

Private Speech in the Classroom: The Effects of Activity Type, Presence of Others, Classroom Context, and Mixed-age Grouping

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This study addressed the question of how young children's spontaneous use of private speech in the kindergarten classroom varies as a function of contextual variables, such as type of activity, immediate presence of others, degree of teacher-given structure, and classroom age composition. Twenty children from two classrooms (one mixed-age, one same-age) were systematically observed in their regular kindergarten classroom during a period of four weeks, using a time-sampling procedure. Results from ANOVA, chi-square, and logistic regression analyses indicated that young children's use of private speech does vary systematically according to the immediate physical and social context. More specifically, children were found to use more self-regulatory language when they were: (1) engaged in goal-directed task activity, as compared to free play or other activities; (2) in a classroom context which provided an intermediate degree of teacher regulation, compared to contexts in which either very little or a great deal of external structure was present; and (3) with their younger classmates, compared to either their same-age or older peers. No differences in overall private speech usage were found between the mixed-age and same-age classes. Frequency of private speech did not vary significantly depending on whether children were alone, with other children, or with adults. Classroom contexts vary in the degree to which they promote self-direction. This study suggests that if one is interested in fostering young children's development of self-regulation or in observing children's use of private speech,

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the optimum context is one which provides an intermediate amount of structure and allows children to spontaneously engage in challenging goal-directed activity.

Private speech is defined as speech which is either overtly directed toward the self or not explicitly addressed to another person. Vygotsky (1934/1962, 1930-1935/1978) saw the young child's use of private speech as representing the significant period in development when language begins to be used by the child not only for communication, but also as a means of self-guidance and self-direction. The primary function of private speech, therefore, according to Vygotsky, is self-regulation. Private speech was seen by Vygotsky as a manifestation of the child's developing integration of thought and language as the child's social speech gradually becomes internalised to form inner verbal thought. This progression from social speech to private speech, and ultimately to verbal thought, is viewed as an important developmental outcome which enables the child to engage in all forms of higher human psychological functioning (i.e. voluntary selective attention, metacognition, voluntary memory, planning). Through the use and internalisation of private speech, young children, whose interactions with the world were once limited to rigid and unreflective reactions to stimuli, are able to gain distance from the concrete stimulus field and function at a more "executive" or intentional level (Diaz, Neal, & Amaya-Williams, 1990).

If, as Vygotsky's theory suggests, private speech is a tool for self-regulation, then young children's use of it would be expected to vary in predictable ways depending on the child's activity and the physical and social context in which he or she is immersed, rather than occur randomly as an epiphenomenal event. More specifically, a child would be expected to use self-regulatory private speech in those situations which require self-regulation and executive functioning, and not in other contexts in which self-direction is relatively unnecessary. For example, during challenging problem-solving activities with little external (parental or caregiver) regulation, children would be more likely to use private speech as a tool to regulate their behaviour than they would during leisure activity. The present study addresses the question of how young children's use of private speech in a kindergarten class varies as a function of several contextual variables in the classroom. That is, what kinds of classroom contexts appear to facilitate or constrain children's spontaneous use of private speech?

Private speech researchers, in overall support of Vygotsky's predictions, have found the following contextual variables to affect children's spontaneous use of private speech: (1) the type of task or activity in which the child is engaged; (2) the difficulty level of the task; (3) the presence of others; and (4) the characteristics of others present (for a review, see Berk,

1992). Most of these findings, however, have been obtained in laboratory settings. We will first review the findings from earlier studies, and then use them to formulate hypotheses about how private speech would be expected to vary in the setting of the classroom.

Type of Activity

Private speech does not occur randomly throughout all activities in which children engage. Several researchers have found that young children use more private speech when they are engaged in a semi-structured problem-solving or goal-directed task activity, as compared with a free play situation (Berk & Garvin, 1984; Dickie, 1973; Rubin, 1979). This finding is consistent with Vygotsky's predictions for it is during precisely these situations, in which the child is trying to solve a problem or to reach a specific goal, that he or she will spontaneously use private speech as a tool to help guide and monitor her/his own behaviour. When engaged in unstructured free play activities, children do not generally need to use private speech because the self-regulatory demands placed on them in these situations are minimal.

Task Difficulty

Another fairly consistent finding in the research literature is that, within a particular goal-directed activity, private speech increases with task difficulty. That is, children use self-regulatory speech more often as their problem-solving activity becomes more challenging (see Anastopoulos & Krehbiel, 1985; Beaudetion, 1973; Deutsch & Stein, 1972; Kohlberg, Yaeger, & Hjertholm, 1968; Vygotsky, 1934/1962). Heightened usage of private speech during cognitively challenging activity is generally thought to help children sustain their attention, reflect on their problem-solving activity, remain motivated, and overcome obstacles throughout the task. Behrend, Rosengren, and Perlmutter (1989) recently extended these findings by demonstrating that private speech only increases under conditions of *intermediate* difficulty—that is, when a task is challenging to a child, but still within her/his range of capabilities. These authors call our attention to Vygotsky's original formulation of private speech as the intermediate step in the internalisation of verbal thought (Behrend et al., 1989, p. 307):

When a task is easy for a child, the necessary regulatory capacities have been internalised already, and little private speech should be expected. As tasks become more difficult, and more appropriate for the child's ability, self-regulatory private speech should increase, but only to a certain point. When a task is too difficult, and children do not have adequate regulatory capacities available, either their behaviour will be unregulated and unsuccessful, or some

other external source of regulation will be required and private speech will decrease.

