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Classroom Activities in Math and Reading in Early, Middle, and Late Elementary School

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ABSTRACT

This study examined activities used during elementary school math and reading instruction. Teachers reported their use of cooperative, competitive, and individual activities in math and reading, their subjective evaluations of teaching each subject, and their level of focus on promoting students' interests. Analyses indicated that teachers used more competitive activities in math than reading. Additionally, individual math activities increased across grades whereas individual reading activities were similar across grades. Finally, the appeal of teaching both reading and math declined across elementary school grade. Results are discussed in terms of teachers' goals and student motivation.

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Teachers can choose among an almost limitless selection of activities and approaches when they decide how to teach subject content and design lesson plans. It is likely that, in this process, teachers base their decisions on their own personal experiences as well as on the goals they have for their students. This possibility raises certain questions: Do teachers' instructional choices vary by grade level? Do teachers' own teaching goals predict their activity choices? Does prior teaching experience predict the activities teachers choose?

Although these questions are fascinating, most of the research on teachers' use of classroom activities has focused on the *outcomes* of using various classroom techniques. Consequently, researchers have identified classroom structures and activities that promote learning and motivation among students (e.g., Deci & Ryan, 1985; Johnson & Johnson, 1991; Schraw & Lehman, 2001; Slavin, 1996), but we know much less about what teachers actually do in their classrooms. Although prior research clarifies how instructional practices can affect student motivation, it leaves unanswered when and by whom various strategies will be implemented.

Prior research on instructional techniques rarely considers variables that might affect teachers' choices to use certain activities over others. One notable exception is a study by Kurita and Zarbatany (1991), examining the extent to which teachers believed various motivational strategies were acceptable and feasible to implement in the classroom. The results showed that practical variables played a crucial role in teachers' reports. For example, teachers favored activities with which they were familiar and that took little time to prepare. Similarly, the present study examines activity choices as outcomes on their own, to better understand the variables that may go into teachers' complex decisions regarding instruction.

An important dimension along which classroom activities can vary is interpersonal focus, including cooperative, competitive, and individual activities (Deusch, 1949; Johnson & Johnson, 1991; Kohn, 1992; Slavin, 1996). Whereas cooperative activities involve students by having them work collaboratively with peers to produce a joint product, competitive activities involve students by having them try to outperform each other. In contrast, individual activities are inherently less social, and focus students on their own learning in a classroom situation. As mentioned above, these types of activities are usually studied with an eye toward examining their effects on student achievement and motivation. Results of these studies indicate that cooperative activities promote a broad range of positive outcomes, and that competitive and individual activities have more mixed results (see Slavin, 1996; Stanne, Johnson, & Johnson, 1999; for reviews).

One purpose of the current research is to test how teachers' selections to use cooperative, competitive, and individual learning activities vary by critical variables such as the subject area being taught (math versus reading)

and school grade. The current research also examines the extent to which characteristics of teachers predict activity choices, including the extent to which teachers have teaching experience, are focused on promoting their students' interests, and have positive experiences while teaching the specific subject content.

Some research suggests that the classroom activities that teachers choose vary by grade level. For example, Anderman et al., (2001) found that teachers' use of motivational strategies that focused students on performing well relative to others was positively correlated with grade level. This is consistent with other research indicating that teachers make performance comparisons between students more salient in older than in younger grades, and a marked increase has been identified in the transition from elementary to middle school (Anderman et al., 2001; Midgley, Anderman, & Hicks, 1995). Because competition involves comparing individuals' levels of performance, we hypothesized that competitive activities would be selected more in older than in younger elementary school grades. We are not aware of any research that links teachers' use of cooperative learning activities with elementary school grade level and therefore could not formulate an a priori hypothesis for this type of activity.

