 30, 2006	Science Office staff	Research posted in project web site, scienceinquiry.org	10% of Chemistry and Physics teachers will post their research on the project web site
2.5 Implement curriculum guides and assessments into instruction	Cohort Conference (4 for Matter & Energy teachers and Earth Space Systems teachers) sessions devoted to inquiry in MCPS curriculum guides	Grant staff and MSTs to plan and facilitate sessions	April 30, 2006	MSTs, Science Office Staff	Teachers post use of MCPS guide activities on the project web site	Teachers document using one inquiry lesson sequence from Earth Space Systems and Matter & Energy guides
	Cohort Conference (4 for Chemistry and Physics teachers) session devoted to inquiry in MCPS curriculum guides	Grant staff and MSTs to plan and facilitate sessions	April 30, 2006	MSTs, Science Office Staff	Teachers post use of MCPS guide activities on the project web site	Teachers document using one inquiry lesson sequence from Chemistry and Physics guides
2.6 Utilize "Tuning Protocol" to steer instruction	Cohort Conference (4 for Matter & Energy teachers and Earth Space Systems teachers) sessions devoted to using the Tuning Protocol	Grant staff and MSTs to plan and facilitate sessions	April 30, 2006	MSTs, Science Office Staff	Teachers post use of Tuning Protocol on the project web site	Teachers document using the Tuning Protocol one time
	Cohort Conference (4 for Chemistry and Physics teachers) session devoted to using the Tuning Protocol	Grant staff and MSTs to plan and facilitate sessions	April 30, 2006	MSTs, Science Office Staff	Teachers post use of Tuning Protocol on the project web site	Teachers document using the Tuning Protocol one time
	Seminars (7 total held monthly at each high school) with part of the agenda devoted to using the Tuning Protocol to review a lesson	MSTs to plan and facilitate the seminars	June 30, 2006	MSTs	Submission of planning templates and evaluations to Science Office after each seminar	Each school will document using the Tuning Protocol one time to review a lesson

2) Montgomery College (MC)

IMPLEMENTATION TARGETS for MONTGOMERY COLLEGE
(10/1/05-9/30/06)

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.
 Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
3.1 Increase the number of faculty participants who use inquiry instruction in science	Recruit new faculty fellow in physical sciences.	Salary funding for director and faculty fellows.	December 2005	Campus project manager.	Fellow assigned compensation for spring 2006.	Fellow has participated in grant activities.
	Recruit/identify faculty participants in earth/space science and chemistry areas.	Faculty stipends; support of Center for Teaching and Learning...	December 2005	Campus project director	Participant Information Sheets provided for participants.	Two new participants identified for each cohort.
	Review/ revision of course/lab activities and outcomes in first-year courses in Biology and Physical Sciences.	Faculty stipends, course syllabi.	Spring 2006	Campus project manager, fellows in each division.	Written review materials; activity/lab plans.	At least one course has new activity integrated into syllabi for all sections.
3.2 Increase the number of inquiry activities used by faculty participants in science instruction	Project Director provides individual professional development support to each participant. Science Inquiry focus groups/learning community gatherings held.	Salary funding; survey of level of inquiry skills.	Ongoing through AY 2005-2006	Campus project director	Documentation of meetings; lesson plans of inquiry activities developed and used.	Each faculty participant has implemented at least one new inquiry activity.
		Facilitator stipend; survey of level of inquiry skills.	Ongoing through AY 2005-2006	Campus project director	Schedule of meetings; attendance records, follow-up survey.	At least 50% of participants report using one new inquiry activity.

