Analysis of Former Learning Assistants' Views on Cooperative Learning

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Abstract. The University of Colorado Learning Assistant (LA) program integrates a weekly education seminar, meetings with science faculty to review content, and a semester-long teaching experience that hires undergraduates to work with groups of students in university science courses. Following this three–pronged learning experience, some of the LAs continue into the teacher certification program. While previous research has shown that this model has more than doubled the number of science and math majors graduating with a teaching certification, the question remains whether these teachers are better prepared to teach. The analysis presented here addresses this question by comparing the views of former LAs to the views of comparable teachers on the issue of cooperative learning. Interviews were conducted with ten middle school and high school science teachers throughout their first year of teaching. Results suggest differences in former LAs views toward group work and their purposes for using group work.

INTRODUCTION

Creating a cooperative learning environment has been shown to produce more effective learning because it not only allows the teacher to manage the classroom, but the students can build on and learn from the ideas of their fellow students. Most students learn best from working with other students [1]. This comes from both the cognitive advantage of being able to share ideas and vocalize their thinking and the motivational advantage of being able to interact with friends and fellow classmates. While placing students in groups is often a necessary condition of cooperative learning, it is not a sufficient condition [2]. The teacher must also create an environment in which students rely on each other to reach their common goals. Creating this type of learning environment is not intuitive for most teachers. Therefore they must be taught why this type of learning is important and how to create it [3].
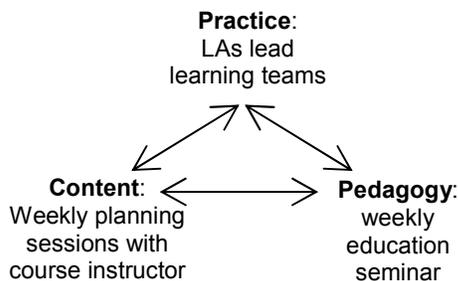
The STEM Colorado Learning Assistant (LA) program [4] began at the University of Colorado in 2003. The program is designed around four goals:

1. To recruit and prepare talented math and science majors for careers in teaching,

2. To improve the quality of math and science education for all undergraduates,

3. To engage math and science faculty in the recruitment and preparation of future teachers and in the transformation of undergraduate courses, and

4. To transform cultures within the university math and science departments to value research-based teaching as a legitimate endeavor for ourselves and our students.

The program has been implemented in nine science, math, and engineering departments across the university and is currently being replicated at six four-year institutions that have received federal funding for this effort. The most obvious work of the LA program is the selection and training of LAs each semester. These LAs are undergraduates hired to assist other students in courses they previously completed by helping instructors make these courses more student-centered and interactive. While most LAs are not considering careers in teaching when they first apply to the LA program, many express an interest in teaching following their experience. Common reasons given for this shift are the positive interactions they had with students and faculty and the realization that teaching is an intellectually challenging activity [4]. Approximately 15% of undergraduates who participate in the LA program go on to enroll in a teacher certification program. This recruitment has led to a dramatic increase in the number of secondary math and science teachers certified at CU and across the state.

Practice:
LAs lead
learning teams

Content: ⟷ **Pedagogy**:
Weekly planning
sessions with
course instructor

weekly
education
seminar

Figure 1. The three-pronged learning experience of the LA program.

The LA program not only recruits undergraduates to help in introductory science and math courses but also trains them (through a three-pronged experience shown in Fig. 1) to facilitate student learning in these transformed courses.

First, LAs further their content understanding in weekly meetings with the lead instructor of the course in which they work. In these meetings they also plan for the upcoming week and reflect on the previous week. Second, LAs develop their pedagogical knowledge through a weekly science and mathematics education seminar that is co-taught by an education faculty member and a high school physics teacher. This class is attended by LAs from all departments and is organized around a series of articles that the LAs read and then discuss. Topics in the seminar include questioning, learning theories, multiple intelligences, metacognition, student epistemology, argumentation, formative assessment, and the nature of science. Finally, LAs engaged in practice as they lead learning teams. While the LA program introduces undergraduates to pedagogical theories and strategies, it is not a teacher preparation program. LAs interested in a teaching career later enroll in a teacher certification program.

