

*Creating Active Pathways to Student Learning:  
A Learning to Learn Project*

**SouthEastern Pennsylvania Consortium for Higher Education (SEPCHE)  
White Paper Submission to The Teagle Foundation**

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**ABSTRACT**

SEPCHE investigated the extent to which learning factors are enhanced by altering instruction to incorporate active pathways to learning. Utilizing metacognitive skills in a “learning how to learn” approach was believed to help students develop cognitive skills that enabled them to master more disciplinary content in targeted courses. The project consisted of four parts:

1. Collaborative faculty development focusing on the application of current research in cognitive science to learning strategies and performance-based learning in core curricula;
2. Adaptation of core courses;
3. Implementation of *project* and *comparison* courses over two semesters;
4. In-depth assessment of student achievement using both qualitative and quantitative measures.

In Fall 2008, SEPCHE convened a collegium of 16 faculty (2 from each SEPCHE institution) who taught core courses in the arts, humanities, sciences, and social sciences. Participating faculty worked together during Spring 2009 to develop metacognitive approaches to instruction in their discipline. During academic year 2009-10, faculty introduced metacognitive teaching strategies in project courses. A smaller sample of comparison courses was also given. Overall results indicate that metacognitive teaching approaches may have provided a protective or stabilizing influence against typical declines in learner confidence in special treatment classes.

## INTRODUCTION

Ongoing developmental brain research indicates that the regions of the brain associated with cognitive control are latest to mature and that the process of maturation continues well into young adulthood (Zull, 2002). Development of cognitive capacities, such as metacognition, abstract thinking, self-regulation, and goal-setting, appear to depend on the brain's ability to synthesize activity among its different regions. It is this synthesizing or integration that characterizes the process of brain maturation (Jernstedt, 2009). This is accomplished through a process called consolidation that allows material to be processed over time and across many regions of the brain. Thus, the brains of students coming to college in their late teens are still in the process of maturing, and their capacity for cognitive control is not yet fully developed. Learning that involves multiple regions of the brain enables greater consolidation and better recall and utilization of material.

Sylwester (2005) offered an overview of the brain's four lobes; frontal, parietal, occipital, and temporal. The frontal lobe holds things in working memory as well as the areas of the brain that inhibit impulses and regulate emotions. The parietal lobe processes motor movement such as note taking, hand manipulations, etc. The temporal lobe involves perception, memory and speech. The occipital lobe processes visual stimuli. Reading involves not only the visual areas, occipital lobe and parietal lobe, but also areas that are crucial to the auditory, language, and reasoning functions of the brain. The rear of the brain (temporal lobe) receives and retains information, whereas the frontal lobe is responsible for generating and implementing action. As Zull (2002) would say, it is as though the brain turns its back on the past and looks to its front for the future.

David Kolb (Zull, 2002) posited that deep learning is achieved through a "learning cycle" of experience, reflection, abstraction, and active learning. He surmised that these processes are circular as we learn. Zull (2002) assigned known biological components of learning to Kolb's cycle for learning. The following diagrams illustrate this overlap of brain function and learning processes. In Figure 1, material is perceived through the senses, stored in memory and used again in later connections and recall. As learning incorporates multi-sensory experiences (e.g. hearing, writing, seeing), more areas of the brain become involved.

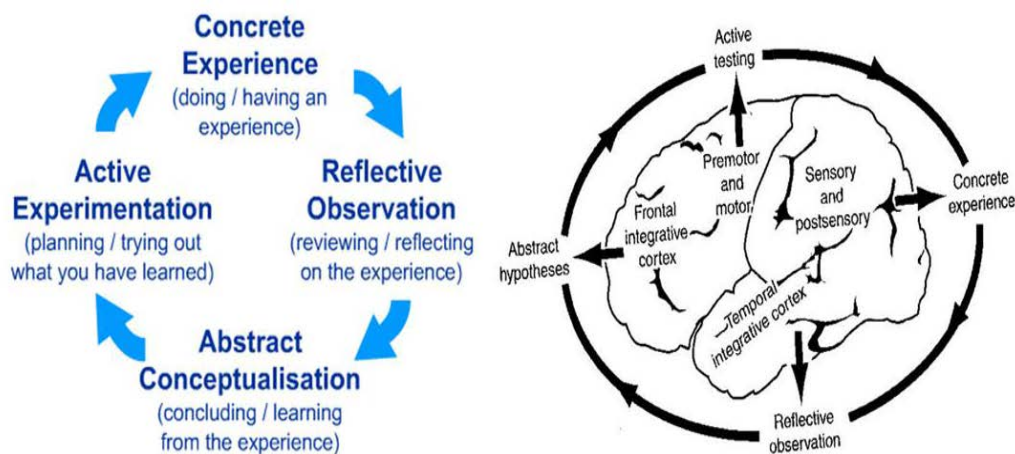


Figure 1: Source: [http://www.ldu.leeds.ac.uk/ldu/sddu\\_multimedia/kolb/static\\_version.php](http://www.ldu.leeds.ac.uk/ldu/sddu_multimedia/kolb/static_version.php)

Active learning, by definition, includes activities that engage the brain in ways that support the retention of information. Active learning is stimulated by activities that are pleasurable and multi-sensory. The Cone of Experience Media provides a pyramid of learning (see Figure 2). The figure suggests that as more areas of the brain that are stimulated, more active learning occurs.