	Establish professional science inquiry library on each campus.	Space made available; funding of materials purchased.	Spring 2006.	Campus project director	List of materials obtained and location established.	Site located and at least five resources provided at each site.
3.3 Improve participating faculty's understanding of inquiry teaching practices	Project Director provides individual professional development support to each participant. Fellows and faculty participants attend summer institute.	Salary funding.	Ongoing through AY 2005-2006	Campus project director	Documentation of meetings; lesson plans of inquiry activities developed and used.	Each faculty participant has implemented at least one new inquiry activity.
	Science Inquiry workshops offered.	Faculty stipends.	July 2006	Campus project manager	Attendance Records, program.	At least three faculty attend the summer institute.
3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers	Fellow attends Cohort conferences. Fellow and faculty participants attend summer institute.	Support of Center for Teaching and Learning; facilitator stipend; survey of level of inquiry skills.	Ongoing through AY 2005-2006	Campus project director	Schedule of meeting; attendance records, follow-up survey.	At least 75% of workshop participants report increased understanding of inquiry teaching practices.
3.5 Develop cadre of college and university science leaders ("Maryland Science Faculty") to provide institutional and statewide leadership in undergraduate science education reform						Fellow attends at least three cohort conferences.

<p>5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching</p>	<p>Field experience course for potential secondary science teachers is offered and students are recruited.</p> <p>Recruit undergraduate students for participation in MCPS classroom observation/assistance.</p>	<p>Faculty stipends; curriculum documents.</p> <p>Student stipends, classroom teacher availability.</p>	<p>No later than Spring 2006.</p> <p>Spring 2006.</p>	<p>Campus project manager, director of Education Institute.</p> <p>Campus project manager, MCPS science faculty.</p>	<p>Course description/objectives.</p> <p>Observation reports, classroom teacher report.</p>	<p>Sufficient students enrolled to offer the course at least once.</p> <p>At least five students are recruited and complete at least one observation.</p>
<p>5.2 Increase the number of participating undergraduate students who consider science teaching as a career</p>	<p>Recruit undergraduate students for participation in MCPS classroom observation/assistance.</p>	<p>Student stipends, classroom teacher availability.</p>	<p>Spring 2006.</p>	<p>Campus project manager, MCPS science faculty.</p>	<p>Observation reports, classroom teacher report.</p>	<p>At least five students are recruited and complete at least one observation.</p>

3) Towson University (TU)

**IMPLEMENTATION TARGETS TOWSON UNIVERSITY
(10/1/05-9/30/06)**

- Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.
- Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.
- Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
3.1 Increase the number of faculty participants who use inquiry instruction in science	Dr. Joseph Topping, professor of Chemistry will be joining our faculty learning community.	Already budgeted. Dr. Topping will be receiving the stipend granted to Dr. Leon Ukens, who is retiring from Towson. University supervise undergraduates S. Stratman and S. Manhein	Dr. Topping will formally join the community in September 2005 and	Director	Continued participation in faculty fellows monthly meetings, attending Cohort conferences/summer institute, monthly meetings with students and director	Reflective report written by Dr. Topping, completion of the Science Inquiry Teaching survey, responsible for students written reports
3.2 Increase the number of inquiry activities used by faculty participants in science instruction	Faculty fellows will increase the number of science inquiry activities used in the classroom. Three more courses prepared or modified for the grant will be taught in Year 4.	Supplies and materials used in new activities	End of 2005-2006 academic year	Drs. Brian Masters and Brian Fath; Drs. Sarah Haines and Roland Roberts and Drs. Berkower and Bruce	Faculty will complete Science Inquiry self-assessment survey at the end of the course, will collect student evaluations and schedule classroom observations by fellows from the learning community	Three completed courses and increase in inquiry activities used in the classroom by other fellows.
3.3 Improve	Manual for inquiry activities in the	Supplies and	End of 2005-	Drs.	Fellows will review manual	Laboratory manual

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
participating faculty's understanding of inquiry teaching practices	classroom will be developed by Drs. Berkower and Bruce. Some faculty will present their work at teaching conferences. Participation in regular learning community meetings.	materials used in new activities. Transportation costs.	2006 academic year	Berkower and Bruce responsible for manual. Sarah Haines and Roland Roberts will present paper.	and provide comments for improvement.	

