Speaking the Language of the Outsider

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There are a variety of audiences for educational research, for example: fellow researchers, educators, those who develop and implement policy for education, and the community. In general the audiences with which we have most effectively communicated are the first two. These can be characterised as 'insiders', with whom communications about our research reflect a shared understanding of education practices. Communication with the latter two groups needs to be different as the members of the 'outsider' communities generally do not share the same understandings of educational practices and purposes. In this paper we will explore implications of these challenges drawing on our research on school-community collaborations in school science programs.

Introduction

For over a decade our research group has been gathering insight through our research studies into collaborations between schools, community organisations and individuals in relation to school science learning. (Symington & Tytler, 2011; Tytler, Symington, Kirkwood, & Malcolm, 2008; Tytler & Nakos, 2003; Tytler, Symington, & Smith, 2011). We have come to realise that these are activities into which community organisations and individuals who value science invest significant time, effort and funds. Yet, while full of potential, it is a largely uncoordinated enterprise much of which is also under-researched. We have recently concluded a study in which we interviewed 27 community people who have participated in one or more of these collaborations about their role in these joint activities, how they view their participation, and their views on such collaborations. Following analysis of the data we have produced two papers with a view to publication in journals that report to the science education research community (Symington, Tytler & Cripps Clark, under review; Tytler, Symington & Cripps Clark, under review). However, we believe the findings of the study have significance for a wider audience and this paper raises questions about how this can be best done. A further methodological question to be addressed here is identifying and selecting people to form the sample for a study of school-community collaborations.

Sampling and describing diverse collaborations

There is a huge range of school-community collaborations contributing to school science programs:

- nationwide programs such as *Scientists in Schools* operated by CSIRO;
- formally recognised programs operating in states or regions which are initiated and supported by a body in that state/region, such as *MyScience* in N.S.W schools, and programs offered by local museums, industry groups, universities, or water authorities;
- collaborations between local people with relevant expertise and schools; and
- collaborations between a single student or group of students and an expert in connection with scientific investigation competitions such as *Science Talent Search*.

To illustrate this diversity further, Table 1 tells the story of the involvement of one of the people interviewed for our latest study, a university science lecturer who had negotiated with his faculty to have such activity recognised as his contribution to research or community development.

Table 1
Collaborative ventures in which a community scientist contributes to school science

• Colin has participated in the nationwide *Scientists in Schools* program and has promoted this form of engagement amongst his colleagues.
• Colin has organised programs for school students, conducted at the university.
○ He has established an annual one-day program related to the curriculum requirement that Year 11 students engage in open-ended enquiry.
○ He has organised an extended learning program for groups of students from a number of schools.
○ As part of the *National Science Week* activity Colin initiated a science quiz night.
• Realising that there are many teachers with a limited background in science, Colin has initiated an annual professional development day for large numbers of teachers.
• He visits schools on request to give specialist talks. He has also distributed a list of potential speakers to schools.
• The University also organises a range of on-campus activities in science particularly for students from low SES or remote schools. Examples include: the *Science School* (year10), *BMA Science Sparks* (primary), *Widening Participation* program (junior secondary). Colin participates in these by offering short practical science activities.
• Colin also acts as a judge for the local robotics competition.

Researching school-community collaborations

There has been limited research into such collaborations both in Australia and internationally. In Australia there have been some substantial and thorough evaluations of the *Scientists in Schools* program (Howitt et al, 2009; Rennie, 2012), a major study of evaluation of STEM outreach programs (Husher, 2010), and some explorations of programs supported as part of the federally funded *Australian School Innovation in Science, Mathematics and Technology (ASISTM)* program (Tytler, Symington & Smith, 2011) and the *MyScience* program (Forbes & Skamp, 2013). However we would argue there has been inadequate attention given to exploring the perceptions of the community people involved, and to the numerous smaller local collaborations, such as those our group has analysed (Tytler, Symington, Kirkwood & Malcolm, 2008).

A further issue with regard to the reported research concerns the tools utilized to analyse and discuss the findings. Our analysis suggested that the concepts of *communities of practice* and *boundary crossing*, which have been used by several researchers in recent studies (Kisiel, 2010; Rennie, 2012; Forbes & Skamp, 2013), have potential to illuminate this form of activity. Lave and Wenger (1991) describe a *community of practice* as a "set of relations among persons, activity, and world, over time and in relations with other tangential and overlapping communities of practice" (p. 98). Boundaries are defined as "sociocultural differences leading to discontinuities in action and interaction" which are "constitutive of what counts as expertise or as central participation" (Akkerman & Bakker, 2011, p. 132 & 152). Collaboration between schools and community organisations in science programs involves school and community members negotiating practices at the boundaries between these communities of practice.

