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Socially Constructed Knowledge: Using Cooperative Learning in Assessment Instruction

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Joseph A. Mayo[1]

>   *Abstract: In an exploratory investigation, groups of undergraduate early-childhood-education candidates completed an end-of-term project, called the cooperative assessment portfolio, in a junior-level educational assessment course. This assignment served three complementary functions for participants: (1) designing varied classroom assessment items (task work), (2) building interpersonal skills (team work), and (3) integrating task with team work. Overall, student performance on the assignment indicated assessment proficiency as applied to simulated classroom practice. Students' surveyed perceptions toward completing the assignment pointed to its effectiveness in facilitating mastery of academic content while encouraging productive group interaction. Discussion centers on social constructivism and concludes with future research implications.*
>   *Keywords: cooperative learning, social constructivism, assessment, early childhood education*

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I.

Introduction

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In the social constructivist tradition, Vygotsky (1962/1986) argued that social interaction is crucial to active construction of negotiated meaning—yet he did not preclude the eventual importance of an internalized knowledge base for each individual. In short, Vygotsky posited that what learners can accomplish on their own is less indicative of their intellectual development than what they can do with others' assistance in a social context. In describing the chronology of events involved in intellectual development, Vygotsky stated that concept formation initiates through social relationships and then culminates with the individual learner internalizing that concept on an intrapersonal level. As a point of intersection between active and interactive processes, cooperative learning relies on the constructivist belief that learning is produced, not reproduced (Millis, 2002). This form of learning "provides opportunities for students to talk and listen, read, write, and reflect as they approach course content through problem-solving exercises, informal small groups, simulations, case studies, role playing, and other [applied learning] activities" (Myers & Jones, 1993, p. xi).

Among the best researched and theoretically grounded of all teaching strategies (Johnson, Johnson, & Stanne, 2000; Mayo, 2010), cooperative learning occurs when groups of students work together to maximize their own and each other's learning (Johnson,

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Johnson, & Holubec, 2008). Cooperative learning is a specific form of collaborative learning that involves assessing the group as whole and simultaneously holding students individually accountable for their own work (Palmer, Peters, & Streetman, 2003). In instructional settings that incorporate cooperative learning, an instructor's role is transformed from dispenser-of-knowledge to facilitator-of-learning (Millis, 2002). A sizeable body of experimental and correlation research has shown that cooperative learning promotes higher-level reasoning, generation of new ideas and solutions, group-to-individual transfer of learning, achievement, social competence, and cognitive and affective perspective-taking (Mayo, 2010).

Despite its strong research and theoretical foundations, cooperative learning is not without its detractors. For example, recent reports (see Lehrer, 2012) dispute the long-held value of brainstorming by questioning the conventional wisdom that feasible ideas emerge within formal group settings. The basic assumption is that the structured atmosphere associated with brainstorming, involving the likelihood of constraining peer pressure, runs contrary to the cognitive benefits derived from innovative thinking in terms of free association. This assumption seems to support solo idea generation, more consistent with a cognitive constructivist view of learning (Piaget, 1973), as the preferred approach to knowledge construction. On closer inspection, however, studies that reassess the functional utility of brainstorming (e.g., Nemeth & Nemeth-Brown, 2003; Nemeth, Personnaz, Personnaz, & Goncalo, 2004) also suggest that the ineffectiveness of this technique stems from instructions to refrain from criticism that lie at the very core of the brainstorming process. Instead, active debate and disagreement foster idea formation because they encourage us to re-examine our own viewpoints while engaging more fully in others' divergent perspectives. Although a deeper look into the relative effectiveness of the cognitive and social constructivist approaches to learning merits additional research consideration, the current exploratory study is not designed to undertake a systematic comparison between these two perspectives. Instead, it will focus squarely on cooperative learning as a social-constructivist learning practice in line with the above-referenced reports regarding the facilitating impact of expressed diversity of viewpoints within group learning environments. However, in proposing directions for follow-up research later in the present report, I will revisit the comparative issue of cognitive versus social constructivist learning.

II.

Instructional Methodology

A. Course

In the current investigation, I examined the efficacy of cooperative learning in the context of a junior-level course in early childhood education (ECE) assessment that bears the academic-catalog designation, EDUC 3002. As the sole instructor of record, I taught EDUC 3002 over an accelerated four-week summer semester (two hours of instruction per day, five days a week). This course was offered within a baccalaureate teacher education

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program at my home institution, a state college located in the southeastern United States with an approximate enrollment of 4,000 undergraduate students.

