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Predictors of Academic Success in First Semester Nursing Students

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Abstract

The anticipated nursing shortage requires a closer look at academic predictors of success for first-year nursing students. Literature shows that there is a significant shortage of students graduating from nursing programs to replace the nurses leaving the workforce. This study examined whether self-efficacy and self-esteem predict student success for first-year baccalaureate nursing students taking an introductory science course: Biology for Science Majors (BIO 130). Understanding the relationships between self-efficacy, self-esteem, and the end-of-course grade to measure academic success can inform future student success programming for undergraduate nursing students. The study used a correlation design to determine relationships between students' self-efficacy, self-esteem, and academic success. The independent variables were self-efficacy and self-esteem. The dependent variable was student academic success measured by students' final course grades. Pearson correlation and linear regression analysis indicated a weak relationship between scores on the General-Self-Efficacy Scale (GSES) and final course grades. Similarly, a weak relationship was found between scores on the Rosenberg Self-Esteem Scale (RSES) and the final course grades. This finding remained consistent when controlling for each independent variable.

Keywords: Nursing students, introductory courses, student self-efficacy, self esteem

Introduction

According to the National Science Foundation (2014), the nursing workforce needs 3.4 million nurses by 2026, and by 2030 about one million nurses will be of retirement age. Moreover, the Organization for Economic Cooperation and Development (OECD) (2018) report indicates that the U.S. educational system may not produce enough STEM graduates to alleviate the nursing shortage. Among the STEM students who major in nursing, many of them often decide to switch majors after they experience introductory first-year STEM courses due to poor academic outcomes and grades (Song et al., 2019). Al-Alawi et al. (2020) argue that often it is first-year nursing students' experience with science "gatekeeper" courses that affects their decision to continue with the nursing degree or to switch to other majors.

Often, first-year undergraduate nursing students report high anxiety and stress regarding studying and test-taking (Brown et al., 2021). Bulfone et al. (2020) associate high levels of anxiety and stress in undergraduate nursing students with low levels of self-efficacy and higher rates of academic failure. When Brown et al. (2021) analyzed nursing students' strengths and explored undergraduate student success characteristics, they found that there were typically four categories of nursing students' stressors: student use of unfamiliar equipment, faculty and clinical staff incivility, the disconnect between theory and practice, and communication in academic and clinical settings. Brown et al. (2021) concluded that first-year nursing students need early detection of anxiety, low self-efficacy, and low self-esteem to assess and foster student success and that nursing students taking introductory science courses were increasingly anxious compared to other undergraduate students. Anxiety interventions resulted in "consistently positive" responses, stress reduction, and increased cognitive reappraisal of stresses (Brown et al., 2021).

However, little is known about the predictors of academic success related to first year, first-semester nursing students' self-efficacy or self-esteem variables. This study sought to determine whether a relationship exists between nursing students' self-esteem and self-efficacy and students' final score in a first semester "gatekeeper" science course, BIO 130, at a college in New York.

Despite a large body of literature that analyzes nursing student academic success and retention, there is little research undertaken that connects student success in introductory science courses to their success and progression through nursing degree programs. Thus, this study attempted to determine if self-esteem and self-efficacy are predictors of academic success for first-year nursing students taking an introductory science "gatekeeper" course, BIO 130, at a college in New York. The study is important because it can help educators determine the best academic pathways regarding healthcare majors and positive outcomes for first-year nursing students' academic success.



A number of researchers have looked at the predictors of academic success for first-year baccalaureate nursing students. For instance, Ott et al. (2018) reviewed the academic records of 4,512 nursing students over a 7.5-year study period, assessing demographic variables including gender, full-time status, marital status. The results indicated that successful students were more likely to be female, between the ages of 20–24, and the majority were low-income (86%) and first-generation students (54%).

In a broader COVID-19 context, Gaffney et al. (2021) studied the relationship between student confidence concerning academic success, NCLEX-RN success, patient care delivery, and the transition to remote learning. The authors noted the importance of the loss of hands-on laboratory experience, direct patient care experience, and the lack of opportunities to connect theoretical base knowledge with hands-on physical skill experiences. In comparing the characteristics of in-person students versus online students, successful online students demonstrate strong communications skills, time management, and technological self-efficacy. The authors concluded that confident nursing students have the potential to adapt to challenges, position themselves for professional success, and transition well into the clinical workplace (Gaffney et al., 2021).

