SELF-REFLECTION ON EXAM PERFORMANCE: DOES PERFORMANCE IMPROVE?

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ABSTRACT

The responsibility of student learning has historically fallen on the shoulders of educational institutions and faculty. The role of teachers is to provide students with the knowledge needed to attain academic success. While the definition of academic success varies, teachers are ultimately responsible for student outcomes. Research on learning styles and factors which influence learning have shown that students’ own behaviors and motivation play just as much a role, perhaps even more, in achieving academic success. The social cognitive theory of human functioning is the basis of most research for promoting student success. A self-evaluation tool, completed by students in a physical therapist assistant program following examinations, was used to identify reasons why questions were answered incorrectly on examinations. The results of the self-evaluation tool were analyzed to determine if self-reflection improved overall performance on future examinations. This project presents an overview of the social cognitive theory of human functioning and its role in promoting academic success.
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SELF-REFLECTION ON EXAM PERFORMANCE: DOES PERFORMANCE IMPROVE?

Educational institutions have always been pressured by local school boards and accrediting agencies to meet benchmarks such as standardized test scores, graduation rates, employment rates, and licensure pass rates. More recently, post-secondary institutions have been charged by the Federal Government to increase transparency with regards to graduation rates, gainful employment, educational costs, and accreditation status (U.S. Department of Education, 2016). Ultimately, improved student outcomes are the focus of the government’s position on transparency in post-secondary education. Student success can have many definitions depending on who is providing the definition. For instructors, academic success may be successful completion of the course with a passing grade while an administrator’s definition may be if the student is gainfully employed in his chosen field. Predicting academic success is difficult and there are many variables to be considered. The social cognitive theory of human functioning contains key elements that have been found to predict academic success. Components include setting goals, self-reflection, and modifying behavior to increase the likelihood of achieving set goals, all of which are necessary for academic success.

Purpose

The purpose of this retrospective study was to introduce a self-reflection tool for students to complete after written examinations to determine if the student’s performance on written exams changed after self-reflection. More specifically, did the results show that reasons for test questions answered incorrectly changed after reflection? Following analysis of the results collected from the self-reflection tool, the impact of student demographics on exam performance is also examined.
Significance of the Project

Admission to most allied health programs is competitive and frequently based on a student’s grade point average, scores earned on a standardized test, and/or personal interview. Students are typically admitted as a cohort and cannot be replaced once the curriculum begins. Student attrition can result from poor academic performance or poor affective skills. Markle and O’Brien (2014) note that affective behaviors have been predictors of student retention, especially in higher education, and directly impacts student success.

Student success is dependent upon many variables which increase the difficulty for educators to assist students in improving performance. Considering the many variables, the complexity of improving student success increases. Examples of variables that may affect academic success include instructor effectiveness, student demographics, socioeconomic status of students, test taking skills, personal motivation and behaviors related to self-regulation. The hypothesis of this project was students’ performance on exams would improve after completing a self-reflection tool and that reflection could serve as a predictor of student success and promote self-regulation on future assessments.

Project Objectives

The primary objective for the project was to introduce and implement the use of a self-reflection tool after written examinations in a specified course to determine reasons for test questions answered incorrectly by students. A second objective was to analyze the results from the self-reflection tool to determine if the reasons for test questions answered incorrectly change over time after reflection and identify any correlation between student demographics and socioeconomic status with student performance. The knowledge gained from collected data will be applied to future students and courses.
Background of the Activity

Physical therapy “improves mobility and relieves pain, reduces the need for surgery and prescription drugs, and allows patients to participate in a recovery plan designed for their specific needs” (American Physical Therapy Association, 2016). Providers of physical therapy include physical therapists and physical therapist assistants. Physical therapists (PT) and physical therapist assistants (PTA) are required to complete formal education programs which include didactic and clinical education components. An entry-level Doctor of Physical Therapy (DPT) degree is awarded to graduates completing a physical therapy education program and an associate degree is awarded to graduates of a physical therapist assistant education program. Graduates from physical therapy education programs are eligible for licensure after successfully completing the National Physical Therapy Exam which is developed by the Federation of State Boards of Physical Therapy. However, exam candidates must be graduates from an education program which is accredited by the Commission on Accreditation in Physical Therapy Education (CAPTE). The ultimate goal of physical therapy education programs is to prepare students with the knowledge, skills and behaviors to practice physical therapy. Furthermore, postsecondary education should prepare students for their future professional lives. In order to do this successfully, institutions, and more specifically, faculty need to assist students in developing critical thinking skills, understanding their chosen discipline, and “‘think like a professional’” (Thompson, Licklider, & Jungst, 2003, p. 133).

In January 2016, new Standards and Required Elements for CAPTE accredited PTA programs replaced the previous Evaluative Criteria. While there are many similarities, there are significant changes to thresholds specific to graduation rates, ultimate licensure pass rates, and employment rates. Because programs are required to meet all accreditation standards, efforts to
improve program and student outcomes must be ongoing. Considering the need for program improvement, which is constant and never ending, the Personal Test Analysis (Appendix I) was created for use in courses within a physical therapist assistant program. The Personal Test Analysis is based on knowledge of cognitive learning theory and is designed to help meet CAPTE standards.