In teaching EDUC 3002, I concentrated on the study of appropriate strategies for assessing the learning of young children from pre-kindergarten through fifth grade, including both standardized testing (formal assessment) and teacher-developed testing strategies (informal assessment). I also covered the role of assessment in accountability within the framework of child development and child, teacher, and school evaluation. In terms of behaviorally stated learning objectives, students were expected to demonstrate proficiency in the following areas:

- communicating the reasons for classroom assessment in historical and contemporary milieus
- examining critically the broad issues surrounding assessment
- comprehending developmental theories embedded in assessment practices, including behavioral, constructivist, psychosocial, and contextual perspectives
- applying test reliability and validity measures to both formal and informal assessment
- detecting and preventing bias concerning assessing children with special needs and children with culturally and linguistically different backgrounds
- deciding accurately what to assess and how to assess it, with emphasis on the cognitive domain of the revised version of Bloom's taxonomy of educational objectives (Krathwohl, 2002)
- constructing well-conceived informal assessments, including selected-response (e.g., multiple-choice questions), constructed-response (e.g., essays), performance (authentic assessment, broadly construed), portfolio, and affective (e.g., student motivation to learn) assessment tools
- interpreting standardized test scores when used as student performance measures
- applying appropriate test-preparation practices regarding standardized achievement testing when used in educational environments to gauge student learning as well as teacher and school performance
- distinguishing between assessment-based evaluation of instruction and grading of students

Along with two unit exams that stressed conceptually applied knowledge of course content, I assigned an end-of-term project called the *cooperative assessment portfolio.* I intended this assignment to provide groups of students with ample opportunity to create informal assessments that demonstrate their understanding of sound principles of test construction that will become essential to their day-to-day classroom success as aspiring early childhood educators. The cooperative assessment portfolio served three complementary functions for student participants: (1) designing varied classroom assessment items (task work), (2) building interpersonal skills (team work), and (3) integrating task with team work.

B. Participants.

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Participants were 50 bachelor-degree ECE candidates enrolled in two equivalent-numbered sections of EDUC 3002. The participant pool consisted of 86% female, with an ethnicity demographic of 90% Caucasian, 8% African-American, and 2% multiracial. Participants' ages ranged from 20 to 46 years (M = 27.49). Seventy percent of participants were first-generation undergraduates, and 42% held a full- or part-time job while enrolled in the course. In addition, all participants had completed two semesters of classroom field experience in pre-kindergarten through fifth grade before enrolling in the course.

C. Purpose of the Study.

The purpose of this study is to explore the usefulness of the cooperative assessment portfolio as a learning assignment in EDUC 3002 that simulates in-depth classroom applications for prospective early childhood educators. In particular, the investigation focuses on the extent to which the cooperative assessment portfolio acts as a formative learning tool for future educators in successfully designing teacher-developed strategies for assessing the learning of young children.

In teaching EDUC 3002 at my home institution in summer semesters prior to assigning the cooperative assessment portfolio, I observed recurring student deficiencies in transferring theory into classroom practice regarding the requisite skills (e.g., rubric construction) for creating effective teacher-developed assessments. I derive this conclusion not only from mixed results on exam questions that asked students to demonstrate applied knowledge of assessment principles, but also from student misunderstandings occurring during brief classroom application exercises that accompanied in-class presentation of course content relevant to this topic. Therefore, I created the cooperative assessment portfolio as a potentially viable solution to this prevailing instructional challenge. I hypothesize that the cooperative assessment portfolio will address this challenge by providing a more extensive and group-based simulation platform from which students may further develop the skill-set necessary for constructing well-conceived teacher-developed assessments. The rationale underlying the current investigation is to offer a preliminary examination of this hypothesis.

D. Procedures.

The initial three weeks of the semester consisted of in-depth classroom instruction over the learning objectives that I've described earlier in this report. Throughout the final week of the semester, students worked in pre-assigned groups of five or six individuals in completing the cooperative assessment portfolio during allotted class time. Once assigned to their respective groups, students met briefly to select individuals to serve in the flexible and rotating capacities of facilitator, recorder, and other defined roles.

In completing the assignment, students relied on an "assessment blueprint" grounded in the revised version of Bloom's taxonomy of educational objectives (Krathwohl, 2002). As such, each group identified upfront Bloom's sequential knowledge dimensions (factual, procedural, conceptual, and metacognitive knowledge) and cognitive-process

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dimensions (remembering, understanding, applying, analyzing, evaluating, and creating) inherent in each behaviorally stated content standard addressed within its portfolio.