We also examined the extent to which teachers' activity choices varied by the subject being taught. In this study we tested whether the use of cooperative, competitive, and individual activities was different in math versus reading. Prior research suggests that competition can facilitate performance when the task requires quick, well-learned responses rather than new and difficult work (e.g., Hunt & Hillery, 1973; Sanders & Baron, 1975; Triplett, 1898). Consistent with this, some math content in elementary school involves the application of rules and the practice of arithmetic operations (e.g., learning the multiplication tables). Elementary school students in math may be practicing skills that are becoming well-learned, and these pursuits might be especially conducive to competitive classroom activities. In contrast, reading might be less conducive to competitive classroom activities because, reading instruction might require students to use material in new ways. We hypothesized that competitive activities would be incorporated more often into math than in reading lessons because the subject content in math is more likely to involve the application of well-learned rules. Due to the lack of research that would suggest how cooperative and individual activities might vary by subject area, we did not specify hypotheses for these activities.

We also examined several variables that were associated with the teachers more directly. First, we included a measure of teachers' years of experience. Not only is this a measure of whether teachers are novice versus expert in terms of the years they have spent teaching, but it also provides an index of how much time has passed since they finished their teacher education programs. Specifically, given the change in the past 15 years in the greater emphasis placed on cooperative learning activities (Johnson & Johnson, 1991), we hypothesized that teachers who finished their teacher education programs more recently would use more cooperative activities than those who completed their teacher education programs a longer time ago.

We also measured the extent to which teachers reported that nurturing their students' interests was important to them. We hypothesized that teachers who wanted to provide activities that promote their students' interests might be more likely to invest time in cooperative activities. As suggested above, a body of research has accumulated that points to the positive effects of cooperative learning activities on motivation and performance, and cooperative learning is generally heralded as an ideal approach to instruction (Kohn, 1992; Mitchell, 1993; O'Donnell & O'Kelly, 1994). Therefore, teachers who are focused on promoting student interests might use cooperative learning activities in their classrooms, regardless of when they finished their teacher training. We also hypothesized that these teachers may be more likely to select individual activities in their lessons, thereby providing flexibility in the curriculum to allow students to explore their own interests.

Finally, we measured teachers' own evaluations of the experiences they had while teaching math and reading. This composite measure included the extent to which they enjoyed as well as felt comfortable and expert teaching math and reading. We did not have hypotheses concerning how teacher's own evaluation of the appeal of teaching a particular subject would relate to the use of cooperative, competitive, and individual activities, but we wanted to explore these relationships in the current study.

METHOD

Participants and Procedure

Data for this study were collected as part of the Childhood and Beyond Study (CAB; Eccles, Wigfield, Harold, & Blumenfeld, 1993). CAB is a multi-cohort longitudinal project of children, their teachers, and parents across the school years. Target children in the CAB study were contacted through their schools in 1986, whereby families consented to participate based on information and forms

disseminated by teachers. This yielded 75% participation. The current research reports the data only from the teachers of children who were part of the larger study.

The teachers in this study were from twelve elementary schools in four school districts surrounding a large city in the Midwestern U. S. Among the 126 teachers in this study, 82% were female. Teachers were selected if, at the end of the 1988-89 or 1989-90 school years, they were teaching a child who was part of the CAB study. Thirty-two of the teachers taught a child from the CAB study during both the 1988-89 and 1989-90 school years, therefore, these teachers completed the questionnaires in two consecutive years. In order to increase statistical power and to utilize all of the available data, these teachers are represented twice in the analyses reported here, bringing the total number of observations to 158.

Measures

Teacher variables. Teachers provided information regarding their gender, the number of years they had spent teaching full- and part-time, and the grade level they were teaching at the time of assessment. Reports of both full- and part-time teaching were summed to create a measure of total years of teaching experience, which ranged from one to fifty years. The school grades that teachers taught ranged from first through sixth grades. In addition, 10% of the teachers were in classrooms where two grades were combined (e.g., second and third graders were in the same classroom). The school grades were grouped into three categories: early elementary school (first grade through second and third grades combined, n = 29), middle elementary (third grade only through fourth and fifth grades combined, n = 69), and late elementary (fifth grade only through sixth grade only, n = 60).

