Teacher and learner interaction when exploring products

PLEASE CITE THE PUBLISHED VERSION

PUBLISHER

© DATA

LICENCE

REPOSITORY RECORD

Martin, Mike. 2019. "Teacher and Learner Interaction When Exploring Products". figshare. https://hdl.handle.net/2134/2836.

Teacher and learner interaction when exploring products

Mike Martin, Liverpool John Moores University, England

Abstract
This paper provides a report of a small-scale study that explored the interaction between a teacher and learner whilst evaluating products. It was hypothesised that the evaluation of a product unfamiliar to both would result in a different interaction than the evaluation of unfamiliar products. Patterns in verbal and non-verbal communication were recorded during the evaluation of two products, one familiar to the teacher and the other unfamiliar to both participants. The coded results showed a change in the behaviour of both participants, most notably the teacher. Overall it was found that the interaction was more symmetrical in nature when evaluating unfamiliar products. The interpretation of the results highlighted the importance of evaluating unfamiliar products in enabling learners to express their ideas about the origin and purpose of technological products.

Keywords: *teaching, learning, products, analysis, evaluation, interaction*

Introduction
The exploration and evaluation of products has been one of the central aspects of the design and technology curriculum in the UK for a considerable number of years. It is seen as crucial in developing pupils' design and technology capability. It also makes an important link between the work of pupils and the work of those involved in design and technological activity outside school. Given its significance, there has been limited research about the processes and dynamic involved when teachers and learners are engaged in product evaluation. How, for example, can we help pupils to articulate their views about products and assess their evaluation capability? Questions about appropriate pedagogical approaches to product evaluation need to be addressed in order to improve the quality of pupils experience and their level of capability.

Literature review highlights
Literature on product evaluation has tended to focus on the rationale for such activities such as that written by Martin (1995) and pupils capability – notably Kimbell et al (1996). Very few explore pedagogical issues with only Siraj-Blatchford (1995) suggesting a specific teaching approach.

The study focused on pupil/teacher interaction and in order to develop an appropriate methodological approach, a wider review of literature was undertaken to include educational psychology. What follows are some examples of relevant literature.

A number of authors stress the importance of intersubjectivity with Mercer and Edwards (1981) going as far as to say that the establishment of intersubjectivity is the single goal of education. This can be verbal or non-verbal in nature and can be regarding as essential to take understanding of concepts forward (Rogoff 1990).

Hoogsteder, Maier et al (1998) claim that an adult does not control a child on a moment-by-moment basis but suggest that a procedure of negotiation is realised between teacher and learner. This view is supported by Rogoff (1990) who proposes that children are active in directing the support of adults. This was very significant for the study and made it clear that observation of the learner, as well as the teacher, would be an important aspect.

Along with the issue of intersubjectivity, the notion of scaffolding was identified as having significance for the nature of research undertaken, particularly as it is within a formal asymmetrical context where the concept of scaffolding is regularly used to explain teaching and learning. As Rogoff (1990) points out, problem solving emphasises the active nature of thinking and creating new understanding. With a view of product evaluation activities as problem solving in nature, it was important to recognise that teacher and learner would be starting from different viewpoints in the sense that Saljo (1998) indicates: that the meaning of things will vary according to the experiential background of individuals.

The methodological approach taken by Hoogsteder, Maier et al (1998) was to be of particularly significance to the study as it dealt with an adult and child involved in a problem solving situation. They suggest that interactions can be structured by actions, pauses, regulations and goal setting in a similar way to verbal discourse. Consequently they observed physical activity by the adult and child as well as their conversation. The recording of pauses and gestures helped to identify different

episodes in the dialogue and this enabled them to present a view of problem solving that relies on negotiation between participants. Their methodology appeared highly applicable to the study. Certainly the recording of non-verbal communication would be important.

It was hoped that the dialogue will be two way with frequent questioning of the learner by the teacher being avoided as such dominance by the teacher is likely to be counter productive. As Wood (1998) suggests children tend to search for the answer that the teachers expects.