The Presence and Characteristics of Others

It is understandable that early studies of the effects of others' presence on private speech were inconclusive (for a review, see Fuson, 1979), because it is only now becoming clear that it is not simply the presence or absence of others that is important for children's private speech production, but the extent to which these other individuals are externally regulating the child's behaviour (Behrend, Rosengren, & Perlmutter, 1992; Diaz, 1992). If there is no need for a child to regulate her/his own behaviour (i.e. if other people are doing it for him or her), then private speech would not be expected to occur. In contrast, if an adult or more competent peer were helping a child complete a task on her/his own, then the child's private speech would be expected to increase. Thus, when children are in a context where their attempts at self-direction are being supported, private speech should be maximised.

Solitary play is one situation in which there is minimal external regulation of children's activity. Several researchers have found that young children's private speech increases when they work alone on a task, compared to working with an adult teacher or a parent (Berk & Garvin, 1984; Martlew, Connolly, & McCleod, 1978; Rubin, Hultsch, & Peters, 1971). Although these studies did not explicitly measure the adults' helping behaviour, it is presumed that the observed decrease in private speech is due to the adult being relatively directive, thereby externally regulating the child's activity.

A second social situation which seems to encourage the use of private speech and self-direction is that in which young children are in the presence of an adult who is carefully scaffolding the child's problem-solving activity. Recently, a group of studies has provided preliminary support for the idea that children use a considerable amount of private speech when they are accompanied by an adult who is scaffolding their mutual goal-directed activity. In such contexts, adults encourage the child to self-direct as much as possible, contingently keeping the task demands at an appropriately challenging level and helping the child stay engaged with the task (Behrend et al., 1989, 1992; Diaz, Winsler, Atencio, & Harbers, 1992). Similarly, Goudena (1987) demonstrated that a "collaborative condition", in which an adult allowed youngsters to complete an activity by themselves while remaining available and responsive to their requests for help, yielded significantly greater amounts of private speech from the children than did having children work in what he called his "noncollaborative condition", in which no contingent support took place.

Thirdly, numerous investigators have demonstrated that private speech is augmented when young children are with their peers as opposed to with

adults (Berk & Garvin, 1984; Dickie, 1973; Kohlberg et al., 1968; Vygotsky, 1934/1962). Because peers seem to function less as direct regulators of children's behaviour than do adults (Azmitia & Perlmutter, 1989), the observed increase in self-regulatory private speech when young children are with their peers can be interpreted as being, at least in part, due to the decreased amount of external regulation present in this context.

Thus, a number of investigations have suggested that young children's use of private speech varies according to theoretically relevant contextual variables. However, with the notable exception of Berk and her colleagues (see Berk, 1986; Berk & Garvin, 1984; Berk & Potts, 1991), the vast majority of these studies were conducted in laboratory or quasi-laboratory settings.

Mixed-age Grouping

There has been renewed interest recently in the field of early childhood education in the idea of mixed-age grouping; the placing of children of slightly different ages together in one classroom. In addition to having an intuitive appeal for many parents and teachers, mixed-age grouping in early childhood has been claimed to be beneficial for children's social and cognitive development (Katz, Evangelou, & Hartman, 1990). Based on the foregoing review, there are a number of reasons to expect that the amount of private speech exhibited by children in a mixed-age classroom would differ from that exhibited in a same-age class. To our knowledge, the present study is the first to directly address the impact of mixed-age grouping on the self-regulatory language of children. It is unclear, therefore, from previous research and theory, in which type of classroom situation more private speech should occur.

On the one hand, there are several reasons to expect children to use more private speech in mixed-age classrooms. First, it has been suggested that youngsters in mixed-age groups do more tasks either on their own or with the help of other children, resulting in less direct adult intervention in the classroom (Katz et al., 1990). Indeed, children in mixed-age classes have been shown to spend more time in social interaction with their classmates and less time in direct interaction with teachers than youngsters in same-age classes (Goldman, 1981; Reuter & Yunk, 1973). Secondly, there has been a recent suggestion that children in mixed-age classrooms engage in more goal-directed task activity, and for longer periods of time, than do children in same-age classes (see Katz et al., 1990).

In addition, older and more competent children in mixed-age situations do appear to assist, lead, and help younger children in a positive, prosocial way (French, Waas, Stright, & Baker, 1986; Stright & French, 1988). This assistance from other children has been likened to scaffolding (Katz et al., 1990), and it is possible that this type of mixed-age peer interaction helps

both the younger and the older children in the class engage in and maintain problem-solving activities. This type of interaction also seems to have a direct and positive effect on the younger child's subsequent private speech. Azmitia (1992) observed that peers who are more competent function as facilitators of subsequent verbal self-regulation in less competent children. Azmitia recorded the private speech of 40 five-year-old novices who were individually working on a Lego-building task before and after they had worked either with an expert, with another novice, or alone. She found that the novice five-year-olds who had worked with an expert peer used significantly more private speech at post-test compared to pre-test, whereas the private speech of the other two groups did not change.

Finally, Lougee and Graziano (1986, reported by Katz et al., 1990) proposed that mixed-age classes improve the self-regulatory skills of older children because, by enforcing classroom rules and helping the younger children, older children are better able to reflect on and regulate their own behaviour. Given the crucial role that private speech plays in the development of self-regulation (Diaz et al., 1990), it is quite possible that self-regulatory language mediates, or is a mechanism for, the development of these self-regulatory skills.

