Promoting STEM-literacy by Designing Decision-Driven Interdisciplinary Courses for Non-Science Majors

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Abstract

Methods traditionally used to teach and train in STEM fields are being used to educate for careers in homeland security, Wall Street investments, and financial planning. An example of this trend is the increasing number of courses offered at institutions of higher education, such as financial engineering, computational finance, and risk analytics. These jobs draw heavily on STEM knowledge and skills, and represent some of the most rapidly growing or wealth producing sectors of the U.S. economy. To better prepare non-STEM majors entering these fields, we developed an interdisciplinary science course for non-science majors with the goals of reducing the negative perceptions and attitudes towards the science general education curriculum. This interdisciplinary course also created a venue to teach non-science majors how to deal with real world STEM issues. By engaging students in activities which promoted skills critical in STEM fields, we designed a course that integrated a sampling of content in physical and life sciences, while at the same time increasing scientific curiosity and literacy. This new course, STEM 1200-Scientific Decisions in Everyday Life was taught employing active engagement techniques and student-centered demonstrations to increase conceptual understanding of scientific concepts. Results of a Wilcoxon Signed Rants test on a pre- and post-course assessment question showed a significant gain in students' confidence in their conceptual understanding as a result of the engaging demonstrations.

What are the best practices for educating non-science majors to become scientifically literate citizens? A response to this inquiry is important because in today's globalized economy, a democratic society, largely unfamiliar or uncomfortable with scientific and technological knowledge, faces a competitive disadvantage. A diverse, well prepared, and innovative workforce of Science, Technology, Engineering, and Mathematics (STEM)-literate citizenry is crucial to the Nation's health & economy. Also, "STEM-capable" employees who work in areas that are grounded in science but considered non-STEM fields, such as physicians, nurses, other health workers and advanced manufacturing professions, are increasingly valued (Holdren and Lander 2012). Methods traditionally used to teach/train in STEM fields are being used to educate for careers in homeland security, financial investments and planning. These jobs draw heavily on STEM knowledge and skills, and represent some of the most rapidly growing or wealth producing sectors of the U.S. economy.

We present a course built upon the recent investments in new nontraditional pedagogies (Train and Gammon 2012, Bhattacharyya 2009, Crouch 2006) to offer an interdisciplinary general-education curriculum (GEC) experience to non-science majors. This new course has been designed with the vision of scientific literacy, which emphasizes the understanding of science through a holistic lens. The learning outcomes are designed to produce a STEM-capable population which "reflects critically on information and appreciates and understands the impact of science on everyday life" (Roberts and Bybee 2014). Below are few examples of our course Student Learning Outcomes (SLOs):

- Students will be able to:
  - construct a scientific argument in favor of or against a topic of current interest in the society across the fields of life and physical sciences;
  - recognize patterns, develop formulae, read and interpret statistical information, and represent information through the creation of graphs, charts, and tables associated with multi-variable and dynamic data sets from life and physical sciences and the global economy;
  - Students will be able to investigate the key biochemical reactions and chemistry of consumer products which have adverse effects on the human health and the environment;
  - characterize the science of music by measuring the properties of the sound waves and the instruments; and
  - investigate the soil composition and environmental factor which affect the soil by creating soil profiles and descriptions, and conducting student inquiry experiments.

Two sections of the course, with 60 students per section, are offered each semester. The class is offered three-times a week in a 50-minute class period. The course is team-taught. Each faculty member is assigned a specific part of the course. Students interact with only one faculty member at a time, but over the semester experience each faculty member assigned to the course. Efforts are made to distribute equal work-load between faculty members. This team effort is supported by university administration: by providing a full work-load credit to each faculty and full credit hours to each of the respective departments. This model is now a sustainable model for team-taught courses and not dependent on external grant funds for support. New faculty members, who were not part of the original course development, offering, or supported by the grant funds are now teaching the course as their regular teaching load. Furthermore, the materials and supplies needed for the course are supplied by educational technology (EdTech) funds through host departments.