The observation categories of Halliday and Leslie (1986) are useful in indicating the kinds of things that might be observed. For example, they suggest that a child might be observed giving an object, holding it, looking around, looking at the object itself, pointing or even looking at the teacher. Such information is likely to be helpful in analysing what transpired during the course of the activities.

Methodology

As has been said above, the aim of the study was to ascertain how the interaction between teachers and learners change when involved in the joint exploration of two different products. In the first instance the product was familiar to the teacher but unfamiliar to the learner. In the second instance the product was unfamiliar to both teacher and learner. The two participants would be asked to discuss the product and speculate on its purpose, function and general use. It was anticipated that the nature of the interaction would change between one activity and the next. The prediction was that when exploring a product less familiar to the teacher, a more symmetrical interaction would be observed.

The main contrast between the two activities, the independent variable, was the product being evaluated by the teacher and learner. The dependent variables being measured related to the nature of the interpersonal relationship between teacher and learner. Specifically, the nature of the verbal and non-verbal communication was quantified. The dialogue was analysed in terms of the number of questions, responses and elaborations that each of the participants uttered. What the participants were looking at whilst talking was also measured as an indicator of the non-verbal communication and the focus of their attention throughout the evaluation activities.

Under control was the environmental conditions in which the study was taking place. In addition the questions they were asked to address for each of the products was the same, namely:

• What is it?
• What could it be used for?
• Where is it from?
• Who would use it?

The resources used for the activities undertaken were a selection of products from different countries. These are illustrated in Figure 1.

Figure 1: Products for evaluation

The child's key was used for piloting and the other seven involved in the main study. The products were selected so that there would be a variety of materials, textures, colours and potential users. In addition it was felt important to select products that were likely to provoke interest.

Given that the products being explored were three-dimensional and the anticipated importance of body-language, it was decided to use video as well as audio recording equipment. Digital video and audio equipment were chosen to facilitate precise timing of the activities and help detailed coding on a frame-by-frame basis.

Results

Quantitative data was collected for all of the coding categories. For the verbal categories, the transcript was analysed in detail and frequencies calculated. The non-verbal categories were measured by analysing the video recording in detail and looking out for one category at a time. For the holding product category, the duration was calculated.

In addition to an analysis of the data by the author, an experienced Research Assistant from the University of Central England was employed as an inter-rater in order to check the frequencies.

The time taken to evaluate the two products was different so for each category (except holding product) the frequency per minute was calculated. A summary of the results is given in Figures 2 and 3.

| Category | Frequency | | | | Average / min | |
| | Author | | Inter-rater | | | |
	Teacher	Learner	Teacher	Learner	Teacher	Learner
Question	24	7	24	7	8.78	2.56
Response	5	21	5	21	1.83	7.68
Elaboration	7	10	7	10	2.56	3.66
Looks at product	19	16	16	16	6.40	5.85
Glances at other	6	7	5	10	2.01	3.11
Looks at other	17	12	18	14	6.40	4.76
Looks elsewhere	7	7	7	7	2.56	2.56

Figure 2: Evaluation of the plastic plug cover

| Category | Frequency | | | | Average/min | |
| | Author | | Inter-rater | | | |
	Teacher	Learner	Teacher	Learner	Teacher	Learner
Question	8	8	8	8	4.53	4.53
Response	2	2	2	2	1.13	1.13
Elaboration	8	9	8	9	4.53	5.09
Looks at product	5	11	5	10	2.83	5.94
Glances at other	1	7	1	6	0.57	3.68
Looks at other	3	8	3	9	1.70	4.81
Looks elsewhere	3	3	3	3	1.70	1.70

Figure 3: Evaluation of the sisal coaster

Of particular interest is the reduction in the number of questions asked by the teacher and the corresponding responses that the learner gave to them. In addition there is a large reduction in the number of times that the teacher looks at the product and the other participant. This is better illustrated in the form of a chart:
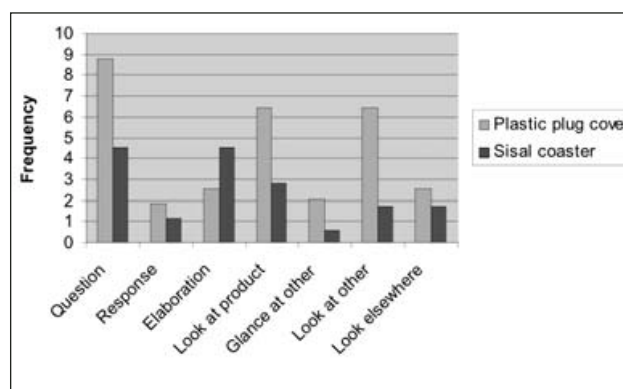

