Social processes and creative collaboration in children

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Although there is an extensive body of literature that investigates the process and outcomes of children's collaboration on scientific reasoning tasks, very little work has focussed on the nature and quality of children's collaboration on creative tasks. One study reported here used a questionnaire to music teachers to ask about their typical design of musical tasks in the classroom and the factors that influenced these decisions. A further study reported here investigated the effects of friendship, gender and previous musical experience upon the interactional processes and musical outcome of children's collaborative compositions. The design included comparison between friendship pairs and non-friendship pairs and also between males and females, with 11-12 year old children at an English middle school. All pairs consisted of one child with previous musical experience and one child without. All compositional sessions were video taped and the musical and verbal elements were coded with reference to the proportion of transactive and non-transactive elements present. Results demonstrated that the communication (both verbal and musical) between the friendship pairs was qualitatively different from the communication in the non-friendship pairs. Specifically, the friendship pairs showed more transactive communication and, when a teacher rated the final compositions, the friendship pairs scored significantly higher. Multiple regression analysis highlighted that the amount of transactive communication was a significant predicator of the quality of the children's composition. The results are discussed with reference to the nature of communication, the impact of friendship and the assessment of creative work.

Introduction

In recent years there has been a healthy growth of research into many aspects of children's collaborative learning, as witnessed both by the papers in this special issue and by the range of literature on which they draw. Much of the research to date on children's collaboration has however focussed on their work on solving scientific and mathematical problems, asking children to complete structured tasks to arrive at a correct solution (e.g. Howe, Tolmie, & Rogers, 1992). In this tradition of work, the emphasis is primarily on the degree of learning achieved by children, and pre- and post-test designs establish the extent to which children acquire an understanding of a particular concept or form of reasoning as a result of the collaborative working period. We have learnt much from such studies about the key factors influencing the success of children's learning on these tasks, such as the importance of reasoned dialogue (Barbieri & Light, 1992), the role played in mediating learning by tools such as computers (Säljö, 1999) and each child's level of understanding relative to each other (Howe & Tolmie, 1999). However, as we aim to develop our understanding of collaborative learning further it is important to study other topics on which children work together. For example, in some areas of the curriculum (e.g. music, creative writing, art) there is an emphasis on creativity rather than concept or skill based learning and there is no "right answer" for the children to strive for, or particular way of thinking for them to learn. One of the challenges in studying collaborative work in these realms is to establish which of the variables found to be important by studies focussing on science and maths can be generalised to other areas of the curriculum. In this paper we begin this process and explore aspects of children's work as they compose and perform music together, asking what is involved as children collaborate to create.

Whilst there is little research on the nature of children's collaboration on creative tasks, music is one of the curriculum areas where children very commonly work together – on compositions, improvisations and in performance. In a study by one of the authors (Morgan), 60 teachers from a range of primary schools in the UK were questioned about their music teaching strategies and a number of factors emerged which typically guide the organisation of lessons for 7-11 year olds in British schools. It was found that the majority of teachers put children into pairs or small groups for music composition, based both on existing friendships and the children's relative abilities. In these tasks, children are typically asked to work together to create, then perform and evaluate their own original music, developing themes or styles suggested by class discussions with the teacher. Very few of the teachers reported ever setting children work to do in music lessons by themselves, underlining the importance of the collaborative context for current UK school music teaching, and the need to expand our research into studies of such creative areas of the curriculum (Morgan, 1999).

One aspect of interaction that has been consistently found to be associated with productive collaboration is the presence of reasoned dialogue (Berkowitz, Gibbs, & Broughton, 1980; Mercer, 1999; Teasley & Roschelle, 1993). Children who actively question and extend the information provided by their partners and justify and explain their own ideas in a way that helps their partner understand their perspective, seem to be more successful in achieving the task objectives. Whilst this has been shown in studies of scientific and mathematical reasoning, Rogoff (1990) suggests that the main task for partners working together on any task is to actively engage and negotiate with each other, thereby establishing a shared social reality. In doing this, Rogoff argues that partners use dialogue to put ideas together which would otherwise not have occurred to the person working alone. This opens up the possibility that joint engagement through dialogue may be particularly helpful in creative tasks where the aim is to come up with original ideas. As research on collaboration in creative writing has shown, working in pairs and groups is an important means of stimulating imagination and creativity and an excellent way of allowing children to be each other's evaluative audience (Johnson, Crook, & Stevenson, 1995).

