# ASSESSING ONLINE LEARNERS' ACADEMIC SELF-EFFICACY IN A SYMBIOTIC LEARNING ENVIRONMENT

[1]Sadik I. Bulut [2]Firouz Anaraki

***Abstract:*** *A symbiotic relationship in a learning environment represents a mutual benefit that is earned from each other's learning experience. Symbiotic learning entails self-directed social learning in which everyone involved learns from one another. It is evident that there is a strong positive correlation between self-efficacy beliefs of learners and their academic performance and achievement. Provided that human beings are social creatures, learning occurs in social environments, and self-efficacy is important in achieving academic goals, it is worthwhile to study the impacts of a well-defined virtual social setting on academic self-efficacy. This paper outlines findings from a quantitative study conducted to assess the effects a symbiotic learning environment has on the academic self-efficacy of online learners. The samples were 78 online students who enrolled in one to three time-intensive eight-week-long, fully online courses, in a degree-granting, higher education institution in the United States chosen by using the simple random sampling technique. A true experimental pretest-posttest research study has revealed that online learners who were immersed in a socially rich symbiotic learning environment throughout an online course demonstrated a significant increase in their academic self-efficacy and reached a higher level of self-efficacy compared to students in the control group.*

***Keywords****: Symbiotic learning environment, academic self-efficacy, social learning, online learning, e-learning, collaborative learning, self-directed learning, higher education*



## Introduction

Educational psychologists have classified learning activities into three separate taxonomies known as the cognitive domain (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956), the affective domain (Krathwohl, Bloom, & Masia, 1964), and the kinesthetic domain (Harrow, 1972). The cognitive domain addresses learning achievement levels such as remembering, understanding, thinking, and the employment of analytical reasoning; the affective domain focuses on intuitive abilities such as senses, perceptions, beliefs, and emotions, while the kinesthetic domain is devoted to psychomotor skills such as visual, auditory, tactile, and physical dexterity. Experts agree that effective learning can be cultivated in all three domains when learning activities are designed to incorporate each domain as much as possible in a holistic, versatile approach (Bloom et al., 1956). How would such an approach be implemented within an online learning setting in order to successfully encompass all three domains to support learning?

Traditional online learning settings are known to ignore the affective and kinesthetic domains of learning to solely focus on the cognitive domain. This deficient approach prevents an efficient learning experience and undermines the social aspect of the learning process. Interpersonal skills such as articulating

[1] sibulut@hotmail.com
[2] fanaraki@au.edu

ideas, advocating opinions, negotiating, and collaborating are correlated with the affective domain of learning. In accordance with Albert Bandura's Social Learning Theory, people learn from each other and learning takes place in a social context (Bandura, 1963). However, studies show that e-learning practices usually emphasize on the cognitive skills and frequently lack utilizing the interpersonal skills. (Yang & Chang, 2008). The affective domain of learning needs to be supported for online learning to become more like a real-life learning experience.

**Literature Review**

Diverse learners have their own way of learning; they recognize, acquire, retain, retrieve, and recall information in different ways. One size certainly does not fit all kinds of learners. Moreover, during traditional classroom discussions or group work, more vocal classmates might participate mostly by asserting complete dominance over the group even when unqualified, driving more hesitant individuals to remain behind social and psychological barriers (Emil, 2001). Online education has the potential to provide equal opportunities for participation in learning activities and customizing individual learning materials and learning processes to offer a more personalized learning experience than traditional face-to-face education thus addressing a wide range of learner needs.

However, it is important to realize the psychological isolation that is present in online learning settings. At this point, it is necessary to visit the social dimension involved in the human learning process, the affective domain of learning. Social learning in its traditional mode is probably the oldest form of learning from an anthropological standpoint (Wentworth, 2014). Collaborative learning is a relevant example of learning in a social context with an instructional approach in which teaching, and learning involve groups of learners working to complete tasks, solve problems, and produce projects as a team. Collaboration implicates an agreement among participants, project work with a shared goal for an outcome that is based on consensus, deep thinking, searching solutions to common problems, knowledge generation, and sharing (Cooper & et al., 1990).

