

A Comparison Of Two Learning Environments On Students' Learning Of An Instructional Strategy

Patricia P. Willems, (Email: PWillems@fau.edu), Florida Atlantic University

ABSTRACT

This study investigated the effects of two learning environments on education students' learning of the reciprocal teaching instructional strategy. Students were taught the strategy via two instructional approaches and their knowledge tested at the end of the session. The results showed that overall the setting in which students' learned the strategy in had effects on how they scored on the test at the end of the session.

INTRODUCTION

The context in which learning takes place has been arguably linked to the information learned and to what information is therefore transferred to a new setting. Research that has studied situational factors in relation to the transfer of information suggests that the transfer of knowledge or skill is influenced by situational factors that are present during learning (Lave, Murtaugh & de la Rocha, 1984; Nunes, Schliemann, & Carraher, 1993). A theory that focuses on the impact that context has on learning and transfer is that of situated cognition or situated learning. Situated cognition is a theory which proposes that knowledge is "situated" in the context in which it is constructed and that the transfer and use of knowledge is affected by the context in which learning took place (Brown, Collins, & Duguid, 1989). Consequently, supporters of situated cognition assert that an individuals' learning is not only affected by the context in which the learning took place, but rather aided by it and as a result learning can be promoted by providing meaningful contexts and relating instruction to real-life experiences (Carr, Johanassen, Litzinger, & Marra, 1994).

Brown, Collins and Duguid (1989), who first introduced the term of situated cognition, argue that students often acquire knowledge that lacks context and therefore cannot be used in everyday life. This is due to learners not being exposed to the community of learners in which the information is used. School itself, is a community of learning that has its set of beliefs and behaviors that all must abide by. Consequently, when a child is being taught a particular subject matter in school, they are not being enculturated in that particular area, but instead are being taught how the school community interprets the meaning and use of that area. Therefore, creating a breach between the learning and the use of information, which leads students to separate what is learned from how it is used (Brown, et al., 1989). As a result, it is argued that tasks learned in school are different than tasks used in real life settings.

The purpose of this study was to investigate the advantages that different instructional methods may have on education students' learning of reciprocal teaching. Due to the need that instructors have for increasing the probability of students transferring of information while using context in the classroom, an instructional approach based on the tenets of situated cognition was devised. The other method is a more traditional, lecture-discussion method of instruction, in which fewer contextual cues are available, but which is commonly used in educational settings.

SITUATED LEARNING AND THE ROLE OF CONTEXT IN LEARNING

Situated cognition stems from sociocultural theory and Vygotsky's contextual theory (Vygotsky, 1962). In sociocultural theory, learning is viewed as the appropriation of socially-derived forms of knowledge; which are

constructed through the exchange between persons and social and cultural circumstances (Billet, 1996). Drawing from the work of Vygotsky, situated learning can be understood as the allocation of knowledge in practice according to socioculturally evolved means of mediation and modes of activity (Harley, 1993).

A number of ethnographic and theoretical works have advanced the area of situated cognition (Brown et al., 1989; Brown & Duguid, 1994; Greeno, 1989, 1997; Greeno & The MSTA Project Group, 1997, 1998; Kirshner & Whitson, 1998; Koran, Willems, & Camp, 2000; Kumar & Voldrich, 1994; Lave et al, 1984; Lave, 1988; Lave & Wenger 1991; Rogoff & Lave 1984). Studies that have examined the situated cognition approach to instruction have indicated that there are differences in the conditions under which individuals learn and use the information that they learned (Brenner, 1989; Griffin, 1995; Griffin & Griffin, 1995; Nunes, Schliemann, and Carraher, 1993; Saljo & Wyndhamn, 1990). Saljo & Wyndhamn, (1990) studied children's collaborative problem solving using postage rate calculations. Results indicated that the setting in which this study took place, a school classroom during a mathematics lesson, proved to be interfering with the students' abilities to solve the problem. Although mathematics was not needed to achieve the correct answer, because the problem was presented in mathematics lesson, students' consistently attempted mathematical problem solving modes to arrive at the answer. Thus, it seems that context provided the essential backdrop to solving the problem, rather than being a peripheral factor of the problem.

Brenner (1989) found that children's understanding of the concept of money varied as a result of setting. In an everyday setting, children understand money to be a tool that permits purchasing, but in the school setting, children realize that money is treated as a symbol system to be acted upon like other symbol systems taught in school. Presumably as a result of the use of contextual cues, which are present in the real life setting but are absent in the school setting.