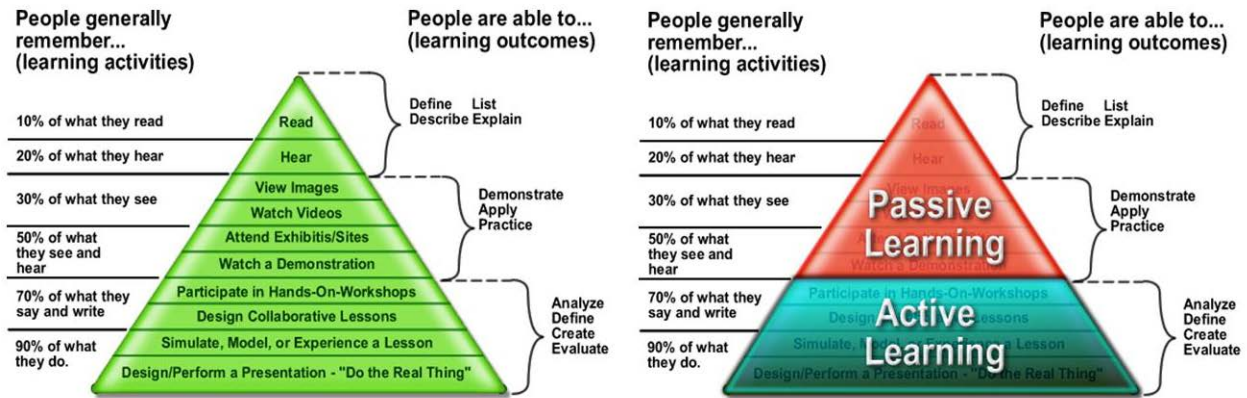


Figure 2: Source: [Cone of Experience Media](http://www.edutechie.ws/2007/10/09/cone-of-experience-media/): <http://www.edutechie.ws/2007/10/09/cone-of-experience-media/>

Given this information, research on cognition at the college level highlights the importance of the development of higher order cognitive abilities as a major factor underlying students' academic success. In order to take full advantage of intellectual opportunities available through postsecondary studies, students must be able to exercise sufficient cognitive control to enable goal setting, development of strategies to achieve goals, self-monitoring and the capacity to make accommodations to meet goals.

### Research Question

The Southeastern Pennsylvania Consortium for Higher Education (SEPCHE), consisting of eight independent colleges and universities in the Philadelphia area -- Arcadia, Immaculata, Holy Family and Neumann Universities; Cabrini, Chestnut Hill, Gwynedd-Mercy and Rosemont Colleges, explored whether alternative pathways to instruction would help foster a metacognitive learning experience in an undergraduate population. The guiding research question was whether or not teaching students "how to learn" alongside course content would enable them think critically about the processes of learning thereby enhancing both comfort and strength in learning. We surmised that such metacognitive teaching approaches that utilized multi-sensory, creative, applied and interactive teaching strategies as alternate pathways to instruction would stimulate a variety of brain sensory regions, thereby creating more meaningful learning experiences. To test our hypothesis, the study utilized alternative pathways to learning in a sample of first and second year college undergraduates. It was thought that, from a developmental standpoint, first and second year college students would be continuing their growth in frontal lobe activities such as cognitive control, self-monitoring, and self-regulation.

## **IMPLEMENTATION**

### **Faculty Professional Development**

The project was launched with a SEPCHE-wide faculty development conference in May 2008 to introduce the topic. Proposals for faculty involvement in this grant were solicited from the eight institutions in the summer of 2008 and by the following fall, the grant leadership team selected a Collegium of sixteen faculty (two faculty from each of the eight institutions) who committed themselves to developing a metacognitive approach to instruction within their disciplines and to implement and assess their modified approach in one or more core sections of their courses. Throughout the Collegium forum during the 2008-2009 academic year, the sixteen faculty members worked in four discipline groups to articulate the epistemology of their own discipline and to identify commonalities across disciplines (e.g., critical thinking, analytical reasoning, goal setting, self-regulation). Discipline groups included the arts, humanities, sciences, and social sciences.

### **Strategy Identification**

Faculty focused on the application of current research in cognitive science to learning strategies and performance-based learning in the core curriculum. To that end, each faculty identified at least three core principles of their discipline and three or four discipline-related thinking processes within the course that would be adapted and modified. Faculty further enhanced the content and delivery to provide a conceptual framework alongside process skills to encourage cognitive synthesis and integration. Prior to training, discipline related groups identified the following strategies as those most beneficial to teaching and learning.

- Lecture
- Questionnaires
- Group work
- Discussion
- Demonstrations
- Lab experiences
- Group problem-solving
- Direct instruction
- Socratic dialogue
- Active immersion
- Relaxed alertness
- Active processing
- Modeling
- Revision, reflection

In addition to working in discipline related faculty groups throughout the 2008-2009 academic year, the Collegium experienced three separate and extensive faculty development opportunities. Collegium members met in November 2008 for a half-day conference presented by Dr. G. Christian Jernstedt, Professor of Psychological and Brain Sciences, Dartmouth College, Adjunct Professor of Community and Family Medicine at Dartmouth Medical School, and Director for Educational Outcomes at Dartmouth. Dr. Jernstedt was selected for his expertise in human learning, educational technology and evaluation research. The Collegium met again in March

2009 to work specifically on learning outcomes, active learning strategies and assessment. In preparation for this workshop, faculty read the text “*The Art of Changing the Brain*” by James E. Zull and the leadership team arranged a presentation entitled “*Using our Brains: Implications of Recent Research on Learning and Teaching*” by Dr. Kathleen Harring and Dr. Laura Edelman Professor of Psychology at Muhlenberg College. In May of 2009, the Collegium met for a two-week intensive workshop presented by Dr. Jernstedt in combination with clear course development strategies and outcomes for course implementation in the 2009-2010 academic year.

### **Course Adaptation**

Following training and discipline related discussions, faculty were tasked with identifying metacognitive skills and related instructional strategies for their courses and developing pre and post measures for assessing students’ development of those skills. A list of new pedagogies for use in their classes with more of a focus on metacognition and creative pathways to learning follows.

#### **New Pedagogy**

- Practicing philosophers
- Project based learning
- Pre/post questionnaires
- Analogies
- Associative learning
- Brain exercises
- Studio method
- Stratification exercise
- College party exercise
- Media comparison exercise
- Film a commercial
- Evaluative writing Process
- Emotional/sensory connections

Faculty began working individually and with their corresponding disciplines to develop alternative teaching strategies. Modified curricular plans were submitted to consultant Dr. Carol Weiss, Director of the Villanova Institute for Teaching and Learning, for feedback prior to implementation.

During the 2009-2010 academic year, the Collegium met in the Fall 2009 semester to review progress and at the beginning of the Spring 2010 semester for feedback on revised courses which were to be taught in the spring semester. Faculty employed techniques such as those suggested by Angelo and Cross (1993), Lovett (2008) and Suskie and Banta (2009) to encourage and assess students’ use of metacognitive techniques and strategies. These included Minute Papers, Memory Matrices, One Sentence Summaries, Course Related Self-Confidence Surveys, Punctuated Lectures, Assignment Wrappers, Journaling, other means of Self-Reflection, etc. At the end of the spring 2010 semester, outcomes were reviewed and faculty prepared for a SEPCHE-wide faculty development conference held in May 2010. A final assessment meeting occurred in the Fall of 2010.