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
4.3 Create or build upon existing graduate teaching portfolios to demonstrate knowledge, skills, and competencies gained through involvement in the project, including research on teaching and learning	B. Wysoki will develop a teaching portfolio	Supplies	End of academic year 2005-2006	Dr. Boucher and Director	Portfolio reviewed by fellows	Revised portfolio sent to Westat
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching	Our undergraduate, S. Stratman will continue her role as “observer” for the MCPS partners Both undergraduates will have monthly meetings with Dr. Topping and the director.	Mileage to Shady Grove. Undergraduate stipends.	End of academic year 2005-2006	Dr. Topping and Director	Reflective statements reviewed by Drs. Topping and Mangurian	Revised statements sent to Westat.
5.2 Increase the number of participating undergraduate students who consider science teaching as a career	Will continue recruitment for year 5. Also, S. Stratman will continue to maintain the Science Education Bulletin Board at Towson.	Undergraduate stipends	End of academic year 2005-2006	Dr. Topping, the Director and all fellows	Project records.	At least one more recruit
5.3 Increase the number of participating	Interaction with MCPS teachers through cohort conferences, Summer Institute, and other	End of grant	All partners	Project records.	One teacher hired by MCPS by end of grant.	

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/ Assessments of Progress	Benchmarks for end of Year 4
undergraduate students who enter teaching careers in MCPS	opportunities that may arise					

4) University of Maryland – Baltimore County (UMBC)

IMPLEMENTATION TARGETS for UMBC
(10/1/05-9/30/06)

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.

Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
3.1 Increase the number of faculty participants who use inquiry instruction in science —and— 3.2 Increase the number of inquiry activities used by faculty participants in science instruction —and— 3.3 Improve participating faculty's understanding of inquiry teaching practices	Revise or teach and evaluate 3 (2 in Fall 05 and 1 in Spring 06) First Year Seminars in Science and Mathematics. Recruit 2 earth space science faculty fellows and appoint 1-2 new members to the UMBC VIP Coordinating Council.	Stipend for NSF VIP K-16 Faculty Fellows and Program Directors.	Recruiting for Fall 2005 in May-August 2005 and Spring 2006 from August-January 2005-06.	Program Directors and UMBC NSF VIP K-16 Faculty Fellows.	Number of such courses taught	2 in Fall 05 and 1 in Spring 06
		Stipend for NSF VIP K-16 Faculty Fellows and Program Directors.	Continuous recruitment efforts throughout year	Program Directors and UMBC NSF VIP K-16 Faculty Fellows.	Number of faculty fellows recruited for participation in VIP activities	2 fellows recruited, 1-2 fellows added to coordinating council

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers	Partnering a UMBC Faculty Fellow with a K-12 MST or RT from MCPS in a related activity.	Stipend for Faculty Fellows and Program Directors.	Recruiting for Fall 2005 in May-August 2005 and Spring 2006 from August-January 2005-06.	Program Directors, Faculty Fellows, and MCPS HS teachers.	Number of partnerships created	Recruit 5 UMBC Faculty Fellows to partner with at least two MCPS teacher for Fall 2005 to increase to at least three for Spring 2006.

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
5.2 Increase the number of participating undergraduate students who consider science teaching as a career	Partnering with MCPS to recruit and place undergraduate students with MSTs and RTs in MCPS HS.	Stipend for undergraduate students.	Recruiting UMBC student for Fall 2005 from May-August 2005 and Spring 2006 from August-January 2005-06.	Program Directors and K-12 teachers from MCPS.	Requirement for undergraduates to complete an evaluation at the end of placement.	Students' evaluations report increased interest in careers in education.
5.3 Increase the number of participating undergraduate students who enter teaching careers in MCPS	Create a special discussion group in BIO 100 for undergraduate students potentially interested in teaching science.	Stipend for Faculty Fellow and Program Directors.	Fall 2005 Semester from September-December; and Spring 2006 from January-May 2006.	Program Directors and Faculty Fellows.	Survey focus group of students in BIO 100 following the end of each semester	Focus group evaluation shows increased interest among students in careers in education.