On the other hand, there is also reason to suspect that children would use less private speech in mixed-age classrooms because of the presence of the older children in the class. Tudge (1990) has pointed out that children, rather than being good "scaffolders", are often quite controlling in their interactions with younger peers. Congruent with this position, Azmitia and Perlmuter (1989) have noted that "expert" children often interact with "novice" peers in a dominating and controlling way. If this is the case, then the older children in the mixed-age class would suppress the younger children's private speech usage by being overly directive.

The Present Study

The present investigation fills an important gap in the private speech literature in that, although there are a number of previous studies suggesting that young children's spontaneous use of self-regulatory private speech is influenced by theoretically relevant contextual variables, evidence of ecological validity is sorely lacking. Almost every investigation in this area has observed children in either a psychologist's research laboratory or in an experimentally manipulated separate room within a preschool or child care facility. The typical protocol for these studies has involved an experimenter bringing the child or dyad into the research room, giving them instructions as to what they are to do with the experimenter's materials, and then observing their behaviour (with or without a video-camera). Because it is quite possible that young children's behaviour in these situations does not

generalise to their typical behaviour in school or at home, a naturalistic investigation of how youngsters use self-regulatory language in their everyday environments was clearly needed.

The present study attempts to replicate, in a naturalistic school setting, the findings from earlier private speech studies through directly observing children's use of private speech as it spontaneously occurs in a variety of different classroom contexts. These contexts vary along the dimensions which have been previously noted to affect private speech production. Specifically, the variables studied in this investigation were type of activity, the presence of different types of others, classroom context, and classroom age composition. Twenty kindergarten children from two classrooms (mixed-age, same-age) were systematically observed while participating in their regular summer school programme. The youngsters from both classrooms were observed in four different classroom contexts which ranged from being unstructured and relatively unregulated (i.e. free play) to very structured and other-regulated (i.e. teacher-directed activities). For each observation, the child's activity and immediate social context were recorded as well as whether or not he or she was using private speech.

The purpose of the present investigation was therefore two-fold: (1) to replicate some of the previous laboratory findings in a naturalistic setting; and (2) to examine the impact of several common early childhood classroom practices on private speech and to assess the degree to which they promote opportunities for self-regulation, using quantity of private speech as a measure of self-regulatory behaviour. The hypotheses for the present project were that children would use more private speech: (1) in classroom contexts which provide intermediate amounts of structure or external regulation, as compared to those which are either very structured or completely unstructured; (2) when they are engaged in goal-directed, problem-solving activity, as compared to free play; and (3) when they are either with their peers or alone, as compared to with adults. No hypothesis was offered with regard to the mixed-age versus same-age variable, since it was unclear what effect, if any, mixed-age grouping *per se* would have on children's use of private speech.

METHOD

Subjects

A total of 20 kindergartners, 10 from a same-age classroom and 10 from a mixed-age classroom, served as subjects for the study. The children were enrolled in a regular summer school programme at a primary education centre in the San Francisco Bay Area. The same-age (SA) group consisted of 10 children (5 boys, 5 girls/Mean age = 72.5 mos.) who were selected at random (stratified by gender) from their all-kindergarten classroom. The

mixed-age (MA) group consisted of the 10 kindergarteners (5 girls, 5 boys/Mean age = 75.3 mos.) who were part of a multi-age/grade classroom consisting of *Prekindergarteners* (\approx 4-yr-old children who would be entering kindergarten soon), *Kindergarteners* (\approx 5-yr-old children who had completed kindergarten and would soon be entering the 1st grade), and *1st-graders* (\approx 6-yr-old children who would soon enter 2nd grade). The ethnic breakdown of the sample of 20, determined from parental self-identification on school registration forms, was 70% white, 25% Hispanic, and 5% black, and all the children came from low-income families—as this was a requirement for enrolment in the subsidised school. Both of the classrooms had 22 children with one teacher and one teacher's aide (all female), and both classes participated in the same types of activities, according to approximately the same daily schedule. In an effort to minimise subject selection bias, the children who had originally registered for the centre's four-week summer school programme were randomly assigned to either the same-age or mixed-age classroom.

Procedure

Naturalistic Classroom Observations. A total of 710, 30-second observations (356 in the mixed-age class, 354 in the same-age class) were conducted during the last three weeks of the centre's four-week summer school programme. The first week of the programme served as an adaptation period during which the children were given an opportunity to become acclimated to the classroom as well as to the presence of the observer. Therefore, with the exception of pilot observations, no data were collected during the first week. A time-sampling observation method was used, whereby each child was observed for approximately nine 10-minute observation sets. Each 10-minute set included 5 independent 30-second periods of direct observation, separated by 90-second intervals. Thus, the observer sampled the behaviour stream of each target child for 30 seconds, recorded the child's behaviour, and the surrounding context on an observational checklist for 90 seconds, and observed the child again for another 30 seconds, and so on. A portable cassette-recorder with prerecorded time signals and one small earphone were used by the observer to help maintain the integrity of the time-sampling schedule. In order to minimise the possibility of observer bias and subject reactivity, the observations were conducted in a predetermined random order, the children were unaware of both the nature of the study and who was being observed at any one time, and the researcher remained as unobtrusive as possible throughout the observations.