**Literature Review**

**Social Cognitive Theory**

**Overview.** Albert Bandura, Professor of Social Science in Psychology at Stanford University, first defined social cognitive theory of human functioning in the mid-1980’s building on work he had begun in the 1960’s and initially termed the Social Learning Theory (Pajares, 2004). Bandura’s early research focused on social modeling and its effect on human behavior, specifically one’s motivation, thought, and action. He discovered that social modeling was not solely imitation but that individuals created new behaviors similar to what they have seen or heard (Pajares, 2004). Bandura’s research then turned to self-regulatory skills in children which suggested that “people are viewed as self-regulatory and self-reflective organisms, not just reactive ones to environmental influences” (Pajares, 2004, para. 17).

In 1977, Bandura published his book, *Social Learning Theory* which influenced further research into social learning and modeling. Bandura (1971) describes social learning theory as “how patterns of behavior are acquired and how their expression is continuously regulated by the interplay of self-generated and other sources of influence” (p. 3). After further researching how one’s thoughts facilitate action and emotion, Bandura re-labeled his social learning theory to social cognitive theory of human functioning. Pajares (2004), states:

> The theory under discussion had always been much broader than the initial descriptive label. It not only addressed how people acquire cognitive, social, and
emotional and behavioral competences, but also how they motivate and regulate their behavior and create social systems that organize and structure their lives.

…the social portion of the title acknowledges the social origins of much human thought and action; the cognitive potion recognizes the influential contribution of cognitive processes to human motivation, affect, and action. (para. 21)

The social cognitive theory of human functioning describes human behavior that is driven and planned by the continuous application of self-influence (Bandura, 1991). Human behavior and function results from a sequence of shared interactions between behavioral, environmental and personal variables (Bandura, 1999). The idea that individuals are preemptive and direct themselves with regards to organizing, reflecting, and regulating behaviors rather than individuals who are merely responsive to environmental factors or personal impulses is embedded in the social cognitive theory (Pajares, 2004). Bandura’s theory implies that people first adopt personal standards of behavior and then regulate their motivation and behaviors based on the consequences produced for themselves by engaging in activities that produce satisfaction and refrain from those which produce negative results. Bandura (1999) states that humans benefit from their cognitive capacities because “while performing activities, they form ideas about what leads to what, act on them or predict occurrences from them, judge from the results of adequacy of their thoughts and change them accordingly” (p. 25).

Definitions

Self-regulation. Self-regulation is a key component in social cognitive theory. Bandura (1991) notes, self-regulatory processes intercede external influences but offer the foundation for purposeful action which is regulated by planning or forethought. Self-regulatory behavior begins with self-efficacy, or a belief in one’s self, followed by consideration of the consequences of
action. The next process is establishing goals and, finally, they plan behaviors and actions which will likely result in the desired outcomes.

**Self-efficacy.** Self-efficacy, the learner’s belief in himself that he is capable of producing the desired outcomes, must occur before self-regulation (Bandura, Barbaranelli, & Caprara, 2001; Ramdass, & Zimmerman, 2011). Bandura (1991) provides a more thorough explanation of self-efficacy which is “people’s beliefs about their capabilities to exercise control over their own level of functioning and over events that affect their lives” (p. 257). An individual’s belief in his own efficacy will have an impact on making choices, setting goals, and amount of effort, motivation, and perseverance put forth in difficult situations (Bandura, 1991). Therefore, self-efficacy is a component of self-regulation.

**Motivation.** A sub function of self-regulation and self-efficacy, key components of the social cognitive theory, is motivation. Motivation is driven by anticipated outcomes based on specific courses of action. Bandura (1991) states “through exercise of forethought, people motivate themselves and guide their actions in an anticipatory proactive way” (p. 1). He also notes that current motivation and actions cannot be caused by future events because they have not occurred but forethought can bring the projected future into the present (Bandura, 1999). However, the future can become current motivators and regulators of behavior when the projected future is brought into the present (Bandura, 1999).

Individuals can be motivated by internal and external factors. Internal motivation can be from perceptions of high self-efficacy, personal goals, and personal standards of behaviors that one has adopted. Personal behaviors are adopted and motivation and behaviors are influenced by the consequences of their own actions, hence, people demonstrate behaviors that produce pleasure and value and abstain from those that result in self-criticism (Bandura, 1999).
Individuals with perceptions of high self-efficacy are more likely to set personal goals and then demonstrate and modify behaviors to facilitate achievement of those goals. External sources of motivation can include social comparisons, performance feedback from other sources, and relevance of activities. Social, or observational, learning is important in that individuals tend to do what they have seen results in success or positive outcomes and refrain from that which results in failure or negative outcomes (Bandura, 1999). Behaviors or actions that yield positive outcomes are eagerly accepted while those that produce negative or unwanted outcomes are quickly rejected. Bandura (1999) explains that while personal external consequences serve as influences for behavior, observing others’ behaviors and resulting outcomes also serve as motivators. The relevance or valuation of activities also plays a role in motivation. Less effort is likely to be given to activities an individual is not interested in or does not recognize the significance of the activity.