5) University of Maryland Biotechnology Institute (UMBI)

2005-2006 Teacher Professional Learning Community

Teachers from both cohorts will be recruited into the professional learning community. The community will meet monthly to discuss teachers' evolving notions of inquiry and inquiry teaching practices. Analysis will take place through discussion of student thinking as captured on videotapes of their own classrooms and in student work. Teachers are compensated at their professional development rate for participation.

2005-2006 Curriculum Development and Implementation

Teachers are expected to modify an existing unit or create a new module based on their summer research projects. A mid-year and end-of-year retreat will be held for the purpose of modeling and sharing curriculum modules developed by ExPERT teachers. The retreats also serve as vehicles for research and evaluation. Implementations will be videotaped for group analysis. Teachers are compensated at their professional development rate for participation.

Data Collection and Analysis

Pre-, post- and follow-up program surveys will be administered at the beginning of the summer program, at the end of the summer program and at the end of the school year. Qualitative analysis will be based on videotapes of professional learning community meetings, facilitated group meetings during the summer sessions and group interviews.

2006-2007 ExPERT Program

Ten to twelve teachers will again have a four-week summer research experience with UMBI Center of Marine Biotechnology faculty in July 2006. Compensation will be at each teacher's school salary rate. For their participation, mentors receive an incentive of \$1,500 for supplies. Teachers will again have the opportunity to participate in 2-5 days of pre-research training (compensation at professional development rate by the school partner). During the summer, teachers will meet as a group three times each week with the ExPERT facilitator. The purpose of the meetings is to enhance understanding of their research projects and the connection to inquiry and the nature of science. Teachers are expected to journal throughout the summer and present their research projects to peers and faculty at the end of the summer program. For research and evaluative purposes, a pre- and post-program survey will be administered, teacher work will be collected and all facilitated working sessions with teachers will be videorecorded. Professional learning communities will take place during Year 5.

IMPLEMENTATION TARGETS for UMBI
(10/1/05-9/30/06)

Goal 2: Improve teacher content knowledge in the sciences by providing high quality professional development to in-service high school teachers.

Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.

Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/ Assessments of Progress	Benchmarks for end of Year 4

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
2.1 Increase the number of inquiry activities in instruction (by MCPS teachers)	1. ExPERT curriculum development and implementation extension of summer research experience, including a mid-year and end-of-year retreat to debud, share and model lessons 2. Teacher professional learning community working meetings	<ul style="list-style-type: none"> • Researcher time • Curriculum development stipends • Curriculum implementation supplies • Teacher professional community stipends • Teacher sub days and PD stipend for mid-year and end-of-year retreat • Space and meals for mid-year and end-of-year retreat • Researcher facilitation, professional community, <p>classroom observation and analysis time.</p> <ul style="list-style-type: none"> • Research supplies including videorecorder plus media 	June 2006: end of data collection June 2007: end of data analysis	S.Honda	<ul style="list-style-type: none"> • Curriculum analysis of ExPERT teacher-developed lessons • Analysis of teaching practices from classroom observations • Analysis of student enactment of classroom inquiry from videotapes • #classroom observations recorded 	<ul style="list-style-type: none"> • # curriculum modules produced or modified by ExPERT teachers during 2005-06 school year • # implementations of lessons developed by ExPERT teachers during 2005-06 school year • #classroom