Each child was systematically observed during the following four

classroom contexts, which are listed in ascending order with respect to the amount of external or teacher regulation present:

Free Play (FP): The least structured part of the day when the children played freely outside during recess.

Plan/Do/Review (PDR): A tacitly structured part of the day when the children could choose who they wanted to work/play with, but were limited to a number of different "activity areas". Activity areas were parts of the room where children could go to encounter a variety of different toys, tasks, or games which all lend themselves well to goal-directed activity. The activity areas included, for example, the block area, the painting corner, the "house" area, and the puzzle area.

Teacher-Directed Spontaneous (TDS): Semi-structured, curriculum-based activities where the teacher would give the children a particular task to do, but the children would be allowed to spontaneously choose who, if anyone, they wanted to work with, and how much and in what fashion the task would be done. The activities typically included things like writing in a journal, making something to eat, or exploring a balance scale.

Teacher-Directed Given (TDG): The most structured of the classroom contexts which was essentially the same as TDS with the exception that the teacher would: (1) tell the children who they were to work with during the activity; and (2) give more explicit instructions to the children about what exactly they were to do with both the task materials and their partner(s).

Observational Categories

The following information was recorded with the aid of a behavioural observation checklist instrument for each observation:

Private Speech. The observer noted for each 30-second observation period whether or not the target child emitted private speech. Private speech was defined as any verbalisation by the child which was not explicitly addressed to another person, as indicated by either a pronoun reference, a gaze to another person, or one of several other signals of social intent, such as physical contact (see Feigenbaum, 1992). This definition, consistent with previous work in the field, incorporates each of the different private speech categories encapsulated by coding systems (Berk, 1986; Diaz, 1986), including inaudible muttering (utterances which are clearly words but not discernible) and whispers. The frequency of children's social speech (any speech which was not classified as private using the above criteria) was also recorded.

Type of Activity. The type of activity the target child was engaged in during the observation period was coded into one of three general categories of behaviour: *Work*, *Play*, or *Other*. "Work" was defined as any behaviour which was clearly oriented toward the attainment of a particular task goal. The goal-directed activities which made up the work category included mostly academic tasks like writing, making something with the help of a model, tangible problem-solving, weighing objects on a balance, and completing a handout from the teacher. "Play", on the other hand was operationalised as behaviour which was not oriented toward a specific task outcome, but rather was an end in itself (Garvey, 1977). Play behaviour included physical play (running, touching, dancing), manipulatory play (spinning a toy on one's finger, repetitively pouring water from one cup to another), and fantasy play ("house" or "school"). The "Other" category included all other miscellaneous classroom behaviour like going to the bathroom, eating, standing around looking confused, or watching others from a distance.

Presence of Others. Whether or not the target child was alone or with others during an observation period was also recorded. If the target child was with one or more persons, the number and type (prekindergartener, kindergartener, 1st-grader, or adult) of individual(s) were also recorded.

Amount of External Regulation. The degree to which a child's behaviour was being externally regulated was coded by having the observer note in which of the four classroom contexts (FP, PDR, TDS, TDG, in ascending order of external control) the observation was taking place. Thus, the classroom activities were thought of as representing four points on a continuum of teacher regulation with *Free Play* (FP) being the classroom context with the least amount of other-regulation and *Teacher-Directed Given* (TDG) representing the context with the most. An attempt was made to observe each child an equal number of times in each of the four classroom contexts.

Reliability of Observation

Inter-observer agreement, calculated during the pilot testing of the observational checklist instrument when two coders conducted 40 simultaneous observations of eight children, was 0.78 (number of others present), 0.88 (private speech: yes/no), 0.95 (activity: work/play/other), and 1.00 (social context: alone/with children/with adult). Determining the number of others present during the observation periods proved difficult for two reasons. First, the long (30-second) duration of the observation period

permitted people to approach the target child/group and/or leave the child/group within the same observation. Secondly, at times there would be another child or two looking in on the target child's/group's activities and in these cases, the point at which the peripheral others became definitely involved with the activity was hard to define. Number of others present, therefore, was not included in the analyses. As noted earlier, however, the more important distinction related to social context (i.e. alone/with children/with adult), was not problematic.

RESULTS

Two of the subjects from the mixed-age class withdrew from the school during the second week of the programme, and two children from the same-age class attended the programme only sporadically. Because these four children had only been observed a few times, their data were omitted from all subject-level analyses. Because of the unequal numbers of observations between children and between contexts, the private speech frequency data were converted to percentages of observations in which the children used private speech. An arcsine transformation was then performed in order to stabilise the data for ANOVAs and *t*-tests. One- and two-way mixed and repeated-measures ANOVAs were then conducted, with the dependent variable being the percentage of observations in which the child used private speech and independent variables being those related to context (class, classroom context, social context, and type of activity). In addition, chi-square and multiple logistic regression procedures (both with observations as the unit of analysis) were used.

