

Department of Science Education (DSE)
Report of the Scientific Advisory Board (SAB)

Introduction

The Scientific Advisory Board met on 23 and 24 March 2015. The members of the SAB were:

Ghislaine Gueudet (University of Brest, France)

Mick Healey (Independent, UK)

Doris Jorde (Chair, University of Oslo, Norway)

Jonathan Osborne (Stanford University, USA)

Doris Jorde and Mick Healey were members of the first SAB in 2010.

The SAB met the management (Head of Department, Deputy Head of Research, Deputy Head for Teaching and Education, Department Research Committee, Department Educational Committee, Department Council) and the members of DSE during various formal and informal meetings. They made various presentations of their work, the overall strategy for the department and its financial state. Internal review material was also supplied in advance. We appreciated the involvement of all these members, and the clear presentations made during our visit.

Changes Since the Last Report and Trajectories of Development

The DSE has grown substantially since the last review conducted in 2010 when the Department was created to enhance teaching and learning in science and to conduct research in this area at the Faculty of SCIENCE as well as within senior secondary education. Over this period, the department has grown from seven to about 35 faculty members today. Growth has occurred in all areas of science and mathematics education, including the addition of faculty from Science Studies. The growth of the department has been successfully managed and the department is in a healthy financial state.

The number of courses taught and the volume of research activities have increased during the last five years. DSE provides courses for faculty members for the improvement of teaching, courses for doctoral students and their advisors, courses for Master and Bachelor students in Science and Mathematics education (didaktik), and courses in Science Studies in Mathematics and Physics. A future goal will also be to provide in-service Master level courses for senior secondary teachers in subject didactics - a development we see as constructive for the future development of science teacher education and the standing of the Department. Research activities have expanded into areas of university pedagogy in the sciences, science teacher

education, museum education, science communication and the philosophy of science and mathematics (science studies). Members of the department are asked to consult within the faculty about curriculum issues as well as throughout the university. Additionally, they are asked to advise the Department of Education on matters of science education at the national level. The department is well recognized at the levels of the university, nationally and internationally.

Departmental funding comes from a variety of sources, including basic funding from the faculty, student teaching at the faculty (BA and MA), courses for employees at the faculty (UP), internal university project funding (KU2016 and KUUPI) and external project/research funding. The Department prides itself on the diversity of its work and this is also demonstrated in the types of funding awarded each year. There is a significant financial reserve that has been accumulated over the years. The financial situation for the present time is secure. However, there are at least three large projects that run out in 2016 so caution needs to be taken and careful planning will be needed if it is to maintain its current level of activity.

It is questionable whether the Department can continue to grow at the rate experienced over the last five years. Hence there is a need to formulate a strategy for the department's growth, consolidation and future trajectory over the next five years.

Departmental Strategy

The Strategy for the Department of Science Education Towards 2017 states the mission as:

“To make original research-based contributions to the improvement of science education and science teaching”

We thoroughly support this mission for upper secondary and higher education and the transition between the two phases.

We recognise and support the desirability of the continued engagement of the DSE at each of the following four levels:

- a. Faculty of Science
- b. Rest of the University
- c. Nationally
- d. Internationally

However, we suggest that particular emphasis is placed on supporting (a) the development of faculty and students in the Faculty of Science, and increased attention is paid to (d) raising the

profile of the Department internationally.

Overall Strengths and Weaknesses

Strengths

- The DSE meets a unique national need for research in science education and research-based education in science in Denmark at the levels of senior secondary and higher education.
- A substantive number of researchers are publishing in international high-level journals.
- A growing number of well-developed and diverse courses is meeting the needs of the SCIENCE faculty.
- Considerable attention is paid to the quality of the teaching and how it might be improved.
- A comparatively young group of enthusiastic faculty offers a foundation for growth, development and promising future work.
- The DSE is a cohesive group which exhibits many features of a learning community.
- The department has been well-managed over a period of growth with the essential administrative structure to support the work of the department.
- The department has been successful in securing a large number of grants and funding for its research, development and teaching activities.
- The department is in a strong financial position.

Weaknesses

- The current organization of the three research groups seems to be rather contingent. A stronger rationale for this organization might be helpful.
- Research groups are important from a management point of view but are reliant too much on informal mechanisms for supporting their work.
- There is a danger that by employing a significant number of the department's own PhDs, the work of the center lacks the exposure to other ideas and frameworks which offer essential challenges to the group's thinking and help the group sustain epistemic vigilance. Hence the increased importance of sustaining existing links and collaborations with outside groups and researchers and developing new ones.
- Areas of research which are pursued solely by one individual potentially are difficult to sustain and develop the depth and range of expertise to pursue a significant research and development program.

Challenges

- There is a need to identify the strengths of the Department and promote these more

strongly both internally and externally.

- In the changing nature of professional education for teachers, the group needs to consider whether they should make greater use of technology-enhanced learning, such as the use of MOOCs, for professional development.
- While we understand the particular need that the science studies group addresses in educating scientists, there is a need for closer links between their teaching and research and the mission of DSE. This may require a discussion of the current mission of the Department to include the work of this group.
- A review of the Department's methodological expertise might be helpful to identify what is needed to meet its research priorities.

Recommendations

1. There is a need to formulate a strategy for the Department's growth, consolidation management and future trajectory over the next 5 years.
2. The Department needs to promote its strengths both internally and externally more strongly.
3. All faculty need to be able to articulate succinctly how their work contributes to the Department's mission.
4. A process needs to be put in place to agree how to prioritise between competing activities on faculty time; this should include ways of evaluating the potential contribution to meeting the mission of DSE and where appropriate benchmarking against comparable groups/departments internationally.
5. There is a need to secure a more stable funding from the SCIENCE faculty to continue the promotion of teaching as an important goal of the faculty.
6. There is a need to improve the development of collaboration between the DSE and other SCIENCE faculty members so that there is common ownership in the goals of better teaching.
7. There is a need to improve and increase the development of international collaborations, resulting in particular in more co-authored publications in international journals, and more international visitors.
8. The mission of the department needs to reflect the work of the Science Studies group. In addition, the Science Studies group needs to consider how they can contribute to the mission of the DSE on improving science education.
9. There is a need for the DSE to develop its expertise in the use of technology-enhanced and blended learning and exploit their potential. Collaboration between DSE and the IT learning center should be improved.
10. Ways need to be found to make Bachelor and Masters students more aware of the courses and projects offered by the DSE.

11. The DSE could be more proactive in seeking to support curriculum development within the SCIENCE faculty on a consultancy basis.
12. More attention should be given to identifying and celebrating good practices so that quality enhancement is more closely linked to quality assurance.
13. There is the potential for the DSE to be proactive in the area of 'Students as Partners' in learning and teaching in higher education; they could learn from international experience in higher education and schools, and become a leader in the field in Denmark.
14. The support provided for young faculty, or colleagues encountering difficulties could be more formally organized and structured.
15. Each research group with the DSE needs to consider more formal structures which would help to improve research.
16. The DSE needs to consider appointing additional faculty in mathematics education.

In conclusion we feel that this review of DSE is very timely given the appointment of a new Head of Department and the forthcoming move into a new building.

We wish the Department well.

Doris Jorde (Chair)
Ghislaine Gueudet
Mick Healey
Jonathan Osborne

3/26/2015