**Social cognitive theory and its role in education.** Since the beginning of public education in the United States, professional educators have struggled with students of various backgrounds and modes of learning (Zimmerman, 2002). Some students are highly motivated and are able to grasp more difficult content quickly while other students wrestle with easy concepts and are disinterested. In the beginning of the 20th century, the field of psychology materialized as a science and “individual differences in educational functioning attracted widespread interest” (Zimmerman, 2002, p. 65). Educational theorists, such as John Dewey, began to explore ways to tailor student’s education based on his own learning styles. Methods used included grouping individual with similar learning styles, age, and expanding the curriculum to include more practical learning experiences (Zimmerman, 2002).
Research on metacognition and social cognition and their effect on an individual’s learning began to emerge in the late 1970’s and early 1980’s. According to Zimmerman (2002), “metacognition is defined as the awareness of and knowledge about one’s own thinking” (p. 65). Poor metacognitive awareness, coupled with the failure to compensate, of personal limitations were thought to be the reasons students were academically unsuccessful (Zimmerman, 2002). Researchers who studied social cognitive theory began to study the effect of social influences on a child’s development of self-regulatory behaviors and concluded that one’s metacognitive awareness of their behaviors could improve their self-control. Zimmerman (2002) reports that researchers recognized individual differences in learning were influenced by lack of self-regulation skills. The ability to self-regulate has been identified as a key component in learning as students must be able to identify their own limitations in learning and take corrective action, or demonstrate self-regulation, in order to be successful. When discussing academic success, two terms commonly found in the literature are self-regulation and self-efficacy (Ramdass, & Zimmerman, 2011). As defined previously, self-regulation occurs when an individual regularly coordinates his thoughts, emotions, behaviors, and environment in order to achieve his academic goals (Garavalia, & Gredler, 2002; Ramdass & Zimmerman, 2011). Self-regulation is neither an academic nor automatic skill, but rather a learned skill. A learner must monitor his own work to receive feedback on the progress toward his goals which promotes changes in his performance (Ramdass & Zimmerman, 2011).

The term “academic success” is ambiguous and its meaning will vary based on the person who provides its definition. For educators, academic success may be defined by grades earned, grade point average, course completion, or acquisition of skills or learning. Administrators may define academic success as gainful employment in chosen field, attrition and retention rates, or
advances in a student’s chosen degree field (York, Gibson, & Rankin, 2015). Whichever definition fits the situation, a student achieves academic success when his academic goals are met.

**Behaviors**

Key behaviors necessary for academic success include goal setting, time management, energy and diligence in completing difficult tasks, and self-monitoring one’s performance, all of which are skills included in self-regulation (Ramdass & Zimmerman, 2011). Learning is proactive behavior to achieving personally set goals while recognizing one’s own strengths and weaknesses (Zimmerman, 2002). When a learner reflects on his performance, progress towards goal achievement, and modifies his behavior to better attain his goals, self-regulation has occurred. Successful learners are cognizant of their own personal strengths and weaknesses, aware of their success or failure, and are able to create realistic goals (Maitland, 2000).

According to Ramdass and Zimmerman (2011), there are three psychological functioning areas in which self-regulation needs to occur in order to promote learning: cognitive, motivational, and metacognitive. The cognitive portion of self-regulation refers to approaches students use to complete tasks more effectively whereas the motivational component refers to believing in oneself and that the task or process will increase learning (Ramdass & Zimmerman, 2011). The metacognitive component includes setting goals, monitoring progress, reflecting on understanding content, and employing strategies which may assist in understanding content or solving a problem (Ramdass & Zimmerman, 2011). Maitland (2000) states that successful learners formulate strategies to achieve goals by relying on their own, or intrinsic, feedback more than from the instructor, or extrinsic, feedback resulting in increased self-esteem and feelings of success. Weinstein and Van Mater Stone (1993) write about the value of self-regulation: “The
future belongs to individuals who can identify their own learning needs and who have the resources to…orchestrate and manage their own learning activities’ (p. 32)”.

Behaviors necessary for academic success are the foundation for Bandura’s social cognitive theory. Anticipation of future events become current motivators and shape one’s behavior in a proactive manner. The combination of external influences and self-regulation abilities provide opportunities for individuals to choose behaviors that increase the likelihood of achieving the personal goals. As explained by Bandura (1991), “if human behavior were regulated solely by external outcomes, people would behave like weathervanes, constantly shifting direction to confirm to whatever momentary social influence happened to impinge upon them” (p. 249). Self-regulation provides the opportunity to accept certain standards of behavior which serve as motivators and guides to adjust behavior. Self-regulated learning is not instinctual, but can be learned from instruction and modeling from various sources such as parents, peers, and mentors. In addition to feedback and modeling, students can assess their own self-efficacy by comparing their own work with peers and recognizing physiological symptoms related to anxiety such as increased heart rate and perspiration (Schunk & Zimmerman, 1997).