Distribution of Observations

Before discussing the results of the analyses concerning the relationship between the contextual variables and private speech, it is important to note that because of the naturalistic design of the study, there were unequal opportunities to observe private speech co-occurring with all levels of each of the variables. For the variables which were determined by the programme and the teacher, namely *classroom* (MA, SA) and *classroom context* (TDG, TDS, PDR, FP), an attempt was made to equalise the number of observations in each setting—to have the same number of observations in each classroom and to observe each target child in the four classroom contexts an equal number of times. However, the other variables of interest, namely, *activity* and *social context* depended on what the child was doing, and who he or she was with during the time of the observation. Thus, for example, although there were many observations during *Play/Disc/Review* where the target child was playing with other children, there were few, if any, occasions during *Free Play* when the child was with an adult, working on a

the children in the mixed-age class used more private speech (17% of the observations) than those in the same-age class (13%), this difference was not significant. Because the same pattern of private speech usage was observed in both classes across the four classroom contexts, the classes were combined for further analyses of classroom context.

Private speech usage did vary reliably and systematically depending on the amount of external regulation provided by the classroom context [$F(3, 13) = 5.59, P < 0.01$], according to the main effect for classroom context in a 2×4 mixed ANOVA with class (MA, SA) as a between-subjects variable and classroom context (TDG, TDS, PDR, FP) as a within-subjects variable. The percentages of observations in which children used private speech were: 18.6% for TDG; 25.7% for TDS; 11.4% for PDR; and 4.1% for FP. As hypothesised, it was a classroom context with an intermediate amount of external structure (TDS) which elicited the greatest amount of private speech from the children (26% of the observations). This finding, combined with the fact that: (1) adults were more often present with the children during TDG (53% of the observations) compared to TDS (24%); and (2) that the children rarely used private speech (9% of the time) when they were in the presence of adults, gives considerable support to the first hypothesis that private speech is used under conditions of intermediate amounts of teacher-provided structure.

In order to examine more closely the differences between each of the four classroom contexts, a series of six pairwise *post-hoc* multiple comparisons were performed. Correlated-pairs *t*-tests (using Dunn's corrected critical value) were chosen as the *post-hoc* comparison procedure because, according to research to date, this procedure provides the best control of alpha with repeated-measures data, especially when satisfaction of the sphericity assumption is questionable (see Toothaker, 1991). These analyses revealed that the amount of private speech used in TDG was greater than that in FP [$t(15) = 3.02, P < 0.05$] and that children used more private speech during TDS compared to FP [$t(16) = 3.80, P < 0.05$]. The remaining pairwise contrasts were either nonsignificant or marginally significant. Children's social speech did not vary much by classroom context in that the kindergartners on average talked to other children during 63, 68, 64, and 72% of the observations in TDG, TDS, PDR, and FP, respectively. None of these differences reached significance.

Activity. The second hypothesis received strong support from the data. In an effort to control for the confounding effects of social context on activity and to minimise the number of subjects that would be deleted due to missing data, the analysis of frequency of private speech by activity type was limited to observations when the children were with other children (63% of the observations). While with other youngsters, considerably more private

speech was used by the children when they were engaged in goal-directed activity (25.9%) compared to free play (5.9%) or other (6.3%) activities [one-way repeated-measures ANOVA: $F(2, 15) = 10.86, P < 0.001$]. Pairwise contrasts (correlated-pairs *t*-tests using the Dunn critical value) indicated that the amount of private speech used during work was significantly greater than that during both play [$t(18) = 4.59, P < 0.01$] and other activities [$t(16) = 4.03, P < 0.01$], and that the amount of private speech used during other activities did not differ from play.

Social Context. Although, in general, more private speech was used when the children were alone (14.3%) or with other children (12.5%) than when they were either in the presence of an adult (10.5%) or exclusively with an adult (3.1%), these differences were not statistically reliable [$\chi^2(3, N = 710) = 3.19, P = 0.36$]. In the hope that an effect of social context on private speech would be obtained if activity were held constant, another chi-square analysis was then performed restricting the observations to those in which the target child was engaged in task activity (the activity where private speech is most commonly observed). However, this analysis also failed to reach significance [$\chi^2(3, N = 288) = 4.73, P = 0.19$]. Thus, in the present investigation, the extent to which young children used private speech did not appear to be affected by whether they were alone, with other children or in the presence of an adult.

However, an interesting and unexpected finding with regard to the effect of social context on private speech was that children's use of private speech while with other children varied systematically depending on the age of the accompanying peers. Kindergartners in the mixed-age class used significantly more private speech with their younger peers (27.6%) than with either same-age (7.4%), or older (3.9%) companions [$\chi^2(3, N = 226) = 8.94, P < 0.05$]. Thus, the older the companion, the less private speech kindergartners use and if the accompanying peers are of a mixture of ages (younger, same-age, and older), children use an intermediate amount of private speech (14.5%). Single degree-of-freedom contrasts between the six possible pairwise comparisons revealed that children used significantly more private speech while in the presence of younger classmates compared to same-age [$\chi^2(1, N = 83) = 6.2, P < 0.01$] and older [$\chi^2(1, N = 55) = 5.6, P < 0.01$] classmates. None of the other contrasts reached significance.

Gender. Another interesting finding of the present study was the suggestion of a gender difference in the amount of spontaneous private speech used by young children. There was a strong, albeit nonsignificant trend [$t(17) = 1.94, P = 0.07$], for boys to use more private speech overall (16% of the time) than girls (8%). Due to the fact that girls spent more than twice as much of their time with adults than did boys (7% vs. 3%), and

because less private speech is generally used by children when they are in the presence of adults, it was thought that this gender difference could be due to the girls' extra time with the teachers. However, even after limiting the observations to those that occurred when the children were with other children working on a task, boys used nearly twice as much private speech (33%) compared to girls (17%) [$t(18) = 1.89, P < 0.05$].