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
	2005 Summer ExPERT program	<ul style="list-style-type: none"> • Stipends • Facilitator salary • Parking and transportation subsidy • Supplies to faculty labs for teacher research • Workshop supplies 	Winter-Spring 2006 (planning); Summer 2006 (implementation)	S. Honda G. Coleman Pre-program/post-program surveys Exit interviews		Improvement in teacher understanding of inquiry
2.4 Conduct action research	School –year teacher professional learning community	<ul style="list-style-type: none"> • Teacher stipends • Meeting space • Videorecorder • Transcription and data analysis • Research time • Facilitator time 	June2006	S. Honda <ul style="list-style-type: none"> • Teacher recognition of aspects of student inquiry and instructional inquiry strategies from videotapes and transcript data from their classrooms • Self-report inventory on quality and quantity of time spent by teachers on reflection • Increase in amount of time teacher spends reflecting on student thinking and behavior; • Increase in amount of time teacher spends reflecting on his/her own teaching practice 		
2.6 Utilize “Tuning Protocol” to steer instruction	School –year teacher professional learning community	Teacher stipends Meeting space Facilitator time	June 2006	Inventory of number of opportunities during learning community meetings to use/offer tool		Use at least one opportunity to introduce Tuning Protocol tool to learning community
3.2 Increase the number of inquiry activities used by				VIP’s Inquiry Teaching Survey (self-assessment)		At least one faculty to use Inquiry Teaching Survey

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
faculty participants in science instruction	Career seminar for REUs	Lecturer time/program slot	August 2007	S. Honda	# of career seminars given	At least one career seminar given
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching						

6) University of Maryland – College Park (UMCP)

**IMPLEMENTATION TARGETS for UNIVERSITY OF MARYLAND, COLLEGE PARK
(10/1/05-9/30/06)**

- Goal 3: Increase and improve inquiry teaching practices by participating college science faculty.
 Goal 4: Increase and improve inquiry teaching practices by participating science graduate students.
 Goal 5: Improve undergraduate student retention in the sciences and participating undergraduates' interest in pursuing careers in teaching.

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
3.1 Increase the number of faculty participants who use inquiry instruction in science	Continue conversations with STEM faculty members to solicit their help in achieving goal 3.1	Staff time and support	Oct. 2005-June 2006	Project Director and supporting GA	Number of meetings	Have at least 5 conservations
	Develop an electronic database of interested STEM faculty for dissemination of information about VIPK16.	Staff time and support	Oct. 2005-Dec. 2005	Project Director and supporting GA	Assembly of the data base	Electronic list populated with at least 12 STEM faculty
	Identified faculty teams for the development of a inquiry-base instruction (IBI) for STEM laboratory exercises	Staff time and support, Individual faculty stipends	Oct. 2005-Dec. 2005	Project Director and supporting GA	Have list of teams, and project titles	Have 3 faculty agree to develop IBI labs
	Continue conversations with Chem-REACT leadership on campus	Staff time and support	Oct. 2005-Sept. 2006	Project Director and supporting GA	Number of meetings and conversation	4 faculty attend the 2006 REACTS conference
	Develop and hold a workshop on inquiry based instruction	Staff time and support, Workshop support to CTE	Nov. 2005-May. 2006	Project Director and supporting GA	Attendance and feedback from participants	At least 4 STEM faculty attend the workshop

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
3.2 Increase the number of inquiry activities used by faculty participants in science instruction	Develop 3-4 IIB laboratory exercises for lower level science courses	Staff time and support, Individual faculty stipends	Oct. 2005- Sept. 2006	Project Director and supporting GA	Meeting and progress reports	Have 3 new IBI laboratory exercises written for Fall semester 2006
	Support the chemistry REACTS initiative on campus	Staff time and support, funding for REACTS conference	Oct. 2005- Sept. 2006	Project Director and supporting GA	Number of meeting regarding REACTS 2006	At least 4 faculty attend the 2006 REACTS conference
3.3 Improve participating faculty's understanding of inquiry teaching practices	Work with STEM faculty to explore the possibility of integration of new IBI exercises into lower level science courses	Staff time and support, Individual faculty stipends	Oct. 2005- Sept. 2006	Project Director and supporting GA	Meetings and progress reports	Have identified specific courses and developed action plan
	Develop and hold a workshop on inquiry based instruction for STEM faculty	Staff time and support, Workshop support to CTE	Nov. 2005- May. 2006	Project Director and supporting GA	Attendance and feedback from participants	At least 6 faculty attend
3.4 Increase the number of faculty participants who are involved in ongoing collaborative relationships with K-12 teachers	Develop 3-4 IIB laboratory exercises for lower level science courses	Staff time and support, Individual faculty stipends	Oct. 2005- Sept. 2006	Project Director and supporting GA	Meetings and progress reports	Have 3 new IBI laboratory exercises written for Fall semester 2005
	Support the chemistry REACTS initiative	Staff time and support, funding for REACTS conference	Oct. 2005- Sept. 2006	Project Director and supporting GA	UMCP faculty attend the 2006 REACTS conference	At least 4 faculty attend conference
	Encourage attendance at the 2006 VIPK16 Summer institute IHE day	Staff time and support funding f	Oct. 2005 – July 2006	Project Director and supporting GA	Attendance at the 2006 VIPK16 summer institute	At least 6 faculty attend the VIPK16 IHE day
	Support the 2005 Maryland Bioscience teachers day conference	Staff time and support funding f	Oct. 2005 – July 2006	Project Director and supporting GA	Attendance at the 2005 Bioscience teachers day	At least 4 faculty attend the Bioscience teachers day