Each group selected the grade level(s), subject area(s), and specific topic(s) to incorporate in its portfolio. In order to permit maximum flexibility in terms of both task and team work, I afforded each group complete autonomy in making these selections. For example, one group may decide on a single learning emphasis, such as the three branches of American government in fifth-grade social studies, as the entire focus of the portfolio assignment. On the other hand, another group may decide to vary the grade levels, subject areas, and topics across the total portfolio. In this instance, the group may integrate a different emphasis in each section of the assignment. In one section, the emphasis may be placed on the water cycle in fourth-grade science; in another section, the concentration may fall on telling time in quarter-hour intervals in second-grade mathematics; and so on.

Each group established a collaborative division of labor in which each member was exposed to a representative sampling of every assessment strategy outlined below:
1. selected-response assessment [20 binary-choice (true-false) items, 10 multiple binary-choice items in two sets of 5, 20 multiple-choice items, and 10 matching questions in two sets of 5]
2. constructed-response assessment (20 short-answer items)
3. constructed-response assessment (two different essay items with an accompanying scoring rubric for each)
4. performance assessment (two different authentic-assessment strategies, such as concept mapping, case-study analysis, analogical reasoning, and autobiographical journaling, with a concomitant scoring rubric for each)
5. portfolio assessment (five hypothetical work samples related to targeted skills and/or knowledge for students to master, along with a rubric on which all work samples can be scored)
6. affective assessment (one multi-focus affective inventory to appropriately measure students' interests, motivations, and/or attitudes toward learning)

Students composed answer keys for all selected-response and the short-answer constructed-response items. Regarding constructed-response essays and the performance and portfolio assessment items, students designed prototypical responses upon which they based their associated scoring rubrics.

In addition to demonstrated mastery of each of the aforementioned assessment strategies, the evaluative criteria for scoring each group's assignment included an applied understanding of the revised version of Bloom's taxonomy and evidence of a collaborative division of labor. I alone rated students on all evaluative criteria except for collaborative division of labor, which I reserved solely for students in corresponding groups to evaluate. Regarding the division-of-labor score, students in each group rated one another in terms of individual contributions to the group (e.g., effort, cooperation, and dedication to team work), with the group's average used for scoring purposes. Students' ratings occurred on a Likert scale with anchors at 1 (*unsatisfactory*) and 5 (*exceptional*), with additional

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opportunity for providing evaluative comments. Although I was aware of the identity of every student rater, all ratings were anonymous to other students.

I weighted all evaluative criteria equally in calculating the cumulative grade for each student. In arriving at this grade, I collapsed all evaluative information onto a master rubric. I distributed and reviewed the content of this rubric during the initial class meeting as part of my course-syllabus coverage. Once I completed the master rubric for each student, I returned it to that respective student at the conclusion of the semester. The master grading rubric, including space for a concise summary of my evaluative comments and a scheme for converting rubric point-totals to grade-level percentages, is shown in Appendix A.

III.

Results and Discussion

Students' grades on the completed cooperative assessment portfolios ranged from 65% to 100% (M = 94.54, SD = 7.52). Overall, student performance on this assignment indicated mastery of the principles associated with sound educational assessment along with application of these concepts in simulated classroom practice.

In addition, I gauged students' perceptions of completing the cooperative assessment portfolio through an anonymous 16-item questionnaire that combined a 5-point Likert rating scale [*strongly agree* (5) to *strongly disagree* (1)] with accompanying opportunity for offering narrative feedback about the assignment's perceived strengths and weaknesses. As part of the directions for questionnaire completion, I informed participants that their responses would be reported as aggregate data only.

Questionnaire findings show that students' attitudes regarding the cooperative assessment portfolio were overwhelmingly favorable. Students' numerical ratings of the experience of completing this assignment are shown below in Table 1. In broadly interpreting these numerical ratings, students viewed the cooperative assessment portfolio as an intellectually challenging assignment that encouraged their active participation in learning, while providing them with an effective organizational framework from which to apply course content in ways that increased its practical significance.

