Assessing Leadership Skill Development: Implementing vLeader © Simulation Software to Capture Advances in Leadership Skills among Undergraduate Students

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Abstract

Student learning of leadership skills among undergraduate business students was assessed using a computer software leadership simulation with two groups of students, one group with prior leadership and management instruction and the second group with no prior instruction. Findings indicate that the first attempt using the software results in approximately similar scores but improvement of scores with repeated play was generally higher for students with prior instruction on leadership concepts. Identification of skill development was evident using the leadership simulation software. Discussion of findings and the benefits of computer simulations for learning and assessment of leadership skills are presented.

Keywords: Student Learning, Learning Technology, Leadership

1.0 Introduction

Teaching leadership is challenging but assessing whether or not students have learned leadership concepts and are able to demonstrate related skills is even more difficult. Active learning techniques have proven to be valuable in teaching students specific skill sets and leadership skills are often taught using role plays, case analysis or active learning methods (Dodd, Brown, & Benham, 2002; Gupta, 2010; Salvatore, 2009). While these methods of learning are useful, they can pose problems from an assessment standpoint. Using any activity that requires demonstration of a skill such as role play or case analysis requires a great deal of time in working through activities, vicarious learning from students observing others must be controlled, and consistent grading must occur among different instructors. Some evidence of the advantages of computer simulation have been noted as simulation provides an efficient means of supporting instruction (Morrison, Rha, & Helfman, 2003).

1.1 Purpose

It is clear that business programs must do more than teach leadership and must have the ability to identify leadership skill development and verify student learning, particularly if programs promote leadership development as a program outcome. However, teaching and assessment of skill development must be done in an effective and efficient way. Computer simulation offers promise as a teaching tool but perhaps it can be used to instruct students and to assess student learning. Therefore, the purpose of the paper is to assess whether or not leadership computer simulation can be used to identify differences in leadership skill development.

To address some of the challenges in assessing student acquisition of leadership skills, a computer leadership simulation was used in two different classes to determine if students ability to engage in specific leadership techniques differed prior to and after instruction on management and leadership concepts. The method of implementing the simulation, its use in learning and assessment, and findings from the study are presented.

2.0 Teaching and Assessing Leadership Skill

Leadership is addressed in most undergraduate programs at least from a conceptual standpoint but often includes a skills-based emphasis in additional to conceptual knowledge attainment. It can be more straight-forward to teach and measure functional knowledge of leadership concepts than leadership skills.

However, developing the ability to lead others is often touted in business programs as an outcome of graduate and undergraduate programs. Morrison, Rha, and Helfman (2003) emphasize the importance of leadership skills as an essential skill needed by business students. At all levels of education from elementary school to doctoral programs, administrators are faced with the need to help students develop leadership skills (Eddy & Rao, 2009; Gamble, 2009; Gupta, 2010).

2.1 Leadership Skill Development

Leadership is a skill set often referred to as a soft skill versus a more tangible, quantitative skill set or hard skills. Such conceptual ideas as management, communication, and interpersonal relations all fall under the realm of soft skills just as leadership does. In teaching soft skills such as leadership, there is an emphasis on concepts and theory just as there might be for hard skills; however, there is an additional challenge of teaching students to apply concepts and theories to make better decisions, influence others positively and effectively and, in other words, enact good leadership. To teach leadership beyond the conceptual level, students must also become aware of underlying factors and characteristics that influence their ability to practice the skill. Among the central tenants of teaching leadership skills are underlying factors such as communication and self-awareness (Salvatore, 2009; Tuleja & Greenhalgh, 2008). Therefore, in teaching leadership skills, students must be made aware of interpersonal skills, self-awareness, conflict management and a plethora of other underlying factors in order to effectively master the higher-level skill of leadership.