We argue here that analysing the processes involved in children's collaborative interactions – the way in which they engage with each other through their talk and negotiate ways of approaching the task – is likely to be a fruitful area for investigation as we explore what happens

in creative collaborations. In researching the nature and content of such collaborations, a key feature of working with music can be drawn on – that music provides another channel of communication between the children besides their talk. This other channel can express thoughts, emotions and ideas just as words can (indeed, learning how to communicate through the medium of music is a key aim of National Curriculum music teaching). Thus, if we are to study the negotiation processes in collaborative compositions we will need to examine both the verbal *and* the musical channels of communication. However, whilst several theorists have suggested that talk and music might fulfil similar functions in communication (Aldridge, 1996; MacDonald, O'Donnell, & Davies, 1999), very few empirical studies have attempted to study the ways in which music might be used to communicate between individuals as they compose or perform.

A series of studies (reported in detail by Morgan, 1999) has begun this process of studying musical communication during collaborative periods of composition and performance. Her studies were designed to assess the importance of different types of communication between children working collaboratively on various music tasks. The main focus of the research was to establish whether the children communicated their ideas through the music itself, and if so, whether this form of communication was more or less important than verbal communication for group productivity. Morgan found clear evidence that music can be used as a separate channel of communication, and this is a feature of collaborative music composition that makes it qualitatively different from other collaborative tasks. One of the key features of the study reported below is to investigate both channels of communication in more detail and to explore how each impacts on the other, and their influences on the quality of the final composition.

Given the importance attached to the communicative process in creative collaborations, a key focus for the study reported below was an examination of the impact of social factors such as the children's relationship with each other on the nature of the interactions. From the questionnaire study conducted by Morgan (1999), it is clear that friendship was one factor considered by teachers in designing classroom music tasks, but previous research has not investigated what the influence of this factor might be on such tasks. We would expect friends to be particularly adept at establishing the shared social reality that Rogoff suggests is at the heart of productive collaborations. As a result, friends might be expected to be more successful in these tasks than children who do not know each other, since they are used to establishing and maintaining a shared social reality in their everyday relationship and are used to generating and developing ideas together. Friends have experience of taking each other's perspective and engaging in joint planning (Hartup, 1996) and they also have a history of shared experiences and engage in more play and pretence together (Miell & Faulkner, 1994).

There has been relatively little research concerned with the effects of friendship on children's collaborative work, and there is conflicting evidence from these few studies about the impact that friendship has. One possible reason for the lack of agreement between different studies is that the nature of the task is influential. Azmitia and Montgomery (1993) established that friends were more likely to use successful problem solving strategies than non-friends (i.e. friends evaluated their own and their partner's proposed solutions and engaged in more transactive dialogues), but this effect was only found with more difficult problems. The study reported below (conducted by the first two authors) examines what effects friendship might have on the collaborative interaction around a creative task.

Method

Sample

Morgan's (1999) questionnaire study of teachers established that children in classroom musical activities are usually grouped in pairs or small groups based on existing friendship groupings and relative abilities. In the experimental study reported here, 20 pairs of children drawn from Year 7 classes at an English middle class school were studied. Each pair was

made up of one child with at least some experience of instrumental music lessons (ranging from 6 to 72 months) and the other with no experience. Half of these pairs (10) were made up of mutual friends from the same class and the other 10 pairs were made up of children from different classes who had not nominated each other as friends. Since the study involved friendship pairs who were all same sex pairs, the non-friend pairs were also same sex children.

