



International Journal for the Scholarship of Teaching and Learning

Volume 3 | Number 1

Article 14

1-2009

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Robert S. Weisskirch

California State University - Monterey Bay, rob_weisskirch@csumb.edu

Recommended Citation

Weisskirch, Robert S. (2009) "Playing Bingo to Review Fundamental Concepts in Advanced Courses," *International Journal for the Scholarship of Teaching and Learning*: Vol. 3: No. 1, Article 14.
Available at: <https://doi.org/10.20429/ijstl.2009.030114>

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The beginning of advanced courses often requires a review of fundamental concepts. Such review is often tedious and boring for both student and instructor. Instead, an active learning exercise such as a modified Bingo exercise can serve to review and re-educate at the same time. Ninety-two university students rated their understanding of developmental psychology theories before and after participating in a modified Bingo exercise designed to review the fundamentals of the theories and concepts. Students reported an improvement of their perceived knowledge of developmental theories and for each of the theories reviewed. They rated the exercise as academically challenging, helpful to learn concepts, and not a waste of time. Students who reported being able to explain the theories to others at the conclusion of the exercise had higher test scores.

Keywords

Games, Active learning, Review exercise, Bingo

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Playing Bingo to Review Fundamental Concepts in Advanced Courses

Rob Weisskirch

California State University, Monterey Bay

Seaside, California, USA

rob_weisskirch@csumb.edu

Abstract

The beginning of advanced courses often requires a review of fundamental concepts. Such review is often tedious and boring for both student and instructor. Instead, an active learning exercise such as a modified Bingo exercise can serve to review and re-educate at the same time. Ninety-two university students rated their understanding of developmental psychology theories before and after participating in a modified Bingo exercise designed to review the fundamentals of the theories and concepts. Students reported an improvement of their perceived knowledge of developmental theories and for each of the theories reviewed. They rated the exercise as academically challenging, helpful to learn concepts, and not a waste of time. Students who reported being able to explain the theories to others at the conclusion of the exercise had higher test scores.

Keywords: games, active learning, review exercise, bingo

Introduction

Instructors of advanced courses in human development and related areas often rely on students' understanding fundamental concepts from prior courses from the first two years of general study to develop the advanced major-focused curricula and instruction. Students sometimes falter when the content in an advanced course begins at a place that exceeds their understanding or continues with information that they can not easily recall (Thompson & Zamboanga, 2003). They engage in the course with an uneven knowledge base, which may lead to frustration, anxiety, and confusion as the instruction continues. Students are likely to participate less and to respond hesitantly to questions posed by the instructor because of their lack of confidence in their knowledge (Covington, 1992). At the same time, the instructor too may become frustrated at the lack of student engagement or become annoyed when students request in-depth review of fundamental concepts, taking time from the core content of the course.

Within a classroom, the students' prior learning and ability to recall differ vastly (Hoz, Bowman, & Kozminsky, 2001). Students who take content-related courses temporally close together (e.g., Intro to Developmental Psychology in one semester and Advanced Developmental Psychology in the subsequent semester) might be better able to recall prior information and engage in new learning more successfully than those with greater time between sequential courses. In addition, students have unique bodies of knowledge based upon numbers of courses taken and specific content areas. Similarly, because many advanced courses occur during the third and fourth years of study, students who transfer from the community college after completing a general course of study to a four-year university may have had different preparatory course content than native four-year

university undergraduates. This difference may create a classroom milieu in which some students easily use prior learning and some students need re-teaching. The instructor should not ignore the students' uneven knowledge base and trudge forward. "Reviewing allows students to reconsider the information and find ways to store it in their brains," (Silberman, 1996, p. 158). Instead, the instructor can introduce review in a way that is neither boring for the instructor nor for the students with greater understanding. Active learning approaches to reviewing can make the process engaging and exciting for students and can alleviate instructor reluctance to review rudimentary concepts. McKeachie (2002) suggested that instructors use games and simulations because they require students to be active participants. Well-known games modified for course content make for easy techniques for instruction. Bingo can be adapted easily for review and requires little instruction in how to play. By using an active method of reviewing fundamental concepts through playing Bingo, students can review or relearn concepts and terms in a quick, efficient manner. In addition, the instructor can be assured of the students' understanding of fundamental concepts.