Examining a situated approach to classroom learning was Griffin's (1995) piece on children's learning of map-skills, which compared the use of an instructional approach based on the tenets of situated cognition with one based on traditional classroom instruction and found that there were differences due to context. Students in the situated cognition group performed better than the traditional group on the performance assessment which paralleled the instruction they received, and equally as well on the written assessment. However, the two groups did not differ in their performance on an assessment that took place in a different environment than where the situated cognition instruction took place (Griffin, 1995). Thus, it seemed that context played a more significant role in this study if the assessment required near-transfer than if the assessment required far-transfer.

Griffin and Griffin (1996) attempted to replicate as well as add to their previous findings by examining the role that prior knowledge had on students learning of map skills and by examining the long-term effects of situated learning by using a delayed performance assessment. Results found the two groups only differed on the immediate performance assessment, with the traditional group outperforming the situated group. The two instructional approaches were found to be equally as effective in teaching map skills if students possessed prior knowledge. Thus, the context seemed to have been mediated by the students' knowledge of the subject matter.

Nunes, Schliemann, and Carraher (1993) performed a study on children's ability to apply previously learned mathematical knowledge to a novel setting. They found that children performed better overall on the informal tests conducted in a natural street setting, than on the formal tests, which occurred in the classroom. The same findings were replicated by Nunes, Schliemann, and Carraher (1993) which in addition to their earlier measures, also included three other measures, a simulated shop, word problems, and computation exercises across two conditions: oral and written. Differences in children's performance on problems that simulated street-mathematics and on problems that were strictly computational were still observed.

In sum, as the results of the studies reported demonstrate, the context associated with a task or activity appears to have an impact on learning and transfer and thus should be further explored. Researchers have noted the need for studies that substantiate situated learning (Brown et al., 1989; Choi & Hannafin, 1995; The CTGV, 1990; Griffin, 1995; Kirshner & Whitson 1998), and for context to be treated as a variable rather than a nuisance so that the conditions under which the instructional context affects learning and transfer may be studied (Garner 1990; Griffin, 1995).

The purpose of this study was to a.) compare the effectiveness of two instructional methods on student's learning of an instructional strategy b.) determine what role if any, did context play on learning and transfer. The instructional strategy chosen for this study was reciprocal teaching, which is a metacognitive strategy, composed of four comprehension-fostering strategies: clarifying, predicting, questioning, and summarizing, which is commonly taught at the preservice level (Palincsar & Brown, 1984,1987). Preservice teachers were chosen because although, the education curriculum is strengthened with field experiences, the majority of courses are still taught using lecture-discussion methods of instruction. Therefore, the dilemma of how to teach students in ways that are more likely to exhibit greater degrees of transfer to the target context is re-visited.

METHOD

Participants And Research Design

One hundred and fifty four education students, 117 female and 37 male primarily between the ages of 20 and 23 enrolled in required or recommended courses for an education program served as the participants in this study. All participants voluntarily chose to partake in this study and once they participated they were compensated with extra credit towards their grade in the course that they were enrolled in when they participated in the study. The ethnic description of the participants was 75% White/ Caucasian, 6% African American, 12% Hispanic, 3% Asian American, and 2% categorized themselves as Other. The sample consisted of 6% sophomores, 40% juniors, 47% seniors, 12% graduate.

The entire sample of participants was randomly assigned to one of the two learning environments. Students' names were written on 2 X 3" pieces of paper, folded in half and placed in a container. The experimenter then reached in the top of the container where a small hole was cut to retrieve the 2 X 3" pieces of paper containing the students' names. Prior to unfolding them, the papers were then randomly placed in one of two boxes which signified the two different instructional strategies. Once the random assignment was complete, the students were contacted and informed of where to meet for their instruction. The situated cognition group was made up of 77 students, and the lecture-discussion group had 76 students. Due to the fact that the sample was randomly assigned, possible confounding variables such as gender, race, SES, ability, I.Q. are therefore controlled for.

Materials

The materials utilized in this study were (a) readings with which the reciprocal teaching activity was conducted, (b) overheads that contained information regarding reciprocal teaching and were used to instruct on the strategy, (c) an exam made up of questions on reciprocal teaching.