School music tasks

Morgan's questionnaire study asked teachers about the tasks that children are typically asked to do, and the instruments on which they usually work in primary classes. They reported typically using percussion, pitched and electronic musical instruments and these were the instruments made available to the children in this study. The teachers reported that an important feature of typical music composition tasks was for the children to gain an understanding of the structure of music. For example, children were taught the use of patterns, repetition and variation of musical ideas, melodic phrasing and so on. Other features that the teachers felt were important were the use of rhythm to maintain a steady flow of musical ideas, the use of different pitches and dynamics and an understanding of the various moods of music. They reported that children are taught that music can represent external stimuli, such as pictures and stories, and are encouraged to experiment with different ideas and instruments, to improvise and experiment with how instruments move and sound. These views provided an indication of the depth and breadth of children's typical music education in England, and enable composition tasks to be developed accordingly.

Experimental task

Children were asked to compose and record a piece of music that was about the rain forest. They were reminded about the importance of various structural elements such as pitch, dynamics and rhythm, and encouraged to experiment with any of the instruments available as well as with their voices to represent any aspect of the rain forest. They were asked to structure their composition with a beginning, middle and end, and were given 15 minutes in which to develop their final piece.

Coding the communication

All the sessions were first transcribed from the video and then coded by research assistants. The verbal communication coding was carried out following the scheme developed by Kruger (1992) from that suggested originally by Berkowitz et al. (1980), which divided up talk into "transactive" (where partners build on and extend previous utterances) and "non-transactive" categories. We also wanted to consider the nature of the musical communication between the children, and the extent to which the children could engage with each other's music as well as the ideas that they exchanged verbally. To investigate this we developed a musical coding scheme also based on Berkowitz et al.'s notions of transactive and non-transactive communication (see Appendices for all codes used).

Assessment of outcomes

We were also interested in the quality of the final product produced by the children. With this in mind, an experienced school music teacher (not from the school used for data collection) listened to each of the final performances of the compositions that had been recorded on audiotape. She was asked to rate each composition on a series of rating scales developed by Hargreaves, Galton, and Robinson (1996) and used subsequently in the Morgan (1999) studies.

Results

Miell and MacDonald (2000) report in full the results of the experimental study discussed here. In the following section we concentrate on the findings from that study which address the issue of differences in talk and music due to the degree of friendship between children.

Teacher evaluations

In order to investigate the effects of friendship and gender on independent ratings of the compositions a 2 (friend *vs.* non-friend) x 2 (male *vs.* female) ANOVA was carried out. The dependant variables were the total scores on the scales developed in research by Hargreaves et al. (1996) on teacher's evaluative dimensions in music education. This analysis yielded a significant main effect for friendship ($F(1,26)=10.65$, $p<.01$). The minimum possible score on the scale was 0 and the maximum was 63. The compositions by friends obtained a mean score of 33.78 ($SD=10.21$), which contrasts with the non-friend mean of 10.65 ($SD=5.32$). These results demonstrate that the pairs of friends produced compositions that were rated overall as significantly better than the compositions produced by pairs of non-friends. No significant effects were obtained for gender. Having established that there were differences in the rated quality of the compositions produced by friend and non-friend pairs, we examined in more detail the interactive processes (both verbal and musical) in the children's collaborations.

Analysis of talk

After the coding process of the video material was completed, each child's total scores for their contributions in each of the verbal and musical coding categories were calculated. A 2 (friend *vs.* non-friend) x 2 (male *vs.* female) x 2 (experienced *vs.* non-experienced) MANOVA was calculated to investigate any differences in the nature and pattern of communication across the different categories of talk. This analysis focused on the amount of talk in each category as a proportion of the total amount of talk. The dependant variables, 11 in total, were the mean proportions of utterances in each of the categories in the verbal coding scheme (see Appendix 1). A main effect for friendship was obtained ($F(10,7)=15.45$, $p<.01$) indicating that the communicative style of the friends was significantly different from that of the pairs of non-friends. Looking at the pattern of talk across individual categories provides more detailed information on these characteristic styles. Friends made proportionally more transactive statements based on their partner's ideas than the non-friends ($F(1,16)=82.25$, $p<.01$), with 19.3% of friends' talk in this category, whereas non-friends had only 7.0% of their talk in this category. Friends also gave proportionally more transactive responses to their partners questions than the non-friends ($F(1,16)=11.02$, $p<.01$), with 7.1% of their talk in this category, but only 1.2% of non-friends' talk being transactive responses. Finally, the friends gave a significantly higher proportion of information to their partner (11.5% of their total talk) than non-friends (4.6% of total, $F(1,16)=17.81$, $p<.01$). Non-friends produced a significantly higher proportion of utterances in two other categories, both of them non-transactive. They gave simple agreements in 22.2% of utterances whereas friends agreed in this way only 11.7% of the time ($F(1,16)=9.85$, $p<.01$). Non-friends also used more unelaborated disagreements than the friends ($F(1,16)=5.69$, $p<.05$) with 4.1% of the non-friends', but only 1.0% of the friends' total talk in this category. Some of the key features of this typical pattern of interaction between friends can be seen in the example below, where there is a clear mutual focus of attention and a good deal of development of each others ideas:

Louise: How can we get... like... the trees swaying?

Nicky: Use that (brush on drum), yeah, oh yeah (plays it)

Louise: Yeah (plays it herself)

Nicky: I could do something with this (plays beater against bell), then you could go like that
          for the wind

Louise: for the trees in the wind

Nicky: yeah

(both play)

Louise: Then the animals could come out or something

Nicky: Yeah

Louise: and we could make up a tune on here (xylophone)

Nicky: that could be for when the sun's gone in... the animals start to move around... you
          make a tune

Louise: OK... (plays) like this?

Analysis of music

A second set of analyses was conducted to investigate the effect of experience, gender and friendship on the nature of music played by different pairs of children. A second 2 (friend *vs.* non-friend) x 2 (male *vs.* female) x 2 (experienced *vs.* non-experienced) MANOVA was conducted, using the mean total of music played in each category (see Appendix 2) divided by the mean total of all the music played as dependant variables. This analysis revealed a slightly different but compatible pattern of effects as had been found in the analysis of talk between the children. The analysis yielded a main effect for friendship ($F(6,10)=36.43$, $p<.01$), suggesting that a different style of music was produced across the various categories by the friends and non-friends. The friends offered proportionally more musical responses to their partners questions or enquiries than non-friends did ($F(1,16)=28.44$, $p<.01$), with the friends having 12.4% of their music in this category rather than the 5.8% of non-friends' music. The friends also played proportionally more motifs (9.3% of total) that were transactive musical elaborations of their partners ideas than non-friends (4.7% of total), ($F(1,16)=5.95$, $p<.05$). Within the non-transactive categories, the friends played proportionally less music directed to the self than the non-friends ($F(1,16)=98.21$, $p<.01$), with friends' music having only 7.8% in this category compared with 24.6% of the non-friends' music. Friends also played proportionally fewer musical propositions (10.5% of total) than the non-friends (18.3% of total), ($F(1,16)=15.32$, $p<.01$). The friends played proportionally more music, however, within one of the non-transactive categories (repeating a previous motif) than the non-friends ($F(1,16)=6.39$ $p<.05$). The friends had 45.6% of their music categorised as being a repeat of previously played motifs, whereas the non-friends only had 34.6% of their music in this category. (Although this category is designated a non-transactive form of music, it is one type of communication that has a rather different significance when comparing music to verbal interactions. To simply repeat a previous verbal utterance without significant change or development rarely serves a constructive purpose in interaction. However, in the process of composition, it is useful, indeed necessary, to repeat phrases or key sections of a piece being prepared in order to practice them before combining each section into the whole for the final performance).

Multiple regression analysis

Multiple regression analysis was employed to investigate further the relationship between the process and outcome variables. Two significant results were obtained when the teacher's score (the outcome variable) was used as a dependant variable in a series of stepwise multiple regression analyses. The predictor variables were the means for the total amounts of transactive and non-transactive music and talk (process variables). The mean total number of transactive utterances predicted 25.2% of the variance between the teachers scores (adjusted $R^2=.252$, $F(1,15)=6.38$, $p<.05$) and the mean total of transactive musical motifs predicted

22.7% of the variance in the teacher's score (adjusted $R^2=.227$, $F(1,15)=5.7$, $p<.05$) when the mean total number of transactive utterances was removed from the equation. The total number of transactive musical motifs and verbal utterances produced significant predictions of the teacher's evaluations independently of each other. However, when looked at together they do not predict any more of the variance in the test score than they do individually. This suggests that it is the total amount of verbal and musical transactive communication that was associated with the final score the children received for their composition. Specifically, the results suggest that the more transactive communication there was between the children the higher the final score awarded by the teacher for the children's composition.