Figure 4: Comparison of coded categories for both activities (teacher)

The large difference in the behaviour of the teacher (Figure 4) is in contrast to the relatively small changes in the behaviour of the learner (Figure 5).
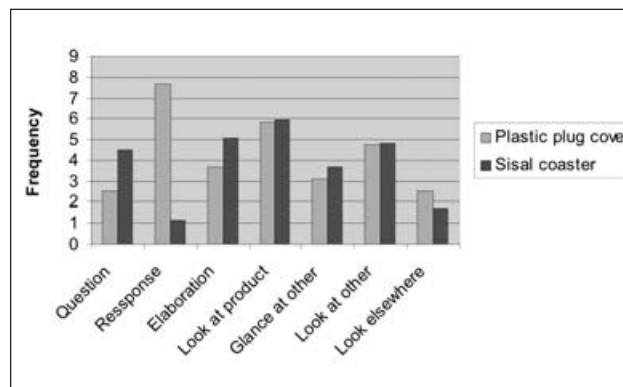

Figure 5: Comparison of coded categories for both activities (learner)

In interpreting the data, care needs to be taken when looking at the bar charts as the frequencies of non-verbal actions only indicate when the participants changed where they were looking. It does not represent how long they spent looking at the product or other participant.

The data concerning the handling of the product has been separated from the tables and charts above as it is quite different in nature. There was a distinct difference in the way in which the two

products were handled by the participants. With the plastic plug cover (familiar to the teacher but unfamiliar to the learner) the teacher held it for the duration of the conversation. For the sisal coaster, however, it was held alternately by the teacher and learner throughout with a total of seven exchanges. This is a significant indicator of the difference in the way in which the two participants related to each other and goes some way to supporting the hypothesis.

Analysis of data
The data does appear to support the hypothesis that the evaluation of unfamiliar products encourages more symmetrical interaction between teachers and learners. When evaluating the product unfamiliar to both participants there was less dominance by the teacher with fewer questions (a reduction from 24 to 8) and a noticeable difference in the handling of the product. A clearer sharing of ideas and thoughts was evident from the increased number of elaborative statements and the opportunity given to the learner to put forward his own thoughts.

There are clear links between the results from each of the activities and the research explored in the literature review. For example in the first activity there was clear dominance by the teacher by the number of questions asked and the limited time the learner had to make a contribution. This is a clear example of the control that Wood (1998) suggests is a common response to the difficulties that teachers have with interactions. In addition, the teacher was aware of what the product was for a good portion of the activity but withheld that information. It was only when the learner actually asked the teacher if she knew what it was that she disclosed the information.

Importantly, at no time was the teacher told how to behave during the activities but from the evidence this was a clear attempt to give the learner the opportunity to discover for themselves what the product was. This fits the findings of Mercer (1995) in his study of interactions and that of Hughes and Westgate (1998) in their discussion of a dominant teacherly style and teachers desire to keep in control.

The second activity, evaluating the unfamiliar product, was exemplified by a period of dialogue between participants without specific questions. Statements were offered, perhaps supported or elaborated but not challenged directly. For example:

T – It could be used for hanging up but ...
L – Or is it like just bristles ...
T – A holder or something ... put something in it?
L – Yeah? Let me see. Put it down there.

This kind of dialogue has more akin to the cumulative talk outlined by Mercer (1995) rather than his disputational talk and links well with the theory of Hoogsteder, Maier et al (1998) in their description of negotiation between teachers and learners. The dialogue, with less dominance by the teacher indicated that the teacher had changed their behaviour and that in a situation where she had no knowledge of the product she changed the teacherly style that Hughes and Westgate (1998) suggest continues even in more formal situations.