Predicting Private Speech. In an effort to tease out the individual and combined contributions of each of the variables in predicting children's spontaneous use of private speech, the data were also submitted to multiple logistic regression procedures. The logistic regression model is one in which a binary response variable can be predicted from a series of categorical variables using the logit transform (Agresti, 1990). Using all of the 710 observations as the units of analysis, the procedure essentially estimates the probability that private speech will occur during the observations, based on the levels of each of the independent variables. One advantage of the logistic regression model is that, like regular least squares regression, it gives partial parameter estimates for each of the effects while controlling for each of the other variables in the model. Thus, in this case, this procedure helps determine the unique contributions of each of the contextual variables to

TABLE 2
Odds Ratios for Each of the Pairwise Contrasts

Variable	Contrast	Odds Ratio
Classroom	(Mixed-Age) over (Same-Age)	1.25
	(Work) over (Play)	3.47
	(Other) over (Other)	4.14
Classroom Context	(Other) over (Play)	1.19
	(TDS) over (TDG)	1.05
	(TDS) over (PDR)	2.38
Social Context	(TDS) over (FP)	4.76
	(TDG) over (PDR)	2.22
	(TDG) over (FP)	4.54
	(PDR) over (FP)	2.00
	(Alone) over (With Adult)	9.93
Activity, Classroom Context, and Social Context	(Alone) over (With Adult + Children)	2.22
	(Alone) over (With Children)	1.01
	(With Children) over (Adult)	9.82
	(With Children) over (With Adult + Children)	2.22
	(With Adult + Children) over (With Adult)	4.45

Note. The odds ratios reflect how much more likely the children were to use private speech in one condition over another, for each pairwise comparison, within each of the variables: Class, Activity, Classroom Context, and Social Context.

predicting children's use of private speech while statistically controlling for the interrelationships between each of the predictor variables (i.e. taking into account the lack of independence between, say *activity* and *classroom context*). A standard way of interpreting logistic parameter estimates is to convert them into odds ratios which express how likely the outcome (i.e. private speech) is in one condition relative to another.

The model tested was *private speech* (yes, no) = *child's activity* (work, play, other) + *social context* (alone, with other children, with an adult, with an adult and children) + *classroom context* (TDG, TDS, PDR, FP) + *classroom usage* [$\chi^2(28, 681) = 138.78, P < 0.001$], and indicated that only *Activity* and *Classroom Context* contributed significantly to the prediction, with goal-directed task activity being the best predictor of private speech, and classroom context/amount of external regulation adding significantly to the prediction even after children's activity was taken into account. Table 2 provides the odds ratios for each of the pairwise contrasts within each of the variables. As can be seen in the table, children were 3.47 times more likely to use private speech while engaged in goal-directed task activities as compared to play activities, and 4.14 times as likely to emit self-verbalisations during task activities compared to other activities. Kindergarteners were only slightly more likely to use private speech during TDS relative to TDG, but they were more than twice as likely to use private speech in either of the teacher-directed contexts as compared to PDR, and more than four times as prone to use private speech in the teacher-directed contexts relative to FP. Also, youngsters were more than nine times as likely to use self-talk when they were alone or with other children, as compared to when they were with an adult. These large odds ratios concerning the presence of only an adult, although accurate, should be interpreted with caution due to the limited number of observations in which the target children were exclusively with an adult.

Interestingly, the effect for social context approached significance ($P < 0.06$) in this analysis, which suggests if one controls for individual differences in children's private speech usage (the *subject* variable in this model), in addition to controlling for the child's activity, social context becomes a reasonable predictor of when youngsters will talk to themselves. That is, given the same activity, children's private speech usage will vary systematically according to who they are with, as they will generally use the most self-regulatory language when they are alone, a modest amount when with other children, and the least when an adult is present.

DISCUSSION

Perhaps the strongest finding in this investigation is that private speech occurs mostly in situations in which the child is engaged in a problem-solving or goal-directed activity as compared to other types of activity. This finding replicates that of previous researchers in the classroom (Berk & Garvin, 1984), confirms in a more environmentally valid setting the earlier laboratory findings (Dickie, 1973; Rubin, 1970), and gives strong support to the idea that young children do use private speech as a tool for guiding their behaviour in challenging academic situations which require executive types of abilities. It is essential for educators to note that private speech is an important tool used by children to guide and regulate their problem-solving activities, and that its use should not be discouraged by a teacher who wishes to maintain a "quiet" classroom.

Another finding of the study was that private speech varied systematically depending on the external regulation given by the classroom context. Of the four classroom contexts in which children were observed (TDG, TDS, PDR, FP), it was a context with an intermediate amount of classroom structure, *Teacher-Directed Spontaneous* (TDS), in which the most private speech was used. This, combined with the increased presence of adults during TDG, supported, albeit somewhat indirectly, our first hypothesis. The data suggest that a curvilinear relationship exists between the amount of external regulation provided by a classroom situation and the amount of self-regulatory speech used by young children. In other words, young children's use of private speech is maximised in those situations which provide enough structure to facilitate their active engagement in cognitively challenging activity, and private speech is minimised in contexts which provide either a great deal of external behavioural regulation or very little external structure. For example, during a highly structured, teacher-directed activity where the teacher is telling the children exactly what to do each step of the way, children do not need to use as much self-regulatory speech to guide their behaviour because guidance is being provided for them externally. Likewise, during a highly unstructured activity, like free play outside, children do not need to use much private speech because there are fewer cognitively challenging demands being placed on them.

