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Teaching of Psychology 2011 38: 102
DOI: 10.1177/0098628311401581

SOCIETY FOR THE TEACHING OF PSYCHOLOGY

Teaching of Psychology
38(2) 102-105

DOI: 10.1177/0098628311401581
http://top.sagepub.com
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Promoting Higher Level Thinking in Psychology: Is Active Learning the Answer?

Aaron S. Richmond[1] and Lisa Kindelberger Hagan[1]

Abstract

The goal of this study was to investigate which common instructional methods (active vs. direct) best promote higher level thinking in a psychology course. Over a 5-week period, 71 undergraduates were taught psychology using both active learning and direct instruction. Pre- and post-course assessments were coded as either higher or lower level questions based on Krathwohl's updated *Taxonomy of Educational Objectives*. Results indicated an interaction effect where higher level thinking was significantly higher in active learning than in direct instruction. In contrast, lower level thinking was not influenced by instructional method. Based on these results, if psychology professors are interested in promoting higher level learning, active learning instruction may be a valuable tool.

Keywords

active learning, higher level thinking, direct instruction

A myriad of research suggests that higher level thinking is critical at the post secondary level because it helps promote more effective application and transfer of course material (Dalai, 1994; Ormrod, 2006; Shell & Kleen, 1992). Higher level thinking "encourages students to think about and use academic subject matter in new, productive, and otherwise 'intelligent' ways" (Ormrod, 2006, p. 256). Dalai (1994) argued that higher level learning promotes critical thinking skills that allow students to be creative, analytical, and evaluative and thus should be infused into higher education curricula. Therefore, if higher level thinking is necessary for mastering course material, then what instructional method best promotes this in psychology? To answer this question, we sought to compare the most common instructional formats used (i.e., active and direct).

Numerous studies have demonstrated the efficacy and potency of active learning instruction over direct instruction (e.g., Butler, Phillmann, & Smart, 2001; Helman & Horswill, 2002; Poirier & Feldman, 2007; Warren, 2006; Yoder & Hochevar, 2005). However, none of this research has empirically examined whether active learning instruction specifically promotes higher level learning. These studies only investigated differences in general academic performance between active and direct instruction. Thus, we sought to contribute to the literature by analyzing the differences between the two methods on both lower and higher level assessments.

There is theoretical evidence that suggests that active learning may increase higher level learning over that of direct instruction. O'Neill and McMahon (2005) theorized that when teachers use direct instruction, they posit themselves as the "expert" on the topic, and students feel that they do not have anything to add or contribute to the educational process. This type of instruction puts students in a more passive role that allows them to disengage from the material. We surmise that disengaging from the material probably would lessen the likelihood of engaging in higher level thinking about classroom content. In contrast, active learning emphasizes deep learning and accountability on the part of the student (Biggs, 1999) and the teacher's role is that of a facilitator; teachers create learning opportunities and assist students in understanding, evaluating, and synthesizing material (e.g., Lea, Stephenson, & Troy, 2003; Yoder & Hochevar, 2005). Furthermore, Lea et al. (2003) suggested that students taught with direct instruction are not encouraged to process information much beyond the memorization of facts. Based on this research, we hypothesized an interaction effect: When students receive active learning instruction, they will have better performance on higher level assessments than when they receive direct instruction; however, there will be no difference in performance on lower level assessments between the two instructional methods.

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Table 1. Examples of Lower and Higher Level Questions