## **Data Collection**

As noted in the “Creating Active Pathways to Student Learning- A SEPCHE Learning to Learn Project Evaluation Summary” prepared by Dr. James F. Trainer (2011), Director of Planning and Assessment, Villanova University, our assessment efforts included a mixture of qualitative and quantitative approaches and formative as well as summative components. The assessment and evaluation strategies were designed to focus on both the content and process of student learning. In choosing assessment tools and evaluation techniques for this project, emphasis was placed on the goal of “learning to learn” and the development of metacognitive capacities in students that characterize cognitive control: 1) the ability to set goals; 2) to develop strategies to achieve goals; 3) to monitor their own progress toward goals; and 4) to make accommodations as needed toward goals. Given that instructors were pursuing the dual purpose of teaching process along with teaching content, evaluation efforts were designed to support both activities and ultimately to enhance the quality of student learning through the incorporation of performance-based metacognitive learning strategies helping students build cognitive control, self-monitoring, and self-regulation as learners. Dr. Trainer summarizes the process for data collection and assessment in his evaluation summary, highlights of which are noted below:

### Participants:

*Sixteen faculty from 8 participating institutions, teaching core courses in the arts, humanities, sciences, and social sciences, who committed to using a metacognitive approach within their disciplines participated in this study. All participating faculty members taught at least one course section in which they pursued the goals of the project, incorporating metacognitive strategies into their work in addition to covering regular course content. Indeed, these 16 faculty members collectively taught 17 course sections which incorporated metacognitive strategies. In addition, 8 of the faculty members also taught a second section of their course in which they did not employ metacognitive strategies. For all intents and purposes, this project included 25 course sections; 17 course sections wherein metacognitive strategies were employed are referred to as the project groups and 8 sections where metacognitive strategies were not used are referred to as comparison groups. By having faculty teach more than one section of the same course, implementing metacognitive strategies in one section and not in the other, afforded us an opportunity to make at least a rudimentary comparison of outcomes, realizing that such an approach was quasi-experimental at best. Approximately 530 students were enrolled across these 25 course sections with 349 students enrolled in project sections and 181 students in comparison sections.*

### Procedure:

*At the beginning and end of the semester, all participating faculty administered a survey instrument, The Motivated Strategies for Learning Questionnaire (MSLQ), to their students which assessed metacognition, learning styles and strategies aimed at helping students focus on the task of “learning to learn.” MSLQ is a self-reporting Likert-scaled instrument initially designed by the University of Michigan to assess college students’ motivational orientations and their use of learning strategies. It contains 81 questions divided into 2 broad categories – motivational scales and cognitive self-regulated learning strategies scales – subdivided into a total of 15 subscales or factors. The scale was adapted for use to include assessment for “Motivational Scale” which included items measuring “Task Value” and “Test Anxiety;” and*

*“Learning Strategies Scales” which items measured “Metacognitive Self- Regulation” and “Critical Thinking.” Questions regarding the students’ experience were added to the end of the semester surveys.*

*Faculty also participated in a brief survey about their teaching experiences and completed end of experience final reports which afforded them the opportunity to reflect upon their participation in this effort, to compare notes and experiences with one another, and to evaluate the success of this endeavor in promoting process as well as content learning in their students.*

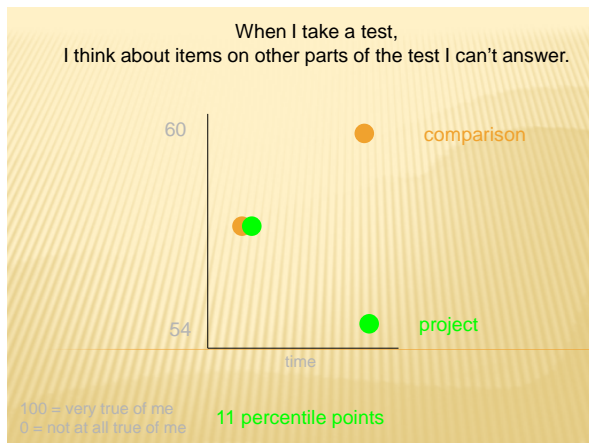
**Student Participant/Respondents:**

At the beginning of the semester, 471 MSLQ surveys were returned and 434 at the end. Surveys were matched for 371 respondents (79% of the pre-test surveys), leaving 96 beginning of semester and end of semester surveys unmatched. In total we had 530 unique respondent records. Of the total records, 181 came from comparison group sections and 349 from project sections. Of the matched records, 110 came from comparison group sections and 261 from project sections. Results are summarized here and a more expansive analysis is provided in Appendix B.

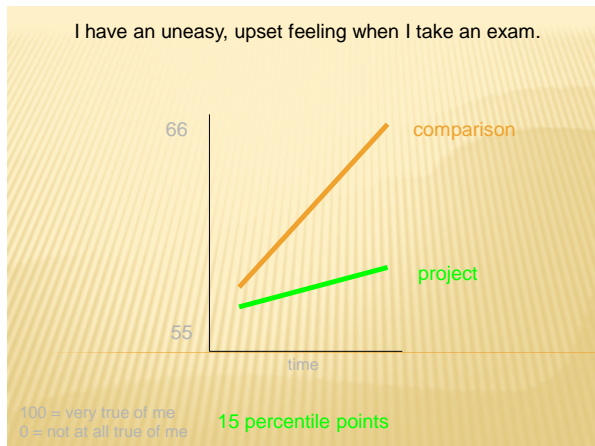
**RESULTS**

**Quantitative Analysis**

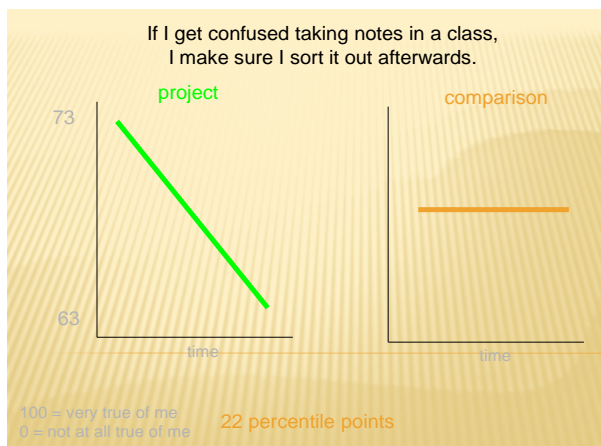
In April 2010, Dr. Jernstedt analyzed the pre- and post-test data collected from both project and comparison sections. He focused particularly upon the signification and marginal interactions between the project and comparison groups and noted the following (See Appendix):