A caveat, however, is in order concerning the global way in which degree of external or teacher-given structure was operationalised in the present study. Rather than measure directly the amount of verbal or physical regulation provided by the teachers in each of the four classroom contexts, we classified external structure simply by noting in which of the four global classroom settings (TDG, TDS, PDR, FP) each observation took place, and then combined this information with whether or not an adult was present or not. Although the four settings can be meaningfully ordered in terms of the

amount of structure they seem to provide for the children in this way, the contexts clearly differed in other ways as well. For example, free play outside (FP) also differs from the other classroom contexts in terms of the types of activities that occur (i.e. more emphasis on social interaction, physical games, and gross motor behaviour in FP). Thus, without a direct measure of teacher-provided structure it is probably best to consider the above results as preliminary and as hypotheses to be better tested in future research. A logical step for research in this area would be to observe children who are engaged in the same type of activity but with varying amounts of adult instructions and control, and see what effect differing levels of adult direction has on children's spontaneous use of private speech.

Interestingly, the *Teacher-Directed Spontaneous* context was the one in which children spent the highest proportion of their time (70%) engaged in goal-oriented task activities. This is compared to 58% for TDG, 45% for PDR, and 9% for FP. This result may seem counterintuitive to educators who believe that children spend more time on task during the most teacher-directed or structured activities. Nevertheless, the results of this study suggest that if the goal is to maximise the amount of time young children spend working productively toward a goal, then the best strategy is to provide a framework of carefully selected instructional goals and appropriate task activities, but then to let children be actively engaged in setting priorities, planning their approach to the task, experimenting with possibilities, monitoring feedback, and evaluating their own work. Although it is still unclear what exactly the factors were that distinguished TDG from TDS in terms of facilitating children's goal-directed activity, the observer's impression was that the difference between the two contexts could have been due to the teachers during TDG: (1) constructing ineffective and a-priori heterogeneous and homogeneous groupings of the children for the tasks; and (2) choosing activities which were, at times, either outside of the children's zone of proximal development (i.e. too easy or too difficult) or simply not very engaging for the children.

The fact that both private speech and goal-directed task activity were most common during the TDS context could lead one to the conclusion that it was simply the goal-directed activity which accounted for the extra private speech and not the classroom structure. However, the results of the logistic regression procedures indicated that both activity and classroom context contributed unique variance to the prediction of private speech. Even after activity was entered into the model, classroom context continued to add significantly to the prediction.

The results on the effect of mixed-age interaction on private speech from this study are interesting in that they depend on the level of analysis. At the classroom level, no significant difference in the overall amount of private speech used by the children in the two types of classes was observed. At the

individual level, however, examining the peer interactions in the mixed-age class, significantly more private speech was observed when the kindergarteners were with their younger classmates, and less private speech was observed as the age of an accompanying peer increased. Thus, there seems to be supporting evidence from this investigation for both of the hypotheses noted earlier regarding the consequences for private speech of placing children in mixed-age settings. Because the target children in this study were kindergarteners (the children in the middle of the age hierarchy) both the facilitating effect of mixed-age grouping on private speech (i.e. when the children were with their younger counterparts), as well as the suppressing effect of mixed-age grouping on private speech (i.e. when the kindergarteners were with their older classmates) were observed.

Why kindergarteners use more private speech while with their younger counterparts, and what exactly they are doing at these times is not clear. However, the fact that they do use more self-regulatory language under these circumstances is commensurate with the claim by advocates of mixed-age grouping (Katz et al., 1990; Longue & Graziano, 1986) that older children's self-regulation appears to be benefited by being grouped with younger peers. A closer examination of the observations involving children interacting with their younger peers revealed that about 70% of the private speech utterances occurred when they were mutually engaged in goal-directed task activities. Although not directly assessed in the study, it is most likely the case that much of the private speech used by kindergarteners in these dyadic situations, in addition to having a self-regulatory function, served as an indirect regulator of the younger child's attention and behaviour as well. Defining private speech as verbalisations which are not *explicitly* addressed to another person includes in this category children's speech which appears to be "quasi-social" or to have dual functions—that is, speech which not only guides one's own activity, but communicates one's behaviour and thinking processes to another person and regulates the other individual's attention and activity as well.

The suggestions from the work of Tudge (1990) and Azmitia and Perinutter (1989) were also supported in the present study as the kindergarteners in the mixed-age class used less private speech while they were with older classmates. This observed suppression of self-regulatory speech when youngsters are with older classmates suggests that the older children are at least indirectly regulating the behaviour of their younger counterparts, just as the target kindergarteners were guiding the joint activities of the younger children with their private speech. Although the dynamic quality of children's peer interactions was not measured in the study, it was *not* our impression, as observers, that the older children were being overly controlling with the kindergarteners, or that the kindergarteners were being overly directive in their interactions with their

younger peers. In fact, the children seemed to be, for the most part, reasonable "scaffolders" of younger children's activities, as a good deal of effective co-operation and mutual collaboration occurred among the small mixed-age groups.