Addressing the gap in defining the predictors of first-year nursing students' academic success, Karabacak et al. (2019) considered the effect of simulation-based learning on self-efficacy and performance among a population of first-year nursing students. The researchers aimed to determine if simulation learning would affect participants' self-efficacy, clinical competency, and performance. The results showed decreased self-efficacy from pre- to post-scenario measures, which was significant in the "establishing a safe patient unit" objective. These results indicate that simulated experiences provided a sense of the natural clinical environment where students could recognize their actual levels of self-efficacy (Karabacak et al., 2019).

Although researchers define academic engagement differently, most include three dimensions: behavioral, emotional, and cognitive (Fredericks et al., 2004). For example, Hubbard and Blyler (2016) analyzed how anxiety and stress affect health science students' working memory and cognitive processing. Their findings showed that motivation and perceived stress influence student engagement and academic performance.

Another study looked at the importance of learning through problem-solving and critical thinking embedded in case-based learning (Roshangar et al., 2020). The researchers found that combined teaching strategies significantly impact students' academic self-efficacy and critical thinking skills (Roshangar et al., 2020). In active learning environments, instructors emphasize Bloom's Taxonomy of higher cognitive skills and students improve their processing skills by making assumptions and reflecting on their performance (Ben-Jacob, 2017).

Analyzing students' learning experiences and motivation reveals that student feedback, interviews, active learning, interconnected structured course components, peer interaction, and instructor tasks are critical determinants in students' success and motivation (Partanen, 2020). While learner-centered teaching puts students in the driver's seat, causing higher anxiety and nervousness (Brown et al., 2021), increasing students' critical thinking also increases their self-esteem and self-efficacy (Roshangar et al., 2020).

Kim et al. (2021) addressed the possibility of peer tutoring or remediation areas that can contribute to first-year nursing students' academic success. The results demonstrated a positive correlation between tutoring sessions per semester and improved exam scores (Kim et al., 2021), concluding that peer tutoring might reduce course failure rates while improving exam scores, both for students at risk of failure and those who exhibit the motivation to improve their academic performance.

Roshangar et al.'s (2020) research questionnaire was used to assess students' self-efficacy levels. The researchers indicated that optimal learning and student success depend on the instructor's selection of educational strategies (Ben-Jacob, 2017). The results indicated significant improvements in critical thinking among the control group, indicating that case-based learning is effective in that regard. Significant differences in critical thinking and self-efficacy were observed in the experimental group, indicating that this integrative educational method may be preferable (Roshangar et al., 2020).

College student attrition for STEM science and nursing majors typically occurs during the first or second year of a student's college experience. Thus, successful completion of first-year college courses plays an influential role in students' decisions regarding their major. However, King (2016) noted that it is evident that "gatekeeper" courses, which consist of introductory college math and science courses, either explicitly or implicitly function to eliminate all but "top tier" students and reinforce the concept that scientists are born and not made.

When Smith et al. (2018) analyzed undergraduate nursing student success in a STEM Chemistry course that used health-related case studies as the active learning pedagogical approach, they found significant improvements in students' critical thinking skills and self-efficacy, suggesting that evidence-based teaching and creating positive learning environments can be applied to similar courses, particularly nursing students or pre-health professions (Smith et al., 2018).

Shariffard et al. (2020) addressed the connections among motivation, self-efficacy, stress, and academic performance among nursing and paramedical students to evaluate their impact on the prevalence of student

burnout. The results indicated that all academic stress, motivation, and self-efficacy subcategories are related to academic burnout. Further, internal motivation; no motivation; and difficulty managing work, family, and university predicted academic burnout (Sharififard et al., 2020).

Dancot et al. (2021) evaluated the relationship between self-esteem and dropout among first-year nursing students via a questionnaire, including self-esteem and self-efficacy measures. Results indicated that self-esteem and academic performance correlate with dropout rates and that self-efficacy is closely correlated with self-esteem. The researchers noted that: "Situations in which self-efficacy has the greatest impact on self-esteem include succeeding in clinical training and succeeding in education (and not in being a good nurse)" (p. 8).

Terry et al. (2020) assessed general self-efficacy, nursing self-efficacy, and psychological capital, which they defined as "a combination of attributes that include self-efficacy, hope, optimism, and resilience" (p. 160). Metropolitan nursing students reported higher general and nursing self-efficacy levels than their rural counterparts, and students under the age of 25 had lower self-efficacy levels than those aged 25–45. The results also indicated positive correlations between general self-efficacy and all psychological capital items, as well as nursing self-efficacy and all psychological capital items except resilience (Terry et al., 2020). Notably, the results indicated higher general self-efficacy levels than nursing self-efficacy among this population (Terry et al., 2020).