As a biological term, symbiotic interaction refers to a mutually beneficial relationship (Douglas, 1994) which is applicable to learning environments. Several researchers have explored the idea of "symbiotic learning" in different contexts (Eikeland, 2013; Wang, 2018; He, Saito, Kubo, & Maeda, 2019). A symbiotic relationship in a learning setting represents a mutual benefit that is earned from each other's learning experience. Symbiotic learning also referred to as "mutualistic learning" (Grey, 2011), represents self-directed social learning in which everyone involved learns from one another. It is important to realize that symbiotic learning pertains to not only "learning from teacher" but also "learning from peers" in a peer-to-peer learning practice (King & O'Donnell, 1999).

As an important component of his social-cognitive theory, Bandura (1986) defined self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances." Self-efficacy is a critical trait of successful online learners because it is so imperative to have confidence, self-motivation, and determination to achieve success in a virtual learning environment. A meta-analytic study conducted by Multon et al., (1991) reported a strong positive correlation between self-efficacy beliefs of

learners and their academic performance and achievement. Other researchers suggested that low self-efficacy results in anxiety, stress, and confusion in the face of difficult tasks (Downey, Eccles, & Chatman, 2005).

Provided that human beings are social creatures, learning occurs in social settings, and self-efficacy is important in achieving academic goals, it is worthwhile to study the impacts of a well-defined socially enriched online learning environment on academic self-efficacy.

## Methods

This quantitative research study employed a true experimental design and collected data through online questionnaires on a Likert scale. The study aimed to determine whether socially enriched virtual environments, such as a symbiotic learning environment, increased the academic self-efficacy of online learners. If the positive effects of a symbiotic learning environment are proven, it can be advised to educational institutions to implement and promote symbiotic learning environments, as a concept, in their online programs.

The subjects selected for this study were online students who were enrolled in one to three time-intensive eight-week-long, fully online courses, in a degree-granting, higher education institution in the United States. In consideration of the fact that many colleges and universities in the United States offer online courses in a similar format, the results of this study can be applied to all degree-seeking online learners, and hence the population of this research study can be defined as all online students in the United States higher education institutions in a broader sense.

The control group and the experimental group students were selected by the use of random assignment. A pre-test followed by a post-test after the intervention has been conducted. In the first stage of the experiment, a survey sent to all participating students collected demographic information. A pre-test survey ($O_1$) was used to collect self-perceived academic self-efficacy and attitude towards online learning of the students in both the control and the experimental group.

As the intervention of the experiment (X), the experimental group was immersed in a socially enriched online learning environment which was rich in electronic communication tools, virtual interactivity tools, and collaborative e-learning tools. The control group was in a relatively isolated learning environment. While the first group was encouraged and instructed to use social interactivity tools throughout the course, the second group was not. However, the control group still had access to minimal communication tools whenever they were needed.

In the final week of the online course, a post-test survey ($O_2$) collected self-perceived academic self-efficacy and attitude towards online learning, for the second time. The statistical analysis procedures included comparing the difference between 1) the pre-test and post-test academic self-efficacy scores of the experimental group, and 2) the pre-test academic self-efficacy scores of the experimental and the control group.

## Results

The data collection of this research study has been done throughout the Fall 2018 academic year. The statistical analysis included a descriptive demographics analysis and a Mann-Whitney *U* test analysis of the self-efficacy scores. No personally identifiable information (PII) such as student names, student ID numbers or email addresses have been collected

from the survey participants; all responses were submitted anonymously. A total of seventy-eight (78) students responded to the pre-test survey between August 20th and August 31st. About two months later, a total of seventy-one (71) subjects responded to the post-test survey which was conducted between October 21st and October 28th.

**Demographics**

Most of the participant students were traditional students, approximately 79%, enrolled in on-campus programs but taking one online course on top of their face-to-face course load. Approximately 21% of the participant students were distant students registered to online-only programs.

A total of 78 online students participated in this quantitative study by responding to the provided survey questions. The sampling frame was 110 students, 44 of whom are (~40%) bachelor's degree-seeking students and 66 of whom are (~60%) either master's degree-seeking students or graduate certificate students. All of the students in the sampling frame were taking at least one online course during the Fall 2018 semester. An unknown number of students dropped from their courses after obtaining these numbers. Out of 110 students who were invited to participate in a number of online surveys, only 78 students (~71%) agreed to participate in the study.