Discussion

Friendship

The results of the experimental study reported here support previous research that has suggested how important mutual active engagement and reasoned dialogue are for productive collaboration. The results further suggest that this level of engagement is affected by the children's relationship with each other, a finding which supports previous work investigating the way in which children's friendships affect their work together. Azmitia and Montgomery (1993), examining why collaboration between friends might lead to increased success on scientific reasoning skills, found that the greater mutuality and involvement between friends led to greater support between the pair. Newcomb and Brady (1982) found that friends are more aware of the need to justify and explain their ideas to a partner. The results of the present study demonstrated that more transactive discussion was observed between friends, meaning that they made more elaborations, responses to and revisions of their own and their partner's ideas than the non-friend pairs and their compositions were rated more highly as a result.

The enhanced communication between friends is likely to be because their established shared knowledge and pattern of interacting allows them to anticipate each other's ideas, draw on experiences they have shared or previously discussed and work efficiently by allocating roles and tasks based on their established expertise and preferences. In the type of open-ended, creative task that we have examined here, non-friends have particular problems as they have no external structure or target end point to help them work together. Instead they have to not only decide on roles and a plan of action themselves but also need to work at developing the shared social reality which Rogoff (1990) has shown helps children to produce creative solutions.

Future research could extend these findings in a number of ways. For example, building on Azmitia and Montgomery's work (1993) which found that friendship had the greatest effect on pairs working on difficult problems, the task's level of difficulty could be varied and/or the nature of the task (e.g. amount of structure). Also, it would be interesting to explore non-friend pairs working together over a period of time, in order to investigate the processes by which they establish a workable shared social reality in order to collaborate more effectively (if indeed they do manage to achieve this).

Musical communication

Morgan (1999) suggested that in some situations of collaborative musical activity children would be more likely to present their ideas directly through the music and less likely to discuss their ideas verbally. In stating this she was highlighting how children could communicate through music, emphasising the importance of music as a separate and distinct channel of communication. She found that children did indeed communicate their ideas through the music itself, and its relative importance for group productivity was dependent on the nature of the task. For example, when the children were asked to compose a piece of music to represent the events of a story, they tended to talk through their ideas for developing the

composition. On the other hand, when the children were working on tasks concerned less with representation and more with musical structure and form, the amount of verbal interaction was significantly less than the amount of musical interaction. The experimental study reported here develops this approach to examine categories of talk and music at a micro-level. It reinforces the idea that the children communicate both verbally and musically and demonstrates that both forms of communication can be used to achieve interactional ends.

Links can be drawn here to the sociocultural literature examining various mediating tools for collaborative learning (Vygotsky, 1978). The musical instruments used, and indeed the music itself, provide tools for the children to use in communicating their ideas and developing their work together. As Morgan has shown, the ways in which talk and music are used vary depending on the nature of the task. The studies reported here suggest that it would be valuable to explore further the role of music as a mediator of children's collaborative work.

Assessment

In part, the present research has focused on important features of interaction among children for the production of a "good" musical composition. However, considerable debate exists as to how to assess effectively the products of creative activities such as musical composition (Barrett, 1998; Morgan, 1999). In other areas of collaborative learning such as scientific reasoning this problem is not so controversial as a correct answer is usually evident. In assessing creative work, Kratus (1989) and Best (1992) have stressed the importance of taking into account both the quality of the finished product and also the nature of the processes through which children produced the final work, suggesting that they are fundamentally interrelated. The experimental study reported here supports both Best's and Kratus' ideas, in that key process variables were indeed related to the outcome ratings of quality. The multiple regression analysis showed that the more transactive communication in evidence the higher the marks which were given to the compositions by the independent rater.