Table 1: Students' Numerical Ratings of the Cooperative Assessment Portfolio

Questionnaire item	*M*	*SD*
How effectively does the assessment portfolio assignment:		
1. Encourage thinking beyond the classroom?	4.50	.65
2. Stimulate creativity?	4.48	.58
3. Increase the practical relevance of educational assessment?	4.52	.61
4. Provide a context for organizing and applying course content?	4.40	.67
5. Facilitate understanding of course material?	4.56	.61

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6. Increase motivation to learn?	3.96	.92
7. Promote intellectual challenge?	4.44	.76
8. Encourage participation in the learning process?	4.54	.58
9. Stimulate interest in the subject matter?	4.08	.90
10. Assist in distinguishing between identifying characteristics of varied assessment strategies?	4.36	.66
11. Teach applied test item-writing guidelines for teacher-developed assessments?	4.42	.61
12. Clarify connections between teaching, learning, and assessment?	4.36	.69
13. Indicate the importance of absence-of-bias in teacher-developed assessments?	4.18	.77
14. Help to apply Bloom's cognitive domain (knowledge and cognitive-process dimensions) to assessment practice?	4.50	.61
15. Highlight the relevance and application of affective assessment to classroom practice?	4.20	.67
16. Show the value of collaborative "test-sharing" when constructing teacher-developed assessments?	4.44	.79

Students' narrative comments on the questionnaire also supported their uniformly positive ratings. Students often noted how the assignment emphasized the importance of validity, reliability, and absence of bias in successful construction of assessment instruments. Students also repeatedly cited the assignment's challenging-but-rewarding nature and its value in stimulating critical thinking and creativity. Moreover, students stressed how the assignment helped them to put their theoretical knowledge of educational assessment to practical use in classroom-focused ways. In the words of one student:

> The most important thing that I took away from this course did not come from the daily lecture and discussion. Instead, it came from completing the group project that pushed me to learn how to apply assessment principles to build the types of assessments that I actually plan to give my students once I begin my teaching career.

Other consistent narrative feedback about the assignment revolved around its merits in encouraging team work and cooperation, along with the related theme of recognizing "test-sharing" among colleagues as a potentially valuable practice both in completing the current assignment and in their projected future as professional educators. One student commented that the cooperative assessment portfolio was "so helpful because it encouraged sharing ideas among peers, which is something that I see myself doing again and again with my teaching colleagues when designing classroom assessments in years to come."

On the opposite side of the coin, a few students criticized the perceived work load associated with completing the assignment. Several others suggested a reduction in group size from five or six to four individuals as a way to facilitate group dynamics and increase

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the likelihood of personal accountability within a group context. One student cautioned about working together on the cooperative assessment portfolio in a six-person group: "I think that we would have done a more efficient job of completing this assignment and communicating with each other if our group had been a person or two smaller in number."

One interesting thread observed across student narrative comments was repeated mention of the facilitating nature of ongoing debate, involving constructive criticism and open expression of differing perspectives, while members of each group worked together to complete the cooperative assessment portfolio. As an illustration, one student voiced that "in the case of my group's work on the [cooperative assessment portfolio] assignment, not always agreeing with one another but working through our differences led to a much better final product." This type of student feedback supports the previously discussed findings that relate to the group dynamics of brainstorming, which show that "dissent, debate and competing views have positive value, stimulating divergent and creative thought" (Nemeth, Personnaz, Personnaz, & Goncalo, 2004, p. 365). If student reactions to this effect are construed in light of the Nemeth et al. findings, they favor the pedagogical efficacy of the cooperative assessment portfolio as a group-based learning assignment rooted in social constructivism.

Consonant with a social constructivist model of instruction, overall questionnaire results point to the cooperative assessment portfolio as an effective strategy for blending task work (learning academic content) with team work (interacting productively as a group). *Multimodal teaching* (e.g., Anderson et al., 2006; Palmer, 2003) represents an important way to link cooperative learning tasks to mastery of course content. In multimodal teaching, the instructional spotlight shines on pedagogies that support more active student engagement. Multimodal teaching is a style in which students learn through more than one sensory modality. With the cooperative assessment portfolio, students are not limited to the visual modality alone—as would have been the case if each student had completed this assignment on his or her own (cognitive constructivism). As a learning assignment stemming from a multimodal teaching approach, the group-based nature of the cooperative assessment portfolio (social constructivism) pushed students toward active engagement in both the visual and auditory learning modalities, while taking into account the content and processes of the discursive experience involved in completing this assignment. As research confirms, the inherent multifaceted nature and complexity of the cooperative assessment portfolio renders a multimodal learning paradigm particularly beneficial. For example, meta-analytic findings (Fadel, 2008) show that interactive multimodality in the form of collaborative problem solving enhances learning for moderate-to-high-complexity learning tasks.