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
4.1 Increase the number of participating graduate students who use inquiry instruction in science	Identified graduate students who will become members of the teams for the development of a inquiry-base instruction (IBI) for biology laboratory exercises	Staff time and support, Individual stipends	Oct. 2005-May 2006	Project Director and supporting GA	Have list of teams, and project titles	Have identified 3 graduates students as part of IBI laboratory exercises writing team
4.2 Increase exposure of participating graduate students to teaching in the sciences and perspectives on faculty careers both in the K-12 and higher education sectors to encourage them to enter teaching	Develop an electronic data base of STEM graduate students and disseminate information about VIPK16 opportunities	Staff time and support	Oct. 2005-May. 2006	Project Director and supporting GA	Tracking of number of posting to the listserv	Database is populated by at least 10 STEM graduate students
4.3 Create or build upon existing graduate teaching portfolios to demonstrate knowledge, skills, and competencies gained through involvement in the project, including research on teaching and learning	Develop and hold a workshop on inquiry based instruction	Staff time and support, Workshop support to CTE	Nov. 2005-May. 2006	Project Director and supporting GA	Attendance and feedback from participants	At least 4 STEM graduates students attend the workshop
	Develop an electronic data base of STEM graduate students and disseminate information about VIPK16 opportunities	Staff time and support	Oct. 2005-Sept. 2006	Project Director and supporting GA	Tracking of number of posting	Database is populated by at least 6 STEM graduate students
	Provide funding to allow STEM graduate students to attend conferences with a focus on teaching or STEM education	Staff time and support	Oct. 2005-Sept. 2006	Project Director and supporting GA	Number of application for support	At least two students attend a teaching conference
	Coordinate and direct information specifically to STEM graduate students regarding the Center for Teaching Excellence programs on teaching and learning and portfolios.	Staff time and support	Oct. 2005-Sept. 2006	Project Director and supporting GA	Attendance and feedback from participants	At least 3 graduate contact CTE seeking information
	Hold a workshop on teaching portfolios, and specifically target STEM graduate students	Staff time and support, Workshop support to CTE	Dec. 2005-Feb. 2006	Project Director and supporting GA	Attendance and feedback from participants	At least 3 graduate students attend portfolio workshop