Method

Procedure

For a class on adolescent development, I created a Bingo board on a piece of paper (a 5 square by 5 square grid with the center square filled with the word "free") for distribution to each student. On the back of the Bingo board, I placed a list of 49 key words from important theories and concepts discussed in the first few days of class and the initial chapters of the textbook. See Appendix A. I also provided the identical list of words on a transparency displayed on an overhead projector. I directed students to fill in the blank spaces on the bingo boards with the terms on the back of their papers and projected on a screen (projecting the list on the screen prevents students from having to constantly turn over the paper to review the terms). There are only 24 spaces on the bingo board, so students had to select the terms they personally most wanted to review. I also instructed them not to put the words in the same order as they appear on the list to avoid everyone having the same Bingo board. See Appendix B. I distributed a handful of small bits of cut up colored, recycled paper to each student to serve as Bingo markers, which cover the spaces of terms called during play.

Prior to the class, I developed clues to the terms. I used the template for address labels on Microsoft Word, printed the text onto address labels, and affixed the labels to 3 x 5 inch index cards. I wrote the clues as definitions or characteristics of a concept (e.g., "In this stage of development, children acquire the ability to think abstractly" or "the perspective that all behavior comes from the environment").

On the day of playing Bingo in class, I confirmed the students' understanding of how to play Bingo. Then, I read the clues aloud and students responded orally as a class. Choral response allows for this exercise to be "low risk" by not focusing on one student for the correct answer (Silberman, 1996). We continued to play until a student had covered five squares on his/her Bingo board and shouted, "Bingo!" At that point, to verify the validity of the student's win, he/she had to read back the covered terms. After each term, I responded with "tell me something about..." and the term. If the student hesitated or seemed uncomfortable, I would say, "Someone help him/her out," soliciting support from classmates. The winning student then received a prize of a small piece of candy.

Students then cleared their Bingo boards and a subsequent game commenced. On further rounds, I shut off the overhead projector with the list of terms illuminated on screen to decrease their reliance on prompts from the list. In addition, I began asking questions as asides in the process. For example, if the answer to a clue was "Industry vs. Inferiority," I might say, "What stage comes after this?" Or, if the answer to a clue was "Skinner," I might say, "Would Skinner's theory look at development as continuous or discontinuous?" The students played three regular games and one blackout version (i.e., all Bingo squares had to be covered).

Sample

Ninety-one undergraduate students enrolled in upper division (usually third or fourth year of study) Adolescent Development completed two surveys ($M = 12$, $F = 79$). Eighty-eight percent were Liberal Studies (pre-Education) majors, 9% were Social and Behavioral Sciences majors, and 3% were Humanities majors. Students had been attending the university between zero semesters (this was their first semester at the university) to 16 semesters ($M = 3.86$, $SD = 2.52$). Ethnicity and age data were not available for this sample.

Measures

Students completed a self-assessment on their understanding of the theories before a one-day lesson on the theories occurred. The assessment consisted of demographic items, items to indicate whether they had read the initial chapters of the book, one item on their knowledge of developmental theories overall, rated on a Likert scale (1 = *Poor* to 7 = *Strong*), eight items students rated on a Likert scale (1 = *Not at all* to 7 = *Very much*) about their familiarity with specific theories, and four items about overarching developmental issues (e.g., classifying theories into the nature vs. nurture controversy) rated on a Likert scale (1 = *Not at all*, 4 = *Somewhat*, 7 = *Very well*).

Students could choose to participate in the study at several opportunities with no penalty. First, the instructor informed the students that they could choose to complete the initial self-assessment or leave it blank without participation affecting any portion of the course. The initial self-assessments were placed in an envelope and set aside until the end of the semester, concealing the students' initial participation from the instructor. Second, during the Bingo activity, students could elect to engage in the activity without penalty. Since the responses were given as a group out loud, there was no way for the instructor to know exactly who was participating.