Our course, Scientific Decisions in Everyday Life (SDEL), is designed to overcome the negative perceptions towards a science course, disinterest and fear of math and science, and science anxiety (Train and Gammon 2012). This has been accomplished by designing a test-free, activities-based course which brings big ideas and broader concepts of science to study: the math behind the stock markets, the science of musical sounds, the kinetics of human body motion, consumer chemistry, soil and the environment, and energy resources. This rapid-paced sampling of science appreciation helps students browse through various science disciplines in a course, rather than a single in-depth factual-knowledge experience of a traditional science course. This scheme has been argued to be effective in scientific literacy (Trefil 2008, Potter and Meisels 2005). This paper reports on the design, implementation, and outcomes of this novel approach to teaching science GEC courses.

Course Design

The SDEL is the first course of its kind designed and developed as part of a Howard Hughes Medical Institute (HHMI) Science Education funded program "Fostering Undergraduates Through University Research and Education

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in the Sciences (FUTURES)", at the institution. The overarching theme of the program was to increase student success by developing "students who will be scientifically curious and literate leaders in society" and asking how can science literacy help you make better decisions in daily life. The course was designed to offer topics in Physical and Life Science, as well as interdisciplinary themes, transforming the experience into a STEAM course which included Liberal Arts infusion. Studies (Hardiman, Rinne and Yarmolinskaya 2011) have shown that arts integrated curricula have a significant effect on long-term retention of content. Moreover, STEAM education benefits have been widely documented (Taylor, Why is a STEAM Curriculum Perspective Crucial to the 21st Century? 2016, Taylor, Transformative science education 2015) to support student engagement in transformative learning

The subject matter is organized into four different levels of engagement: 1) individual projects which students must continuously engage in throughout the semester (maintaining stock portfolios); 2) a group project on which students work outside the classroom for 7-8 weeks of the semester (e.g., pro/con arguments of an energy resource); 3) rapidly changing short topics (e.g., music and mathematics); and 4) focus units utilizing inquiry-based, hands-on, learning about Human Kinetics, Soils, and Consumer Chemistry. These modules and their fractional percentage class-contact and exposure times during the semester are listed in Table 1.

Students remain in constant contact for more than 75% of the semester for two out-of-class activities: the scientific argument and the stock market portfolios. The rationale for modules which require extensive engagement with the topic, outside the classroom, is to provide a constant exposure to a discipline, which is not parsed from one class period to the next. For example, the Math behind the Markets (Stock Markets) unit is designed targeting the Business majors, which typically comprise nearly thirty percent of the class. In this unit, the focus is neither learning of financial modeling, nor long-term speculation based upon complex statistical or mathematical strategies, but to teach students introductory level mathematical, computational, and scientific tools which can be employed for analyzing multi-variable data sets. Lectures and hands-on activities, related to mathematical concepts which are essential for stock trading, pattern recognition, and actual trading tools for the Math Behind the Stock Market unit are taught during regular class contact hours. The students are able to calculate profits and losses based upon various trading scenarios, retrieve data on stock performances, plot financial data to observe performance trends, and observe how different variables such as product releases, consumer news, or other variables affect the patterns of stock prices. This training in data analysis and pattern recognition has been identified as a necessary tool in the Next Generation Science Standards (NGSS) (Next Generation Science Standard n.d., Lopez 2013). After this class-contact time and training, each student is given a simulated trading account with an initial investment using the Investopedia service (Investopedia 2017). Students prepare and report their portfolios by using the math they have learned in the class, and reasoning behind their trades based upon the pattern recognition techniques. On the contrary, units such as the Science of Music are shorter in duration. In these cases, experiences are limited to the class contact time. All learning and activities are performed during the boundaries of the class periods and without out-of-classroom activities or assignments.