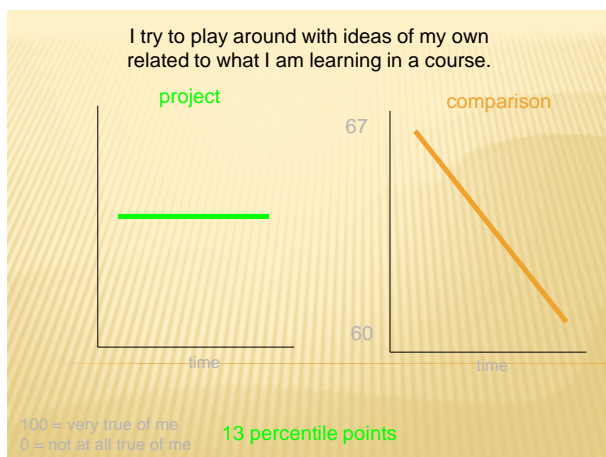
*At the end of their course, students in the project’s special treatment classes were less likely than comparison group students to report anxiety about difficult questions on tests.*



*At the end of their course, students in the project's special treatment classes were less likely than comparison group students to report anxiety about taking exams.*

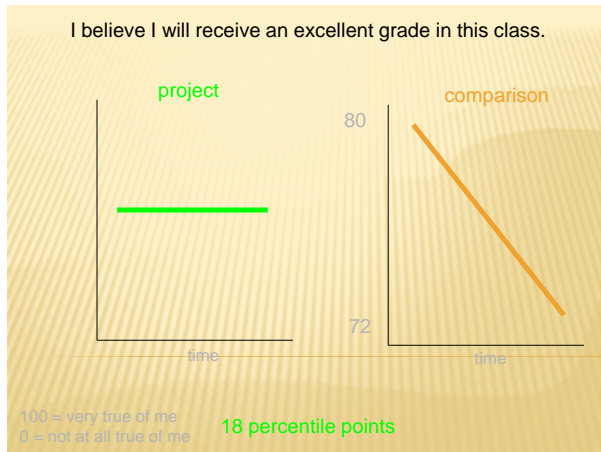


*Unanticipated results were yielded in 2 of 8 significant interactions. Faculty hypothesize that for the trend shown below, students were less reliant on notes because students in special treatment classes had access to many more resources from which students could reference if confused.*

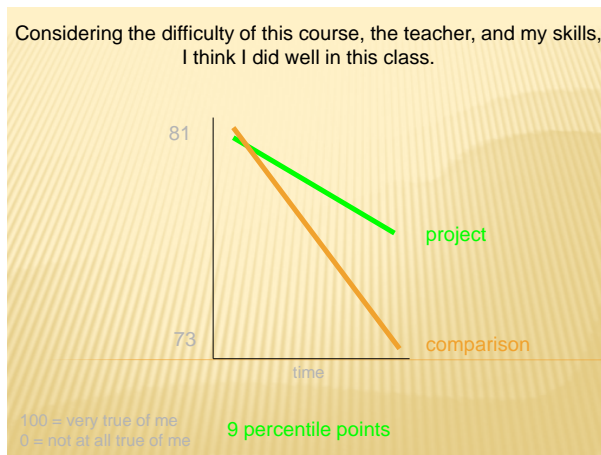


*Students in the project's special treatment classes maintained their initial inclination to play around with ideas and their belief in receiving an excellent grade than other students.*





*Students in the project's special treatment classes maintained their belief in receiving an excellent grade than other students.*



*At the end of their course, all students were less likely to report that they thought they did well in the course. However, at the end, students in the project's special treatment classes were higher than the other students in reporting that they thought they did well.*

A complete evaluation of pre- and post test results provided by Dr. Trainer is included in Appendix B.

### Qualitative Survey Results

Representative responses from student survey and faculty survey responses following implementation are provided below:

#### Student Survey Responses:

- *“It provided me with more writing strategies + allowed me to become more reflective.”*
- *“I've found out that everyone learns differently. For my style, I've realized I need to do certain thing in order to actually learn. There is no one-size-fits-all approach to learning.”*
- *“It has helped me study better and take better notes when I take better notes, that is when I know I paid attention. So, this class helped me pay attention.”*

- *“This course affected my learning because it really motivated me to learn. I began to yearn for a deeper understanding of the knowledge that I learned. It also gave me a thirst for more knowledge as the course went on.”*

#### Faculty Survey Responses:

- *“Students were more prompt in submitting labs and assignments than usual. Questions were more perceptive and deeper.”*
- *“Generally, students start to bring in applications they have noticed in the world around them around Thanksgiving. This year we were getting them almost everyday starting in October. One student called me on a Saturday from the Brooklyn Bridge. He and his family were spending a weekend in New York and were walking across the bridge together. He said he was making them listen to all the physics about the bridge.”*
- *“The most telling anecdotal evidence for me is how much more insightful their definitions are of readers, writers, historians and teachers by the end of the unit and the course. I have also found that their ability to generate attainable work goals for themselves improved over time in the course because of their need to set weekly learning goals for themselves. They are broadening their definition of what a teacher is and what a teacher does which is exciting to me.”*
- *“Please know that not all has been “sweetness and light.” My students have been frustrated about revising and editing and peer reviewing...I hope to further refine [my teaching strategies] as I work with two developmental groups next academic year.”*

#### **Limitations**

In the design of the study, it was difficult to develop a true control group. Faculty who had multiple sections of one course in the same semester were selected for the project in order to have direct comparison groups. Initially these were designed to be control groups but it was determined that all variables could not be controlled for those course sections. As a result, control and experimental group titles were changed to comparison and project group titles. As faculty gained knowledge in brain-based learning and metacognitive strategies, it was difficult for them to teach without that knowledge. Consequently, comparison groups were affected by the instructor even though new strategies were not directly implemented. In reviewing research on similar studies, Dr. Jernstedt indicated that students who were exposed to these metacognitive strategies showed changes over time and immediate changes in one semester were not likely.