In the next class session, the students played Bingo. In the class session following playing, the students filled out a second self-assessment. Students indicated how many class sessions they had missed and whether they had participated in the Bingo exercise. I removed those who did not participate from analyses. In addition, the students answered the same one item on their knowledge of developmental theories overall using a Likert scale (1 = *Poor* to 7 = *Strong*), eight items students rated on a five point Likert scale (1 = *Not at all* to 7 = *Very much*) about their familiarity with specific theories, and four items on overarching developmental issues. They also responded to items about the Bingo game helping them to understand the concepts, the academic challenge of playing the game, and how enjoyable it was, using a five-point Likert scale (1 = *Not at all*, 2 = *A little*, 3 = *Somewhat*, 4 = *A lot*, and 5 = *Very much*). They further reported on whether the instructor should use this exercise again in future semesters, did they learn more by participating, could they explain the theories to someone else, and was the bingo game a waste of time, using a five-point Likert scale (1 = *Not at all* to 5 = *Absolutely*). One additional item asked

students to rate the bingo game in comparison to other learning activities they have experienced in the past from 1 = *Bad* to 10 = *Good*. Students could also provide written comments about the exercise. Students' responses on the second assessment were again placed in an envelope and remained unopened until the end of the semester to prevent disclosure of responses and participation from the instructor.

Results

Students rated the Bingo activity highly after participating. They noted that the activity helped them to understand the concepts and was academically challenging. They also indicated enjoying the activity and learning more about the concepts by participating. The students strongly indicated that the instructor should use the exercise in future semesters and that the activity was not a waste of time. Overall, on a scale of 1 being bad and 10 being good, the students rated the activity, on average, 8.65 ($SD = 1.53$). See Table 1 for details.

Table 1. Means and Standard Deviations of Evaluation of the Learning Activity Items

Item	<i>M</i>	<i>SD</i>
Did playing the BINGO game help you understand the concepts?*	3.98	.80
How academically challenging was it playing BINGO?	3.37	1.06
How enjoyable was the BINGO game?	4.54	.75
Should the instructor use this exercise again in future semesters?†	4.80	.53
Did you learn more about the concepts by participating?	4.59	.76
Could you successfully explain these theories to someone else?	3.33	.78
Do you think the BINGO game was a waste of time?	1.07	.34
In comparison to other learning activities you have experienced in the past, how would you rate the BINGO game? ‡	8.68	1.42

* 1 = *Not at all*, 2 = *A little*, 3 = *Somewhat*, 4 = *A lot*, 5 = *Very Much*

† 1 = *Not at all*, 5 = *Absolutely*

‡ 1 = *Bad*, 10 = *Good*

More specifically, I assessed the influence of the Bingo activity on the students' perceived understanding of fundamental theories and concepts. I compared, using paired *t*-tests, mean ratings of familiarity with specific developmental theories and concepts prior to participating in the Bingo exercise and afterwards. Using a scale of 1 = *Poor* and 7 = *Strong*, the students indicated that their overall knowledge of developmental theories improved significantly, $M_{\text{before}} = 4.00$, $M_{\text{after}} = 4.58$, $t(84) = -5.86$, $p < .001$. In addition, students reported similar significant rises in their ratings of understanding of the other developmental theories. Only the understanding of Vygotskian theory and concepts did not

show improvement after participation in the Bingo exercise (See Table 2 for detail). Students also indicated an improvement in their ability to classify the theories as supporting the environmental model or the organismic model, to categorize the theories into the sides of the nature versus nurture controversy, to classify the theories as seeing development as continuous or discontinuous, and to classify the theories as taking a reductionistic approach or an epigenetic one.

Table 2. Means, Standard deviations, and T-test scores for Items on Developmental Theories and Concepts