If students are to learn leadership as a skill rather than as a concept or theory alone, other, more active learning methods should be used. Morrison, Rha, and Helfman (2003) discuss the importance of giving students opportunities to practice what they have learned. The authors caution against a focus on knowledge attainment or skill development alone without linking concepts to practical application. Similarly, Rotherham and Willingham (2009) stress the importance of student-centered methods of learning that include both practical application and knowledge development and, according to the authors, one without the other will leave students lacking in the ability to compete in today's increasingly complex and global world. Further, practical application with repeated opportunities to master skill sets is critical in developing functional skills.

That practical application and repeated practice are important components of teaching leadership is evident in research and numerous methods of instruction are available to instructors. For example, service learning opportunities have been promoted as a means to interject real-world experience into classroom learning as have other methods such as case analysis and classroom discussion (Dodd, Brown, & Benham, 2002; Govekar & Rishi, 2007). In fact, the increased availability of learning technologies such as simulations and games is becoming very popular even in teaching soft skills. These more active techniques increase student engagement and interest and result in increased student learning (Collier, Shernoff, & Strati, 2011). For example, simulations have been used in specific industries such as nursing to create realistic situations which allow students practice different behaviors associated with theories and concepts from class (Smith, Gillham, McCutcheon, & Ziaian, 2011).

2.2 Assessing Leadership Skill Development

Despite the method of instruction used to teach leadership skills, student learning must be assessed. Computer simulations may have advantages as an instructional method but may also have advantages related to assessing student learning. Simulations in general typically allow for repeated play so that students can enact different behaviors and decisions and compare outcomes. The instructor can easily observe the number of times students engage in the simulation and decision that are made. There is little or no class time that must be used for practicing simulations and, unlike role play or case analysis, the simulation can be done by students individually so that no vicarious learning from watching other student perform skills contaminates measurement of learning. From an administrative viewpoint, a computer simulation is convenient and can be administered to many students at a time. Measurement of decisions and responses are consistent and not influenced by rater preferences or biases.

Despite the potential usefulness of leadership simulations, it is unknown whether or not such computerized learning tools can detect differences in learning. Of course, the simulation may provide experiences that lectures and even case analyses may not provide, but as a method of assessing student learning, is the simulation a potential and reasonable tool? The primary question of interest in this study is, can the leadership simulation detect differences in leadership and management skill attainment?

If indeed students who receive prior instruction can outperform students with no prior instruction, this may provide evidence that the simulation tool not only engages students, but is useful in discerning whether or not learning occurs. Therefore, the following hypothesis is presented:

H1: Students with prior leadership or management theory instruction will attain higher performance scores on a computerized leadership simulation than students with no prior instruction.

3.0 Method

In this study, a leadership simulation software package vLeader by SimuLearn, Inc. was used to assess leadership skill prior to and after instruction of management and leadership concepts. The simulation software has five leadership modules, each emphasizing a different aspect of leadership. Each module of the simulation placed students in the position of the leader and required interaction with at least one associate. Two groups of students were used in this study, one group had no instruction on leadership concepts and the other group had completed an entire course on management and leadership.

3.1 Courses of Interest – The Sampling Environment

Given the focus of the simulation, classes which focused on aspects of leadership offered a more salient context within which to incorporate and administer the simulation software. Further, given that the purpose of the study was to assess leadership skill development and to evaluate the simulation as a learning and assessment method, classes relevant to leadership and related concepts offered a useful opportunity to accomplish both aspects of the study.

Two classes in particular seemed relevant to the purpose of the study, one class focused on developing basic knowledge of management and leadership theory while the second class focused on putting theory into practice. These classes were particularly useful because the introductory class was a pre-requisite to the second class used in this study. Students in these two classes became the focus sample of the study.

3.2 Sample

Forty-eight students participated in this study all of whom were completing an undergraduate degree in business. Of the 48 students, twenty-one were in a group with no prior instruction on leadership and management concepts and 27 students were in the group which had some leadership and management instruction. The general demographics of the larger population from which this sample was taken is comprised of 52% female and 48% male. Percentages based on ethnicity are 34% Hispanic, 31% Asian, 9% Caucasian, 8% African-American, and 12% unknown.