Objective	Specific Supporting Activities	Resources Needed to Implement Activity	Timeline for Completion	Responsible Individuals	Measures/Assessments of Progress	Benchmarks for end of Year 4
5.1 Increase exposure of participating undergraduate students to teaching in the sciences and perspectives on faculty careers in both the K-12 and higher education sectors to encourage them to enter teaching	Continue to partner with the Colleges in their presentations of sessions on careers in K12 teaching Support Colleges in their efforts to connect undergraduates with HS teachers	GA support Stipends for students and teachers	Oct. 2005- May 2006	Project Director and supporting GA	Have supported at least one undergraduate career session on K12 teaching	At last 6 undergraduates attend workshop on K12 teaching career
5.2 Increase the number of participating undergraduate students who consider science teaching as a career	Support Colleges in their efforts to connect undergraduates with HS teachers Continue to partner with the Colleges in their presentations of sessions on careers in K12 teaching	GA support Stipends for students and teachers	Jan. 2006- May 2006	Project Director and supporting GA	Number of undergraduates who are working with area HS science teachers increases	At least four undergraduates work with area HS science teachers.
5.3 Increase the number of participating undergraduate students who enter teaching careers in MCPS	Support Colleges in their efforts to connect undergraduates with HS teachers Continue to partner with the Colleges in their presentations of sessions on careers in K12 teaching	GA support Stipends for students and teachers	Dec. 2005- May 2006	Project Director and supporting GA	Number of meetings	The number of undergraduates working with area HS science teacher has increased.
	Explore whether the various science based living-learning programs can be adapted to integrate service-learning with area HS teachers as part of the curriculum.	Staff time and support GA support	Oct. 2005- Sept. 2006	Project Director and supporting GA	Number and attendance at planning meeting	Have one or more of the service learning programs integrate this options as part of the programs curriculum.

Section 6: CASHE Year 1 Annual Report

The CASHE Project began in October 2004 with a concept paper developed in collaboration with several nationally-respected higher education policy experts: Donald Langenberg (Chancellor Emeritus, University System of Maryland), Russell Edgerton (former President, American Association of Higher Education and Chair, Pew Roundtable on Undergraduate Teaching); Daniel Fallon (Vice-President, Educational Programs, Carnegie Corporation of New York), and Spencer Benson (Associate Professor, University of Maryland College Park), in consultation with the NSF MSP program officers, James Hamos and Diane Spresser.

The initial plan for the project included a timeline for hiring a project director, establishing a small working group/design team to define the project objectives, identifying a national advisory board, and beginning to review data and cases for inclusion in the project.

In the first year of the project we have completed most, if not all, of the first year activities:

March:

Initial meeting of the design team took place March 11: Judith Ramaley (former Assistant Director, National Science Foundation EHR and current President of Winona State University), Donald Langenberg, Russell Edgerton, Bernard Khouri (Executive Officer, American Association of Physics Teachers), Spencer Benson, Patricia Maloney (former program manager, American Council on Education Presidents' Task Force on Teacher Education), and Nancy Shapiro.

Additional meetings with the Knowledge Management Development (KMD) project (Iris Weiss, Horizon Research and Barbara Miller, Education Development Center), *Project Kaleidoscope* (Jeanne Narum), and National Research Council (Jay Labov and Janet Garton) moved the project concept forward.

April

The Project Manager position was posted, and Patricia Maloney was hired. The new project manager began reviewing self-reported evaluation data on NSF MSP projects, identifying possible case studies. After meeting with NSF staff (James Hamos and Diane Spresser) the University System of Maryland internal working group met to provide guidance for these analyses and developed list of potential CASHE advisors. Melvin George agreed to chair the Advisory Council.

May

The first draft of a brief CASHE concept paper was developed and shared with NSF for comment. Additional meetings with potential advisory board members included meetings with Willis Hawley, former executive director of NPEAT and Penelope Earley, director of the Center for Education Policy at George Mason University.

June

Project staff met with Joy Frechtling of WESTAT regarding general research issues and Bruce Alberts, president, National Academy of Sciences.

The design team will meet on June 29, 2005 and worked with Joy Frechtling (Westat) to establish a timeline and benchmarks for a strategic plan which will be presented to the advisory council at the first meeting in August, 2005.

The project management team is in hiring a graduate assistant to assist in doing research and collecting data.

Next Steps

Define role of advisory council and the parameters of the study. Identify MSP projects for case studies, and develop case study protocols. Determine which additional tools (surveys, interviews, annotated bibliographies) would be useful for the project and begin development of those tools. Begin collecting data and evidence of institutional change, undergraduate educational change, and faculty involvement in teaching and learning at different types of institutions. Attend MSP evaluation summit September 2005.