

## Summary

### UTS Evaluation Findings and Recommendations March 2018

#### Background

*Science by Doing* is an evidence-based online science program for Years 7 to 10, developed by the Australian Academy of Science (AAS). There are four stages in the development of *Science by Doing*. This research was undertaken to identify perceptions of Stage 4 of the program.

The evaluation of Stage 4 of the *Science by Doing* program focused on the revised curriculum units and the student e-Notebooks. The timing of the release of the revised curriculum units within the Stage 4 evaluation phase involved only Years 7 and 8 updated units and e-Notebooks. Hence, this report accounts largely on the use of these resources in schools and teacher education programs at the universities.

*Science by Doing* Stage 4 evaluation involved qualitative and quantitative research to be conducted in approximately six case study schools and with teacher education providers. The research questions relate to the four research areas for this evaluation: Effectiveness, Appropriateness, Efficiency and Governance. In summary, effectiveness of implementation of *Science by Doing* units within schools was determined through surveys of school science teachers and students together with case studies with teachers and students in six schools. Effectiveness of science teacher educator workshops and resources was determined using focus groups and a survey of science teacher educators and science teacher education students. Existing data on *Science by Doing* held by the AAS was also reviewed to investigate effectiveness. Appropriateness was evaluated using document mapping and interviews, and efficiency evaluated via a document audit and discussions with stakeholders. The surveys noted above also obtained information on participant perceptions of appropriateness. Finally, governance was evaluated using an audit of existing governance plans, procedures and practices.

#### Findings

##### Effectiveness

###### ***School teachers and students***

According to the evidence gathered from the high school teachers and students during this evaluation process, the revised curriculum units containing the student e-Notebook have had a very positive impact on their teaching and learning experience. The students taking part in focus groups conducted in the six case study schools were very positive about using *Science by Doing* and said they found it interesting and fun to use. They stated that they enjoyed learning science using these resources.

There was a great deal of variability in the technology provision evident in the case study schools and in the responses of teachers nationally to the teacher surveys. This dictated the ways that teachers used *Science by Doing* but the report noted it is a tribute to the program's flexibility and its adaptability that teachers find ways to use it in a way that's more useful for their students and which works for them in their schools. Responses from teachers suggested that they value the ability to adapt the *Science by Doing* resources and modify them to their needs.

### ***Science teacher educators and teacher education students***

The focus group data from university teacher educators and the online responses of pre-service science teachers to the *Science by Doing* resources indicated that both groups had positive attitudes toward the resources. Teacher educators found the *Science by Doing* workshops to be particularly useful and effective. Both the teacher educators and the teacher education students expressed the view that they would appreciate more online video examples of *Science by Doing* in the classroom.

### **Appropriateness**

Evidence from the analysis of policy documents indicates that *Science by Doing* Stage 4 aligns with the current Australian Government education policy priorities in relation to science education in schools.

### **Efficiency**

At the time of reporting, *Science by Doing* had achieved all of its targets and all indications suggested that the project would meet its objectives within the allocated budget.

### **Governance**

The evaluation of governance indicates that the Australian Academy of Science, the Department of Education and Training and the Steering Committee have effectively supported and overseen the delivery of Stage 4.

There have there been no major contract management issues during Stage 4.

## **Recommendations**

### ***Recommendation 1***

Online learning and technology are changing quickly and if *Science by Doing* is to have the maximum impact, there is a need to continually keep up with that technology and adjust accordingly. The evaluation findings indicated that *Science by Doing* caters for a very wide range of school circumstances and that schools vary widely in their ability to use the digital resources. It is recommended that future *Science by Doing* development use technologies that are universally compatible with the wide range of devices found in schools to allow participation by the maximum number of students.

### ***Recommendation 2***

Many teachers see the benefits of accessing learning analytics. It would be advantageous if *Science by Doing* were able to incorporate student feedback and learning analytics into the program that teachers could access to monitor their students' performance. This means that teachers need to be able to access feedback data from students' digital activities online and e-Notebooks.

### *Recommendation 3*

Both in-service and pre-service teachers expressed a need to differentiate the curriculum to cater for the different abilities of students in their classes. It is recommended that *Science by Doing* explore ways that this can be done through digital means, such as using adaptive technologies.

### *Recommendation 4*

In many schools, the time that teachers have available for teaching science is limited. Many teachers have said that they find it difficult to condense the *Science by Doing* units for the time available. This is despite the provision of optional units. It is recommended that *Science by Doing* provide more guidance for teachers who have limited teaching time with their classes so that the integrity of the curriculum unit is preserved.

### *Recommendation 5*

Teacher educators who attended the *Science by Doing* workshops expressed that they gained a lot in terms of how to use the professional learning units and the other *Science by Doing* resources, including the student e-Notebook. It is recommended that AAS continue to offer *Science by Doing* teacher educator workshops.

### *Recommendation 6*

Given that many schools use learning management systems and include both *Science by Doing* and other resources in their science programs, it would be advantageous to brand all *Science by Doing* resources to make it clear where the resources originated.