How familiar are you with...	Before activity	After activity	<i>t</i> (<i>df</i>)	<i>p</i>
	<i>M</i> (<i>SD</i>)*	<i>M</i> (<i>SD</i>)*		
Bronfenbrenner's Ecological Model of Human Development	3.08 (1.59)	4.12 (1.36)	-6.56 (84)	< .001
Pavlov's theory of classical conditioning	4.60 (1.42)	5.08 (1.22)	-3.23 (84)	< .01
Skinner's theory and Behaviorism concepts	4.08 (1.46)	4.64 (1.18)	-4.38 (84)	< .001
Bandura and Social Learning Theory concepts	3.48 (1.54)	4.28 (1.31)	-5.03 (83)	< .001
Piagetian theory and concepts	4.29 (1.29)	4.92 (1.10)	-4.36 (84)	< .001
Freudian theory and concepts	4.89 (1.25)	5.40 (1.11)	-3.79 (83)	< .001
Eriksonian theory and concepts	4.42 (1.37)	5.15 (1.00)	-5.20 (84)	< .001
Vygotskian theory and concepts	4.06 (1.49)	4.37 (1.18)	-1.91 (84)	ns
How well can you...				
classify these theories as supporting				
categorize these theories into sides of the nature vs. nurture controversy?	3.75 (1.45)	4.67 (1.17)	-6.05 (84)	< .001
classify these theories as continuous or discontinuous?	3.19 (1.41)	4.18 (1.10)	-5.48 (84)	< .001
classify these theories as reductionistic or epigenetic?	2.71 (1.32)	3.55 (1.14)	-5.10 (84)	< .001

*1 = *Not at all*, 7 = *Very Much*

Some students also wrote some narrative feedback on the activity:

"The Bingo game was great! I felt like I really have a grasp on the concepts after playing! Plus it was much better than just lecturing"

“Bingo really helped clarify the different terms.”

“Excellent way to drive the information into the brain with a visual Bingo card and then relying on memory and knowledge to retrieve answers”

To assess whether the activity had any influence in academic performance, I compared ratings from the post-questionnaire with the test score for the exam that included the material from the introductory and theories chapter (Two additional chapters' information was included on the exam). After the Bingo activity, students who reported greater ability to successfully explain the theories to someone else had higher scores on their exam, $r = .23$, $p < .05$.

Discussion

The Bingo activity successfully increased students' self-reported understanding of most of the fundamental theoretical concepts. They found the activity engaging, worthwhile, and enjoyable. Ebner and Holzinger (2007) described the importance of enjoyability of a learning game on the motivation and learning of college students. As a review of prior learning, the students were able to refresh their understanding and familiarity with the concepts, fill in gaps of their understanding by relearning familiar concepts, or learn new concepts in the process. The exercise may afford opportunity to build confidence in knowledge, resulting in higher performance.

The exercise may also be applied in a variety of contexts and settings. Before an exam, the Bingo activity could be played in class and used as both review and preparation. The format is also flexible to accommodate all content areas and inserts an element of active learning into lessons (Bonwell, 1996).

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Appendix A

Sample terminology word list for bingo board

Accommodation	Mesosystem
Assimilation	Microsystem
Sensorimotor	Developmental tasks
Preoperational thought	Anal stage
Concrete operations	Ego
Formal operations	Superego
Equilibrium	Id
Piaget	Oral stage
Bandura	Phallic stage
Skinner	Latency stage
Epigenesis	Genital stage
Reductionism	Fixated
Discontinuity	Freud
Continuity	Vygotsky
Nurture	Psychosocial
Nature	Integrity vs. despair
Gillian	Generativity vs. stagnation
Menarche Gender	Intimacy vs. isolation
Stereotype Gender	Identity vs. role confusion
difference Sex	Industry vs. inferiority
difference	Initiative vs. guilt
Bronfenbrenner	Autonomy vs. shame and doubt
Chronosystem	Trust vs. Mistrust
Exosystem	Erik Erikson

Appendix B

Sample completed bingo board

<i>Epigenesis</i>	<i>Sex difference</i>	<i>Vygotsky</i>	<i>Mesosystem</i>	<i>Exosystem</i>
<i>Menarche</i>	<i>Assimilation</i>	<i>Freud</i>	<i>Bandura</i>	<i>Ego</i>
<i>Nature</i>	<i>Anal stage</i>	<i>Free</i>	<i>Piaget</i>	<i>Erikson</i>
<i>Chronosystem</i>	<i>Superego</i>	<i>Generativity vs. stagnation</i>	<i>Preoperational Thought</i>	<i>Id</i>
<i>Developmental tasks</i>	<i>Bronfenbrenner</i>	<i>Sensorimotor</i>	<i>Equilibrium</i>	<i>Trust vs. Mistrust</i>