Conclusion

An experimental study was designed to assess the impact that social variables would have upon the process and outcomes of children's musical collaborations. The results demonstrated that friendship was a key factor influencing both the process and outcome of the task. The musical and verbal coding systems demonstrated that the children were communicating both musically and verbally while they composed and the friends produced proportionally more verbal *and* musical communication than non-friends. Also, multiple regression analysis highlighted that the more transactive communication the children produced (in music and talk) the higher the mark given to their composition by an independent rater.

Appendix 1

List of verbal codes and operational definitions

The first five are for simple non-transactive turns:

P   when the child *proposes* something – asserts/suggests it. e.g. "Let's use the drum", "I can make a good lion noise"

R   when the child *reiterates* something – repeats without substantial alteration. e.g. Child A: "When does the snake come in?" [Child B: "um..."] Child A: "When do we hear the snake?"

I   when the child provides *information* about something. e.g. "you can only just hear the sound"

A   when the child expresses explicit *agreement* about something. e.g. "oh yeah, right"

D   when the child expresses explicit *disagreement* about something. e.g. "No, that's C, D not C, E"

The remaining six codes are for transactive turns:

TS   Transactive statements are spontaneously produced critiques, refinements, extensions or significant paraphrases of ideas. Operations on the other's ideas (TSO) are labelled 'other oriented' (Child A: "key 18 gives us an insect noise" Child B: "that doesn't sound like insects, it's more like a big animal!"). Spontaneously produced clarifications of the child's own ideas are coded as 'self oriented' (TSS) (Child A: "I'll play 18" [Child B "OK"] Child A: "Wait a minute, not 18, it should be 8")

TQ   Transactive questions are spontaneously produced requests for clarification, justification or elaboration. Requests for elaboration of the partner's ideas are labelled "other-oriented" (TQO) (Child A: "make the tree felling noise again" Child B: "how did we do that – did we press key 20?") and requests for evaluative feedback on the child's own ideas are coded "self-oriented" (TQS) (Child A: "we want something that sounds smoother" [plays on keyboard] Child A: "what about that?").

TR   Transactive responses are clarifications, justifications or elaboration of ideas given in answer to a TQ. Responses that elaborate on the partner's ideas are "other-oriented" and coded TRO (Child A: "we could use that – what's that called?" Child B: "um... 'bells'... yes, try that, that could be what we need"), and those that elaborate on own ideas are "self-oriented" and coded TRS (Child A: "Now we need to make rain" [plays on xylophone] Child A: "That works... yes, tinkly rain noises").

(N.B.: We had originally included a further non-transactive verbal code, for "off-task chat", to include any utterances which were not concerned with the task in hand. However, we observed so few of these utterances (a total of 9 utterances across all sessions), that we decided not to include them in the analysis).

Appendix 2

List of musical codes and operational definitions

MS   When a child appears to be playing for him/herself and is not engaged with/oriented to the partner, the motif is coded MS.

MP   When a new musical motif is played for the first time

MR   When a child re-iterates a motif without substantial alteration

MTS   Spontaneously produced musical refinements, extensions or elaborations of previously played motifs. Where the previous motif was played by the child, this is coded MTSS, and where previously played by the partner it is coded MTSO.

MTR   Musical responses and elaborations of earlier (verbal) questions or enquiries. Where the question was asked by the child, this is coded MTRS, and where it was asked by the partner, it is coded MTRO.

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Current theme of research:

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Most relevant publications in the field of Psychology of Education:

Miell, D., & MacDonald, R.A.R. (2000). Children's creative collaborations: The importance of friendship when working togethe- on a musical composition. *Social Development, 9,* 348-364.

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Current theme of research:

Children's friendships, creative collaborations, new technology in music teaching, training for creative work.

Most relevant publications in the field of Psychology of Education:

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Current theme of research:

Children's collaborative music compositions, developmental approaches to understanding post-traumatic stress disorder.

Most relevant publications in the field of Psychology of Education:

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