#### **Discussion**

The repeated measures analyses revealed that project group students maintained a belief in their ability more than comparison groups, particularly in the areas of believing they would receive an excellent grade in the course in which they were enrolled, worrying less about items on exams that they could not initially answer, believing they mastered course content and believing they did well in their courses. Such beliefs may be related to project group students' level of

involvement in the content through new pedagogies introduced in the study. Project based learning strategies and application to real life appeared to engage students with content and create an understanding of the content at an increased level of confidence.

In addition, project group students appeared to have an engaged level of interest as reported that they were more likely at the end of the semester to play around with ideas on their own related to what they were learning in their courses. Project group students indicated over time that they were more likely to think about what they were supposed to be learning on a given topic, rather than simply reading the material over again. One of the metacognitive strategies introduced during training was “consolidation.” This strategy provided students with time between learning concepts in order to absorb the material. Faculty were fascinated by the strategy and believed it directly influenced learning.

At the end of the project, faculty developed summary reports identifying their strategies, assessments and outcomes of the project over the past year of implementation. Faculty responses indicate that significant differences in quantitative results were not yielded between comparison and project groups. Qualitative findings reflect increased joy of teaching, important insights into student learning and collaborative partnership with fellow faculty participants.

### **Faculty Final Reports**

Throughout the training, faculty were excited to enhance their teaching practices with this new knowledge of student learning and engaged pedagogy. One faculty member reported,

*“There were many moments during this semester in this class where I experienced the joy of teaching. My students were excited about this assignment and determined to do well.”*

In addition, faculty gained new insights into student learning. Another faculty member stated,

*“Most of what we learned about in this project concerned how to promote ‘active learning,’ especially by applying knowledge about learning gained from and/or confirmed by brain research. In order to promote more active learning in this course, I modified the course with the following goals in mind, goals drawn from what we learned about the relationship between learning and the brain:*

- get more concrete experiences involved in the learning process in order to, for example, enhance student engagement with the material and aid memory*
- promote more engagement of the emotions in the learning experience*
- include more activities that provide students with opportunities to identify ‘meaning’ and value in the material to be learned*
- overall: have student effort and energy be guided more by individual interest than it usually is.”*

Critical thinking was clearly identified as a valuable aspect of student learning. One faculty member stated,

*“My goal for this project was to provide a space for my students to think critically and over time about the activities of the class and the craft of being a poet, historian, and teacher. I wanted my students to deepen and nuance their understandings of poetry, history, and what it means to be a teacher. I also wanted them to speak directly to how the work of the class was influencing their developing understandings. To achieve this goal, I had my students critically reflect on their work at the end of each week of the semester.”*

As stated earlier, metacognitive strategies were used to enhance learning. One faculty member concluded,

*“Some benefits that I see for doing this kind of metacognitive work with my students:*

- *develops an ongoing work discussion between teacher and students*
- *creates a running record of the deepening of thoughts and ideas over time*
- *develops the discipline of deepening an understanding*
- *creates meaningful work to share with the class*
- *concretizes work and shows students that they are able to construct knowledge*
- *provides a model for the kind of work they should be doing with their own students*
- *offers an evaluation free zone to recognize limitations and areas for growth*
- *encourages students to make links between classes*
- *creates meaning that students transport into other assignments and experiences”*

Faculty also found the collaborative exchange among their colleagues to be of particular value in their participation in this initiative. A faculty member stated,

*“Being part of the writing group for this project was a positive experience. We met in various locations including one another’s homes and the libraries of our alma maters. We easily fell into sharing assignments and activities that worked in our freshmen composition classes.”*

To date, faculty continue to stay connected with many of their colleagues on this grant project and look to explore furthering their own learning and discussion on these active pathways to student learning.

#### Suggestions for future research and strategies for enhancing pathways to learning:

Findings indicate that project group students were more likely at the end of the semester to play around with ideas on their own related to what they were learning in their courses than were comparison group students and project group students expressed less anxiety over taking exams than did comparison group students. Faculty conveners believe that the metacognitive strategies introduced to these project group students did enhance pathways to learning. It appears the project group students are less anxious about their learning and more creative in playing with ideas related to their learning.

As suggested by Dr. Jernstedt, more time may be necessary in order to identify significant differences to student learning through development of these active pathways. The leaders of this project suggest a longitudinal study that would track project group students throughout their four years of college. Further research on faculty attitudes toward teaching following extensive faculty development on brain-based learning and metacognitive approaches is also suggested. Throughout the qualitative data and the summary reports, faculty clearly benefited from professional development and from working with colleagues from local higher education institutions.

## **APPENDIX**

**A.** MSLQ instrument

**B.** Evaluation Summary by Dr. James Trainer, Director of Assessment, Villanova University

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# Motivation & Strategies for Learning

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<p>2. What is your class level?</p> <p><input type="radio"/> 1 Freshman</p> <p><input type="radio"/> 2 Sophomore</p> <p><input type="radio"/> 3 Junior</p> <p><input type="radio"/> 4 Senior</p>																																																																																											

## Part A - Motivation

A. The following ask about your motivation for and attitudes about the class. There are no right or wrong answers, just answer as accurately as possible. Use the scale to the right to answer each statement. If you think the statement is very true of you, fill in the circle with the rating of 7; if a statement is not at all true of you, fill in the circle with the rating of 1. If the statement is more or less true of you, fill in the number between 1 and 7 that best describes you.

