GEOGRAPHY 101: Introduction to Physical Geography
Towson University

Geography 101, *Introduction to Physical Geography,* is primarily taught in a traditional lecture setting, two and a half hours per week, accommodating an average of 600 students per semester in 18-24 sections, which are generally taught by 5-7 tenured and tenure-track professors, and 2-4 adjunct instructors annually. The traditional lecture-and-testing format does not offer students the opportunity to learn collaboratively from one another or interactively from diverse assignments that address a range of learning styles. Student participation and engagement with course materials, each other, and with the instructor tends to be both passive and inconsistent.

The redesigned 101 is organized in a manner so that students will

- *Interpret* processes of scientific reasoning and be able to *apply* these processes to the atmosphere, hydrosphere, lithosphere, and biosphere;
- *Apply* elementary quantitative analysis and *interpret* environmental data;
- *Synthesize* geography as "exploration," both historically and as a contemporary process;
- *Describe* some of the broad themes of physical geographic research;
- *Discover* the excitement of current work in geography;
- and *Practice* web-based technology interactively to *identify* and *illustrate* geographic concepts and techniques; to *discuss* with peers and faculty the concepts of introductory physical geography, and *independently & actively learn* by using feedback from computer-based assessments.

Engaging students in inquiry-based learning, involving a high level of interactivity with their peers and instructors, can effectively achieve these goals. The more often students are able to engage actively in extended discussions and dynamic learning-centered activities (less common in traditional 101 classes), the more likely they are to learn and truly retain course material. Thus, the interconnected goals of this redesign initiative are to restructure large-lecture sections to better attain the advantages of a smaller, interactive class, and use technology to increase students' learning. Further, the redesign is attempting to lower the DFW rate, and anticipated decreasing the costs of instruction for students, faculty, and the university in general. This issue of cost-effectiveness will be discussed at the end of this interim report.

To achieve these learning and teaching goals, the redesign has moved Introductory Physical Geography from only being a lecture-based course to one in which there are numerous and ongoing opportunities for active learning, peer-peer, and instructor-student interactions.

Traditional sections of 101 did not deploy an organized mechanism to identify which or how learning goals were addressed, nor were assessments applied to gauge how well students were achieving these specific outcomes. This, however, will be addressed fall semester 2013 when a new mechanism to assess three learning outcomes will be

implemented. For the spring 2013 redesign, however, several mechanisms were already applied to assess learning outcomes. The following section summarizes "Learning Outcomes" as a result of the Spring 2013 Pilot. Next, a brief discussion compares in summary format test results from spring 2009, 2010, and 2013. This then is followed by an explanation of student satisfaction and pedagogical innovation, and then impacts on cost savings, and a note on sustainability.

Selection of Learning Outcomes Summary Information for PILOT 1.0
Introduction to Physical Geography 101
based on weekly Homework Assignments, Spring 2013

Learning Outcomes	# of Items	% Complete	% Average Score
Geography Subject & Specific Course Outcome: Demonstrate the ability to think critically and to employ critical thinking skills. "Utilize scientific vocabulary and example to describe major ideas appropriate to a scientific discipline."	111	80	81.9
Geography Subject & Specific Course Outcome: Read and interpret graphs and quantitative data . "Use quantitative reasoning to analyze and/or support scientific information."	32	78.6	83.3
Geography Subject & Specific Course Outcome: Synthesize (collect, organize, summarize, and arrange) data in ways that demonstrate understanding of the physical processes that shape the patterns of Earth's surface (& near surface above/below)	90	79.4	81.6
Specific Course Learning Outcome: Students after completing course are able to explain the characteristics and spatial distributions of ecosystems and biomes of Earth's surface	15	84.4	83.4
Specific Course Learning Outcome: Students after completing course are able to analyze ways that human actions and natural processes modify the physical environment ("Explain scientific issues of current importance to society within scientific, technological, societal, and ethical contexts")	8	75.9	78.9
Specific Course Learning Outcome: Students after completing course are able to Explain and recognize the four driving forces within the atmosphere (gravity, pressure gradient force, Coriolis force, and friction force).	4	87.1	85.6
Specific Course Learning Outcome: Students after completing course are able to Diagram Earth's interior in cross section, and describe each distinct layer.	6	81.1	80.1
Specific Course Learning Outcome: Students after completing course are able to	4	78.2	85.4