Lower Level Questions	Higher Level Questions
Children learn through their senses and their motor actions during what stage of cognitive development? **a. Sensorimotor** b. Concrete operations c. Formal operations d. Preoperational	At snack time, Josh and Megan both got one graham cracker sheet. However, Josh's sheet was broken into 2 pieces and Megan's was broken into 4 pieces. Josh got VERY upset when he saw that Megan "got more" snack than he did. Why would Josh have this faulty logic? a. He is egocentric. **b. He doesn't have decentration.** c. He doesn't have abstract thought. d. He doesn't have symbolic thought.
A schema that describes a series of things that happen in an event is called a **a. script.** b. concept. c. chunk. d. link-node.	Mr. Yeh gave his first-grade students some simple sorting and counting problems to work on. He noticed that the children, working independently, readily solved the problems. There was some self-talk, however. According to Vygotsky, what is likely to happen if Mr. Yeh gives the children a more challenging task to solve? a. The amount of self-talk should decrease because the children have to concentrate harder. b. The amount of self-talk should remain the same because private speech is a natural part of development. **c. The amount of self-talk should increase because it facilitates problem solving through self-communication.**
Socio-Cognitive Development Theory suggests that children learn by a. encoding knowledge into their long-term storage. **b. social interaction with others.** c. actively constructing their own knowledge. d. associating individual stimuli with individual responses.	

Note: Stems in bold are the correct answers. Some of these questions were modified from the Ormrod (2006) test bank.

Method

Participants

Seventy-one undergraduate students participated in this study. Participants were selected from two sections of the same junior-level developmental psychology course (Section A: $n = 31$ and Section B: $n = 40$) taught by two different instructors. The sample consisted of 64 (90%) women.

Measurements

The authors assessed the students' higher and lower level knowledge of course material by giving them a 16-item multiple-choice pre and post assessment. Eight of the questions were drawn from the Ormrod (2006) test bank, and eight were developed by the authors. See Table 1 for examples of lower and higher level questions. After data collection, two blind coders designated these questions (not part of the students' grades) into eight higher and seven lower level questions (100% agreement) using Krathwohl's (2002) updated taxonomy. One question was omitted from analyses as they did not agree.

Procedure and Design

Because prior knowledge may play an important factor in the recall of information learned (Hwang & Levin, 2002), we employed a pretest and posttest design. Also, to control for the effects of individual teacher characteristics, participants in our study were taught two theories via active learning and two theories taught via direct instruction,[1] thus constituting a 2 (higher vs. lower level question) × 2 (active vs. direct instruction) within-subjects design. In addition, each of the four theories was counterbalanced across the two classes so that each of the four theories was taught with both active and direct instruction.[2]

On the first day of class, all participants were given a 16-item pretest that measured their lower level and higher level knowledge of course material. Over the next 4 weeks, a total of four 75-minute class periods was taught using the active learning format and four 75-minute class periods were used for direct instruction. We operationalized active learning instruction as students creating knowledge for themselves through in-class problem-based activities, synthesizing multiple psychology theories, and small and large group discussions. See Table 2 for examples of active learning instruction. As suggested by O'Neill and McMahon (2005), when students received direct instruction, a standard lecture was used with very little questioning, and in one lesson a short video was presented. Five weeks after Day 1, all participants received the posttest of the same higher and lower level questions.

Results

We conducted a 2 × 2 within-subjects analysis of variance (ANOVA). We subtracted pretest scores from posttest scores and then converted them to percentages to create a mean percentage knowledge gained score. Results indicated an effect of question type, $F(1, 70) = 104.09$, $MSe = 1.14$, $p < .001$, $\eta_p^2 = .60$, and of instruction type, $F(1, 70) = 93.09$, $MSe = 2.21$,

Table 2. Examples of Active Learning Instructional Strategies

Topic	Instructional Strategy
Cognitive Development Theory	Students in small groups filled out a worksheet defining and giving examples of each stage of Piaget's Cognitive Development Theory. Student groups then acted out one of these stages for the class. Each student group was given a board game (e.g., Uno, checkers, Trivial Pursuit) and asked to identify what cognitive development level the game was created for and why. Last, students discussed how cognitive development theory informs developmentally appropriate practice.
Socio-Cognitive Development Theory	For 10 minutes, students reviewed a case study in which they identified theoretical concepts of scaffolding, zone of proximal development, and self-talk. Students then created a mini-lesson in which they had to scaffold a brief lesson that was developmentally appropriate for the child in the case study. Students discussed why Socio-Cognitive Development Theory was helpful and how it could be applied in elementary school classrooms.
Information Processing Theory	Students engaged in four different in-class activities to demonstrate the principles of sensory memory, working memory, retrieval cues, and metacognition. These activities served as a spring board for discussions about Information Processing Theory and how students can create lesson plans that would further enhance the memories of their students.
Schema Theory	Students engaged in class activities that demonstrated how schemas help to enhance memory. Students were then asked to discuss why their prior schema knowledge enhanced their memories in the activities. Furthermore, students discussed how prior schema knowledge could be used in a classroom to facilitate better retention for elementary school students.