	Not at all true of me						Very true of me
1. When I take a test I think about how poorly I am doing compared with other students.	1	2	3	4	5	6	7
2. I think I will be able to use what I learn in this course in other courses.	1	2	3	4	5	6	7
3. I believe I will receive an excellent grade in this class.	1	2	3	4	5	6	7
4. I'm certain I understood the most difficult material presented in the readings for this course.	1	2	3	4	5	6	7
5. When I take a test I think about items on other parts of the test I can't answer.	1	2	3	4	5	6	7
6. It is important for me to learn the course material in this class.	1	2	3	4	5	6	7
7. I'm confident I understood the most complex material presented by the instructor in this course.	1	2	3	4	5	6	7
8. When I take tests I think of the consequences of failing.	1	2	3	4	5	6	7
9. I'm confident I understood the basic concepts taught in this course.	1	2	3	4	5	6	7
10. I am very interested in the content area of this course.	1	2	3	4	5	6	7
11. I have an uneasy, upset feeling when I take an exam.	1	2	3	4	5	6	7
12. I'm confident I did an excellent job on the assignments and tests in this course.	1	2	3	4	5	6	7
13. I think I did well in this class.	1	2	3	4	5	6	7
14. I think the course material in this class is useful for me to learn.	1	2	3	4	5	6	7
15. I like the subject matter of this course.	1	2	3	4	5	6	7
16. Understanding the subject matter of this course is very important to me.	1	2	3	4	5	6	7
17. I feel my heart beating fast when I take an exam.	1	2	3	4	5	6	7
18. I'm certain I mastered the skills being taught in this class.	1	2	3	4	5	6	7
19. Considering the difficulty of this course, the teacher, and my skills, I think I did well in this class.	1	2	3	4	5	6	7

**Part B - Learning Strategies**

B. The following ask about your learning strategies and study skills for this class. Again, there are no right or wrong answers, just answer as accurately as possible. Use the same scale to answer this group of questions.

	Not at all true of me					Very true of me	
1. During class time I often miss important points because I'm thinking of other things.	1	2	3	4	5	6	7
2. When reading for a course, I make up questions to help focus my reading.	1	2	3	4	5	6	7
3. I often find myself questioning things I hear or read in a course to decide if I find them convincing.	1	2	3	4	5	6	7
4. When I become confused about something I'm reading for class, I go back and try to figure it out.	1	2	3	4	5	6	7
5. If course materials are difficult to understand, I change the way I read the material.	1	2	3	4	5	6	7
6. When a theory, interpretation, or conclusion is presented in class or in readings, I try to decide if there is good supporting evidence.	1	2	3	4	5	6	7
7. I treat course material as a starting point and try to develop my own ideas about it.	1	2	3	4	5	6	7
8. Before I study new course material thoroughly, I often skim it to see how it is organized.	1	2	3	4	5	6	7
9. I ask myself questions to make sure I understand the material I have been studying in a class.	1	2	3	4	5	6	7
10. I try to change the way I study in order to fit course requirements and instructor's teaching style.	1	2	3	4	5	6	7
11. I often find that I have been reading for class but don't know what it was all about.	1	2	3	4	5	6	7
12. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying.	1	2	3	4	5	6	7
13. I try to play around with ideas of my own related to what I am learning in a course.	1	2	3	4	5	6	7
14. Whenever I read or hear an assertion or conclusion in a class, I think about possible alternatives.	1	2	3	4	5	6	7
15. When studying for a course I try to determine which concepts I don't understand well.	1	2	3	4	5	6	7
16. When I study for a class, I set goals for myself in order to direct my activities in each study period.	1	2	3	4	5	6	7
17. If I get confused taking notes in class, I make sure I sort it out afterwards.	1	2	3	4	5	6	7

**Your Course Experience**

To what extent do you agree or disagree with each of the following statements?

	Strongly Disagree		Strongly Agree		
1. This class focused on learning styles and strategies as well as course content.	1	2	3	4	5
2. This class contributed to my understanding of how I best learn.	1	2	3	4	5
3. This class helped me develop strategies to improve my learning.	1	2	3	4	5
4. This class helped enhance my self-confidence as a learner.	1	2	3	4	5
5. This class helped increase my motivation to learn.	1	2	3	4	5
6. This class helped me accept responsibility for my own learning.	1	2	3	4	5
7. This class helped me develop strategies to analyze and think more deeply about the course content and material.	1	2	3	4	5

**Please describe how this course has affected your learning.**

**Creating Active Pathways to Student Learning  
A SEPCHE Learning to Learn Project**

**Evaluation Summary**

Prepared by:

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Director of Planning and Assessment  
Villanova University

A number of assessment activities and evaluation techniques were pursued throughout the course of the Southeastern Pennsylvania Consortium for Higher Education (SEPCHE) Creating Active Pathways to Student Learning – Learning to Learn project. The methods employed in the evaluation process included a mixture of qualitative and quantitative approaches and formative as well as summative components.

In choosing assessment tools and evaluation techniques for this project, we remained focused on the goal of “learning to learn” and the development of metacognitive capacities in students that characterize cognitive control: 1) the ability to set goals; 2) to develop strategies to achieve goals; 3) to monitor their own progress toward goals; and 4) make accommodations as needed to work toward goals. We were aware that instructors were pursuing the dual purpose of “teaching process along with teaching content, and of structuring assessment that allows students to demonstrate mastery of both kinds of learning, especially during early years of college,” and we tried to design our evaluation efforts to support this dual purpose. Ultimately, we knew that our efforts should help facilitate the overall aim of the project to “enhance the quality of student learning through the incorporation of performance-based metacognitive learning strategies” helping students “build cognitive control, self-monitoring, and self-regulation as learners.”

In turn, the assessment and evaluation strategies employed throughout this process aimed at developing evidence of both content and process learning. In addition, the assessment techniques had to include both formative and summative components for both students within individual courses as well as for faculty members throughout the duration of their involvement with the project. Thus, given the nature of this effort, a number of the assessment techniques utilized called for students and faculty to reflect on their experiences in this project not only to help evaluate the success of the project *in cursu* and ultimately *in toto*, but also to allow students, in particular, to demonstrate their use of metacognitive strategies.