Successful self-regulated learners are defined as those who seek help from others to aid in the learning process, demonstrate personal initiative, diligence, and skill acquisition in social and solitary situations. Students with high self-efficacy demonstrate eagerness with participation, increased persistence when presented with difficulties, work harder and are successful at a higher level (Schunk & Zimmerman, 1997). While self-efficacy influences academic performance, it is not the only influence. Students must have requisite knowledge and skills in order to demonstrate academic performance, recognize the importance of learning and understand the relevance of what they are learning. Schunk and Zimmerman (1997) state if “students possess
adequate skill, hold positive outcome expectations, and value what they are learning, self-efficacy is hypothesized to exert an important effect on the instigation, direction, and persistence of achievement behavior” (p. 198).

**Instructional Strategies**

**Overview.** Teachers are responsible for helping students achieve their educational goals by not only learning the content, but how to learn the content. As mentioned previously, a primary goal of postsecondary education is to prepare individuals for their future or professional career. Faculty should support students in learning required content and developing critical thinking skills required for the student’s chosen profession (Thompson et al., 2003). Historically speaking, education has been teacher centered where the teacher was in control of the classroom and played the central role. More recently, educational strategies have focused on placing the learner at the center of educational activities, not the teacher. There is much debate as to which strategies are most effective in promoting student success and conclusions vary. However, these does appear to be consensus of what elements are required for effective pedagogy: instructional strategies, management techniques, and curriculum design (Marzano, Pickering, & Pollock, 2001). As noted in Weinert and Helmke (1995), “how students learn and what forms of instruction are chosen to support learning depends on the learning goals” (p. 141). Research on educational theory and methodologies has been ongoing for decades and will continue as there are advances in instructional technologies and data gathered from current research.

**Teacher centered learning.** Teacher centered learning uses a passive approach, limits students’ creativity and critical thinking abilities, and the knowledge delivered to students is determined and evaluated solely by the teacher. The teacher makes all of the decisions regarding content, such as the amount, type, when, and how it is to be delivered (Barman, 2013). As
discussed in Schunk and Zimmerman (1997), the possibility for learners to attain self-regulatory competence in the absence of explicit direction of others is acknowledged but they believe students benefit the most when there is direct guidance of a teacher or model to provide guidance, feedback, and social reinforcement. The role of the teacher is to create the environments for learning, which initiates and encourages a student’s acquisition of relevant behavioral and cognitive skills.

Teacher centered learning has many advantages including preserving academic focus, reducing disruptions in the classroom, and safeguarding student learning and outcomes (Weinert & Helmke, 1995). The teacher is responsible for choosing instructional methodologies that ensure a majority of the students are successful. Continual assessment of each student’s learning progress and difficulties and providing effective remedial instruction to students are roles of the teacher in teacher centered learning. Weinert and Helmke (1995) found that teacher centered learning is best suited for situations when knowledge attainment and academic performance are the goals.

**Learner centered education.** Learner and learning centered education approaches are based on the social constructivist theory and cognitive theory, which suggest both social and cognitive factors influence an individual’s learning. The philosophy of learner centered education is collaborative, supportive, and cooperative where students and teachers learn together. Thompson et al. (2003) explain the following:

Effective learner-centered teaching strategies, then, should contribute to the breadth and depth of content knowledge, assist students in learning how to organize knowledge around major concepts and principles, enhance student retention and retrieval, and contribute to student development of metacognitive abilities, among other things (p. 135).

Learner centered education uses active learning techniques to put the learner, or student, at the center of all educational activities. Active engagement, problem solving, and interaction with
peers and the teacher facilitate learning whereby students must make an active effort to discover
the knowledge (Barman, 2013). In the learner-centered approach, the teacher acts as a facilitator,
not an authoritarian. Students are encouraged to experiment, use inquiry, and take risks while
being supported by the teacher (Martin, 2004).

The Classroom Environment Study conducted by the International Association for the
Evaluation of Educational Achievement (IEA) in the early 1980s was an international study
aimed to 1) “describe the similarities and differences in the nature of teaching in classrooms in
many countries” and 2) use the results of “this descriptive inquiry to identify those teaching
behaviors that were associated with greater student achievement” across ten countries
(International Association for the Evaluation of Educational Achievement, 1989, p. 3). The
study included a list of criteria to classify teaching behaviors into either management practices or
instructional practices. Management practices included behaviors that dealt with classroom
management skills such as providing clear rules for student conduct, imposing disciplinary
action for misbehavior, monitoring student behavior during seatwork, and transitioning between
content efficiently and effectively (IEA, 1989).

“Behaviors that directly influence the learning processes of students during their contract
with the learning tasks” were classified as instructional practices (IEA, 1989, p. 4). Examples of
instructional practices included providing cues and emphasizing main ideas during a lesson,
frequently asking questions at a variety of cognitive levels, reacting positively for correct
answers or accepting a range of answers if applicable, providing feedback to students even when
they are incorrect, setting clear expectations for testing and grading, using formative assessments
to determine student achievement, provides remedial instruction to students who need additional
help, and ensures content is thoroughly covered prior to assessment (IEA, 1989). The findings
from the Classroom Environment Study showed that teacher behaviors were more associated with students’ engagement than with achievement and students who spent more time in engaging classroom activities achieved higher scores on post-tests (IEA, 1989). The results of this study support learner centered education in that engaging students in relevant activities facilitates learning and student achievement.

