

# Investigative school research projects in biology: Effects on students

Wilton Lodge, Michael J.  
Reiss & Richard Sheldrake



# Theoretical background

- A growing literature on school students' engagement with science and their aspirations and choices towards science and science-related studies and careers (Bøe et al., 2011).
- Aspirations and choices can involve identity, as ways to convey who someone is or who they want to become, and/or to undertake personally meaningful, interesting and enjoyable activities (Holmegaard et al., 2015).
- Wider theoretical frameworks also highlight the relevance of intersecting personal and socio-cultural aspects, such as finding science enjoyable (Avraamidou, 2020).
- Science education is sometimes orientated around students *learning* science by *doing* science.

# Investigative research projects

- Investigative research projects typically involve students determining a research question, with the outcome being unknown, and approaches to answer it, undertaking the investigation, analysing the data, and reporting the findings; the project may be undertaken alone or in groups, with support from teachers and/or others such as scientists and researchers (Bennett et al., 2018).
- Investigative research projects may be intended to reflect some aspects of science more authentically than other teaching and learning approaches, such as confirmatory practical activities and teacher demonstrations.
- What remains under-researched is what the effects on students are as a result of undertaking such projects.

# Key objectives

- In this study we collected data from students who were participating in investigative research projects as a result of their schools' involvement in the work of IRIS (Institute for Research in Schools)  
<https://researchinschools.org>.
- Our objective was to gather data so as to understand what consequences such projects had for students' perceptions of science.
- Specifically, our research question here is 'How do secondary school students participating in a biology research project see science and themselves in relation to it?'

# The IRIS model



# Research design and methodology

- Twenty four participants between the ages of 12-18 were drawn from eight schools in England (six state and two independent schools). All the participants were undertaking their own scientific research project through IRIS and volunteered to take part in our study. Participation in the study required each student and at least one of their parents to consent. The participants' schools represented a wide coverage of geographic (including urban and rural) and socio-economic backgrounds.
- Here, we report on emerging findings from the fourteen students (using pseudonyms that indicate gender) who were undertaking biology research projects and participated in 1:1 interviews lasting 20-30 minutes in 2021. All interviews were transcribed, and thematic analysis undertaken.

# Findings

- There was an association between the participants' motivation for engaging with the investigative research project and their science identities, with many of them articulating that the project provided them with an “authentic” experience of what “real scientists” do:
  - For me, it's an ideal way to say you have actually had exposure to the type of equipment scientists use in the lab. This makes you feel like a real scientist, which you don't get when you do school practical. (John)

# Findings (cont.)

- Participants were nearly always positive about taking part in a research project; this was particularly the case for those students who presented their findings at a conference arranged by IRIS, where presenters received feedback from peers and members of the science community. Students also valued the experience of working in a collaborative context. Such collaboration was seen by the participants as a means for creating new forms of knowledge, negotiate meaning and develop new skills:
  - Well, as we saw from the pandemic working in a group is important for science. Scientists need to share their ideas with each other. So, working in a team with people I have never worked with before was really nice to do, and although we had disagreements it really deepened our friendships. Some of the people in the group knew a lot more than me so I learnt a lot about science. (Pat)



# Findings (cont.)

- For some of the participants, engaging in an investigative research project afforded them opportunities not only to develop their scientific inquiry skills but to gain a deeper understanding of the epistemological dimensions of science and its connection with historical, cultural and social values. This greater appreciation and insight into the nature of science increased their science-related career aspirations, as illustrated by one participant:
  - Doing the project gave me a better understanding of the subjective nature of science and how our personal view can influence the scientific process. It was exciting working with students from differently background and this has reinforced my passion for science and biology especially. (Susan)

# Conclusions

- Participation in an investigative biology research project enthused the participating students. The students felt that it helped them better understand how science was undertaken by scientists and in some cases led them to critique their school science for not helping them learn how science is practised by scientists.

# Questions and Comments

Thank you!