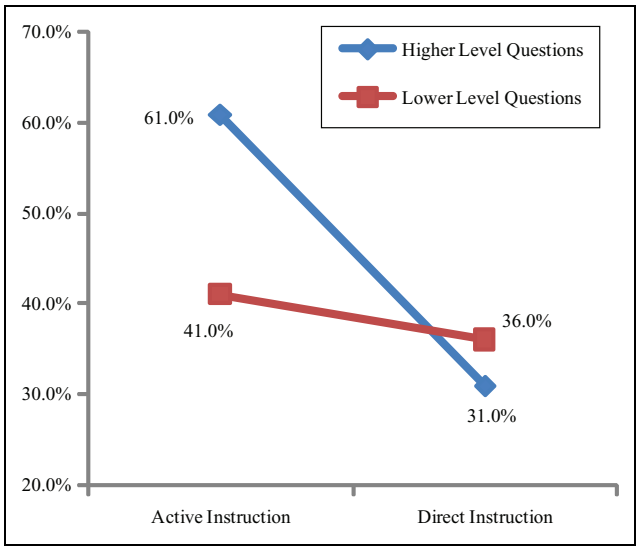

Figure 1. Mean percentage of knowledge gained as a function of type of question (higher vs. lower) and instruction (active vs. direct)

$p < .001$, $\eta_p^2 = .57$. Results also indicated a significant interaction between instructional method and question type, $F(1, 70) = 34.32$, $MSe = .36$, $p < .001$, $\eta_p^2 = .33$. See Figure 1 for an illustration of effects. To analyze the simple interaction effects of active versus direct instruction, dependent t tests were conducted for both the higher and lower level questions. Results indicate that when participants received active learning instruction ($M = 61\%$, $SD = 17\%$), they scored significantly better on the higher level test score questions than when they received direct instruction ($M = 31\%$, $SD = 14\%$), $t(70) = 16.31$, $p < .001$, $d = 1.92$. In contrast, there was no difference between active learning instruction ($M = 41\%$, $SD = 21\%$) and direct instruction ($M = 36\%$, $SD = 11\%$) on understanding of lower level questions, $t(70) = 1.97$, $p > .05$, $d = .29$.

Discussion

Because the depth at which students think about classroom information is paramount to their academic success (Ormrod, 2006), this study investigated which instructional method best facilitates higher level thinking in psychology. Our results indicate that students who were taught using active learning were better able to answer questions that required the use of higher level thinking skills than when taught through direct instruction. We suggest that active learning helps encourage higher level thinking because it builds on students' prior experiences and emphasizes students' active involvement with course material. In addition, active learning emphasizes accountability on the part of the student, thereby encouraging students to engage, think critically, and apply course material to novel situations (Biggs, 1999; Lea et al., 2003).

Our prediction of no difference in performance on lower level questions between the two instructional methods was also supported. Lea et al. (2003) would suggest that lower level questions tap into students' ability to engage in rote memorization and that direct instruction lends itself to students' learning through rote memorization. Thus, if one's course objective is to get students to have a basic knowledge and comprehension of course material, then according to this study, it appears that this can be achieved through a variety of instructional methods including direct instruction. However, if one's course objectives are to have students think critically about course material, which Shell and Kleen (1992) suggested is critical in higher education, then it seems that active learning is necessary.

If higher level thinking is promoted by active learning instruction, then common oppositions to using active learning should be discussed. Many instructors do not use active learning because they have too much content to cover and it takes too much preparation time (Lea et al., 2003). In response to the first criticism, Halonen (2005) would suggest that instead of

covering more material, instructors should cover less material and go into more depth. As our results suggest, this is far more beneficial to students. Time preparation is a valid criticism; however, to help alleviate this problem, many well thought-out empirically validated active learning lessons have already been developed and published (see Society of Teaching Psychology at http://teachpsych.pbworks.com/).