3.3 Leadership Simulation Software

The leadership simulation VLeader © is a computer software package created by Simulearn, Inc. that has several modules of interactive scenarios. The modules require students to interact as a leader in a meeting scenario with the goals of getting positive financial results, keeping a productive level of attention among team members, and maintaining employee satisfaction. Students begin each module by reading a brief description about the goals of the meeting and some background on each character. Students interact with the characters by "clicking" on highlighted bars indicating ideas or characters on the computer screen during the module. As students click on ideas or characters, statements are made. The student hears and sees his or her statement and sees and hears the response from other characters. Every idea and character can be "clicked on" in a different way to elicit a positive, neutral or negative comment about the idea or person. For example, each idea on the screen is highlighted with a bar that is green on the right side and red on the left. To elicit a positive comment and show support for an idea, the student clicks on the green part of the bar and hears, for example, "What about getting the computer set up today, it's a great idea and really needed." A click to the middle part of the bar elicits a neutral response such as "Hmmm, could you tell me more." A negative response can be created by clicking the red part of the bar and might be "I need a lot more convincing." The further to the right (green part of the bar) or the further to the left (red part of the bar) at student clicks, the more positive or negative, respectively, the responses. Each character has an associated bar on which the student may click to represent positive, neutral, or negative support.

3.4 Instrumentation

It should be noted that the purpose of this study is not to promote vLeader but to assess computer simulation as a learning method and as a means to assess student learning. The computer simulation used in this study was selected as one potential simulation to use in on-going assessment activities. The vLeader © simulation software was developed by Simulearn, Inc. and based on leadership and management theories. The software presents illustrations of behaviors associated with several styles of leadership and allows students to make decisions and experience possible consequences of those decisions.

While no formal reliability has been published, there are several unpublished works that systematically assessed results of using vLeader and were reported to SimuLearn, Inc. For example, in a study using a 360 degree pre- and post-assessment of business performance of managers, use of vLeader in management training sessions was found to increase reported relationship strength with peers and subordinates and improve overall business performance of managers. Further, the authors note that negative behaviors exhibited by managers abated after training using vLeader.

A second study completed by a business professor compared the use of case studies and reports to computer simulation finding that the students exposed to the computer simulation, vLeader, were able to better recall, explain and apply concepts and theories. Another study comparing teaching methods focused on case studies vs. computer simulation finding that students using computer simulation, in this case vLeader, were far better able to apply the appropriate leadership style to a scenario in a case. In fact, correct application of the appropriate leadership style was made 75% of the time by students whose training included the computer simulation as a learning method compared to correct application of the appropriate leadership style 25% of the time by students using case method alone.

The final study compared traditional and experiential teaching methods. Findings showed that use of the simulation had a stronger effect on students' perceptions of appropriate leader behavior than did traditional methods of learning such as lecture and discussion. Although these studies are unpublished, results tend to support extant research on the effectiveness of interactive learning methods such as computer simulation (Rotherham & Willingham, 2009).

3.5 Module Measurements and Scoring

All modules in the computer simulation are scored based on three measures: financial result, productive attention or tension, and morale. Scores range from 0 to 100 with 100 as the highest possible attainment of all three measures. The ability of the student to get the most important ideas passed, the duration of the meeting, and the number and types of clicks (positive, neutral or negative) are counted to create an estimated score of each of the three measures and an overall score.

The first two modules were used in the assessment. The first module focuses on a one-to-one meeting with an associate and placed the student in the supervisor's role. The goals of the first module are to balance attainment of results with encouraging ideas from the associate. Students are challenged not just to be directive and tell the associate what to do, but to encourage the associate to share ideas so that goal attainment, productivity and morale are positive. The second module focuses on a more complex meeting. Again the student is placed in the supervisor's role but now must facilitate a meeting with two associates. The point of the second module is that goal attainment becomes more complex and the student must pay attention to each associate but also be mindful of the interaction between the two associates. The remaining three modules grow more complex in nature with more open conflict to resolve and different meeting settings. The first two modules were chosen because they represent reasonable challenges in management and leadership without getting involved in more complex situations that obviously require more knowledge and skill attainment than the first group of students could be expected to demonstrate.