Sampling for research into such collaborations

Reference has already been made to the issue of obtaining an acceptable sample for studies such as we have been engaged in. This was not a new problem for us as we have undertaken a number of studies involving community members, in which there were difficulties in both defining and locating a population and selecting an appropriate sample. With sampling for this study the issues were:

- What is the range of people and projects?
- What is a *representative sample*?
- How do we identify appropriate participants?

To identify potential study participants we drew upon insights gained from earlier studies.

For example:

- knowing that university science staff have been involved in such activities we contacted Deans of Science, asking them to identify staff so engaged;
- knowing of awards made to successful collaborations we located and contacted community members who had been selected for awards;
- contacting individuals involved in collaborations from previous studies; and

- asking interviewees to suggest others who had relevant experience and could provide valuable insights.

From the information gathered before and after the interview schedule began we attempted to obtain a representative sample while recognizing that it would be unnecessary to cover all forms of collaboration, in all states and territories, and school systems.

We used two criteria to determine when to conclude the data gathering. The first concerned whether any further possible interviewees were likely to add to the data due to their project involvement representing a substantially different form of collaborative venture from those already covered. The second was the notion of 'data saturation' in which we stopped when we felt the information we were getting was repeating what we already knew. This led to the sample consisting of 27 collaboration participants being interviewed. An interview framework was developed from knowledge gained from the literature and the previous studies we had conducted. The interview framework is detailed elsewhere (Symington, Tytler & Cripps Clark, under review)

The data were gathered by telephone interview. The interviews were recorded and from these, and notes taken during the interview, a summary was made of each interview and this was sent to the study participant for checking. One member of the team reviewed the interview summaries, identified the issues which emerged, and grouped the relevant material from the summaries which addressed these issues. This grouping and interpretation of the material was then discussed and refined by the members of the team. In this paper we will only report two of a number of issues which emerged, which arose particularly in response to the questions: 'What factors enhanced or limited your contribution to the program?' and 'In the light of your experience, what advice would you give on developing effective school/community collaborations relevant to learning science in schools?'

Research findings related to 'Communication' and 'Curriculum'

Two of the issues showed clearly the significance of differences between the communities of practice from which the teachers and scientists who were the collaboration participants came. These were communication, and curriculum.

Communication

There was specific comment from approximately a quarter of the interviewees about problems of communication across the boundary between school and the community organisation. Under the general heading of communication we could identify several specific issues. The first was the necessity of establishing a link with a key person within the school community. This involved both identifying and making contact with this critical person, and then capturing their attention when there are many others vying for their attention.

> It is important to know the gatekeepers for the school. You can be headed off at the pass. There have been cases where we found that teachers didn't know about things because of the principal. So we are thoughtful about who we approach. (OI)

The second aspect of the communication issue was the mode of communication. For the community people e-mail was a preferred means of communication and they were surprised and frustrated to find that this was not so within the school communities.

> At this time teachers are not as used as scientists to using e-mail to communicate. Some partnerships fold because of the lack of good communication from the school. (MB)

There were problems also with the alternative, the use of the telephone, as teachers are often not contactable by telephone for most of the working day.

When the interviewees were asked for advice on how to ensure successful school-community partnerships, communication was again raised.

> Communication is the real key, from both sides. (NU)

There was, however, a deeper level at which communication was important, focusing on the development of personal relationships that would facilitate communication rather than on the mechanics of communication per se.

> And you need people in the school who are interested in making that happen. (NU)

> You need a champion in the school to represent you. (KN)

In effect these community members recognised the importance of effective communication across the boundary, but saw the solution to these problems not just in technical terms but in developing good relationships, particularly with a key person who could champion the collaboration within the school. These people acted as 'brokers' sitting at the boundary between the two communities. Often they were teachers who had prior or industrial experience, or they were the collaborating scientists themselves by virtue of previous experience as teachers.