Summarily, active learning may not be an "educational panacea." It has, however, demonstrated to be a useful and effective tool for encouraging higher level thinking about psychology.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

Notes

1. It may be argued that one class was academically higher than the other or that one teacher was more charismatic or effective than the other. To address this issue, we assessed if students in one class differed academically from the other and compared teacher evaluations between the two class instructors. Independent *t* tests indicate that there was no significant difference in overall academic performance ($p > .05$) and students' perception of teaching effectiveness ($p > .05$) between the two classes. Thus, our results were not confounded by these variables.
2. In classroom research, a common criticism is that of lack of double-blind randomized control designs. Although it is true that both authors were the teachers in this class, we attempted to alleviate this limitation by (a) counterbalancing active and direct instruction between both instructors and the four topics; (b) control for teacher characteristics[1]; (c) the use of a within-subjects design; (d) the use of a control condition; and (e) fairly large class sizes. In addition, Dunn (2008) argued (in this case) for vigor over rigor; therefore, we have presented a valuable classroom study that has ecological validity and may be helpful to other psychology instructors.

References

Biggs, J. B. (1999). *Teaching for quality learning at university.* Buckingham, UK: Open University Press.

Butler, A., Phillmann, K. B., & Smart, L. (2001). Active learning within a lecture: Assessing the impact of short, in-class writing exercises. *Teaching of Psychology*, *28*(4), 257-259.

Dalai, N. P. (1994). Higher order thinking in MIS. *The Journal of Computer Information Systems*, *34*(4), 26-30.

Dunn, D. (2008). Another view: In defense of vigor over rigor in classroom demonstrations. *Teaching of Psychology*, *34*(4), 349-352. doi:10.1080/00986280802374039.

Halonen, J. S. (2005). The path of less trouble. In T. A. Benson, C. Burke, A. Amstadter, R. Sidey, V. Hevern, B. Beins, & B. Buskit (Eds.), *The teaching of psychology in autobiography: Perspectives from exemplary psychology teachers* (pp. 127–134). Retrieved from http://teachpsych.org/resources/e-books/tia2005/tia2005.php

Helman, S., & Horswill, M. S. (2002). Does the introduction of non-traditional teaching techniques improve psychology undergraduates' performance in statistics? *Psychology Learning & Teaching*, *2*(1), 12-16.

Hwang, Y., & Levin, J. (2002). Examination of middle-school students' independent use of a complex mnemonic system. *Journal of Experimental Education*, *7*(1), 25-38.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice*, *41*(4), 212-218.

Lea, S. J., Stephenson, D., & Troy, J. (2003). Higher education students' attitudes to student-centered learning: Beyond "educational bulimia"? *Studies in Higher Education*, *28*(3), 321-334.

O'Neill, G., & McMahon, T. (2005). Student-centred learning: What does it mean for students and lecturers? In B. O Neill, S. Moore, & B. McMullin (Eds)., *Emerging issues in the practice of university learning and teaching* (pp. 27–36). Dublin: All Ireland Society for Higher Education.

Ormrod, J. E. (2006). *Educational psychology: Developing learners* (5th ed.). Upper Saddle River, NJ: Pearson/Merrill/Prentice Hall.

Poirier, C. A., & Feldman, R. S. (2007). Promoting active learning using individual response technology in large introductory psychology classes. *Teaching of Psychology*, *34*(4), 194-196.

Shell, W. L., & Kleen, B. A. (1992). Innovative pedagogies for outcomes based teaching in the core MIS course. *The Journal of Computer Information Systems*, *33*(2), 3-7.

Warren, C. S. (2006). Incorporating multiculturalism into undergraduate psychology courses: Three simple active learning activities. *Teaching of Psychology*, *33*(2), 105-109.

Yoder, J., & Hochevar, C. (2005). Encouraging active learning can improve students' performance on examinations. *Teaching of Psychology*, *32*(2), 91-95.

Bios

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