Despite a large body of research that addresses student success characteristics, self-esteem continues to be a challenge for first-year nursing students' academic success. Valizadeh et al. (2016) identified the relationship between psychosocial challenges associated with low self-esteem and suggested that reducing effects like depression are important. The authors further concluded that as nursing students progress from the second to their third year of study, their professional knowledge increases, and indirectly high levels of low self-esteem decrease, and students' engagement and interactive communication increase (Valizadeh et al., 2016).

Figen and Avci's (2020) study results from 360 nursing students on the Nursing Education Stress Scale and the Professional Self-Esteem Scale concluded that professional self-efficacy is important for success in the profession and that educational stress can negatively impact it at the personality/development stage of nursing education. They showed a high negative correlation between nursing educational stress and professional self-esteem in their first year of study, negatively affecting decision-making, problem solving, and critical thinking. The results indicated higher professional self-esteem among female students and students in their final year of study.

Abdulghani et al. (2020) addressed the relationship between self-esteem and achievement among students enrolled in health science colleges, including nursing, medical, dental, pharmacy, and applied science students. Participants reported that factors including living situations and physical and mental health issues affected their self-esteem. In addition, English language proficiency and time management were important to students' academic achievement.

Bandura's Social Learning Theory (SLT) and Social Cognitive Theory (SCT) served as foundational theoretical guidance for this study. The SLT theory asserts that human behavior is learned through observation, imitation, and modeling and that social modeling, teacher feedback, classroom strategies, and building self-efficacy are rooted in SLT. Expanding from SLT, Bandura developed the SCT that proposes that learning happens in a dynamic contextual interaction between the environment and the individual, including the construct of self-efficacy (Zimmerman et al., 1992). The cause and effect from these interactions shape human functioning and behaviors. Any source for motivation is embedded in the person's self-belief of efficacy, and it influences performance.

Materials and Methods

The problem addressed by this study is that student self-efficacy and self-esteem may impact first-year undergraduate nursing students' academic success in an introductory STEM course. Using a quantitative correlational design, this study examined whether self-efficacy and self-esteem can predict student success for first-year baccalaureate nursing students taking an introductory science course: Biology for Science Majors (BIO 130). The independent variables were students' self-efficacy and self-esteem. The dependent variable was students' academic success within the first year of a baccalaureate nursing degree as measured by final course grades in a nursing STEM "gatekeeper" course, BIO 130.

The research questions specific to this study primarily intended to analyze the relationship between nursing students' self-efficacy/self-esteem and academic success among nursing students enrolled in a BIO 130 course at a college in New York. Secondly, the researcher wanted to know if self-efficacy/self-esteem can predict nursing students' academic success while controlling for self-esteem among nursing students enrolled in a BIO 130 course at a college in New York.

A quantitative correlational research design was employed for this study because it can determine the relationship between variables and how they predict one another. Thus, using a quantitative correlational research design, the relationship between the self-efficacy and self-esteem variables and their effect on student success as measured by the BIO 130 end-of-course grade was examined. Understanding the relationships

between self-efficacy, self-esteem, and the end-of-course grade as a measure of academic success can inform future student success programming for undergraduate nursing students. More specifically, fitting with this study, quantitative correlational studies can analyze the relationships between the independent and dependent variables and establish the predictive relationships through correlational or regression statistics (Portney, 2020).

The population of the study was recruited from a college in New York state during the fall 2021 semester. The researcher selected this college because the participants met the specific aim of this study and the site offered convenience and readily available suitable student population. The sample included nursing students enrolled in an introductory biology course, BIO 130. The BIO 130 course is an introductory general education class taken during the first semester in the first year of the traditional baccalaureate nursing degree. All participants were recruited at mid-term or after the mid-term point of the fall semester via class email listing.

The survey tool was constructed by combining two existing validated scales, the General Self-Efficacy Scale (GSES) and the Rosenberg Self-Esteem Scale (RSES). The GSES, developed by Schwarzer and Jerusalem (1995), is a ten-item self-report survey with four-choice responses: not at all true, barely true, moderately true, and exactly true, going from negative to positive. The Rosenberg Self-Esteem Scale (RSES) is a self-report ten-item survey scale with four choice responses on a Likert scale, ranging from strongly agree to strongly disagree. Higher scores indicate a higher sense of an individual's self-esteem (Rosenberg, 1965).

For this study, the two scales were combined as one instrument. Both scales consistently used the same four-choice responses, ranging from strongly agree to disagree strongly. The demographic data were used to characterize the sample and determine if the findings could be generalized. It included the following attributes: familial status, age, ethnicity, gender, and credits load for the semester.

