What Questions Do Students Ask Scientists?

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This research brief has been made available by Relating Research to Practice (RR2P). RR2P provides short synopses of current peer-reviewed research relevant to informal science education (ISE).

This study, conducted in New Zealand, is an analysis of the questions that students in their final year of school were anticipated to ask, and actually asked, during a visit to a biomedical research institute. The analysis highlights, along with the interview findings, the ways in which students developed an understanding of biomedical research, saw science as a process, and acknowledged a commonality of values between themselves and the scientists. The impact of the experience on the identities of the students is also pointed out. This study will be of interest to ISE educators who facilitate interactions between students and scientists and who organize opportunities for students to observe the authentic practice of science in professional settings.

The day-long program, coordinated by education specialists within the research institution, was designed to complement New Zealand's high

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school biology curriculum. Using sophisticated equipment, the students engaged in three practical sessions involving the technical processes of polymerase chain reactions in which the DNA is copied and gel electrophoresis in which molecules are separated, with the assistance of the institute staff. At the end of the day, small groups of students were made to meet with the scientists to ask questions and engage in general discussion.

The questions that the students had prepared in advance of the day and also those that they had perceived to be the 'best' out of the range of questions finally voiced to the scientists during the discussion were analyzed by the authors. In addition, they interviewed a subset of students on their choice of questions.

Research Design

The authors divided the questions the students asked into the following groupings: **philosophical**, asking about the nature of science; those asking about **content**; those pertinent to the **issues of citizenship**; and those of a more **personal nature**. The most prevalent among the questions that were anticipated to be asked by the students and that were actually asked by them were the questions of a personal nature (asking about the scientist's life history or career choice). The authors suggest that this may be explained by the fact that the participating students had all selected biology in their final year and were likely to be thinking about their future career options. They also point out that the students felt comfortable with the scientists and were able to make personal connections with them by asking about their everyday lives.

Research Findings

The least commonly asked questions were those relating to the nature of science, although the authors acknowledge that given the students' experience during the day, in which they engaged with the processes of science in the practical sessions, such questions may have been regarded as unnecessary or superfluous.

The analysis of the interviews and the discussion of question choices offer further insights into the thinking of students. The authors present a number of case studies in which they highlight the ways in which the students themselves acknowledged how their questions and the subsequent discussion had informed their understanding of science and contributed to their perceived personal identity as potential future scientists. The authors also draw attention to the way in which personal questions can act as a bridge between the students and the

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scientists. They also bring to light the recognition on the part of the students that scientists share commonly held values and are responsive to ethical and moral considerations.

In summary, this study illustrates the manner in which the exposure to scientific practice – in this case, a visit to a research institute – provides students with an opportunity to cross a "cultural border" and make connections between themselves and the scientists. Moreover, the students were able to connect their personal experiences with those of the scientists by asking questions, thus helping to cement the bridge between their own educational experience to date and the work of the scientists.

Implications

For ISE practitioners (designers of learning experiences and settings), this study emphasizes the potential provided by out-of-school visits to research institutes and other science-rich venues. It also identifies a relatively simple approach—that of analyzing student questions—as a way of understanding students' perception of science, how they make connections with science and scientists, and how their identities as science learners or potential future scientists may be formed.

Related Resources

- Evaluation of the Long-Term Impact of a University High School Summer Science Program on Students' Interest and Perceived Abilities in Science
- Exploring Middle School Girls' Science Identities: Examining Attitudes and Perceptions of Scientists when Working "Side-by-Side" with Scientists
- Identifying and resolving uncertainty as a mediated action in science: A comparative analysis of the cultural tools used by scientists and elementary science students at work
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- Translations of scientific practice to "students' images of science"

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