Teachers also evaluated their subjective experiences while teaching math and reading. Their evaluations of teaching math had four items, including, "How much do you like teaching math?" (1 = *very little*, 7 = *very much*) and "How comfortable do you feel teaching math?" (1 = *not at all comfortable*, 7 = *very comfortable*). Items that tapped teachers' evaluations of reading were identical to those used for math except that they specified reading as the focal subject area. The scales for math and reading were reliable measures as indexed by Cronbach's alphas of .90 and .87, respectively.

Teachers were also asked three items designed to measure the extent to which they adopted goals to promote their students' academic interests. For example, teachers responded to items such as, "Pursuing their own [the students'] ideas and interests" and "Having fun doing projects and assignments, even if it takes more class time than expected" on a 7-point scale (1 = *not at all*, 7 = *a great deal*). This scale showed sound reliability (Cronbach's alpha = .81).

Instructional activities. Teachers also reported the extent to which they used cooperative, competitive, and individual activities as part of math and language arts lessons. Teachers indicated from 1 (*never*) to 7 (*daily*) how much they used cooperative ("How often do you schedule cooperative academic activities or games where students must work collaboratively to plan and carry out a group activity or produce a group product in math?"), competitive ("How often do you schedule competitive academic games or contests in math?"), and individual ("How often do you use individualized lesson plans or learning goals for each student in math?") activities as part of math instruction. For reports of activities in language arts, the word "math" was replaced with "reading/writing" for cooperative and competitive activities and with "reading/language arts" for individual activities.

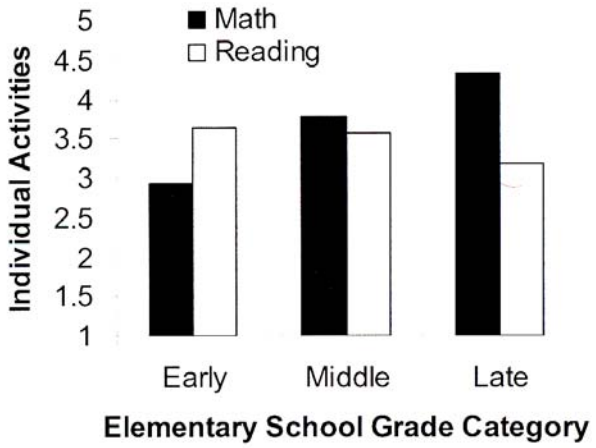

Figure 1. Adjusted means for individual activities by subject area and grade level category. Teachers' reports of activities could range from 1 (*Never*) to 7 (*Daily*).

RESULTS

Descriptive Statistics and Correlations

Table 1 displays descriptive statistics, number of observations, and correlations for variables included in this study. The number of people in each analysis varies slightly due to incomplete data on some items.

First, it is useful to examine some specific relationships at the zero-order level. Consistent with our hypothesis, teachers who had been teaching for fewer years used more cooperative activities than those who had been teaching for more years, and this was the case in both math and reading. This parallels trends in research and teacher education that has led to greater emphasis on cooperative learning activities (O'Donnell & O'Kelly, 1994).

Moreover, in partial support of our hypothesis, teachers whose goal it was to foster their students' interests were more likely to use cooperative activities in math, but not in reading, and to use individual activities in reading, but not math. Interestingly, teachers focused on students' interest were also more likely to use competitive activities in reading, but not in math. It appears that teachers who had a goal to promote their students' interest used cooperative, competitive, and individual activities differently across academic domains.