Selection of Broad & Specific Learning Outcomes Derived from Selected Homework Items;
Percent of Class Completing Assignments, & Results (% correct)

Specific Course Learning Outcome: Students after completing course are able to Describe Pangaea and its breakup, and relate several physical proofs that crustal drifting is continuing today.	4	78.2	85.4
Specific Course Learning Outcome: Students after completing course are able to interpret erosional and depositional landforms created by alpine and continental glaciation.	4	82	83.1
Specific Course Learning Outcome: Students after completing course are able to explain photosynthesis and respiration, and derive net photosynthesis and the world pattern of net primary productivity.	2	84.1	76.4
Specific Course Learning Outcome: Students after completing course are able to relate abiotic ecosystem components to ecosystem operations, and explain trophic relationships.	2	84.5	87.3
Specific Course Learning Outcome: Students after completing course are able to relate how biological evolution led to the biodiversity of life on Earth.	2	84.5	68.8
Specific Course Learning Outcome: Students after completing course are able to describe terrestrial ecosystems, including biomes and ecotones, and illustrate formation classes as a basis for describing plant communities within biomes.	2	84.5	84.8
Specific Course Learning Outcome: Students after completing course are able to summarize Earth's major terrestrial biomes, locate them on a world map, and relate them to climate and soils.	5	84.1	82.5
Specific Course Learning Outcome: Students after completing course are able to Relate human impacts, real and potential, to the Biosphere	2	83.7	76.7
Specific Course Learning Outcome: Students after completing course are able to	2	72.7	79.8

Comparison of Spring Semesters 2013, 2011, 2009
Test 1, Test 2, Test 3
(Course Material Evaluated Equivalent for all Three Semesters.
Exams 2009 were online and in-class)

For the Spring 2013 Pilot, in addition to student satisfaction as reflected by end of semester student course comments (see below), assessment involves direct comparisons of student exam performance on common instruments in traditional and re-designed sections. The lead team member utilized a set of common, objective, questions derived from a single textbook and in-class lecture material to measure the understanding of key introductory physical geography concepts. Three examinations marking each third of introductory physical geography 101 were administered in spring semesters 2009, 2011, and 2013. Results obtained from the traditional 101, spring semesters 2009 and 2011, are compared with those from the redesigned version, spring 2013, below.

Mean	75.37	72.29	62.56
Median	76	73	62
Mode	76	74	75
Range	70	46	77
Minimum	38	46	19
Maximum	108	92	96
Count	126	97	43
	TEST 1, 2013	Test 1, 2011	Test 1, 2009

Mean	75.50	68.94	63.63
Median	73	70	65
Mode	70	64	86
Range	118	96	70
Minimum	8	3	21
Maximum	126	99	91
Count	126	97	43
	Test 2, 2013	Test 2, 2011	Test 2, 2009

Mean	82.0625	73.76	74.95
Median	80	74	81
Mode	80	89	93
Range	86	65	109
Minimum	40	31	11
Maximum	126	96	109
Count	126	97	43
	Test 3, 2013	Test 3, 2011	Test 3, 2009

A one-tailed T-Test reveals that at a 99% confidence level the mean difference is statistically significant between TEST 2, 2011 and TEST 2, 2013 ($t=3.09$, $p=0.001$, one-tail test). Then, at a 95% confidence level, the mean difference is statistically significant between TEST 1, 2009 and TEST 1, 2013 ($t=1.83$, $p=.033$, one-tail test). The same analysis does not reveal a statistically significant difference between TEST 3, 2011 and TEST 3, 2013 nor between TEST 3 2009 and TEST 3, 2013. By the end of the semester,

students often work more intensively than during the earlier part of the semester in a final effort to demonstrate as strong a course result as possible. As TEST 3 for all three semesters is not cumulative, a final effort enhanced by

more attention in the lecture, more careful study of the textbook, additional office hour attendance, and a conscientious attempt to complete homework and extra credit assignments are all strategies employed by students during the final weeks of a semester and in combination can have a significantly positive impact on final exam results.