Arriving at an optimal number of students to assign to each group is critical to the success of a cooperative learning assignment. In cooperative learning environments, it is important that accountability exists on two levels: (1) group accountability for achieving its learning goals and (2) individual accountability for each group member shouldering his or her fair share of the work load. According to Flowers and Ritz's (1994) analysis of cooperative-learning configurations, *small-group cooperative learning* (three to five students) affords students greater opportunities to participate in peer tutoring, establish

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mutual responsibility toward learning, and build cooperative team work. Conversely, however, small-group teaming may also intensify some students' unwilling attitudes toward cooperating with certain other students. In contrast to a small-group paradigm, *large-group cooperative learning* (six or more students) allows students to simulate real-world experiences that demand quality operations in large functional teams (e.g., multidisciplinary educational teams operating in special education venues), but also may be conducive to some students "hiding in the crowd" (*social loafing*; Gilovich, Keltner, & Nisbett, 2006) and thereby failing to complete assigned work. This latter caution may have accounted for some students in the present study recommending a smaller group size of four in those situations where teams of five or six students had worked together to complete the cooperative assessment portfolio. This suggestion should be viewed as valid feedback that may prove useful in subsequent instances where college educators elect to use the cooperative assessment portfolio or similar group-based projects.

V.

Directions for Research

Although classroom-based evidence contained in the present report indicates that the cooperative assessment portfolio is a promising instructional tool, these findings must be considered preliminary in nature because of the absence of comparative control-group data. Consequently, there is a call for additional implementation of the cooperative assessment portfolio (or comparable group-based assignments) under more rigorously controlled scientific conditions.

In terms of future research that builds on the exploratory nature of the current report, a potentially fruitful path to consider with using the cooperative assessment portfolio is to examine potential differences between the cognitive constructivist (relying on an individual context of learning; Piaget, 1973) and social constructivist (stressing the social context of learning; Vygotsky, 1978) approaches to implementing this assignment as part of teaching principles of educational assessment applied to ECE or any other school-grade level. This proposed research would allow for a systematic test of different constructivist pedagogies in order to clarify if group processes are vital to the success of the cooperative assessment portfolio, or whether an individual student could just as successfully complete the component elements of this same task. Under controlled conditions, two equivalent class sections may be assigned a project that requires students to construct numerous teacher-developed assessments: one requiring individual students to complete this assignment and the other involving group-focused project completion. Through quantitative and qualitative group comparisons involving these two class sections in conjunction with a well-designed baseline condition where no constructivist-learning assignment (cognitive or social) is given, a more complete picture can be drawn about the educational efficacy of the cooperative assessment portfolio as a constructivist learning technique.

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Appendix A: Master Scoring Rubric for the Cooperative Assessment Portfolio

Rating Scale

Evaluative Criteria:	5= Exceptional	4 = Above Average	3 = Average	2 = Needs Improvement	1= Unsatisfactory
1. Bloom's Taxonomy (knowledge and cognitive-process dimensions per content standard)	_____	_____	_____	_____	_____
2. Group's division of labor (average within-group peer rating per respective student)	_____	_____	_____	_____	_____
3. Selected-Response Assessment	_____	_____	_____	_____	_____
4. Constructed-Response Assessment: Short Answer	_____	_____	_____	_____	_____
5. Constructed-Response Assessment: Essay	_____	_____	_____	_____	_____
6. Performance Assessment	_____	_____	_____	_____	_____
7. Portfolio Assessment	_____	_____	_____	_____	_____
8. Affective Assessment	_____	_____	_____	_____	_____

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Total score = _____ /40 points = _____ %

Instructor's evaluative comments (summarized): _____

_____

_____

Converting rubric point-totals to grade-level percentages (A = 90-100%, B = 80-89%, C = 70-79%, D = 60-69% and F = < 60%):

40 points = 100.0%	29 points = 72.50%	18 points = 45.00%	7 points = 17.50%
39 points = 97.50%	28 points = 70.00%	17 points = 42.50%	6 points = 15.00%
38 points = 95.00%	27 points = 67.50%	16 points = 40.00%	5 points = 12.50%
37 points = 92.50%	26 points = 65.00%	15 points = 37.50%	4 points = 10.00%
36 points = 90.00%	25 points = 62.50%	14 points = 35.00%	3 points = 7.50%
35 points = 87.50%	24 points = 60.00%	13 points = 32.50%	2 points = 5.00%
34 points = 85.00%	23 points = 57.50%	12 points = 30.00%	1 point = 2.50%
33 points = 82.50%	22 points = 55.00%	11 points = 27.50%	0 points = 0.00%
32 points = 80.00%	21 points = 52.50%	10 points = 25.00%	
31 points = 77.50%	20 points = 50.00%	9 points = 22.50%	
30 points = 75.00%	19 points = 47.50%	8 points = 20.00%	