In addition, two additional, non-hypothesized correlations deserve mention. First, it appears that older teachers found math more appealing to teach than did younger teachers. This might be a result of selection over time, such that teachers who enjoyed teaching math were more likely to stay in the profession. Second, teachers who found

Table 1

Zero-order correlations and descriptive statistics for all variables

	1	2	3	4	5	6	7	8	9	10
1. Years experience	--									
2. Nurture interests	-.05	--								
3. MA teaching appeal	.17*	.09	--							
4. MA cooperative	-.18*	.26*	.08	--						
5. MA competitive	-.05	.07	.17*	.31*	--					
6. MA individual	-.01	.11	.04	.16	.13	--				
7. RD teaching appeal	.09	.30*	.20	.03	-.09	-.02	--			
8. RD cooperative	-.16*	.12	.04	.52*	.17*	.13	.23*	--		
9. RD competitive	-.04	.19*	.26*	.27*	.46*	.10	.07	.24*	--	
10. RD individual	-.01	.27*	.16	.19*	.08	.52*	.08	.21*	.08	--
M	18.64	5.71	6.02	3.86	3.09	3.78	6.28	4.10	2.05	3.42
SD	9.42	0.98	1.13	1.59	1.66	2.20	0.76	1.55	1.43	2.12
N	152	157	156	139	140	127	158	154	149	147

Note. Years experience included the number of part- and full-time years of teaching for each teacher. Values on all other variables ranged from 1 to 7, where higher values reflect more of that construct. MA = math; RD = reading.

*, $p < .05$

teaching math more versus less appealing also used more competitive activities. Teachers who find it more appealing to teach math might perceive math as easier than those who find it less appealing. If this is the case, then teachers who find math more appealing to teach might choose competitive activities in math because they perceive math lessons as opportunities to practice well-learned operations.

Analyses of Teacher Responses by Subject Area and Grade Level

A series of 2 (subject area: math versus reading) x 3 (grade category: early, middle, and late elementary) mixed-model ANCOVAs were conducted. The within-participants variable was subject area and the between-participants variable was grade category. Years of teaching experience was a covariate in each analysis, and adjusted means are reported. In order to reduce the chance of a Type I error across the whole series of four ANCOVAs, we set alpha to equal .01. Similarly, simple effects and contrast analyses were performed after significant effects were identified from the omnibus ANCOVAs. The critical alpha level for these follow-up tests was also set at .01. Effects with a significance value between .01 and .05 were interpreted as marginally significant.

First, we used the ANCOVA model to predict teachers' use of cooperative activities in math and reading. Although teachers' years of experience predicted a marginally significant amount of variability, $F(1, 127) = 5.20$, $p < .05$, no other effects emerged. The use of cooperative activities did not vary as a function of grade level or subject area.

Next we used the ANCOVA model to parse teachers' use of competitive activities. This yielded a significant effect of subject area, $F(1, 125) = 12.93$, $p < .01$. Teachers reported using more competitive activities in math ($\hat{Y} = 3.18$) than in reading ($\hat{Y} = 2.04$). No other effects emerged, and years of teaching experience did not account for significant variability in this analysis.

Third, the model was used to predict teachers' use of individual activities. Although there were no main effects, the interaction between subject area and grade category was significant, $F(2, 116) = 7.13$, $p < .01$ (see Figure 1). Simple effect analyses were conducted to compare the use of individual activities in math and reading at each grade level. These analyses revealed that teachers used individual activities marginally significantly more in reading ($\hat{Y} = 3.69$) than in math ($\hat{Y} = 2.92$) in early elementary school, the same amount in reading ($\hat{Y} = 3.58$) and math ($\hat{Y} = 3.78$) in middle elementary school, and significantly less in reading ($\hat{Y} = 3.18$) than in math ($\hat{Y} = 4.34$) in late elementary school. The pattern suggests that teachers' use of individual activities increased across grade level in math, but not in reading. Teachers' years of experience was not a significant covariate in this analysis.

Finally, we conducted the 2 x 3 ANCOVA on teachers' subjective experience of teaching math and reading. First, there was a marginally significant effect of subject, $F(1, 145) = 6.15$, $p < .05$, indicating that teachers reported somewhat greater subjective appeal with regard to teaching reading ($\hat{Y} = 6.35$) than math ($\hat{Y} = 6.06$). In addition, teachers' subjective experiences while teaching either subject declined across grade level, $F(2, 145) = 6.08$, $p < .01$. Contrast analyses of pairwise comparisons of adjusted marginal means across grade level indicated that teachers evaluated teaching math and reading in late elementary school ($\hat{Y} = 5.92$) as less appealing than in either early ($\hat{Y} = 6.43$) or middle ($\hat{Y} = 6.27$) elementary school. Ratings early and middle elementary school grades did not differ from each other The interaction of subject area and grade level was not significant. Consistent with the correlations described above, teachers' years of experience accounted for a marginally significant amount of variability in the analysis, $F(1, 145) = 5.18$, $p < .05$.