In total, 16 faculty from 8 participating institutions, teaching core courses in the arts, humanities, sciences, and social sciences, who committed to using a metacognitive approach within their disciplines and were willing to implement and assess such an approach within their core courses, participated in this effort. All participating faculty members taught at least one course section in which they pursued the goals of the project, incorporating metacognitive strategies into their work in addition to introducing their regular course content. Indeed, these 16 faculty members collectively taught 17 course sections which incorporated metacognitive strategies. In addition, 8 of the faculty members also taught a second section of their course in which they did not employ metacognitive strategies. In turn, for all intents and purposes, this project included 25 course sections -- 17 course sections wherein metacognitive strategies



were employed – hereafter referred to as the *project sections* – and 8 sections where metacognitive strategies were not used – hereafter referred to as *comparison sections*. By having faculty teach more than one section of the same course, implementing metacognitive strategies in one section and not in the other, afforded us an opportunity to make at least a rudimentary comparison of outcomes – realizing that such an approach was quasi experimental at best. Approximately 530 students were enrolled across these 25 course sections with 349 students enrolled in project sections and 181 students in comparison sections.

### **Specific assessment/evaluation strategies pursued:**

1. At the beginning and end of the semester, all participating faculty administered a survey instrument to their students which spoke to metacognition, learning styles and strategies aimed at helping students focus on the task of “learning to learn.” In selecting the instrument for this purpose, we considered using inventories such as the Learning and Study Strategies Inventory (LASSI) and the Visual, Aural, Read/Write, Kinesthetic (VARK) Questionnaire, and the Metacognitive Awareness Inventory, among others. Ultimately, we elected to employ an adapted, shortened version of the Motivated Strategies for Learning Questionnaire (MSLQ) initially developed at the University of Michigan.
2. Likewise, early on in the semester, faculty assigned students a task which afforded the assessment of both content and process knowledge. In a number of cases, such assignments were be open-ended and assessed via a rubric developed by the project faculty as a group (especially for the focus on process).
3. Throughout the course of the semester, faculty embedded within assignments and exams problems, questions and tasks which helped assess both students’ process as well as content knowledge.
4. Throughout the course of the semester, a number of faculty employed techniques such as those suggested by Angelo and Cross (1993), Lovett (2008) and Suskie (2009) to encourage and assess student’s use of metacognitive techniques and strategies. These included Minute Papers, Memory Matrices, One Sentence Summaries, Course Related Self-Confidence Surveys, Punctuated Lectures, Assignment Wrappers, Journaling, and other means of Self-Reflection, etc.
5. Ultimately, faculty attempted to compare the content acquisition and performance of students in *project* – metacognition – and *comparison* -- non-metacognition -- sections of courses (either presently or historically) to help ascertain whether a focus on process learning enhanced and/or contributed to gains in content knowledge.
6. We appended supplemental questions to the end of the semester administration of the adapted MSLQ which addressed questions to students about process learning, reflection and metacognition and the contribution of the courses in which they were enrolled to their learning process. These questions included 7 quantitatively oriented, Likert scale questions and one open ended question.
7. Finally, faculty participated in a brief survey about their experiences teaching these courses and completed end of the experience final reports which afforded them the opportunity to reflect on their participation in this effort, to compare notes and experiences with one another, and to

evaluate the success of this endeavor in promoting process as well as content learning in their students.

### **The Motivated Strategies for Learning Questionnaire (MSLQ)**

- The MSLQ is a self-report, Likert-scaled instrument designed to assess college students' motivational orientations and their use of learning strategies
- It contains 81 questions divided into 2 broad categories – motivational scales and cognitive self-regulated learning strategies scales – subdivided into a total of 15 subscales or factors
- We employed 5 subscales and a total of 36 questions on our adapted instrument (see attached document)
- The subscales we employed were as follows (see attached):
  - Motivational Scales
    - Task Value (6 items) – A2, A6, A10, A14, A15, A16
    - Self Efficacy for Learning and Performance (8 items) – A3, A4, A7, A9, A12, A13, A18, A19
    - Test Anxiety (5 items) -- A1, A5, A8, A11, A17
  - Learning Strategies Scales
    - Metacognitive Self Regulation (12 items) – B1, B2, B4, B5, B8, B9, B10, B11, B12, B15, B16, B17
    - Critical Thinking (5 items) – B3, B6, B7, B13, B14
- Student Experience Questions were added to the end of the semester surveys (see attached document)
  - 7 Quantitative Likert-scaled items
  - An Open-ended Qualitative Question
- Student Participants/Respondents:
  - 471 Beginning of semester surveys were returned
  - 434 End of semester surveys were returned
  - We successfully matched beginning and end of semester surveys for 371 respondents (79% of the pre-test surveys)
  - 96 beginning of semester and end of semester surveys went unmatched
  - In total we had 530 unique respondent records
  - Of the total records, 181 came from comparison group sections and 349 from project sections
  - Of the matched records 110 came from comparison group sections and 261 from project sections

- The first analyses run were an evaluation of the indexes of the subscales included on our abbreviated version of the MSLQ
  - We ran both **factor and reliability analyses** to evaluate how the subscales we employed performed relative to when they were used and evaluated earlier by other researchers
  - **Exploratory factor analysis** correctly identified all 3 of the motivational subscales and the critical thinking subscale in the strategies section of our survey. However, the self regulation subscale subdivided into two components/factors. Three questions failed to load on any one factor.
  - The Cronbach's alpha values calculated in our reliability analyses almost perfectly matched the values reported by others previously:

<b>Cronbach's alpha results</b>		
<u>Motivational Subscales</u>	Previously Reported	Current
Test Anxiety	.80	.796
Task Value	.90	.905
Self Efficacy	.93	.924
<u>Learning Strategies Subscales</u>		
Self Regulation	.79	.830
Critical Thinking	.80	.809

- **Analysis of Variance (ANOVA)**
  - ANOVAs were run on each of the now 6 scales and each of the 36 individual questions. These analyses were first run using data from all of the project and comparison group sections. Then, the analyses were repeated using data from only those instructors who had both project and comparison group sections. Ultimately, the analyses reported here include data from all 16 instructors regardless of whether they taught both project and comparison sections or simply project sections. However, the final analyses were restricted to employing only the data from those students for whom we had both beginning of the semester (pre-test) and end of the semester (post-test) survey responses (matched).