The survey was administered at mid-term or after the mid-term point of the fall semester. Students' survey responses were based on their class experiences and course grades. The results provided information on students' perceived self-efficacy, self-esteem, and ability to succeed in their program of study. These results were matched with the participant's final course grades and further analyzed with SPSS 26 software.

Using the Pearson correlation, the relationship between pairs of variables addressed in RQ1 and RQ2 was examined. A linear regression model was utilized to examine RQ3 and RQ4, using self-efficacy and self-esteem as the independent variables and student success as the dependent variable. In addition, this data analysis method employed to ensure consistency of results as well as to analyze the overall responses and score distributions to determine if there was a skewed predictor or a non-ratio outcome. No incomplete surveys were used in this analysis.

Results and Discussion

Through the data analysis, Pearson correlation was used to examine the relationship between the nursing students' self-efficacy/self-esteem and academic success while enrolled in a BIO 130 course. Table 1 represents the Pearson correlation of academic success between GSES/RSES and BIO 130 end-of-course grade.

For these research questions, the analysis shows a weak relationship between the variables (GSES/RSES and end-of-course grade). The independent variables listed as GSES ($r(35) = .099, p = .559$), and RSES ($r(35) = .145, p = .392$) did not show a significant relationship with the dependent variable listed as BIO 130 end-of-course grade.

Table 1

Demographic Data Based on Gender and Ethnicity

Please indicate your gender:		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	2	5.3	5.3	5.3
	Female	35	92.1	92.1	97.4
	Other	1	2.6	2.6	100.0
	Total	38	100.0	100.0	

The researcher ran a linear regression using self-efficacy and self-esteem as the independent variable with BIO 130 end-of-course grade as the dependent variable. Before running the regression, the researcher tested all assumptions. The first assumption is that all variables are normally distributed. This was checked by the skewness and kurtosis as listed in the earlier discussion. All values were met, and values were in range after outlier removal. The next assumption was that a linear relationship exists between the variables. This was tested using a visual inspection of scatter plots of BIO 130 end-of-course grade against GSES/RSES. This involved

checking the skewness and kurtosis as listed in the earlier discussion. All values were met and were in range after outlier removal. The next assumption was that a linear relationship existed between the variables. Results do not indicate strong evidence of a linear relationship between the two variables. The third assumption was that no multicollinearity exists between the predictors. The researcher tested this using Tolerance and VIF coefficients. All tolerance values were above 0.1, and all VIF values were below ten (Table 2). Therefore, the assumption was met.

Table 2
Descriptive of Continuous Variables with the Outlier Removed

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis		
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Your age:	33	18	56	19.42	6.624	5.594	.409	31.748	.798
GSES	37	24.00	35.00	29.3243	3.00050	.184	.388	-.619	.759
RSES	37	19.00	40.00	27.5676	4.33680	.895	.388	1.206	.759
Grade	37	2.00	4.00	3.1895	.59631	-.409	.388	-.577	.759
Valid (listwise)	N33								

The assumption for homoscedasticity was tested using a visual inspection of the scatter plot of the predictive values against the residuals. The variance was fairly evenly distributed for all predicted values of the dependent variable. Therefore, the assumption was met.

The final assumption was to check for multivariate normality of the residuals using the Q-Q Plot. Visual analysis of the standardized residuals showed that all residuals were evenly distributed. Therefore, all assumptions were met.

Regression model results were not significant ($F(2,34) = .415, p = .664$). The predictor variables accounted for less than one percent of variation in grades (adjusted R^2 as < 0.001). GSES was not a significant predictor of grade when controlling the RSES ($B = .011, p = .754$). RSES was not a significant predictor of grade when controlling the GSES ($B = .017, p = .490$).

Conclusions

The purpose of this quantitative correlation research design study was to examine the relationship between the self-efficacy and self-esteem variables and their effects on student success as measured by BIO 130 end-of-course grade. Based on the data analysis results, no relationship exists between students' self-efficacy or self-esteem with students' academic success as measured by BIO 130 end-of-course grade. The survey tool used in this study provided sufficient quantitative data to answer the four research questions with a good sample size of participants. For RQ1 and RQ2, the researcher used a Pearson correlation model, and for RQ3 and RQ4, the researcher used a linear regression model. The researcher examined the possibility of self-efficacy and self-esteem predicting student academic success in obtaining a nursing degree. However, no strong evidence exists of a correlation or linear relationship between the independent variables and the dependent variable. In the context of SLT and SCT theories, and based on the final course grade results, all participants in this study will move to the next level of their nursing education degree.