DISCUSSION

Overall, these data suggest that, during the time these data were collected, teachers' choices to use cooperative, competitive, and individual activities in their classrooms were determined by several factors. Grade level, subject area, and characteristics of the teacher, including years of teaching experience, focus on students' interest development, and subjective experience of teaching all related to which instructional activities were selected. These factors will be described separately for cooperative, competitive, and individual activities.

Cooperation. Teachers who had been teaching for fewer years were more likely to use cooperative activities than those who had been teaching for more years. This is likely to reflect trends in teacher education programs. Cooperative classroom activities have been shown to be beneficial for learners on a number of levels (e.g., Slavin, 1996). This evidence was accumulating around the time these data were collected, and it appears that the benefits of cooperative learning activities were effectively communicated to the teachers who had been trained more recently, as teachers with fewer years of experience were more likely to adopt cooperative learning practices in their classrooms. Interestingly, neither grade level nor subject area predicted

teachers' use of cooperative activities.

Teachers who reported that they focused on nurturing their students' interests implemented more cooperative activities in math, but not in reading. This suggests that there is something particular about math that they are considering when constructing lesson plans, otherwise we might expect that these teachers to use more cooperative activities overall. Teachers focused on their students' interests may be responding to the negative perceptions they believe their students have about math. For example, during the time that these data were collected, there was increased attention on attitudes about math. Whereas some students express anxiety about their math performance, others have negative impressions of math as abstract and impersonal (Bar-Haim & Wilkes, 1989; Matheson & Strickland, 1986). If teachers believe cooperative activities can counter such negative attitudes then teachers might infuse math lessons with such activities in order to help sustain their students' engagement in math.

Competition. Teachers reported using more competitive activities in math than in reading. This effect might reflect perceptions of math as involving drills focused on well-learned skills. As described earlier, research suggests that competitive activities can promote performance for well-learned or easy tasks (Hunt & Hillery, 1973; Sanders & Baron, 1975; Triplett, 1898). If teachers design math lessons that include drills in which students have opportunities to perfect skills that already are well-learned, then competitive activities might be perceived as optimal for promoting math performance.

Moreover, teachers' own beliefs about teaching math also related to their choices concerning competitive math activities. Teachers who reported more positive subjective experiences while teaching math were more likely to use competitive math activities. Teachers' reports of their subjective experiences included feelings of comfort and expertise while teaching math content. In other words, these teachers felt more expert and confident while teaching math than those who report more negative subjective experiences. Compared with teachers who report more negative experiences while teaching math, those who report more positive experiences might perceive the substantive content of math lessons to be well-learned and easier to grasp, and therefore conducive to competitive learning games. In summary, the tendency for teachers to use competitive activities in math may be rooted in perceptions of the nature of math content overall, as well as in individual teachers' perceptions of the material.

In addition, teachers used more competitive activities in reading if they were focused on nurturing students' interests. Although this was not predicted, it is possible that this is a reflection of the relationship described above concerning teachers' focus on student interest and their greater use of cooperative activities in math. Teachers who wanted their students to find the material interesting may have used more competitive activities in reading because they might believe that adding competitive activities to reading might appeal to a wider array of students.

Individual. Grade level interacted with subject area to predict teachers' use of individual activities. Whereas individual activities were used more in reading than in math during early elementary school, individual activities were used more in math than in reading, in late elementary school. We can only speculate about what this meant for math instruction across elementary school at the time these data were collected. One possibility is that teachers implemented individual activities in late elementary school with the intent of allowing students to pursue their own interests in math. Interests develop and deepen as individuals get older, acquire more knowledge, and value their knowledge within certain domains (Renninger, 2000). To facilitate this, teachers may implement individual activities, geared toward working toward students' own personal learning goals, so that students can pursue their own math interests as they get older.