During the first seven weeks of the semester, the entire class meets together. These weeks are used to expose the class to the units of Scientific Argument, Math Behind the Markets, and Science of Music. The Science of Music module completes its activities and assessments during this phase of the class, whereas, the Scientific Argument and Math Behind the Markets complete the lectures but start their semester-long out-of-class activity. After this phase of the class, students divided into three equal groups start their focus units. The focus units continue for six weeks in which students are placed into one of the following modules: 1) Human Kinetics, 2) Consumer Chemistry; or 3) Digging the Soil. During these six weeks, students perform various hands-on activities to learn in-depth about a particular science concept. For example, the Unit Learning Outcomes for Digging the Soil module are outlined below:

- Students will be able to:
  - Collect soil samples in the field;
  - Model a soil profile to measure soil permeability;
  - Calculate the rate of chemical and mechanical weathering rates for various types of rocks;
  - Carry out a collaborative, inquiry-based experiment;
  - Communicate their findings by maintaining laboratory journals and writing collaborative technical laboratory reports.

Module	In-Class Contact Time (Class Periods)
Scientific Argument	6
Science of Music	6
Math Behind the Markets	10
Focus Units	18
Digging the Soil	
Kinetics	
Consumer Chemistry	

Table 1. The In-Class contact times.

Each focus unit is self-contained and constitutes a significant part of the students' overall grade. The example of the focus unit given above is of the learning outcomes from Digging the Soil module. Similar focus units in life sciences, such as Biochemistry were also taught in which Students were able to investigate the key biochemical reactions and chemistry of consumer products which have adverse effects on the human health and the environment. After completing the focus units, the class returns to complete the group project which they had started prior to the focus unit activities. This project work is completely independent of the activities in the focus unit. The group project fulfills one of the main learning outcomes of constructing a scientific argument in favor of or against a topic of current interest in the society. Since the inception of the course, this topic has been on energy resources and their impact on the society. Each team presents its scientific argument in favor of or against the use of a particular source of energy production. The presentations are judged using a grading rubric (Seawel 2015). At the end of the semester, the students closeout their stock portfolios and report on its performance.

Course Evaluation

The effectiveness of the course is constantly measured by performing a quantitative and qualitative survey of the students at the beginning (pre-) and end (post-survey) of each semester. The data set for this study stretches across 191 undergraduate students who were enrolled in STEM 1200 and completed both pre- and post-surveys. Data were collected across four consecutive semesters (Fall 2015, Spring 2016, Fall 2016, and Spring 2017). A total of 427 students were enrolled in the course across these four semesters, and all students were invited to complete surveys.

The distribution of student academic level is given in Table 2.

Enrollment statistics indicated nearly equal percentages of male and female students in the class. Furthermore, 97.9% of the students indicated race/ethnicities that are considered underrepresented in the sciences. A representative distribution of the student majors from the Spring 2018 class is shown in Table 3.

Data were self-reported using pre- and post- questionnaires that were designed in Summer 2015 by the project leaders and the external evaluator and measure attitudinal and behavioral responses. Learning gains are

College Level/Year	Percentage of Students in SDEL
First Year	31.9%
Sophomore	44.5%
Junior	9.4%
Senior	3.1%
Early College High School	11.0%

Table 2. Distribution of students' academic level in the SDEL course.

Major Field of Study	Percentage of Class (N=122)
Business Administration	29%
Mass Communication	15%
Education	12%
Criminal Justice	10%
Undecided	10%
Consumer and Other Sciences	7%
Political Science	4%
Art	6%
Social Work	6%

Table 3. Distribution of students enrolled in the Spring 2018 course of SDEL. Data are representative of the trends observed in other semesters. The majors are listed in the descending order of enrollment. Nearly one-third of the class comprises of business majors.

measured by open-ended, content based pre- and post-surveys.