It is difficult to see any alternative interpretations of the data. There had clearly been a change of behaviour in the teacher and the only thing that had changed was the product.

The methodological design of the study, focusing equally on the verbal and non-verbal communication helped to provide appropriate data to test the hypothesis in the same way that Hoogsteder, Maier et al (1998) found it useful to observe physical activity by the adult and child in their study and present a view of problem solving.

It is possible, however, that given that the interaction was being observed that the teacher behaved differently than she would have done in a less contrived situation. The study was indeed outside the everyday classroom routines and beyond effects of other people.

The products used were relatively simple with relatively few parts or mechanisms. Consequently the time taken to evaluate each item product was relatively short. The study could be improved by introducing more complex products that would be more likely to facilitate longer conversations and provide a larger amount of data.

Conclusion
The main result was that the behaviour of the participants changed towards each other from one activity to the next. The change was most noticeable for the teacher with a reduction in the number of questions asked of the learner and a sharing of the product and ideas of what it might be and where from.

The observation of the two activities were interpreted through a coding system of verbal

and non-verbal communication to provide numerical data. This was used to compare the two situations directly. Whilst the coding scheme could have been improved there was nevertheless a distinct difference in the results from one activity to the other.

The hypothesis has been tested and verified by a small study. To increase the validity of the research conclusions, further studies on similar dyads would be worth undertaking using the same products. To make the research of greater value to teachers it would be worth undertaking the same study in a busy classroom environment to observe the effect of change of environment from the almost clinical to the real.

The *National Curriculum for Design and Technology* QCA (1999) provides an entitlement for primary age children to look at familiar products. The research study has, however, concluded that there is value in learners looking at unfamiliar products with their teachers. Should further research in this area come to similar conclusions then it is likely to be significant for curriculum development in the subject area.

References

Halliday, S. and J. Leslie (1986), "A longitudinal semi-cross-sectional study of the development of mother-child interaction." *Journal of Developmental Psychology* 4(3): 221-32.

Hoogsteder, M., R. Maier, et al (1998), Adult-child interaction, joint problem solving and the structure of cooperation, in M. Woodhead, D. Faulkner and K. Littleton (1998) *Cultural worlds of early childhood*, London: Routledge.

Hughes, M. and D. Westgate (1998), Teachers and other adults as talk partners for pupils in nursery and reception classes, in M. Woodhead, D. Faulkner and K. Littleton (1998) *Cultural worlds of early childhood*, London: Routledge.

Kimbell et al (1996) *Understanding practice in design and technology*, Buckingham: Open University Press.

Lave, J. and E. Wenger (1999), Learning and pedagogy in communities of practice, in J. Leach and R. Moon (1999), *Learners and pedagogy,* London: Paul Chapman Publishing.

Martin, M (1995) Perceptions of products and applications. *IDATER'95.*

Mercer, N. (1995), *The guided construction of knowledge*, Clevedon: Multilingual Matters.

Mercer, N. and D. Edwards (1981), Ground rules for mutual understanding, in N. Mercer (1981) *Language in school and community*, London, Edward Arnold.

QCA (1999), *National Curriculum: handbook for primary teachers*, London: QCA Publications.

Rogoff, B. (1990), *Apprenticeship in thinking: cognitive development in social context*, Oxford: Oxford University Press.

Saljo, R. (1998), Thinking with and through artifacts: the role of psychological tools and physical artifacts in human learning and cognition, in D. Faulkner, K. Littleton and M. Woodhead (1998) *Learning relationships in the classroom*, London: Routledge.

Siraj-Blatchford, J (1995), Kelly's repertory grid: a technique of developing evaluation in design and technology.

Tharp, R. and R. Gallimore (1998), A theory of teaching as assisted performance in D. Faulkner, K. Littleton and M. Woodhead (1998), *Learning realtionships in the classroom* London: Routledge.

Wood, D. (1998). Aspects of teaching and learning, in M. Woodhead, D. Faulkner and K. Littleton (1998), *Cultural worlds of early childhood*, London: Routledge: 157-177.