However, an alternative possibility is that, as students develop more math skills, teachers encourage greater independence to work on problems on their own. In this sense, teachers might have scaffolded learning math to instill the basics early on, and less so as students gained knowledge and skills. Although this is sensible in terms of skill development, it could have negative consequences on students' motivation if this pattern is still evident today. The increase of

individual activities across grade level might contribute to the belief that math is an activity done in isolation rather than as a group, which might decrease students' enjoyment of math (Bar-Haim & Wilkes, 1989; Matheson & Strickland, 1986; Morgan, Isaac, & Sansone, 2001). Indeed, Mitchell (1993) pointed to group work as being one way to promote interest in math among middle school students.

Teachers' subjective evaluations of teaching math and reading. Teachers' subjective experience of teaching math was lower than that of reading. Moreover, these subjective evaluations became more negative as grade level increased. This parallels findings elsewhere that have documented declines in students' academic motivation across grade levels (Wigfield et al., 1997). Students begin school with great zest for academic pursuits, and this declines as they progress through the school system. We found a similar pattern for teachers' with regard to their experiences of teaching across grade level. In this sample, early elementary school teachers reported higher subjective evaluations of teaching both math and reading than late elementary school teachers. It is not possible to know from these data what is causing this decline. The increased performance pressure and normative grading practices that increase with grade have been identified as predictors of students' decrease in academic motivation over time (Eccles, Midgley, & Adler, 1984). If this is the cause, then it is possible that similar processes might be hampering teachers' subjective experiences too. In other words, it might be less enjoyable to teach in more versus less performance-oriented classrooms, thus causing a decline in teachers' subjective experiences across grade level. Further research will need to examine teacher and student motivation in tandem to understand these mutually-influencing processes.

Limitations. It is important to point out two limitations to the current study. First, our measures of classroom activities were teachers' reports of the extent to which they used various activities while teaching math and reading. From these data it is not possible to know how exactly teachers structured each type of activity. There are many ways to implement each type of activity studied here and the success of a given activity depends on nuances of the social situation (Johnson & Johnson, 1991; O'Donnell & O'Kelly, 1994). Moreover, research suggests that teachers are not always familiar with the most optimal ways to structure cooperative learning environments (Palinscar, Stevens, & Gravelek, 1989). So, although teachers with fewer years of experience were implementing more cooperative activities, it is not clear how successfully those activities were implemented. Measuring cooperative, competitive, and individual activities by asking teachers the extent to which they use each type of activity relies heavily on their familiarity and thorough understanding of each activity. It is not possible to speak to those variations in the current study.

Second, these data were collected over 15 years ago, and therefore caution should be used when considering whether these effects are generalizable to today's teachers. Although there is no specific reason to believe these patterns would change over time, it is possible that the picture painted by these data does not reflect the experiences and activity choices of teachers today. However, we contend that it is important to record these relationships, so that this study can serve as a basis for future research that can document historical changes.

Conclusions. This study examined the activities that teachers reported using during instruction across the elementary school grades in math and reading. Specifically, we examined teachers' use of cooperative, competitive, and individual activities within each subject area as well as their self-reported appeal of teaching each subject. Both subject and grade level effects emerged. Whereas cooperative activities did not vary by subject or grade level, teachers reported using more competitive activities in math than in reading. In addition, teachers' use of individual activities in math increased from early to late elementary school whereas their use of individual activities in reading did not change across elementary school. Finally, the level of appeal in teaching these subjects varied across grade level such that teachers reported less appeal in teaching both math and reading in late elementary school, compared with early and middle elementary school. Overall, these results provide a picture of the nature of elementary school instruction during the time these data were collected. It is worthwhile to consider how these variations across subject area and grade level map on to students' motivation for math and reading across elementary school.

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