**Shift in teaching paradigm.** In more recent years, the education paradigm has shifted from teacher centered to learner centered. The transition from teacher centered learning to learner or student centered learning provides students with options on how they receive knowledge. Instead of being lectured to, students communicate with peers, answer each other’s questions, engage in group discussions, and most importantly, are able to evaluate their own learning (Barman, 2013). Peer-assisted learning uses cooperative groups, peer tutoring, peer assessment, and reciprocal teaching and can be a useful tool in a learner centered environment (Schunk & Zimmerman, 1997). The learner centered approach strengthens student motivation for learning, requires the student to self-reflect on his performance, and promotes responsibility for his own learning (Barman, 2013).

**Implementation Plan/Methodology**

**Methodology**

This retrospective study design used results from a self-reflection tool in an established physical therapist assistant education program in the Southeastern United States to determine if students’ performance on written exams changed after self-reflection on why questions were answered incorrectly. Prior to data collection, approval from two Institutional Review Boards was obtained granting permission to conduct the study using human subjects (Appendices III and IV). Anonymized student test analyses from a fifth semester course were used for analysis. The
self-reflection process after an exam is important so that factors that affect performance may be identified. Once factors are identified, students can modify behaviors that will hopefully improve performance on future exams. To assist students in the self-reflection process, a Personal Test Analysis (Appendix I) was developed for students to complete after written exams.

The Personal Test Analysis was first introduced to students in one course at the beginning of their final semester of study. The specific course the tool was implemented in focused on advanced rehabilitation techniques. The course emphasized interventions for orthopedic and neurologic treatment techniques, therapeutic exercise procedures and analysis and treatment of pathologic gait. The terminal student learning outcome for the course was for students to demonstrate an understanding of advanced rehabilitation techniques appropriate to orthopedic and neurologic dysfunctions through a combination of written examinations and skills assessments.

The physical therapist assistant program is located in a rural community college. The program’s faculty is comprised of two full time employees: the program director is a physical therapist and the clinical education coordinator is a physical therapist assistant. Part-time faculty are used in laboratory courses but not as primary instructors in the curriculum. The program is a 22 month curriculum divided into five semesters of varying lengths of didactic courses and clinical education experiences for a total of 48 credits in the technical phase and 28 credits in general academic courses for a total of 76 credit hours needed for degree completion. The class size during the study period was 28 students. The 20 students for this study were from a fifth semester cohort of physical therapist assistant students. At the time of data collection, students were completing their didactic courses and preparing for the terminal clinical education experience.
Assessment Tool

This study used a self-reflection tool titled “Personal Test Analysis” (Appendix I) which was developed for students to complete after written exams. The form contains three categories of mistakes: academic, test taking, and other. In efforts to more accurately discern the reasons for answering test questions incorrectly, four to six phrases were added within each category to further describe why a question was answered incorrectly. An instruction form (Appendix II) which outlined how to complete the test analysis was created, distributed, and reviewed with students prior to completion of the first analysis. Students completed the test analysis form after each unit exam while reviewing their individual results of the exam, specifically reviewing the questions answered incorrectly. Each participant completed five test analyses that resulted in a total of 100 test analyses completed for this study.

**Academic Mistakes.** The first category, academic mistakes, was used to identify tests questions missed based on the student’s academic deficiencies or knowledge of the content being tested. Students were able to choose from five phrases within this category to explain the reason for the academic mistake such as did not know the answer or made a blind guess, could not apply the knowledge, or studied the wrong information.

**Test Taking Mistakes.** The next category was titled “test taking mistakes”. This category was used to detect the type of test taking mistake made by the student. Within this category were six phrases to decipher which kind of mistake was made. Examples of test taking mistakes include marked the wrong answer, changed an answer, did not see key words in the stem of the question, or misread the question.

**Other.** The final category, “other”, contained four descriptive phrases for other types of mistakes that would not be considered academic or test taking. Statements in this category
included did not know terminology, answered the question based on clinical experience, and mental block. Additionally, there was a blank space for students to write in a reason if it did not fall within one of the other categories or descriptive phrases. Additionally, questions were added to the bottom of the form to include: 1) Did you prepare differently for this exam? 2) If so, please explain the changes you made. 3) Did you feel the changes were beneficial?

**Data Analysis**

Results from each student’s Personal Test Analysis form were reviewed by the instructor of the course and entered into a Microsoft Excel spreadsheet following each examination prior to being returned to the student for review. The spreadsheet format was identical to the Personal Test Analysis to help ensure consistency in data entry. The only individual who entered data from the analyses was the course instructor.

Statistical analyses were conducted using Microsoft Excel 2013. The data were examined to determine which type of statistical tests should be used. It was determined that nonparametric statistical tests should be used because of the small sample size and skewed shape. Paired samples t-tests were used to determine 1) if the reasons for test questions answered incorrectly changed over time and 2) if there were changes in overall exam performance. To determine if the reasons for test questions answered incorrectly changed, a paired samples t-test was conducted for each category of mistakes where the independent variable was the class average of missed questions on the first two exams and the dependent variable was the class average of missed questions on the last two exams. For changes in overall exam performance, the independent variable was the class’s average score earned on the first two exams and the dependent variable was the class’s average score earned on the last two exams. A single factor analysis of variance (ANOVA) was used to determine variance of exam
performance and students’ demographic information. The relationship between student demographics was investigated using the Pearson product-moment correlation coefficient.