Student Satisfaction Measures and Pedagogical Innovation

With 126 enrolled students meeting in a traditional amphitheater-style lecture hall (seats bolted to the floor, sloping to the back of the room) in-class meetings only occasionally included small group hands-on experiments and smaller-group discussion. Most class meetings consisted of pair-share, entire group facilitated discussion, and lecture. Thus, to ensure that the course provided an opportunity for enrolled students to experience the friendly and helpful attention more commonly associated with smaller classes, office hours were carefully integrated into the course.

To achieve this, a new learning resource, "Undergraduate Teaching Assistants," or ULAs, were incorporated into the course. On the recommendation of department colleagues, several outstanding undergraduate students were interviewed and 7 ULAs were chosen. The combination of ULAs, one assigned graduate TA, and the instructor provided 18 hours of weekly office hours, Mondays through Thursdays, to assist enrolled students better grasp course material while also providing students a very direct opportunity to demonstrate active participation in the course.

The integration of office hours was an innovation not attempted previously in Geography 101. Faculty (full and part time) teaching Introduction to Physical Geography reported that during an average semester fewer than 10 students would typically attend respective office hours (with some colleagues reporting 10 was a maximum), regardless of class size. The Spring 2013 Pilot exceeded office hour visitation expectations by several magnitudes.

Office Hour Totals, Spring 2013

Total Office visits before Exam 1= **127** (by 55 students)
- Mondays= 25 students
- Tuesdays= 17 students
- Wednesdays= 31 students
- Thursdays= 54 students

Total Office visits between Exam 1 and 2= **234** (by 56 students)
- Mondays= 49 students
- Tuesdays= 54 students

Comparison of Spring Semesters 2013, 2011, 2009
Test 1, Test 2, Test 3
(Course Material Evaluated Equivalent for all Three Semesters.
Exams 2009 were online and in-class)

- Wednesdays= 52 students
- Thursdays= 79 students

Total Office visits after Exam 2 (5/16)= **378** (by 71 students)

- Mondays= 76 students
- Tuesdays= 90 students
- Wednesdays= 81 students
- Thursdays= 131 students

Total for the Semester (5/16) = **739** (by 88 students)

- Mondays= 150 students
- Tuesdays= 161 students
- Wednesdays= 164 students
- Thursdays= 284 students

The Redesign Proposal anticipated office hour visits as a required component of he planned Replacement Model (see below, impacts o cost savings). However, to accommodate the College of Liberal Arts' faculty teaching load expectations a Supplemental Model was employed instead for the actual Pilot. No longer able to *require* students to attend outside of class time meetings (as anticipated in the approved Redesign Proposal), an incentive mechanism was implemented as a way to encourage attendance at weekly office hours. Attendance at office hours, for assessment purposes, was identified as *participation*.

Many syllabi in geography and in other subjects, include formally or informally in some manner a student's participation for final grade assessment. Sometimes as much as 10% of the final grade may be derived from an instructor's determination of students' participation. But grading participation is often a matter of keeping an in-class tally of correctly answered questions or even through a more subjective assessment by the instructor, for example when deciding whether or not to round up or down final course grades. There may not be a mechanism such as a paper, test, or class project that specifically is used to assess "participation." In many cases an instructor is assessing a student's performance in a relatively nebulous activity that stretches across an entire semester.

As is the case for many courses, physical geography is not only about knowledge acquisition but includes focus on the development of intellectual skills and attention to the learning process. While students may meet weekly in the classroom education quite obviously is not constrained by the classroom's four walls. As part of a robust physical geography course, students are expected to use particular vocabulary to describe major ideas, apply logical reasoning to analyze information, and develop the confidence and background to discuss scientific issues of current importance to society. Students can learn to do this and to demonstrate it through active 1:1 and small group engagement with their peers and the instructor, as well as through active independent work. In other

words, active participation is a significant component of physical geography and thus, in addition to assessment based on in-class exams, willingness to participate in outside of class active discussion and problem solving with peers and the instructor should receive credit. Classroom instruction with over 120 students can be challenging particularly when students are reticent to respond or interact. Not only is the inclusion of participation (as a function of office hours attendance) a stick to the carrot of learning that helps students become more engaged, office hours provide encouragement and confidence to students, who then are ready to participate during the larger lecture-hall discussions.