Materials and Procedure

Questionnaires

Pre-surveys included 10 items, four of which were adapted with permission from the Research on the Integrated Science Curriculum (RISC) survey. The scale of these RISC survey items was adjusted to document students' confidence levels across 32 course elements and 16 course benefits, instead of their self-perceived gains. Additional items included on the pre-survey documented students' future goals and their confidence levels across 12 learning scenarios that were directly aligned with the STEM 1200 syllabus. All ratings for confidence-related items were collected based on a 5-point Likert scale from 1 (Not at all Confident) to 5 (Totally Confident). "Highly Confident" is the aggregate of "4-Very Confident" and "5-Totally Confident".

Post-surveys repeated the 10 items that were included on the pre-survey, but also included an additional five items (2 closed-ended and 3 open-ended) that asked students to rate the quality of the course and the extent to which the course met their expectations. These five close-ended items, developed by the external evaluation team, related to the quality of the course and were collected based on a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

Survey Administration

Pre-surveys were administered to students on the first meeting of class, and post-surveys on the last day of class. Surveys were collected by course instructors, but processed and analyzed by the external evaluation team. Only the external evaluation team had the ability to link student identifiers on the survey to their survey responses. No incentives were offered for students to complete the survey, and completion of surveys was optional.

Statistical Analysis

IBM SPSS Statistics Version 21 (Spss 2012) was used to compute descriptive statistics, as well as test for statistical significance. McNemar tests (Huck 2004) were used to look for significant differences across the data students provided regarding their future goals. These data were dichotomous (yes/no), with matched pairs. Therefore, the McNemar tests determined whether the row and column marginal frequencies were equal. P-values for these items were set at .05. Wilcoxon Signed Ranks tests (Huck 2004) were used to determine whether the means for each scale variable (overall confidence levels) were equal across our paired-subjects. Due to multiple comparisons, p-values were adjusted using the Bonferroni method (Huck 2004) for each cluster of items. For example, for items related to confidence levels across the 32 various course elements, p-values were set at .002, to be considered significant (p=.05/32). Similarly, p-values for items related to the 16 course benefits and 12 learning scenarios were set at p=.003 and p=.004, respectively. Test results with p-values higher than the Bonferroni-adjusted thresholds but lower than .05, were considered to be "strong trends."

Study Data Samples

We present here selected sample items and responses from a set of pre- and post-assessment surveys carried out at the beginning and end of the semester. There were a total of sixty items sampling the students' behavior towards science and their confidence levels in learning the content and how it reinforces the learning outcomes. The items in Table 4 measure the confidence of students in performing tasks which are typical of a STEM course and working environment in scientific fields.

In addition to the behavioral items towards science education, pre- and post-surveys included items to specifically document students' growth in confidence related to the desired course learning outcomes. Pre- and post-data from a representative selection of these survey questions are outlined in Table 5.

Discussion of Findings from the Surveys

Based upon the p-value significance criteria, we observed both strong gains and declines in various trends. Strong positive growth in confidence with which students could make healthy dietary choices or trade stocks (both $p<0.001$) indicate that decision-driven skill sets were successfully acquired by the students. These strong gains also emphasized that the learning gains are maximal when students are continuously exposed to the content. For example, remaining engaged with the stock market for a majority of the semester or taking care of an egg during the entire focus unit on consumer chemistry provides students a constant contact with the subject matter. These findings support the success of the course design in which students remain involved with subject matter in- and out-of-the-classroom. In addition, an invaluable skill in the STEM literacy, communication of the research findings and ability to convey science to the general public, was positively identified in this course. For example, the ability to convey complex relationships between the environment and the soil ($p<0.001$), as well as the ability to communicate a science topic by summarizing indicates fulfilment of the student learning outcome of communicating science.