Seventy-one (71) students completed both the pre-test and the post-test surveys in matched pairs. Thirty-two (32) subjects from the control group and thirty-nine (39) subjects from the experimental group completed both surveys. The collected data showed that there was no statistically significant difference ($p$ = 0.4617) between the gender proportion of the students in the control group (58.3% female vs. 41.7% male) and the experimental group (50% female vs. 50% male). There was no statistically significant difference between the two groups in terms of age ($p$ = 0.6045). Likewise, there was no significant difference between the control group and the experimental group in regard to their racial identity ($p$ = 0.3194). There was a significantly higher proportion of graduate students in the experimental group (85.7% graduate students vs. 14.3% undergraduate students) compared to the control group (66.7% graduate students vs. 33.3% undergraduate students) ($p$ = 0.0465). There was no statistically significant difference between the two groups in their previous online course experience ($p$ = 0.6416). The breakdown of all demographic characteristics of the subjects is summarized in Table 1 below:

| | | Control Group | | Exptl. Group | |
|---|---|---|---|---|---|
| | | Freq. | Perc. | Freq. | Perc. |
| Gender | Female | 21 | 58.3% | 21 | 50.0% |
| | Male | 15 | 41.7% | 21 | 50.0% |
| Age | Under 18 | - | 0% | - | 0% |
| | 18-20 years old | - | 0% | - | 0% |
| | 21-24 years old | 10 | 27.8% | 10 | 23.8% |
| | 25-44 years old | 24 | 66.7% | 27 | 64.3% |
| | 45 and older | 2 | 5.6% | 5 | 11.9% |
| Racial Identity | African American | 3 | 8.3% | 6 | 14.3% |
| | Asian | 14 | 38.9% | 9 | 21.4% |
| | Hispanic | 2 | 5.6% | 6 | 14.3% |
| | Native American | - | 0% | - | 0% |
| | Pacific Islander | - | 0% | - | 0% |
| | White | 15 | 41.7% | 20 | 47.6% |
| | Other | - | 0% | - | 0% |
| | Not Specified | 2 | 5.6% | 1 | 2.4% |
| Degree Program * | Graduate | 24 | 66.7% | 36 | 85.7% |
| | Undergraduate | 12 | 33.3% | 6 | 14.3% |
| Previous Online Course | Yes | 29 | 80.6% | 32 | 76.2% |
| | No | 7 | 19.4% | 10 | 23.8% |

** denotes a significant difference*

**Table 1:** Demographic Characteristics of the Subjects

**Academic Self-Efficacy**

The subjects in the experimental group were exposed to a socially enriched online learning experience which was the independent variable in this experimentation. The instructors who were facilitating the online courses with experimental group students were encouraged to use the collaborative tools available in the Canvas Learning Management System (LMS) in a meaningful way to build an environment that promotes social learning in which students can mutually benefit from each other. The facilitators were instructed to 1) actively engage in weekly discussion forums where questions pertaining to the weekly instructional materials were discussed, 2) promote and require peer-to-peer interactions in the weekly discussions, 3) communicate to students via frequent announcements through the LMS tools and email channels to ensure that students are on track to achieve stated learning outcomes, 4) provide meaningful and constructive feedback in a timely manner for assignment submissions, and 5) assign group projects where students are given the opportunity to collectively and collaboratively work on tasks when appropriate.

In order to create a symbiotic learning environment for the experimental group students, the course facilitators were introduced to the textual communication tools, and the grouping tools that are available in the LMS. Additionally, the instructors were introduced to the strategies that effectively make use of these LMS tools and were encouraged to practice and apply these strategies in their daily pedagogy. The course facilitators were sent weekly reminder emails with information explaining how to engage students in the learning activities and how to promote a social learning environment. Information sent to the instructors included references to the resources where they can find further information and tutorials regarding the utilization of aforesaid LMS tools that they were asked to use. The LMS tools that promote social and collaborative learning are listed in Table 2 below:

| Tool | Function |
|---|---|
| Electronic mail | Textual, asynchronous communication |
| Canvas Messaging | Textual, asynchronous communication |
| Chat | Textual synchronous (real-time) communication |
| Announcement | Textual or visual asynchronous one-way communication |
| Discussion Forums | Textual or visual, interactive information exchange |
| Groups | (Virtual space for group assignments and wiki pages) Interactive, collaborative information sharing |

**Table 2:** Social Interaction and Collaboration Tools Used

The independent variable (treatment) in this experiment was the presence of a symbiotic learning experience, as the measured academic self-efficacy of the subjects was the dependent variable. The intervention of the independent variable was employed with the experimental group only. The purpose of this experiment was to control online students' exposure to the treatment (independent variable) while observing and measuring the effects on the academic self-efficacy (dependent variable) of the students both in the experimental group and the control group. The main hypothesis was that the value of the dependent variable would change in response to the independent variable mimicking a cause and effect relationship.