An office hour visit, generally assumed to be 30 minutes or more, will allow a student to earn two points, the equivalent to one exam question correctly answered. Students are able to decide for themselves how many points they will have added to their exams; in other words, students can determine their own "extra credit" or "test curve."

The following quotes have been excerpted directly from the Spring 2013 course evaluation. Quotes that reflect on the integration of office hour visits and independent learning have been included.

What did you like about this course? [PILOT Spring 2013, Introduction to Physical Geography]

- Office hours
- I liked his teaching style
- Lots of extra credit
- the extra credit for going to office hours
- amount of extra credit
- A lot of visual aids made it better to understand and retain more information. Also the extra credit assignments, as well as a more hands on approach to learning the information.
- This was a very large lecture class. Professor Tasch was aware of this and made sure office hours were offered everyday to the students. He had his TA meet with students and same goes for other students he had as assistants. He proposed a nice incentive for students where if they attended office hours, they received bonus points towards the next test.
- Office hours for extra credit
- I loved the professor. He was so helpful and enthusiastic.
- Professor gave us every opportunity to do well with office hours and extra credit.
- The discussions we would have about specific events within the topics we spoke about.
- funny teacher who really broke down a lot of information effectively, always available to take time and explain things after class
- I liked how he was enthusiastic about the course and very energetic. I also liked how he encouraged all of us to do our best and gave out plenty of extra credit opportunities if you were struggling.
- This course was a good pace for a 100 level course.
- I enjoyed the online homework and all the availability for office hours.

Comparison of Spring Semesters 2013, 2011, 2009
Test 1, Test 2, Test 3
(Course Material Evaluated Equivalent for all Three Semesters.
Exams 2009 were online and in-class)

- I liked that the students were provided study guides and that office hours were used as the 'curve' on the tests.
- That their was online homework assignments and that even though it was a big lecture hall, the professor still got to know you individually.
- The homeworks really helped the learning in class. In addition, Professor Tasch is a great person, and was always available for extra help.
- office hours give you points on tests
- interesting topics were covered, extra credit office hours HELPED A LOT!!
- Online assignments were good to make up for any lost points on exams, as well as all of the extra credit offered throughout the semester
- The instructor was always available to communication; he clearly tried hard to work with individuals needs, problems,, and learning matters.
- I liked that there were a lot of extra credit opportunities.
- the office hours really helped with understanding the course material
- I did the study guides which I think helped me on the tests. I also liked the extra credit opportunities.
- Very interesting topics were discussed. Jeremy wanted you to do your best. Office hours were always available
- Or professor gave us numerous hours every week to complete office hours, and for each one you attended you received 2 extra credit points. It was a great opportunity to ask questions and further understand the material. Office hours were a must for me, they should be available for every class at Towson.
- lectures and the office hours
- the instructor was great and since it was a Gen ed there wasn't a lot of unnecessary assignments. the online mastering geography was great
- Was always available
- large class, awesome professor
- That we could get extra credit format tending office hours.

Impact on Cost Savings

The planned course redesign proposes what could be considered a combination of both the Supplemental and the Replacement Models. Much like the standard Replacement Model lectures were anticipated to be replaced more with in-class discussion and focused recitations, with use of lectures relegated to shorter interludes to allow for more student-student and instructor interaction. Instructors will be able to reduce class time spent on topics the students clearly understand, increase time on problem areas, and target individual students for remedial guidance. Thus, by *adding* additional time students when students would be encouraged to interact with the instructor, as well as with each other through small group recitations, the proposed redesign expected to align with the Supplemental Model.