While previous research has already shown that the LA program is increasing the number of people entering the teacher certification programs, it is still unclear whether these former LAs become more effective teachers than their colleagues who did not participate in the LA program as undergraduates. The purpose of the research reported in this paper is to study these former LAs in one aspect of effective teaching – cooperative learning and group work.

METHODOLOGY

In an effort to evaluate the LA program, over the past three years we have been interviewing beginning middle and high school teachers who participated in the LA program and a comparable group of beginning teachers who were not LAs. These teachers are being followed over the first several years of their teaching career. The teachers in the control group were chosen so that the control group is similar to the group of former LAs in terms of the subjects the teachers are teaching, and the type of certification programs the teachers attended. Each teacher is interviewed three to four times over the course of the academic year. The first interview focuses on the teacher's teaching in general while the following interviews are each conducted after an observation and focus on the specific lesson observed. The interviews cover a range of topics including group work. Teachers are asked how they would deal with a group of students who are struggling, when they find group work to be useful, how group work helps students, and the reason for choosing or not choosing to use group work in a particular lesson.

The analysis discussed here focuses only on interviews with first year science teachers in order to concentrate on a single type of subject and to diminish the effects of teaching experience on the analysis. Five of these teachers are former LAs and five are control teachers. The gender, type of school, and subject taught for each teacher are listed in Table 1. There were 36 interviews conducted with these teachers.

TABLE 1. Demographic information for participating teachers.

Teacher	Gender	H.S./M.S.	Subject
LA1	Female	H.S.	Earth Sci
LA2	Female	H.S.	9th gr Sci
LA3	Female	H.S.	Biology
LA4	Female	H.S.	Biology
LA5	Male	M.S.	Life Sci
Non-LA1	Male	H.S.	Phys Sci
Non-LA2	Female	H.S.	Earth Sci
Non-LA3	Female	H.S.	Chemstry
Non-LA4	Male	H.S.	Phys Sci
Non-LA5	Female	H.S.	Chemistry

The interviews were coded by the research team using a coding scheme that has emerged from the analysis of the interviews and from previous research. Prior to coding the interviews included in the analysis discussed here, the team coded and discussed other interviews to establish reliability within the team. We first identified the data for all instances in which teachers talked about small group work. Related instances were then grouped into categories and then we considered only those that appeared frequently in the data (either in one interview or across multiple interviews). The substance of each category was then further articulated by sub-codes which emerged from the data. We then re-coded all of the data using these sub-codes. The final coding scheme is discussed in the following section. Finally, we counted the number of

occurrences of each sub-code for each teacher. In doing so, we realized that there was no objective way to create a meaningful frequency comparison between teachers because some teachers talked for long periods of time, some teachers were more verbose about a particular issue than others, some returned repeatedly to a specific issue, and some teachers were incredibly succinct but still seemed to be very concerned about an issue. Therefore, we chose to consider only whether a teacher discussed a sub-category at any point or not. Former LAs were then compared to non-LAs according to occurrences and omissions of sub-categories that characterize discourse about small groups. These differences are discussed in the below section. Throughout the analysis, other substantive differences between former LAs and non-LAs were noted. These differences are presented in the form of "thick description."

RESULTS

Based on the analysis of the interviews three general categories were distinguished with nine sub-codes divided among these categories which describe teachers' views of cooperative learning. The categories, sub-codes, and their descriptions are shown below. These categories and sub-codes will be used to compare the former LAs and Non-LAs in the next section.

Category I. Pitfalls of Group Work

A. Holding students accountable – group work may allow one student to not do any work while his or her partner(s) carry the group. Teachers want to find a way to make sure that all students participate and are accountable for doing their work.
B. Individual understanding – working with other students may mask a student's lack of understanding. The teacher needs to know that every student is learning the material.

Category II. Purposes of Group Work

C. Advanced teach the struggling – teachers see group work as a way for students who are advanced and understand the material to help students who are struggling. This can be divided into two styles.
  1. *Role implicit in the classroom arrangement* - while the teacher may not make the arrangement known to students, the room or groups are arranged so that advanced students can help struggling students.
  2. *Role is explicit to students* – the teacher tells the students that she or he wants the students who

understand the material to go around and help those who do not.
D. Builds a learning community – group work helps a class of students to turn their course into a learning community.
E. Builds skills - working in groups helps students build important skills like working together, argumentation, and vocalizing their ideas.
F. Necessitated by equipment – group work is necessary because there is not enough equipment for students to work individually or the data cannot be collected individually.
G. Students help each other – group work allows students to brainstorm together, bounce ideas off each other, and learn from one another.