The observed declines are not necessarily negative findings. A decline in confidence could represent students becoming more aware of the true skill a task requires or the result of inflated confidence at the onset. For example, students in liberal arts disciplines lack the experience in appreciation of factual knowledge. For example, it comes as a surprise to many students that they have to anchor their scientific argument in factual knowledge and not opinion. These declines found in the data can be viewed also as positive reinforcement in self-realizing a shortcoming. It can be concluded from the strong decline in confidence of students working in small groups ($p=0.001$), maintaining notebooks ($p=0.006$), being

	Pre-Response (N=191)		Post-Response (N=191)		
	Highly Confident	Mean ± Std. Deviation	Highly Confident	Mean ± Std. Deviation	p-value
Areas with statistically significant growth in confidence					
Skill in science writing	39.5%	3.17 ± 1.18	49.2%	3.53 ± 1.02	$p<0.001$
Understanding of how scientist think	45.0%	3.38 ± 1.05	59.0%	3.72 ± 0.96	$p<0.001$
Understanding of how scientist work on real problems	48.9%	3.48 ± 0.96	56.7%	3.67 ± 0.98	0.023
Working on problems that have no clear solution.	28.9%	2.91 ± 1.13	37.2%	3.18 ± 1.07	0.004
Reading a textbook.	45.0%	3.43 ± 1.09	57.7%	3.66 ± 1.10	0.017
Areas without statistically significant gain or loss in confidence					
Collecting data.	66.0%	3.81 ± 0.93	62.8%	3.73 ± 1.01	0.145
Analyzing data.	62.8%	3.75 ± 0.91	60.3%	3.67 ± 1.00	0.238
Taking tests in class.	40.3%	3.30 ± 1.09	47.8%	3.46 ± 1.05	0.112
Presenting my science work in written papers or reports	51.3%	3.48 ± 1.06	53.4%	3.58 ± 1.03	0.194
Areas with statistically significant decline in confidence					
Working in small groups or teams.	71.2%	4.01 ± 0.89	61.9%	3.74 ± 1.02	0.001
Learning that the use of disciplinary knowledge needs to be accurate and fair.	75.8%	3.97 ± 0.75	59.6%	3.74 ± 0.85	0.001
Becoming responsible for a part of a project	73.3%	4.09 ± 0.83	66.8%	3.89 ± 0.94	0.025
Working on a problem in which the students know the expected outcome	71.7%	3.97 ± 0.83	63.5%	3.77 ± 0.81	0.010
Maintaining notebooks.	75.4%	4.04 ± 0.93	63.2%	3.81 ± 1.02	0.006
Working together with other students as a whole class	71.2%	4.04 ± 0.90	61.6%	3.79 ± 1.01	0.009

Table 4. A selection of pre- and post-assessment survey questions to measure the confidence of students in behaviors which are typical of STEM learning and professional environment.

part of a team ($p=0.025$), or working on problems with expected outcomes ($p=0.010$) that what this course provided was a self-realization of their shortcomings in these critical skills. Working on problems with uncertain or unknown outcomes potentially exposes students' lack of training in problem solving skills. Once, these weaknesses are identified and recognized by students, they can be positively reinforced by instruction. Strong positive trends in Scientific Literacy (SL) and Critical Thinking (CT) in the form of writing skills and the understanding of the scientific process and thinking (both $p<0.001$), and strong enhancement in students' ability to read ($p=0.017$) were encouraging findings. The SL and CT are considered to be foundational blocks of science teaching from elementary to post secondary education (Hand, Lawrence and Yore 1999, Genlott and Ake Gronlund 2013, Glynn and Muth 1994, Pearson, Moje and Greenleaf 2010)

The success of the course was also determined by the learning gains in course content. At the beginning and end of the course, students were asked to respond to several open-ended, content based questions. These pre- and post-content-assessments were not part of the course grade, but provided data which could be analyzed for learning gains, which are not self-reporting. A rubric was developed which gauged the responses based upon use of terminology (level 1), making suitable deductions (level 2), and higher-order critical thinking analysis (level 3) of the content. Each student response was graded based upon this rubric. The responses were blinded for student information and the pre/post information. Average scores for pre- and post-content-assessments with errors in mean were calculated and compared for learning gains. The results for two topic areas of stock market trading and the knowledge of nutrition facts are shown in the Figure 1.