But in keeping somewhat with the Replacement Model, the number of formal in-class meetings was planned to be reduced from 45 to 30 hours, while instructors, adjuncts (according to the proposal), the course graduate TA, and undergraduate learning assistants (UTAs) would provide even *more* supplemental opportunities for one:one and instructor:small group meetings for all students enrolled in Geography 101 than what has previously been achieved in the traditional 101 lecture format.

The actual number of formal lecture meetings was not reduced in the actual redesign, and adjuncts were not utilized to assist with course administration (cf. proposal). After submission and approval of the redesign proposal, the redesign team amended its choice from a combination of Replacement and Supplemental models to only Supplemental. The team decided to amend its plan after the department chair and College of Liberal Arts Dean explained that a redesigned course, if it reduced lecture contact hours, or expected to integrate the services of an adjunct, would require relegate the instructor to adding another course to his/her semester teaching workload to compensate for the "time savings" of fewer lecture hours.

Consequently, the redesign has expanded its enrollment to over 120 students per semester, by far the largest course section offered by the department. The geography department chair initially did not accept that a large enrolled 101 course could deliver a satisfactory learning experience. The chair, however, indicated (fall 2013) that she had changed her mind, based on the results of the redesign: "You have managed to convince me over the last year that students can have an excellent experience in a large classroom setting if the instructor is willing to go the extra mile outside of the classroom, which you clearly are." But, when asked if this large format could be expanded to other sections, which was part of the plan for the proposed redesign, she suggested that "The limited availability of these rooms [able to accommodate more than 90 students) does constrain our ability to teach very large sections."

With physical constraints on the opportunities to expand 101 enrollments, limited support from CLA to employ a Replacement model, and a clear disincentive for redesign instructors to work towards a reduction in the number of adjuncts who teach introductory 101, the original expectations for redesign cost reduction have not been met. A one credit "Leadership in Geography" option for Undergraduate Learning Assistants has been created. This will help ensure that ULAs will continue to be used beyond the two-semester redesign pilot. Given the results from "Participation" as elaborated, above, the addition of ULAs appears a highly appreciated and well used attribute of the redesign project. Concurrently, any instructor willing to hold a 120 and higher enrolled course is reaching a much larger number of students than average (a singe section course typically has 36 enrolled students) during the same amount of time, which indeed is a clear savings for the institution.

PILOT ASSESSMENT PLAN

Institution: **Towson University**
Course Title: **GEOGRAPHY 101: Introduction Physical Geography**

1. Which method of comparing learning outcomes do you intend to use? (Put an X next to all that apply)

	<---Parallel Sections
	# of traditional sections
	# of students in each section
	Total # of students
	# of redesign sections
	# of students in each section
	Total # of students
X	**<---Before and After**
Spring 2009, Spriong 2011	<---Timeframe for baseline data (e.g. fall 2006 semester, AY 2006-7, five-year average 2001-2006)
2	# of traditional sections
43; 96	# of students in each section
139	Total # of students
1	# of redesign sections
126	# of students in each section
126	Total # of students

2. Which method of obtaining data do you intend to use? (Put an X next to all that apply)

X	A - Comparisons of common final exams
X	B - Comparisons of common content items selected from exams
	C - Comparisons of pre- and post-tests
	D - Comparisons of student work using common rubrics

Describe briefly:

For the Spring 2013 Pilot, in addition to student satisfaction as reflected by end of semester student course comments, assessment involves direct comparisons of student exam performance on common instruments in traditional and re-designed sections. The lead team member utilized a set of common, objective, questions derived from a single textbook and in-class lecture material to measure the understanding of key introductory physical geography concepts. Three examinations marking each third of introductory physical geography 101 were administered in spring semesters 2009, 2011, and 2013. Results obtained from the traditional 101, spring semesters 2009 and 2011, are compared with those from the redesigned version, spring 2013

FULL IMPLEMENTATION ASSESSMENT PLAN

Institution: **Towson University**

Course Title: **Geography 101: Introduction to Physical Geography**

1. Which source of baseline information do you intend to use? (Put an X next to all that apply)

X	**<---an offering "before" the redesign began**
	<---parallell sections during the pilot phase