Study Sample

The sample size for the study was determined by voluntary participation of students enrolled in their fifth semester of study of a CAPTE accredited PTA program. This is a sample of convenience. Of the 28 eligible participants, 21 elected to participate. One participant failed to submit demographic information and was excluded from the final sample. The final study sample was comprised of 14 (70%) females and 6 (30%) males. Ethnic make-up by self-report consisted of 25% African-American and 75% Caucasian. The average age of participants was 28.9 (SD 9.8).

Each student completed the Personal Test Analysis after every summative exam during the semester with the exception of the final exam. There were five summative examinations given during the semester therefore, a total of 100 Personal Test Analysis forms were collected and analyzed for this study.

Results

Performance improvement. The results of the paired samples t-test for changes in overall exam performance are shown below in Figure 1. An alpha of 0.05 was used, m1= the students’ (class) averaged scores on the last two examinations and m2=the students’ (class) averaged scores on the first two examinations. Averaged scores on the students’ (class) last two examinations was 85.08% which decreased from the averaged scores on the first two examinations which was 85.49%. The hypothesis that students’ performance on exams would improve after completing a self-reflection tool was not demonstrated. Instead of an increase in test scores, class scores actually decreased by 0.404 points. Even though the class’s averaged
scores decreased, exactly one-half of participants had an increase in averaged test scores of the last two examinations from the first two examinations. The average increase was 4.725 points for students whose averaged last two examination scores increased.

*Figure 1. Paired Samples t-test for Overall Exam Performance*

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</tbody>
</table>

Analyses of the reasons for test questions answered incorrectly, analyzed by category of mistakes, was also performed and are shown in Figures 2, 3, and 4. Using an alpha of 0.05, m1= the class average number of mistakes per category on the first two examinations and m2= the class average number of mistakes per category on the last two examinations. Results from the statistical analysis for each category show there was not a significant decrease in reasons why test questions were missed after self-reflection in any category. When comparing the number of mistakes made per category, 7 out of 20 students made fewer academic mistakes, 11 out of 20 made fewer test taking mistakes, and 5 out of 20 made fewer “other” mistakes. While there were decreases in the means for “Test Taking” and “Other” categories, these observations are not enough to say that the average difference in the types of mistakes made differs significantly.
DOES SELF-REFLECTION IMPROVE PERFORMANCE

Figure 2. Paired Samples t-test for Academic Mistakes

<table>
<thead>
<tr>
<th></th>
<th>m1</th>
<th>m2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.2</td>
<td>2.5</td>
</tr>
<tr>
<td>Variance</td>
<td>3.51052632</td>
<td>3.973684</td>
</tr>
<tr>
<td>Observations</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>0.69049365</td>
<td></td>
</tr>
<tr>
<td>Hypothesized Mean Difference</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>t Stat</td>
<td>-0.8796338</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) one-tail</td>
<td>0.19502393</td>
<td></td>
</tr>
<tr>
<td>t Critical one-tail</td>
<td>1.72913281</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) two-tail</td>
<td>0.39004786</td>
<td></td>
</tr>
<tr>
<td>t Critical two-tail</td>
<td>2.09302405</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3. Paired Samples t-test for Test Taking Mistakes

<table>
<thead>
<tr>
<th></th>
<th>m1</th>
<th>m2</th>
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</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.1</td>
<td>1.925</td>
</tr>
<tr>
<td>Variance</td>
<td>1.884211</td>
<td>2.586184</td>
</tr>
<tr>
<td>Observations</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>0.426781</td>
<td></td>
</tr>
<tr>
<td>Hypothesized Mean Difference</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>t Stat</td>
<td>0.486657</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) one-tail</td>
<td>0.316034</td>
<td></td>
</tr>
<tr>
<td>t Critical one-tail</td>
<td>1.7291333</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) two-tail</td>
<td>0.632068</td>
<td></td>
</tr>
<tr>
<td>t Critical two-tail</td>
<td>2.0930248</td>
<td></td>
</tr>
</tbody>
</table>

Demographics correlation. The correlation analysis identified no significant correlation between student demographics and exam performance as a whole. Using the Pearson Product-Moment Coefficient, none of the variables showed a positive correlation (>0.75). In fact, nearly 45% of the correlations were inversely related. The two variables that were most closely related were age and highest level of education at 0.54. Age and test average were the two variables most inversely related indicating that older students had decreased performance from younger
students. Figure 3 shows the correlation analysis performed between student demographics and exam performance.

\[\text{Figure 4. Paired Samples t-test for Other Mistakes}\]