Readings

Readings used in this study were age-appropriate and were taken out of excerpts from the Encarta Encyclopedia and included a variety of topics.

Overheads

Overheads on reciprocal teaching contained information regarding the history of the strategy, its use, and its components.

The exam on reciprocal teaching

This assessment, which was developed specifically for this study, consisted of 25 multiple-choice test items designed to measure students' mastery and application of the reciprocal teaching strategy. Questions 1-10 were factual questions that asked the students about their knowledge of the reciprocal teaching strategy. Questions 11-20 consisted of short scenarios that used reciprocal teaching in the real-life context, and required students to apply their knowledge of the strategy to novel real-life situations. The reciprocal teaching test yielded two separate quantitative scores; a

score for the factual items, and a score for the applied items. Content validity was assessed by a group of individuals with expertise in some aspect of reciprocal teaching. The reviewers were given a description of the reciprocal teaching domain and asked whether the items covered the intended domain. All reviewers consistently reported that all of the items covered the intended domain of reciprocal teaching.

Procedure

The data was collected by means of the multiple-choice test and a demographic questionnaire. Students' knowledge about reciprocal teaching was measured using students' scores on the multiple-choice test designed for this study. In addition, a few background questions were presented on a questionnaire in order to assess demographic variables.

Once the participants were randomly assigned to one of the two groups, each group received the exact same lecture on reciprocal teaching from the same instructor. Following the lecture, the two groups participated in different activities, one situated and the other a discussion. In the situated cognition instruction group the students performed all aspects of the reciprocal teaching strategy using age-appropriate readings exactly as they would engage in this activity in their future classrooms, the only difference was that they were not instructing children. Thus, all students performed the four comprehension-fostering strategies: clarifying, predicting, questioning, and summarizing several times. The lecture-discussion did not have the real-life simulation of the environment, thus they did not perform the strategy. Instead they were given a reading on the reciprocal teaching strategy and then in small-groups they answered questions about that reading.

The amount of time spent on the activities was the same for both of the groups, approximately one hour and a half. This amount of time was deemed adequate to accomplish the teaching of this strategy considering that in a regular semester this would translate into almost two full class sessions. All groups were administered the exam on reciprocal teaching (ERT) following the treatment session. Confidentiality of the participants' answers was maintained since participants did not identify themselves on the questionnaires or on the ERT, they were each assigned a random number.

RESULTS

Descriptive statistics for both sections of the exam on reciprocal teaching (ERT): factual and applied are reported for both instructional groups: situated cognition and lecture-discussion in Table 1. The descriptive statistics for the two instructional groups showed that the situated cognition group scored higher on the applied section but lower on the factual section than the lecture-discussion group. Thus, further analyses using an independent samples t test were conducted to compare the means of the two instructional groups on both sections of the ERT. Results of the t test for the factual section were significant, $t(152)=3.04$, $p=.002$ with the lecture-discussion group having the higher score and the effect size being .49. On the applied section of the ERT, the results of the t test were also significant $t(152) = -11.05$, $p=.000$ with the situated cognition group having the higher mean and the effect size being 1.77. Results are listed in Tables 2 and 3.

DISCUSSION

The purpose of this study was to compare the effectiveness of an instructional method based on situated cognition versus the lecture-discussion method of instruction on education students' learning of the reciprocal teaching strategy. The results showed that the instructional method that the students were placed in had an effect on their test scores. The mean of the situated cognition instruction group was higher than the mean of the lecture-discussion group for the applied section of the ERT indicating that students that were in the situated cognition group were able to better answer the applied questions. On the other hand, the mean of the lecture-discussion group was higher than the mean of the situated cognition group for the factual section of the ERT, thus demonstrating that the reverse was also true. These results imply that in this study the way in which the students were taught the strategy affected their scores differently on the two sections of the ERT. Thus, both teaching methods showed strengths and weaknesses and thus the better method will depend on the goals of the instruction.

SITUATED COGNITION

In general situated cognition research argues that the likelihood that an individual will transfer information learned in the classroom to the real-life setting, increases if the individual learns the information in the setting in which it will be used. Therefore presenting students with meaningful contextual cues in the learning environment would then be one way to assist students in creating a bridge between learning in the classroom and application of that material in the real-world. The finding that the situated group in this study, which had contextual cues embedded in the task and then in the test outperformed the lecture-discussion group on the exam questions that required application and thus also possessed contextual cues, supports the idea that context can increase the likelihood of transfer. Therefore, it seems beneficial to provide students with contextual cues from the real-life setting in the learning situation in order to maximize transfer. Consequently, the differences in the scores of the students in the situated cognition group versus the lecture discussion group on the applied section of the ERT is a new finding that is consistent with and lends support to the situated cognition literature.