Spring Semester 2009, 2011	<---Timeframe (e.g. fall 2006 semester, 7, five-year average 2001-2006)	AY 2006-
2	# of traditional sections	
43; 96	# of students in each section	
139	Total # of students	
1	# of redesign sections	
126	# of students in each section	
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PILOT ASSESSMENT RESULTS

Institution: **Towson University**
Course Title: **Geography 101: Introduction to Physical Geography**

Did you carry out the assessment(s) as planned and reported on the Pilot Assessment Plan? (If the
from what you previously reported, please complete a revised version and submit it with this report.)

Please complete a separate chart for each comparison made (for example, if you conducted more th
assessment method.)

1. Please report the results of your assessments using the appropriate summary chart below

Measures: **Comparisons of Common Exams (Final Exam Used Below)**

In the performance sections of the chart, report the mean score and standard deviation for each gro

	Total # of Students	Performance on Pre-Assessment (if applicable)
Traditional Course A:	43	
Traditional Course B:	97	
Timeframe A:	Spring 2009	
Timeframe B:	Spring 2011	
Redesigned Course:	126	
Timeframe:	Spring 2013	

In the performance sections of the chart, report the percentage of students at each level of performa
"a", percent "b", etc.: or the percent rated at each level of a scoring rubric.)

Traditional Course

Timeframe A: Spring 2009
Timeframe B: Spring 2011

Score/Grade A	Number A
90+/A	12
80+/B	12
70+/C	7
60+/D	4
59-/F	8
Total	

Redesigned Course

Timeframe: Spring 2013

Score/Grade	Number
90+/A	23
80+/B	28
70+/C	33
60+/D	26
59-/F	16
Total	

2. Were any difference in performance between the three groups statistically significant?

Yes, 99% c <---Yes. At what level of confidence?

<---No

3. Did the groups of students assessed differ from one another in any important ways (e.g. g motivation, etc.)? If so, please describe these briefly:

4. Did you learn anything else about the impact of the redesign on students (e.g. changes in performance in downstream courses in the same discipline, etc.)? If so, please describe thes

Students enrolled in especially large lecture courses apparently value the opportunities presented b

assessment(s) you actually performed differed

han one pilot or if you used more than one

up of students assessed.

	Performance on Post-Assessment		

nce (for example, the percent earning a grade of

Number B	Percentage A	Percentage B
14	28	14
16	28	16
37	16	38
20	9	20
10	18	10
	100%	**100%**

		Percentage				
		18				
		22				
		26				
		20				
		13				
		100%				
ender balance, prior preparation levels,						
student attitudes toward the subject, better ***e differences briefly:***						
y attending office hours and small group recitations. Further, weekly homework assignments that provide im						

mediate feedback and consistent practice are also appreciated.					

PILOT COURSE COMPLETION/RETENTION

Institution: **Towson University**

Course Title: **Geography 101: Introduction to Physical Geography**

Traditional Course

Timeframe: Spring 2011

	Number	Percentage
A	52	19
B	84	30
C	79	28
D	33	12
F	13	5
W	20	7
DR	NR	
Other:	40	8
Total	**281**	**100%**

Redesigned Course

Timeframe:

	Number	Percentage
A	16	13
B	29	24
C	30	25
D	15	13
F	5	4
W	6	5
DR	NR	
Other:	18	15
Total	**119**	**100%**

Your definition of successful completion (e.g., a C or better):

Students who complete Geography 101 with a C or higher have successfully demonstrated satisfactory comprehension of course material. Geography 101 is not only focused on acquisition of information but practice discussing scientific ideas and concepts. This is demonstrated through active and consistent "participation."

Your definition of retention (e.g., a D or better, enrolled in course to end, including F grades):

Students who have earned a D or better while not excelling have nonetheless benefitted from remaining in the course in ways not demonstrated clearly by exam results. In addition to exams, this course redesign utilizes weekly homework assignments and an array of extra credit assignments that are deployed startegically to emphasize particular course concepts.