3.6 Incorporating the Simulation into the Classroom

Students with prior instruction on leadership and management concepts were required to use the simulation as a part of the course. Students with no prior instruction on leadership and management concepts were required to complete the simulation modules and awarded points for doing so; however, the simulation was not a graded component of the course.

A link to a brief instructional video was provided to both groups of students and an MS Powerpoint slide presentation was available for review. Both groups received the same materials before attempting to operate the leadership simulation for the first time.

It was expected that scores from students in the early class would be lower than scores of students in the later class because students should have accumulated conceptual knowledge and practical skills throughout the program, and in particular, during the prerequisite course.

4.0 Analysis and Findings

Data were analyzed using averages and standard deviations for each group for the first and best scores for each of the two modules. Standard deviations were examined for each group for the first and best scores for each module to determine if within-group variances were significant. The result was used to determine the type of t-test to apply to examine differences in mean scores for first and best scores for each group and module. Results are shown in Table 1.

4.1 Assessing Student Learning

Two scores were collected for each student, the first score indicates the first score obtained and the second score indicates the best score among all plays for each module. Hypothesis 1 stated that students with prior leadership or management theory instruction will attain higher performance scores on a computerized leadership simulation than students with no prior instruction. Based on the findings, this hypothesis is supported as evidenced by the higher scores earned by the group with previous instruction, Group 2. In fact, the group with prior instruction earned higher scores on the first play of the simulation and overall. This finding supports Hypothesis 1 and shows that student learning did indeed occur and receiving instruction on leadership and management concepts resulted in improved performance during the simulation.

Table 1. Leadership Simulation Scores, Improvement and Plays

	Module 1			Module 2		
	MGMT 489 (Post)	MGMT 307 (Pre)	Diff. in Means*	MGMT 489 (Post)	MGMT 307 (Pre)	Diff. in Means*
Avg. First Score	67	67	n.s.	76	77	n.s.
Avg. Best Score	88	78	$p \leq .001$	88	85	n.s.
Avg. Improve	21	11		12	8	

* Differences in means between the two groups were tested with a t-test

4.2 Scores between Groups for Module 1

Scores for the first play of the first module ranged from 24 to 92 among students with leadership instruction with the average first score of 67. Best scores ranged from 78 to 95 with an average best score of 88. The range of scores for students with no prior instruction was from 23 to 87 with an average first score of 67. The range of best scores was 63 to 91 with an average best score of 78. Although average first scores are about the same among the two groups and students may have been experimenting with the leadership software, the average best score differs by 10 points between the two groups. Students with prior instruction scored higher than students with no prior instruction.

4.3 Scores between Groups for Module 2

For the second module, scores ranged from 44 to 94 with an average first score for students with prior instruction of 76. Best scores ranged from 76 to 95 with an average best score of 88. For students with no prior instruction, first scores ranged from 65 to 91 with an average first score of 77. Best scores ranged from 68 to 91 with an average best score of 85. For the second module, best scores were only slightly higher for module 2 for students with prior instruction and first scores for the two groups only differed by one point.

Average improvement of scores was calculated as the difference between the average first score and the average best score and was 21 points for students with prior instruction for the first module and 10 points for students with no prior instruction. For the second module, average improvement was 12 points for students with prior instruction and 8 points for students with no prior instruction.

4.4 Variance between Groups for Modules 1 and 2

An F-test was used to determine whether or not variances were equal or unequal between groups to determine which type of t-test to apply. First and best scores for each group and for each module were tested using a t-test to determine whether not mean differences were statistically significant. First scores from module 1 was the only set of data that indicated no statistically significant variance between groups of scores, so a t-test for two samples with equal variance was calculated. The results are shown in Table 2.