A Mann-Whitney *U* test was used to compare the experimental group's pre-test scores vs. post-test scores and the control group's pre-test scores vs. the experimental group's pre-test scores. The experimental group's pre-test scores indicated a significantly lower academic self-efficacy when compared to the control group (pre-test) at the onset ($p = 0.0026$). A Mann-Whitney *U* test score of 455 was calculated, and the *z*-score was -3.01194. The *p*-value

of .00262 indicated a statistically significant result at $p < .05$. The experimental group's post-test scores showed a statistically significantly higher academic self-efficacy than their pre-test scores ($p = 0.00001$), suggesting that the symbiotic learning environment that the experimental group partook in throughout the course helped them enhance their academic self-efficacy significantly. A Mann-Whitney *U* test score of 95 was calculated, and the *z*-score was -6.83857. The *p*-value of .00001 indicated a statistically significant result at $p < .05$. The medians and quartile ranges of the self-efficacy scores are depicted in the Figure 1 below:

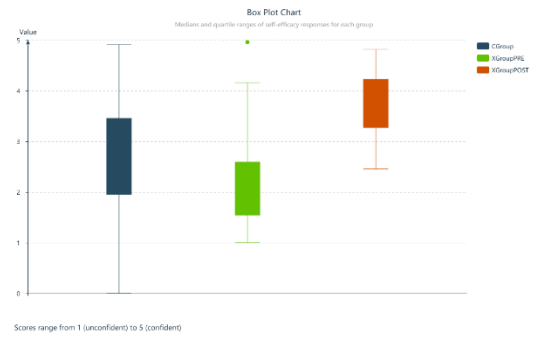


**Figure 1:** Medians and Quartile Ranges of Self-Efficacy Scores

## Discussion

The purpose of this study was to find the extent to which a symbiotic learning environment can enhance the academic self-efficacy of online learners. Because they are fully responsible for their own education, online students greatly benefit from the learned virtues of self-motivation and self-discipline when it comes to the success of their studies. Evidently, a strong perceived academic self-efficacy yields a positive impact on the academic achievement of online students (Multon, Brown, & Lent, 1991; Downey, Eccles, & Chatman, 2005). The results of this study indicated that there is a significant positive correlation between a symbiotic learning environment and the learners' academic self-efficacy.

A symbiotic learning environment can be defined as a virtual setting for online learners in which they are socially active by using all available electronic communication channels to ask and answer questions, share information, collaborate on learning tasks, and learn from each other's experience. In a symbiotic learning environment, each learner benefits from one another and supports each other's learning simultaneously, making every social interaction a learning opportunity for the entire group. Social interactions that build relationships between the teacher and learners, or even among the learners, can be an essential part of the learning process if these activities serve the learning goals. Communicating, connecting, contributing, and collaborating are doubtlessly powerful knowledge-building learning activities that promote an engaging learning environment. Therefore, a socially enriched online learning environment, in fact, complements the learning process by appending the missing social dimension.

The proven positive correlation between a symbiotic learning environment and online learners' academic self-efficacy aligns with Bandura's (1977) social learning theory which suggests that learning occurs in a social environment through observing others and interacting with others. Also, the results of this study agree with Cooper's (1990) work which suggests that knowledge generation and sharing in a collaborative learning environment increase instructional productivity.

Although there was a significantly higher proportion of graduate students in the experimental group compared to the control group, this is not considered a substantial variable due to the nature of this study because the undergraduate and

graduate studies are very much alike in terms of their learning experience. The format of the online courses for both degree levels is identical, facilitation of the courses and expectations are comparable.

## Conclusion

In conclusion, based on the findings of this study, the existence of the symbiotic learning environment in online learning increases the academic self-efficacy of the learners, consequently, resulting in greater academic achievements. Meaningful and intense social interactions among online learners greatly enhance their learning experience. This approach suggests a solution to the problem of the sense of psychological isolation and feeling of being lost in an online learning environment, furthermore, it is much needed to have the social and affective aspects supporting the learning process in an online learning setting.