- We looked at all of the following:
  - Differences between the project and comparison groups at the outset
  - Differences between the project and comparison groups at the end
  - Differences in the project sections over time
  - Differences in the comparison sections over time
  - Interactions between group and time of survey administration (repeated measures)
  
- The most informative of the results came from the repeated measures ANOVA analyses examining the interaction between groups (project vs. comparison groups) and survey administrations (pre-test vs. post-test). The repeated measures analyses revealed significant interactions ( $p < .05$ ) for 4 of the motivational subscale questions and 2 of the learning strategies subscale questions and another 2 marginal interactions ( $p > .05 < .10$ ) on motivational subscales questions, 2 learning strategies subscales questions, and 2 of the 5 subscales.

Note: All items were evaluated on a 7 point scale from 1 equals “not at all true of me” to 7 equals “very true of me.” Future tense items on the start of the semester survey were converted to present or past tense, as appropriate, on the end of the semester instrument. Likewise, data for items that were negatively worded on the survey instruments had their polarity reversed before any analyses were run so that all comparisons could be made consistently.

- The significant findings included:
  - Project group students maintained a belief in their ability to receive an excellent grade in the course in which they were enrolled; whereas this belief fell for comparison group students ( $F = 3.970$ ,  $p = .047$ ). At the end of the semester, both groups had similar scores.

**Q. A3** I believe that I will receive an excellent grade in this class

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	5.55	5.04	5.293	104
Project	5.25	5.10	5.176	245
Margin Total	5.34	5.08		349

- Comparison group students worried more about items on exams that they couldn't initially answer than did project group students ( $F = 4.435$ ,  $p = .036$ )

**Q. A5** When I take a test I think about items on other parts of the test I can't answer

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	3.93	4.20	4.064	109
Project	3.99	3.79	3.890	231
Margin Total	3.97	3.92		340

- Comparison group students saw a greater drop in their belief that they could master the content of their classes than did project group students ( $F = 4.398$ ,  $p = .037$ ).

**Q. A18** I'm certain that I can master the skills being taught in this class

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	5.24	4.50	4.868	106
Project	5.09	4.71	4.901	253
Margin Total	5.13	4.65		359

- Project group students maintained a belief in their ability to do well in their course; whereas this belief fell for comparison group students ( $F = 5.553$ ,  $p = .019$ )

**Q. A19** Considering the difficulty of this course, the teacher, and my skills, I think that I will do well in this class

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	5.69	5.12	5.405	110
Project	5.57	5.38	5.477	260
Margin Total	5.61	5.30		370

- Comparison group students reported that they were more likely to go back and try to figure something that confused them when they were reading than were project group students. This behavior actually dropped for all students, but especially project group students over time ( $F = 6.392$ ,  $p = .012$ )

**Q. B4** When I become confused about something I am reading for class, I go back and try to figure it out

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	5.76	5.41	5.586	110
Project	5.67	4.92	5.295	258
Margin Total	5.70	5.07		368

- Project group students were more likely at the end of the semester to play around with ideas of their own related to what they were learning in their courses than were comparison group students ( $F = 10.737$ ,  $p = .001$ )

**Q. B13** I try to play with ideas of my own related to what I am learning in a course

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	4.66	4.20	4.431	108
Project	4.36	4.53	4.445	253
Margin Total	4.45	4.43		361

○ Marginal findings on individual items included:

- At the end of the semester comparison group students expressed greater anxiety over taking exams than did project group students ( $F = 4.831, p = .069$ )

**Q. A11** I get an uneasy, upset feeling when I take an exam

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	4.02	4.63	4.324	108
Project	3.83	4.08	3.956	236
Margin Total	3.89	4.25		344

- Again students' expectations about how they expected to do in their course dropped more so for comparison group students over the period of the semester than they did for project group students ( $F = 2.895, p = .090$ )

**Q. A13** I expect to do well in this class

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	5.98	5.30	5.642	109
Project	5.72	5.34	5.530	253
Margin Total	5.80	5.33		362

- Project group students indicated over time that they were more likely to think about what they were supposed to be learning on a given topic, rather than simply reading the material over again. This behavior declined for comparison group students ( $F = 3.491, p = .063$ )

**Q. B12** I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	4.62	4.39	4.505	110
Project	4.32	4.47	4.393	258
Margin Total	4.41	4.44		368

- Project group students were less likely to report at the end of the semester that if they got confused taking notes during class that they would go back and sort it out later than were comparison group students ( $F = 3.283, p = .073$ )

**Q. B17** If I get confused taking notes in class, I make sure that I sort it out afterwards

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	5.14	4.83	4.982	109
Project	5.08	4.37	4.725	260
Margin Total	5.10	4.50		369

- Marginal findings on subscales included:
  - At the end of the semester, project group students had less test anxiety than their comparison group counterparts; whereas the two groups had similar levels of test anxiety at the beginning of the semester. The level of test anxiety increased for comparison group students over the period of a semester; whereas it remained relatively constant for the project group students ( $F = 3.525, p = .061$ )

#### Subscale – Test Anxiety

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	4.2411	4.5869	4.414	107
Project	4.1458	4.2522	4.199	203
Margin Total	4.1787	4.3677		310

- Over the period of a semester, task value dropped more for project group students than it did for comparison group students ( $F = 2.797, p = .095$ )

#### Subscale – Task Value

Group	Pre-test mean	Post-test mean	Est. Margin Total	N
Comparison	5.3091	5.0906	5.200	103
Project	5.5339	5.1131	5.324	221
Margin Total	5.4624	5.1060		324

### Supplemental End of the Semester Questions

We found no statistically significant differences in the responses of the students from project and comparison groups to the questions about their experiences in the courses which were evaluated as part of this project.

Question		Project Group Student Responses	Comparison Group Student Responses
This class focused on learning styles and strategies as well as course content	Mean	3.77	3.79
	N	260	110
This class contributed to my understanding of how I best learn	Mean	3.72	3.71
	N	260	110
This class helped me develop strategies to improve my learning	Mean	3.61	3.59
	N	260	110
This class helped enhance my self-confidence as a learner	Mean	3.55	3.48
	N	260	110
This class helped increase my motivation to learn	Mean	3.60	3.48
	N	260	110
This class helped me accept responsibility for my own learning	Mean	3.78	3.85
	N	260	110
This class helped me develop strategies to analyze and think more deeply about the course content and material	Mean	3.78	3.83
	N	260	110

Rated on a 5 point scale from 1 equals *strongly disagree* to 5 equals *strongly agree*.