The other finding related to the effects that instructional method had on students' performance on the ERT was on the factual section of the ERT. Students who learned reciprocal teaching under the lecture-discussion method of instruction had a significantly higher mean on the factual section of the ERT than the students who learned reciprocal teaching under of the method based on situated cognition. This would indicate that reciprocal teaching knowledge for the factual items could be acquired employing either of these instructional methods, with the lecture-discussion method being a better choice. Thus, for education courses the implication for this finding is directly related to what the instructor wants the students to learn and how they will be assessed. If the instructor is measuring knowledge of a subject area or testing the acquisition of a knowledge base using factual questions, then the lecture-discussion method of instruction would be as good of method to use or even better at achieving such goal than the situated cognition approach.

CONCLUSION

The use of an instructional strategy based on situated cognition proved to be an effective method in learning and applying reciprocal teaching to simulated novel classroom situations and the use of a traditional method of instruction proved to be more effective when the knowledge was conceptual. Thus, the most important finding of this study with regards to knowledge acquisition and transfer is that the method that is most effective for acquisition and transfer is directly related to the type of knowledge to be learned and later transferred. Acquisition of facts or of a knowledge base by students was not shown to require the use of a situated approach; however, the acquisition of information by students that needed application was shown to be more effectively applied using a situated approach to instruction.

Nevertheless, as mentioned earlier, the instructional method used in this study is based on the tenets of situated cognition because it employed the learning of an instructional strategy in a setting similar but not identical to the setting in which the instructional strategy will be used. Thus, the situated cognition method of instruction attempted to simulate more closely than the lecture discussion method of instruction, the conditions under which the strategy is used in real life. However, the way in which the situated cognition method was structured does allow for an instructional method based on the tenets of situated cognition to be incorporated and used in the typical college classroom. Likewise, the participants in this study were not assessed in the exact setting in which the strategy will be used in; rather they were tested using a simulation of the classroom setting through the use of real-life scenarios. Therefore, generalization of results to the real classroom situation will be limited to discussing the likelihood that the preservice teachers who were able to successfully transfer the information to the ERT, will also be successful in transferring reciprocal teaching to the real-life situation. This study was not done over an extended period of time. Thus conclusions regarding long-term transfer can only be speculative.

In sum, because the literature indicates that little research has examined the relationship between situated cognition studies pertaining to this area should be replicated using different instructional methods, a different population, and different subject areas.