Table 2. Leadership Simulation Scores, Improvement and Plays

	Module 1			Module 2		
	MGMT 489 (Post)	MGMT 307 (Pre)	Diff. in Variance*	MGMT 489 (Post)	MGMT 307 (Pre)	Diff. in Variance*
St. Dev. – First Score	20	17	n.s.	14	9	$p \leq .05$
St. Dev. – Best Score	4	8	$p \leq .01$	4	7	$p \leq .05$
Avg. Plays	38 (3 to 5 modules	11 (2 modules)				

* Variance of scores was tested with F-test to determine equal or unequal variances

F-test results for the remaining three sets of data for the best scores from module 1 and the first and best scores for module 2 indicated statistically significant variance between groups, therefore, a t-test for two samples with unequal variances was calculated. Best scores for module 1 were the only data resulting in a statistically significant difference between the two groups. This, however, is important because this represents the first attempt at the software with only existing conceptual knowledge and skills. This finding is the best measure of the difference in student learning between the two groups without experience with the software itself.

4.5 Post-Hoc Findings

Although the number of times a student used the simulation was not meant to be a focus of the study, upon review of overall scores and number of plays for each module, some interesting results were observed. Students with prior instruction played an average of 38 times with all students completing at least three of the five modules and several students completing all 5 modules. Some students were quite relentless in operating the simulation with five of the 27 students playing more than 60 times and one student playing 95 times. Students with no prior instruction played an average of 11 times to complete 2 modules.

The difference in the number of times the two groups played the simulation could be due to the fact that the simulation was used as a graded part of class for students with prior instruction, while students with no prior instruction received points for using the simulation but it was not a part of the grading process. The fact that students were motivated to repeat play does indicate that the software itself may be intrinsically interesting to students.

5.0 Discussion

Findings indicate that the first attempt using the software results in approximately similar scores but improvement of scores with repeated play was generally higher for students with prior instruction on leadership concepts. This is important because it may indicate the differences in skills based on prior instruction and it provides some evidence of student learning and, more importantly, skill development. The purpose of this study was to determine if scores of students with prior instruction on management and leadership concepts would be higher than students with no prior instruction. Indeed, students with prior instruction scored higher on the first time using the computer simulation and overall, across all plays. This finding lends support to the fact that the computer simulation can indeed identify differences in knowledge of concepts and ideas and students' ability to apply those concepts in the computer simulation.

Researchers have noted the benefits of interactive learning methods and particularly the advantages of computer simulation (Morrison, Rha, & Helfman, 2003). This study extends findings of others and indicates that computer simulation may be a good instructional tool but also may be a useful tool for assessment of student learning.

As a learning tool, students become engaged because of the interactive nature of simulation and the quick feedback from decisions. As an assessment tool, the computer simulation allows for efficient collection of student performance scores and administration of assignments.

Given the nature of the computer simulation, students were able to use the simulation on their own time and for as long or short a time as they wished. Student time spent on the simulation, scores attained for each attempt at every scenario and trends of improvement can all be easily seen by instructors, making this, and many types of computer simulations useful tools in assessment. Further, the data recorded can be compared over time to determine whether or not improvements or maintenance of learning is taking place.

6.0 Implications of the Study

The computer simulation has many advantages, as an instructional tool and method of assessment. The computer simulation is convenient for students and instructors and allows students to work as a class in a computer lab setting to complete an assignment or, if the instructor, prefers, students may work at their own pace on their own computer. The computer simulation eliminates contamination of measurement because it requires students to complete their own work without observing the work of other students as is often the case in role plays or case analysis completed in class. Computer simulations also mitigate the group learning effect where one or two groups of students may start a thread of thought or focus on specific concepts and then subsequent student groups focus on similar issues. Finally, there is an objective aspect of computer simulations that ensures that all student responses and activities are evaluated similarly. There is no need for inter-rater reliability checks or rater training.