Category III. Teacher's Attitudes

H. Teachers uncomfortable with some aspect of group work – the teacher feels he or she cannot facilitate group work because they are uncomfortable with the material or with losing control of the classroom.

Table 2 indicates which of these sub-codes was mentioned by which of the teachers.

TABLE 2. Sub-codes present in the interviews with each teacher

	A : Hold students accountable	B : Individual understanding	C1 : Advanced teach struggling: Role implicit in classroom arrangement	C2 : Advanced teach struggling: Role is explicit to students	D : Builds a learning Community	E : Builds skills	F: Necessitated by equipment	G : Students help each other	H : Teacher uncomfortable with aspects of group work
LA1	X	0	X	X	X	X	0	X	0
LA2	X	X	X	X	X	X	0	X	0
LA3	X	0	0	0	0	0	0	X	0
LA4	X	0	X	0	0	0	0	0	0
LA5	X	X	0	0	0	X	0	X	0
Non-LA1	X	0	0	0	0	0	0	X	0
Non-LA2	X	X	0	X	0	0	X	X	X
Non-LA3	X	0	X	X	0	X	X	X	0
Non-LA4	X	0	X	X	0	0	X	X	0
Non-LA5	X	X	0	0	0	X	0	X	X

ANALYSIS

An analysis of the codes that arose from the interviews and the relative frequency of these sub-codes among the two populations reveal several interesting features.

All first year science teachers interviewed at some point expressed concern over holding students accountable for the work they did in group activities (see Table 2). Almost all of the teachers deal with this issue by adjusting the size of the groups or by requiring individual output from each group member.

Former LAs are more likely to talk about building a learning community in their classroom. For these teachers this is an important goal for their teaching and a source of personal pride when it is accomplished.

On the other hand, Non-LAs are more likely to talk about how group work is necessitated by the lack of equipment even though the two groups of teachers are teaching in similar school situations. Non-LAs are also more likely to express discomfort with attempting to incorporate group work into their teaching. One teacher does not feel she is familiar enough with the material to create the mini-lessons she believes are required for successful group work activities. Another teacher worries that students would get out of hand and become rowdy in group work situations unless the group tasks are highly regimented. Also relevant is that both Non-LA1 and Non-LA2 have post observation interviews in which group work is not discussed at all.

While both former LAs and Non-LAs describe setting up situations where they explicitly refer struggling students to students who understand the material or ask advanced students to help struggling students, both former LAs who discuss this mention talking with their students about how to help other students (e.g. don't simply ask if they if they need help, don't simply give them the answers). The Non-LAs did not mention providing this type of training to their students. While both former LAs and Non-LAs view group work as an opportunity for students to build a variety of skills such as: comfort speaking/sharing their ideas, developing independence from the teacher, gaining confidence in their abilities, and improving their written or spoken language skills, only the two former LAs talked about the opportunity for students to improve their argumentation and justification skills.

CONCLUSIONS AND FUTURE WORK

In 1975 Lortie [5] discussed the notion of "apprenticeship of observation." Broadly speaking, by this he meant that we teach the way we are taught. The data presented here suggests that the former LAs were apprenticed under a different model of teaching than the non-LAs. For example, the LAs discussed the value of argumentation, building a learning community, and coaching their own students in assisting other students in the process of learning. Based on the data presented here, the other teachers in the study (non-LAs) tended to put students in groups to solve logistical problems (such as not having enough equipment) rather than as a mechanism for facilitating learning and argumentation. The LA program is, by design, an experiential learning program in which content is learned through the practice (or experience) of helping others learn. Argumentation and learning communities are explicitly valued and promoted throughout the Learning Assistant experience. The LAs experienced a non-traditional way of learning leading them to teach their students in a non-traditional way. If classroom practice is to become more student-centered and aligned with contemporary research, the way our future teachers are taught truly matters.

Future work will attempt to test the above conjectures by increasing the sample size to include first year math teachers and more experienced teachers from both the former LA and non-LA populations. Additionally, we will examine differences between former LAs and non-LAs in their views of assessment and their self-efficacy.

ACKNOWLEDGMENTS

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