Although this study's findings did not support the researchers' hypotheses, the knowledge gained from this study could benefit educators by providing them with insight into the factors that can promote first-year nursing student success during their introductory science courses. For instance, using nursing educators' pedagogical skills to create a learner-centered environment would promote student success and empowerment. As has been determined, students' knowledge of professional skills significantly impacts students' self-esteem, self-efficacy, and academic success and boosting students' self-esteem indirectly increases their academic performance (Abdulghani et al., 2020). When students understand their emotions and know what motivates them, they problem-solve with ease and have a greater sense of self-efficacy and self-esteem. As a result of gaining such self-knowledge and associated personal skills, the likelihood that such a positively affected nursing student completes their degree is significantly greater. Furthermore, knowing that students often switch majors when they receive poor grades in introductory STEM courses, such as BIO 130 (Song et al., 2019), this study can

support further research that could look at additional predictors of academic success and early detection of low self-efficacy or self-esteem amongst first-year nursing students.

Further research to investigate the academic predictors of first-semester nursing students taking a science course could include a larger sample population, expanding the study to a mixed-method approach and adding the science “gatekeeper” courses (e.g., chemistry) and their designated learning interventions. A future qualitative assessment could help triangulate this data and further strengthen the points from this quantitative study.

The limitations of this study included using a small sample of students, access to only one STEM science course, and it did not account for other variables of the first-year college experience, such as finances, life experiences, student life, and the COVID-19 pandemic’s impact on students and other factors that may affect students.

This study suggests that evidence-based teaching and creative pedagogical strategies can be applied to similar “gatekeeper” nursing courses and even expand to all pre-health profession students (Smith et al., 2018). By promoting a cooperative learning environment, students gain confidence in their ability to learn and get motivated to succeed.

The results of this study, combined with future research, revised instructional design, and expansion to include more first-year nursing student participants can assist academic administrators and educators to establish the best academic pathways to ensure nursing success in science courses. Results can bring insight into which factors promote nursing student success. A deeper analysis can differentiate between the first-year nursing student predictors of success in science courses versus nursing foundational courses. The results of this study, combined with future research, revised instructional design, and expansion to include more first-year nursing student participants could assist academic administrators and educators to establish the best academic pathways to ensure nursing success in science courses. Results could bring insight into which factors promote nursing student success. A deeper analysis could differentiate between the first-year nursing student predictors of success in science courses versus nursing foundational courses.

Data Availability (excluding Review articles)

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Conflicts of Interest

There are no conflicts of interests.

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Author Biographies

Cristina Dumitrescu, EdD, is an occupational therapist with over 25 years of experience. Her doctoral studies are in Education with a specialty in Teaching and Learning. She received her BS/MS in OT in 2008, and her clinical experience is with the adult client in primarily in sub-acute/ management positions. Currently Dr. Dumitrescu works as the occupational therapy assistant program director at Mercy college in NY and she is responsible for the management and administration of the program, including planning, evaluation, budgeting, selection of faculty and staff, supervision of faculty and staff, maintenance of accreditation, and commitment to strategies for professional development. She is also responsible for teaching, student advisement, committee work in the department of School of Health and Natural Sciences and college level recruitment.

Lori Kupczynski, EdD has served over 24 years in higher education in the areas of English, Communication, Adult Education, Higher Education and Educational Leadership. She currently serves as a Professor of Education at the University of St. Augustine for Health Sciences (USAHS). Previously, she has served as Associate Professor and Program Director of the Educational Leadership doctoral program, doctoral level transcribed certificate program in Higher Education Administration and Leadership (HEAL) and the Adult Education Masters Program at Texas A&M University-Kingsville. Lori lead her USAHS team to win the Effective Practice Award from the Online Learning Consortium at Accelerate 2019 for the "Concierge Support Model: Promoting Doctoral Student Efficacy, Persistence, and Matriculation in an Online Program." Most recently, she was the recipient of the Board of Directors' 2020 Excellence in Scholarship Award from the University of St. Augustine for Social Sciences. Her research agenda focuses on developing a deeper understanding of interactions among adult learners in online learning environments through the development of grounded theory to explain the interactions within the Community of Inquiry Framework (CoI).

Marc Campo, PhD serves as a Professor at Mercy College, where he has been teaching since 2002, in the Doctoral of Physical Therapy program. Instructional content areas include orthopaedics, research design and methods, epidemiology and biostatistics. In addition, he coordinates student research projects and the Case Study Clinical Problem Solving course. His research interests are in occupational injury epidemiology and rehabilitation outcomes. He also serves as a consultant on research projects across the college and beyond.