REFERENCES

1. Billet, S. (1996). Situated learning: bridging sociocultural and cognitive theorizing. *Learning and Instruction*, 6(3), 263-280.
2. Brenner, M.E. (1989, March). *Everyday problem solving: dollar wise, penny foolish*. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Chicago, IL.
3. Brown, J.S., Collins, A., and Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32-42.
4. Brown, J.S., and Duguid, P. (1994). Practice at the periphery: a reply to Steven Tripp. *Educational Technology*, 34(8), 9-10.
5. Carr, A., Johanassen, D.H., Litzinger, M.E., and Marra, R.M. (1994). Good ideas to foment educational revolution: the role of systemic change in advancing situated learning, constructivism, and feminist pedagogy. *Educational Psychologist*, 38(1), 5-15.
6. Choi, J. and Hannafin, M. (1995). Situated cognition and learning environments: roles, structures, and implications for design. *Educational Technology Research and Development*, 43(2), 53-69.
7. The Cognition and Technology Group at Vanderbilt. (1990). Anchored instruction and its relationship to situated cognition. *Educational Researcher*, 19(6), 2-10.
8. Garner, R. (1990). When children and adults do not use learning strategies: toward a theory of settings. *Review of Educational Research*, 60(4), 517-529.
9. Greeno, J.G. (1989). A perspective on thinking. *American Psychologist*, 44(2), 5-26.
10. Greeno, J.G. (1997). On claims that answer the wrong questions. *Educational Researcher*, 26(1), 5-17.
11. Greeno, J.G., and The Middle School Mathematics Through Applications Project Group. (1997). Theories and practices of thinking and learning to think. *American Journal of Education*, 106, 85-127.
12. Greeno, J.G., and The Middle School Mathematics Through Applications Project Group. (1998). The situativity of knowing, learning, and research. *American Psychologist*, 53(1), 5-26.
13. Griffin, M.M. (1995). You can't get there from here: situated learning, transfer, and map skills. *Contemporary Educational Psychology*, 20, 65-87.
14. Griffin, M.M., and Griffin, B.W. (1996). Situated cognition and cognitive style: effects on students' learning as measured by conventional tests and performance assessments. *The Journal of Experimental Education*, 64(4), 293-308.
15. Harley, S. (1993). Situated learning and classroom instruction. *Educational Technology*, 33(3), 46-50.
16. Kirshner, D., and Whitson, J.A. (1998). Obstacles to understanding cognition as situated. *Educational Researcher*, 27(8), 22-28.
17. Koran, M.L., Willems, P.P., and Camp, B.D. (2000). Situated Cognition: implications for visitor studies. *Journal of Interpretative Research*, 5(2), 5-13.
18. Kumar, D., and Voldrich, J.F. (1994). Situated cognition in second grade science: literature books for authentic contexts. *Journal of Elementary Science Education*, 6(2), 1-10.
19. Lave, J. (1988). *Cognition in practice: mind, mathematics and culture in everyday life*. Cambridge, MA: Cambridge University Press.
20. Lave, J., Murtaugh, M., and De la Rocha, O. (1984). The dialectic of arithmetic in grocery shopping. In Rogoff, B., and Lave, J. (Eds.), *Everyday cognition: its development in social context* (pp.67-94). Cambridge: Harvard University Press.
21. Lave, J. and Wenger, E. (1991). *Situated learning: legitimate peripheral participation*. New York, NY: Cambridge University Press.
22. Nunes, T., Schliemann, A.D., and Carraher, D.W. (1993). *Street mathematics and school mathematics*. Cambridge, MA: Cambridge University Press.
23. Palincsar, A.S., and Brown, A.L. (1984). Reciprocal teaching of comprehension fostering and comprehension monitoring activities. *Cognition and Instruction*, 1(2), 117-175.
24. Palincsar, A.S., and Brown, A.L. (1987). Enhancing instructional time through attention to metacognition. *Journal of Learning Disabilities*, 20(2), 66-75.
25. Rogoff, B., and Lave, J. (Eds.). (1984). *Everyday cognition: its development in social context*. Cambridge: Harvard University Press.

- 26. Saljo, R. and Wyndhamn, J. (1990). Problem-solving, academic performance and situated reasoning, a study of joint cognitive activity in the formal setting. *British Journal of Educational Psychology*, 60, 245-254.
- 27. Vygotsky, L.S. (1962). *Thought and language*. (E. Hanfmann, and G. Vakar, Eds., Trans.). Cambridge: The M.I.T Press.
- 28. Winn, W. (1994). Why I don't want to be an expert sitar player. *Educational Technology*, 34(8), 11-22.

Table A1
Means And Standard Deviations Of Students' Responses On The Two Sections Of The Exam
On Reciprocal Teaching (ERT)

Instructional Group		ERT Measure	
		Fact	App
Lect-Disc	M	9.71	6.44
	SD	2.61	2.17
Sit Cog	M	5.40	10.78
	SD	2.69	2.67

Note. Both sections of the ERT, factual and applied are on a 15-point scale.

Table B2
Analysis Of Variance For Group (Instructional Method) And The Exam
On Reciprocal Teaching (ERT) Scores: Factual Section

Source	SS	df	MS	F	p
			<u>Between-Subjects</u>		
Intercept	2622.190	1	12622.190	1795.59	.000*
Group	67.69	1	67.69	9.629	.002*
Error	1068.491	152	7.030		
Total	13736.500	154			

*p <.05

Table C3
Analysis Of Variance For Group (Instructional Method) And The Exam
On Reciprocal Teaching (ERT) Scores: Applied Section

Source	SS	df	MS	F	p
			<u>Between-Subjects</u>		
Intercept	11418.184	1	11418.184	1920.342	.000*
Group	725.470	1	725.470	122.012	.000*
Error	903.778	152	5.946		
Total	13124.250	154			

*p <.05

NOTES