The two topics represented here show different trends. The learning gains in stock market knowledge were extraordinary, with nearly six-standard deviations of difference between pre- and post-assessments. A prior knowledge of the data analysis techniques and tools which are employed to explore the stock markets was unlikely since most of the student population (86.4% of the students) had none or at most one semester college-level science education and 85.7% of the students were non-science majors. This assumption was further ascertained by the open-ended question in the pre-survey about stock markets in which students were gauged by a scale based upon knowledge of key stock terms and were found to be at a level of little to not-at-all confident about the subject matter. Whereas, the learning gains in the consumer science indicate a high-level of pre-knowledge of the material, highlighting an informed consumer.

The overall success of the course can be established by comparing it to other similar GEC and science courses. One measure of course performance is the D-W-F rate, i.e., the fraction of students which receive failing grades or withdraw from the course. Furthermore, the high-achievement rate (rate of grades A or B in the course) can also be compared. A comparative analysis of this course, a traditional GEC course called Language of Science, and a traditional science course, General Physics-I, at the institution is shown in Table 6.

The D-W-F rate of this course is the lowest in this comparison. The A-B rate is not as high as in the Language of Science course, but considerably higher than a traditional science course. The cause and effect of this trend would have to be analyzed based on longer-term data, and a study of content retention.

Course Revisions

Over the duration of this curse, based upon evaluation data and the faculty assessments, we have continuously tweaked the course to improve its offering. For the first three semesters, only two focus units were introduced in the course. One-half of the students first attended the Human Kinetics module and the remaining half concurrently attended the Consumer Chemistry module. In the middle of the semester, the two groups then interchanged such that the entire class experienced both modules. However, based upon the student comments and the course evaluations, the transition from one unit to another restricted the in-depth engagement in both units due to the short duration. To address this concern, a third focus unit was later added, titled Digging the Soil, and the transition between focus units was removed. This revision increased the contact time available for the focus units. This revision has also provided for longer contact times for the case of other units such as Science of Music and Scientific Argument. Each semester, the students in the course report on various survey questions administrated by the university. The students can report on both closed and open-ended, free response questions directed at various aspects of the course from behaviors, instruction, and content. These surveys are called Student Rating of Instruction (SRI). SRIs are based on a 5-point system (1, Strongly Disagree – 5, Strongly Agree). Based upon these SRIs, the student re-

	Pre-Response (N=191)		Post-Response (N=191)		
	Highly Confident	Mean ± Std. Deviation	Highly Confident	Mean ± Std. Deviation	p-value
Course learning outcomes with statistically significant growth in confidence					
How confident are you that you could identify important components on a Nutritional Fact Label, if you were concerned about making healthy dietary choices?	31.2%	2.99 ± 1.06	48.7%	3.46 ± 0.99	p<0.001
How confident are you in your knowledge of the US Stock Market?	16.9%	2.35 ± 1.15	48.9%	3.41 ± 1.02	p<0.001
How confident are you that you could describe the composition of soil and the environmental factors which affect the soil? (N=112)	25.0%	2.64 ± 1.18	48.5%	3.44 ± 1.07	p<0.001
How confident are you that after listening to a public lecture regarding some science topic, you could write a summary of its main points?	45.5%	3.34 ± 1.07	51.9%	3.59 ± 0.97	0.010
Course learning outcomes with strong upward trends in confidence					
How confident are you that after reading an article about a science experiment, you could explain its main ideas to another person?	49.2%	3.46 ± 1.06	57.1%	3.67 ± 0.97	0.021
Course learning outcomes without statistically significant gains or declines in confidence					
How confident are you that after watching a television documentary dealing with some aspect of science, you could explain its main ideas to another person?	56.6%	3.60 ± 1.06	58.2%	3.70 ± 0.96	0.276

Table 5. A selection of pre- and post-assessment survey questions to measure the confidence of students in course content and its effectiveness towards reaching the desired course outcomes.