Other findings of the study suggest that the learners' gender, age, racial identity, the degree program they are in, or previous online course experience have no significant effect on their academic self-efficacy and academic achievement. However, being exposed to a socially enriched learning experience and the opportunity to interact, communicate, collaborate, and share knowledge have a huge impact on the achievement of learning outcomes. Symbiotic learning environment as a concept has the potential to serve as a valuable venue towards academic advancement for a multitude of learners and it can be suggested to academic institutions to implement and promote symbiotic learning environments in their online programs.

## Recommendations

This research examined specifically the cause and effect relationship between the existence of a symbiotic learning environment and academic self-efficacy of online learners. Although communication, interaction, and collaboration channels have been identified and introduced to the learners, how they used these channels in knowledge building and how often they used these channels remained out of the scope of this study. Another research investigating how learners use the opportunities for knowledge exchange would bring valuable insights to the area. Possibly a mixed method or exclusively qualitative research can address the questions.

Motivation and engagement are other two important factors in achieving academic goals. Future researchers can consider incorporating these parameters and try to measure the effects of a symbiotic learning environment on motivation and student engagement as well as self-efficacy. Also, it would be appropriate to collect grading data in order to investigate the relationship between 1) academic achievement and self-efficacy, 2) academic performance and the existence of a symbiotic learning environment.

## References


Bandura, A. (1963). *Social learning and personality development.* New York, NY: International Thomson Publishing.

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory.* Englewood Cliffs, NJ: Prentice Hall.

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of Educational Objectives: The Classification of Educational Goals, by a committee of college and university examiners. Handbook I: Cognitive Domain.* New York, NY: Longmans.

Cooper, J., & et al. (1990). *Cooperative Learning and College Instruction: Effective Use of Student Learning Teams.* Long Beach, CA: California State University Foundation.

Douglas, A. (1994). *Symbiotic interactions.* Oxford University Press. Retrieved 4 1, 2019

Downey, G., Eccles, J. S., & Chatman, C. (2005). *Navigating the Future: Social identity, coping, and life tasks.* New York, NY: Russell Sage Foundation.

Eikeland, O. (2013). Symbiotic Learning Systems: Reorganizing and Integrating Learning Efforts and Responsibilities Between Higher Educational Institutions (HEIs) and Work Places. *Journal of the Knowledge Economy, Volume 4, Issue 1*, 98-118.

Emil, B. (2001). Distance Learning, Access, and Opportunity: Equality and e-quality. Metropolitan Universities, 12(1).

Grey, B. (2011, October). Symbiotic Learning. *T&L Advisor Blog*.

Harrow, A. (1972). *A Taxonomy of Psychomotor Domain: A Guide for Developing Behavioral Objectives.* New York, NY: David McKay.

He, S., Saito, K., Kubo, T., & Maeda, T. (2019). From Collaborative Learning to Symbiotic e-Learning: Towards Creation of New e-Learning Environment for the Knowledge Society -- Symbiotic Learning Environment Based on Occasional Collaboration of Diverse Participants. *Research Gate*.

Kentnor, H. (2015). *Distance Education and the Evolution of Online Learning in the United States.* Retrieved from https://digitalcommons.du.edu/cgi/viewcontent.cgi?article=1026&context=law_facpub

King, A., & O'Donnell, A. M. (1999). *Cognitive Perspectives on Peer Learning.* New York, NY: Routledge Taylor & Francis Group.

Krathwohl, D. R., Bloom, B. S., & Masia, B. B. (1964). *Taxonomy of educational objectives, Book II. Affective domain.* New York, NY: David McKay Company, Inc.

Multon, K. D., Brown, S. D., & Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of Counseling Psychology, 38(1)*, 30-38.

Wang, C.-L. (2018). Learning from and for one another: An inquiry on symbiotic learning. *Educational Philosophy and Theory*.

Wentworth, D. (2014). *Social and Collaborative Learning.* Delray Beach, FL: Brandon Hall Group.

Yang, F.-Y., & Chang, C.-C. (2008). Examining high-school students' preferences toward learning environments, personal beliefs and concept learning in web-based contexts. *Computers & Education Journal*.