The school curriculum

The data generated in this study and in related studies identify the importance of the school curriculum to the success or failure of these collaborations. Curriculum can be a major site of socio-cultural discontinuity across the boundary. A number of the participants portrayed the school curriculum as a barrier to their ability to contribute to school science programs; the key issue often being lack of flexibility on one or both sides of the boundary. There are those community members whose employment dictates the fields in which the collaboration is to operate. For example, participants employed by water authorities perceived the field of their possible contribution to school science programs constrained by the purposes of their employers: to raise young peoples' awareness of water supply and usage issues.

> Schools are very curriculum driven and the challenge for educators in the water field is to identify ways in which programs about water catchments and treatment can be made relevant to the demands of the curriculum. (EE)

Perception of curriculum as a barrier is not solely related to the specific purposes of the community collaborator. It also depends on the flexibility and capability of the

school and the teacher. Negotiating the nature of the collaboration requires some flexibility on both sides.

Not all interviewees portrayed curriculum as an obstacle to collaboration. Amongst the participants in our study there were those whose knowledge of the curriculum created opportunities for collaboration. For example Colin, the university scientist referred to earlier, reported establishing an annual one-day program in response to the new syllabus requirement for Year 11 students in his state to engage in open-ended enquiry. Realising that many students and teachers had limited experience on which to draw when thus confronted, he created a program where the school students heard from postgraduate science students about their research programs.

Further, there are cases where collaborating community members see themselves as adding value to the curriculum beyond its particular topic or outcome framework, often focusing on attitudes and meta-cognitive knowledge and skills.

The insight into school-community collaborations offered through our study suggests that there is significant variability in the experiences upon which the interviewees were drawing. There were some who continued the theme of fitting the existing curriculum: "We have to make sure that what we are offering meshes in with the curriculum" (CK). However others focused on the benefit to the students or on the authenticity of what is being offered, addressing curriculum in its broader sense. The key to matching community members' knowledge and skills to the needs of schools depends upon clarity of purpose, as understood from both sides of the boundary.

Communicating the findings of our research

Elsewhere (Symington et al, under review; Tytler et al, under review) we have described the significant issues raised by research on school-community collaborations in school science programs. These include clarifying the relative benefits which can be derived from such collaborations in order to maximise the benefit for school science which can be gained from the goodwill of the science community, and ensuring that there is greater understanding and coordination of this potentially significant area of activity. This immediately raises the question of which audiences should be targeted, in order to realize the potential value of the research. A major methodological concern is thus the issue of communicating the research findings with others than science education researchers. For any study the issues of communicating with these audiences are:

- identifying the relevant audiences;
- reaching the target audiences;
- deciding the key messages to convey; and
- understanding how the practices in education are understood by the different audiences so appropriate concepts and language can be used.

In this study we have identified four groups, apart for the science education research community, with which we would wish to communicate the findings of the research: teachers of science, school administrators, education policy makers and the people in the community who can and do make contributions to school science

through such collaborations. Identifying and framing the communication to these groups constitutes, as for the collaborations we have been studying, a boundary issue. The difficulty of reaching these audiences varies. Communicating with science teachers presents the least problems. We have customarily published aspects of our research relevant to teachers in professional journals, with appropriate adjustment of focus, and language (e.g. Symington & Tytler, 2011). To communicate with the community of educational administrators and policy makers poses more significant problems as there are no obvious channels of communication and there is the further problem of capturing their attention. For reaching the policy community we have at times sent copies of our reports to key contacts, for instance in the Office of the chief Scientist, to government agencies, and to CSIRO. We have also included mention of our findings in public forums with a policy focus. At times we have also designed targeted press releases through the university public relations system. The greatest problems in this case, however, attach to communicating with the community people responsible for and involved in such collaborations. There are challenges both with identifying the members of such a diverse and ill-defined group and with finding effective methods of communicating with them. We suggest that it is worth pursuing whether developments in technology can create new opportunities to reach such audiences such as online forums, blogs, or well tagged websites. This group are so integral to these collaborations that it is important that this issue is explored rather than be dismissed as too difficult.

This study has drawn attention to the fact that community people interested in such collaborations do not all understand adequately the ways in which schools operate and this impairs their ability to contribute to school science programs. It is important that the lessons from this study about how this lack of understanding of school practices such as curriculum can impact on school-community collaborations in science is communicated.

We believe that the issues ofcommunicating research findings beyond the education research community, while particularly relevant to our particular study, apply much more widely. The study has alerted us to the fact that while status and career trajectories for academic researchers are mainly determined by publications in peer reviewed research journals, the impact of our work demands more diverse and well planned communication approaches. This should be integral to the process of planning research.

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