<table>
<thead>
<tr>
<th></th>
<th>m1</th>
<th>m2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.275</td>
<td>0.2</td>
</tr>
<tr>
<td>Variance</td>
<td>0.223026</td>
<td>0.089474</td>
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<tr>
<td>Observations</td>
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<td>20</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>0.149032</td>
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<tr>
<td>Hypothesized Mean Difference</td>
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<td></td>
</tr>
<tr>
<td>df</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>t Stat</td>
<td>0.645026</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) one-tail</td>
<td>0.263312</td>
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</tr>
<tr>
<td>t Critical one-tail</td>
<td>1.729133</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) two-tail</td>
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<td></td>
</tr>
<tr>
<td>t Critical two-tail</td>
<td>2.093024</td>
<td></td>
</tr>
</tbody>
</table>

\textbf{Study Limitations}

This study controlled student responses by using a form with designated categories and reasons for incorrect test questions. However, because responses were subjective, student honesty in completing the Personal Test Analysis is a limitation of the study’s reliability and validity. The small sample size is yet another limitation. Eligibility requirements for the study initially limited the sample size to 28 and then only 20 voluntarily consented to participate. An increased sample size may have influenced the correlation between student demographics and performance.

The progressive level of difficulty in exams could have also affected averages on examinations. As the semester progressed, carryover knowledge from previous exams was required in addition to applying new content knowledge. The inability to use a control group and experimental group was perhaps the most limiting factor of this study. Institutional policies prohibited using a control group due to fear of not providing the same resources to all students.
The use of a control group and experimental group may have affected the average scores on the last two examinations. Providing test taking strategies and individual review of the Personal Test Analysis form after each examination with an experimental group may have affected the outcomes of this study and shown that self-reflection does improve future performance.

Figure 5. Pearson Product-Moment Correlations Between Student Demographics and Examination Performance (n=20)

<table>
<thead>
<tr>
<th></th>
<th>Test Avg.</th>
<th>Age</th>
<th>Gender</th>
<th>Marital Status</th>
<th>Race</th>
<th>Highest L.O.E.</th>
<th>Children at home</th>
<th>Employed</th>
<th>Financial aid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Avg.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.6129</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.4172</td>
<td>-0.4478</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td>0.1617</td>
<td>0.0619</td>
<td>0.1937</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>-0.0339</td>
<td>-0.1398</td>
<td>-0.2894</td>
<td>0.0171</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Highest L.O.E.</td>
<td>-0.3522</td>
<td>0.5379</td>
<td>-0.3285</td>
<td>0.3230</td>
<td>0.1179</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children at home</td>
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<td>-0.0413</td>
<td>0.1240</td>
<td>0.3948</td>
<td>0.2307</td>
<td>-0.1179</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>-0.3141</td>
<td>0.0738</td>
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<td>0.3216</td>
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<td>0.3202</td>
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<td></td>
</tr>
<tr>
<td>Financial aid</td>
<td>-0.0295</td>
<td>0.3525</td>
<td>-0.6</td>
<td>-0.2491</td>
<td>0.3721</td>
<td>0.0864</td>
<td>-0.2067</td>
<td>0.2581</td>
<td>1</td>
</tr>
</tbody>
</table>

Abbreviations: Test Avg: test average; Highest L.O.E.: highest level of education.

**Outcomes/Summary of the Project**

A review of the literature on improving student outcomes and student success resulted in a more extensive review of educational theory and the social cognitive theory of human functioning, also referred to as social cognitive theory. In an attempt to better understand what factors influence students’ test performance, a self-evaluation tool was implemented into a course in a physical therapist assistant program. Each student completed the tool after
summative examinations in efforts to identify why questions were answered incorrectly. The underlying intention of the Personal Test Analysis was that after identifying why questions were answered incorrectly, students’ would modify their behaviors in ways which would improve future performance on examinations. Even though completing a self-evaluation tool may seem meaningless to some students, especially those whom already practice self-regulation, the ability to reflect on past performance creates the opportunity to identify deficiencies and modify behaviors that may lead to increased student success.

The hypothesis that performance on future examinations would improve following completion of a self-evaluation tool was not proven. Results showed that the participants’ examinations averaged scores decreased over the course of the semester and that the reasons for answering test questions incorrectly did not change significantly. Despite the participants’ aggregated results, one-half of students had increased scores over the course of the semester. However, there is no clear evidence that suggests that completion of the self-evaluation tool led to an increase in individual student examination scores. One might hope that completion of the Personal Test Analysis after each examination influenced changes in one’s behavior which led to increased student success. There was no correlation (> .50) identified between student demographics and exam performance but small sample size may have been a limitation.

Conclusion

It has been demonstrated through research that several factors influence student learning which ultimately affect student outcomes and student success. While many researchers agree that self-regulation is a key component in academic success, differences persist about which educational strategies are most effective in promoting student learning. Studies agree that intrinsic and extrinsic factors influence one’s learning, motivation, behaviors, and success
therefore, recent shifts in educational pedagogy are grounded in Bandura’s social cognitive theory of human functioning in which motivation, behavior modification, and self-assessment are used to actively engage students in the learning process while simultaneously promoting self-regulation.
References


DOES SELF-REFLECTION IMPROVE PERFORMANCE


DOES SELF-REFLECTION IMPROVE PERFORMANCE


**APPENDIX I**

**Personal Test Analysis**

<table>
<thead>
<tr>
<th>Name: __________________________</th>
<th>Class: ________________________</th>
<th>Reviewed: ______</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: __________________________</td>
<td>Exam: __________________________</td>
<td></td>
</tr>
</tbody>
</table>