The observation from the post-hoc analysis on repeated play sheds some light on the potential usefulness of a simulation. As is typical in the search for useful instructional materials, many instructors seek out materials that students with which student will become engaged. It appears from the repeated play of the simulation, even among those students not receiving a grade on their performance, students were willing to spend more than the required amount of time to complete one or two rounds of play in the simulation software. For those students receiving a grade, the repeat play was particularly compelling. Implementation of the simulation in class as a graded component, along with embedded concepts from the simulation into class discussion might provide a learning experience for that is perceived as interesting and engaging.

6.1 Study Limitations

This study has some limitations, but adds to our understanding the usefulness of computer simulations in teaching and assessment. Primarily, the student groups were comprised of two groups of students, one group with no prior instruction on leadership and management concepts and one group with prior instruction. Of course, there is no way to control for differences in work experience or education that may influence performance; however, the finding that first-time scores were similar between the two groups of students supports the likelihood that the two groups were balanced in terms of experience and education. Another limitation of this study was that the student sample was relatively small; however, significant differences even between these small groups emerged.

6.2 Future Research

Comparison of performance across different groups might be quite interesting and useful. For example, scores from student groups and executives might be compared to determine if indeed leadership experience in translated into decisions made in the computer simulation. Certainly, seasoned leaders should earn higher overall scores that less experienced leaders or individuals with no leadership experience. Testing of the types of leadership knowledge and experience might be a useful comparison to determine if, for example, individuals with a great deal of leadership instruction such as students would score lower than students with supervisory experience and leadership instruction. These comparisons might help to verify that the computer simulation can identify differences in leadership knowledge and ability.

Comparison of instructional methods might be another useful study. Focusing on computer simulation as a training tool and comparing functional knowledge and ability to analyze and answer scenario-type questions to groups of students who were trained using computer simulation vs. other methods such as case analysis, lecture, and others could shed light on the differential advantage, if any, of using an interactive or computerized training method. Studies have shown that interactive methods of instruction have a positive impact on student learning and a direct comparison of methods would be useful (Gupta, 2010).

Among the future research projects that might be useful is a general comparison among students with computer savvy and those without such skill. If groups of students with about equal levels of prior instruction and experience could be groups by experience with software and other technologies, differences in scores and the influence of general confidence and ability with technology could be isolated. This might help in the interpretation of scoring in general and knowing what factors might contaminate or influence overall scores.

Finally, there are a plethora of factors related to leadership and learning in general that might influence scores. For example, a confidence with one's leadership ability, personality, emotional intelligence, or propensity to take risks, for example, might all be individual constructs that could potentially change the nature of performance in this or any computer simulation. These factors are likely to influence learning in any setting, and a computer simulation is no different. However, identifying potential influential factors could be very helpful in understanding students' overall performance and an instructor's ability to use the computer simulation as a classroom tool. For example, if these factors are known influences, then perhaps they could be addressed in the instruction itself.

7.0 Conclusion

This study investigated the usefulness of a computer simulation software on leadership skills in assessing student learning and skill development. Findings indicate that, after familiarizing themselves with the software, students with prior instruction on leadership and management concepts performed better than students with no prior instruction. Support was found for student learning of skills identified by the computer simulation software. Benefits of using computer simulation software in teaching and assessment may provide many benefits including efficiency in delivering instruction and assessing learning and objectivity in rating student performance.

Assessing student learning has moved beyond simply measuring functional knowledge and many academic programs publicize both knowledge and skill development to potential employers and students. However, in touting programs and helping to develop students' skill sets, some assurance of that skill development based on the program content must be assessed. However, the extent to which real skill development occurs is difficult to assess. If leadership skill development is touted as an important outcome of a program, we must be able to improve leadership instruction and our ability to assess improvements in student skill. Incorporating interactive methods such as computer simulation may be one means by which we can improve instruction and assessment of student learning.

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