Thus, at the classroom level, it appears that mixed-age grouping does not produce an effect on the overall amount of self-regulatory language used by children in the classroom because the observed differences in private speech usage due to the age of children's accompanying classmates cancel each other out when they are averaged across both social situations (when the kindergarteners are with older classmates and when they are with younger classmates). Mixed-age grouping could influence private speech production through a different route, however, by affecting the type of activity that goes on in the classroom. There is still the possibility that more goal-oriented task activity goes on in mixed-age, as compared to same-age classrooms. That the present study found a marginally significant ($P = 0.08$) difference in the amount of goal-directed activity in the two classrooms (greater in the mixed-age class) is interesting, and suggests that more research should be conducted regarding this question.

An obvious limitation of the present study with regard to increasing our understanding of the effect of peer age on private speech was that the actual behaviour of the older and younger children during the observations was not recorded. Clearly, further research is needed in order to understand the content and function of the dynamic social interaction which takes place during these mixed-age situations, and to explore the effect of mixed-age interaction on the self-regulatory development of young children. Another limitation of this study is the lack of a content analysis of the private speech used by the children. As it was not possible to record the actual speech emitted by the children, the data from this study indicate only whether or not during each of the observations the youngsters were talking to themselves. The assumption which remains untested in the present study is that most of the private speech used by the kindergarteners was self-regulatory in nature. This assumption, however, seems reasonable on two accounts. First, previous research has shown that the great majority of children's private speech at this age is task-relevant and thought to have a self-regulatory function, as typically very few of children's utterances are considered by researchers to be "task-irrelevant" and "self-stimulatory" (Berk & Garvin, 1984; Fraucnglass & Diaz, 1985). Secondly, there is some question in the literature as to whether the relatively rare "task-irrelevant" types of utterances should in fact be considered nonregulatory (see Diaz, 1992). Even private speech utterances labelled "self-stimulating word play" or "task-irrelevant affect expression" can serve important motivational/emotional functions, such as regulating one's emotional arousal and maintaining one's motivation to continue with a task. This is not to say,

however, that all forms of self-talk are strictly self-regulatory in nature. Other types of private speech are known to exist, such as the speech which accompanies a toddler's solitary fantasy play in the home, or the evening "crib talk" of an infant (see Nelson, 1989), and these types of speech are probably different in terms of their form and function than the speech which was observed in this study.

There were no significant differences in private speech usage depending on whether the children were alone, with other children, exclusively with an adult, or in an adult's presence. The present study, therefore, fails to replicate many of the earlier findings on the effect of social context on private speech (Berk & Garvin, 1984; Dickie, 1973; Kohlberg et al., 1968; Marlew et al., 1978; Rubin et al., 1971; Vygotsky, 1934/1962), but is consistent with more recent work (Behrend et al., 1992) in suggesting that what is important for children's spontaneous use of private speech is not so much whether other people are present or not, but what it is the people present are actually doing. The fact that an effect for social context was almost obtained ($P = 0.06$) in the logistic regression model is interesting as it suggests that if one controls for the child's activity and individual differences in private speech usage, children's social context does begin to predict when they will talk to themselves. This helps account for why, under laboratory conditions, researchers have found an effect for social context, whereas it has proved difficult in the present investigation. In the laboratory, contextual conditions (most notably—the child's activity) are held constant while the presence of others is systematically manipulated. In naturalistic studies like the present one, there is little or no control over these variables and it is more difficult to uncover isolated effects. The failure to obtain an effect of social context on private speech is not surprising, however, given the unequal distribution of observations with respect to this variable. As can be seen in Table 1, there were very few observations where the child was alone, and only limited opportunities to observe the children either exclusively with an adult, or in the presence of an adult.

Lastly, the suggestion of a gender difference in the amount of private speech used by young children is interesting and not without precedent. Duncan (1991) also found that 4- and 5-year-old boys were more likely to use private speech than were girls, and Berk and Garvin (1984) reported that, in their sample of 5-, 8-, and 10-year-old elementary school children, the boys used significantly more of the egocentric or "immature" types of private speech than did girls. We interpret this gender difference in private speech usage to be due to at least two factors. First, it is consistent with the well-documented finding in the clinical literature that self-regulatory difficulties or disorders (i.e. Attention Deficit Hyperactivity Disorder, impulsivity, hyperactivity) are more commonly observed in boys than in girls (Ross & Ross, 1982). If private speech is a tool used by young children to

gain self-regulatory control over behaviour, and if boys have, for whatever reason, more difficulty with impulsivity and inattention, then it makes sense for boys to engage in relatively more private speech in order to maintain similar levels of functioning. They simply need to use this self-regulatory tool more often. Also, it is commonly reported that boys and girls mature at different rates. Given that girls are, in some ways, more biologically mature than boys, and given the well-documented curvilinear relationship between age and private speech (Frauenglass & Diaz, 1985; Kohlberg et al., 1968), it is logical that boys would use more private speech because girls of the same age are farther along on the developmental trajectory of internalising their private speech.

In summary, young children use a substantial amount of private speech in the classroom. Kindergarteners' private speech appears systematically in situations where it can be used as a tool for self-regulation. Classroom contexts vary in the degree to which they promote self-direction through private speech. This study suggests that if one is interested in fostering young children's development of self-regulation or in observing children's use of private speech, the optimum context is one which provides an intermediate amount of structure and allows the children to engage in challenging goal-directed activities. This investigation replicates, in a naturalistic setting, a number of earlier findings from private speech researchers and describes the impact of novel contextual variables, such as classroom social organisation and structure, on young children's use of self-regulatory language.

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