### Questions Missed/Answered Incorrectly

(Write question number in top row)

<table>
<thead>
<tr>
<th>Academic Mistakes</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Didn’t know answer/blind guess</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Studied wrong information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Studied but couldn’t recall correct answer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Couldn’t apply knowledge to answer correctly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Didn’t study enough (breadth &amp; depth)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Test Taking Mistakes

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Marked the wrong answer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changed an answer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Misread the question</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rushed for time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not see key word(s) in stem</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Didn’t understand the question</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Other

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental block</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Didn’t know terminology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatigue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answered based on clinical experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Did you do anything different to prepare for this exam from the previous exam?  □ Yes  □ No
If yes, briefly explain the changes you made. ____________________________________________________________

Do you feel the changes were helpful?  □ Yes  □ No
Explain:_________________________________________________________________________________________________
APPENDIX II

Instruction Sheet for
Personal Test Analysis

The Personal Test Analysis is designed to help you, and me, analyze exam results. You are to complete the analysis and return the completed form(s) to your instructor by the date specified by the instructor. Below are explanations of each category and statement. Please also complete the questions at the bottom of the page.

Academic Mistakes
1. Didn’t know answer/blind guess—you just didn’t know the answer to the question or you randomly picked an answer; deductive reasoning was not used to choose an answer
2. Studied wrong information—you studied for the test but didn’t study the correct information
3. Studied but couldn’t recall correct answer—you studied the correct information for the test but just couldn’t remember the material “in the heat of the moment”
4. Couldn’t apply knowledge to answer correctly—you studied the correct information but couldn’t apply concepts to clinical application; couldn’t link multiple pieces of information together to answer it correctly
5. Didn’t study enough (breadth & depth)—you studied the correct information but not to the extent (breadth & depth) required to answer the question correctly

Test Taking Mistakes
1. Marked the wrong answer—accidentally marked the wrong answer but CERTAIN you knew the correct answer
2. Changed an answer—you marked an answer and then second-guessed yourself and changed it to another option
3. Misread the question—you thought the question was asking one thing but it was asking something different
4. Rushed for time—spent too much time on certain questions; did not pace yourself for allotted time
5. Did not see key word(s) in the stem—you overlooked terms such as “all”, “except”, “least”, “most”, “avoid”, “best”, etc.
6. Didn’t understand the question—you didn’t understand what the question was asking

Other
1. Mental block—you had a mental block or brain freeze and couldn’t think/recall the answer
2. Didn’t know terminology—you didn’t know/understand terminology in the question which prevented you from answering it correctly or using deductive reasoning
3. Fatigue—got tired during the test and didn’t try 100%; gave up
4. Answered based on clinical experience—you answered the question based on what you’ve seen done in the clinic, not on information taught in textbooks/class.

Blank—add reason if not listed or included above
February 5, 2016

Shannon D. Turner
1439 Ashford Road
Ashford, AL 36312

Dear Ms. Turner:

Based on the review of your research proposal and confirmation of the processes you plan to use in implementation, you have permission to conduct your study entitled “Self-Reflection on Test Taking Skills: Does Performance Improve” within the instructional parameters of Wallace Community College. As part of this study, I authorize you to collect data from Physical Therapist Assistant (PTA) students enrolled in their second year of program study who voluntarily choose to participate in this project. It is understood that student identity and personal information is considered confidential and compliance with guidelines of the Family Educational Rights and Privacy Act is mandatory. Wallace Community College reserves the right to withdraw approval of this study at any time circumstances affecting compliance with these understandings change.

I confirm that I am authorized to approve instructional research in this setting. Data collected is to remain entirely confidential and may not be provided to anyone outside of the research team without permission from Wallace Community College and the Washburn University Institutional Review Board.

Sincerely,

Tony Holland, MS
Dean, Instructional Affairs

TH/kmb
From: Kelly Mourning-Byers
Sent: Monday, February 15, 2016 8:56 AM
To: Tracy Routsong <tracy.routsong@washburn.edu>; Shannon Turner <shannon.turner@washburn.edu>
Cc: Vickie Kelly <vickie.kelly@washburn.edu>
Subject: RE: IRB Request - Turner expedited

Your IRB application number is 16-12. Thank you!

Kelly Mourning-Byers
Administrative Specialist
Washburn University
Academic Affairs
Bradbury Thompson Alumni Center, Suite 200
1700 SW College Ave
Topeka, KS 66621

Tel: 785-670-1648
Fax: 785-670-1048

From: Tracy Routsong
Sent: Saturday, February 13, 2016 2:27 PM
To: Shannon Turner <shannon.turner@washburn.edu>
Cc: Vickie Kelly <vickie.kelly@washburn.edu>; Kelly Mourning-Byers <kelly.mbyers@washburn.edu>
Subject: RE: IRB Request - Turner expedited

Shannon,

Thank you for the clarification. With this information, your IRB application is approved. Kelly Mourning-Byers can give you your IRB number.

Good luck!

Dr. Routsong