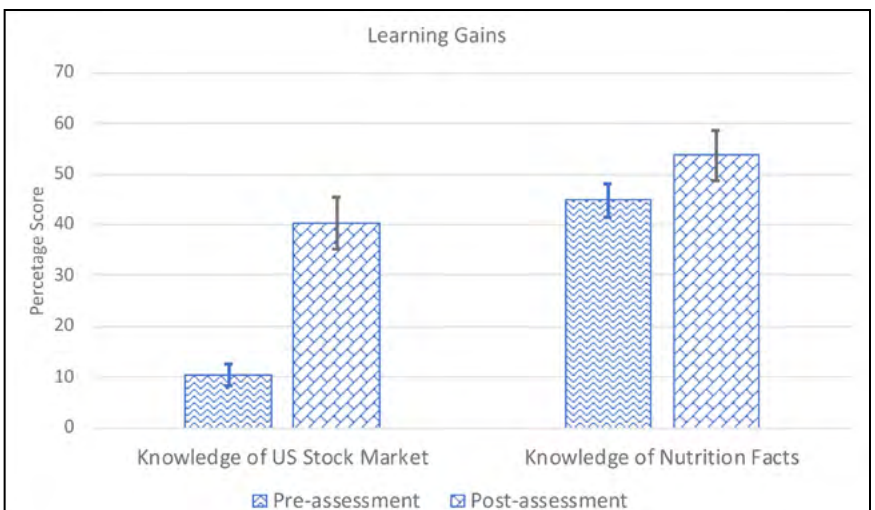

Figure 1. Average scores in pre- and post-content-assessment for two topic areas in the course.

sponses to course revisions have been overwhelmingly positive. Few representative SRI questions and responses are listed in Table 7.

Conclusion

An interdisciplinary course for non-science majors was designed to address the needs of increasing scientifically literate citizens and the STEM-capable workforce. The goal of this course was to create an appreciation of science among students who are anxious toward science and who are often disinterested in or even fear science (Train and Gammon 2012). Furthermore, this unique course was designed as a sampling of content in physical and life sciences, and liberal education with the goal of increasing scientific curiosity and literacy of scientifically-driven decision making. The effectiveness of the course and its design was measured by administering pre- and post-surveys, which contained both quantitative and qualitative items. While strong positive and negative trends emerged from the initial analysis, these trends helped establish the success of the course design and the student learning outcomes by indicating behavioral trends and academic growth which aligned with educating student populations in scientific methodology, STEM working environment and skills, decision making, and successful communication. The learning gains and comparative study of this course with other GEC and science courses establish the success of this novel method of teaching such courses. Based upon these findings, it can be concluded that the course is a success in producing students who will be scientifically curious and literate leaders in society.

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Course	D-W-F Rate	A-B rate
Scientific Decisions in Everyday Life	3%	44%
Language of Science	6%	85%
General Physics -I	60%	27%

Table 6. Rate of D-W-F and A-B compared across three courses.

SRI Questions	Rating
I have attended class regularly.	4.5
I have put a great deal of effort in this course	4.5
The stated goals and outcomes for the course are consistent with what was actually taught.	4.4
The subject matter of this course is well organized.	4.3
My power to think, criticize, and or create have been improved as a result of this course.	4.2
This instructor is effective in promoting learning.	4.4
The instructor uses instructional approaches (for example, discussions, lectures, audio-visuals, field work, demonstrations, computer programs, etc.) which effectively enhance learning in this course.	4.5

Table 7. Student Rating of Instruction for the course (SRI). There are a total of fifteen questions asked in the SRI. All responses for this course are above a rating of 4.2 (Strongly Agree).

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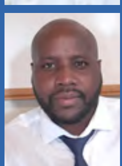

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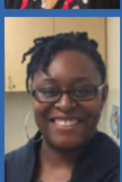

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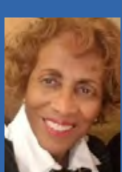

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