



**Committee for the Evaluation of Education and Science Education
Study Programs**

Weizmann Institute of Science
Evaluation Report

March 2015

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Chapter 1: Background

The Council for Higher Education (CHE) decided to evaluate study programs in the field of Education and Science Education during the academic year of 2013-2014.

Following the decision of the CHE, the Minister of Education, who serves ex officio as Chairperson of the CHE, appointed a Committee consisting of:

- ***Prof. Sam Wineburg*** - Graduate School of Education, Stanford University - California, USA. Committee Chair.
- ***Prof. Patricia Alexander*** - College of Education, University of Maryland - Maryland, USA.
- ***Prof. Yehudit Judy Dori*** - Department of Education in Science and Technology, Technion – Israel Institute of Technology – Israel, and Electrical Engineering and Computer Science Department, Massachusetts Institute of Technology – Massachusetts, USA.
- ***Prof. Sharon Feiman-Nemser*** - Mandel Center for Studies in Jewish Education, Brandeis University - Massachusetts, USA.
- ***Prof. Stephen Jacobson*** - Graduate School of Education, University at Buffalo - New York, USA.
- ***Prof. R. Malatesha Joshi*** - College of Education and Human Development, Texas A & M University - Texas, USA.
- ***Prof. Jeremy Kilpatrick*** - Mathematics Education Program, University of Georgia -Georgia, USA.
- ***Prof. Alan Lesgold*** - School of Education, University of Pittsburgh – Pennsylvania, USA.
- ***Prof. Arie Wilschut*** - School of Education, Amsterdam University of Applied Sciences – Netherlands.
- ***Prof. Anat Zohar*** - School of Education, The Hebrew University in Jerusalem – Israel.

Ms. Maria Levinson-Or served as the Coordinator of the Committee on behalf of the CHE.

Within the framework of its activity, the Committee was requested to:¹

1. Examine the self-evaluation reports, submitted by the institutions that provide study programs in Education and Science Education, and to conduct on-site visits at those institutions.
2. Submit to the CHE an individual report on each of the evaluated academic units and study programs, including the Committee's findings and recommendations.
3. Submit to the CHE a general report regarding the examined field of study within the Israeli system of higher education including recommendations for standards in the evaluated field of study.

The entire process was conducted in accordance with the CHE's Guidelines for Self-Evaluation (of July 2012).

¹ The Committee's letter of appointment is attached as **Appendix 1**.

Chapter 2: Committee Procedures

The Committee held its first meeting on March 18, 2014, during which it discussed fundamental issues concerning higher education in Israel, the quality assessment activity, as well as Education and Science Education Study programs in Israel.

In March 2014, the Committee held its first round of visits of evaluation, and visited Bar-Ilan University, the Open University and Tel-Aviv University. In June 2014, the committee held its second round of visits of evaluation, and visited Ben-Gurion University and the Hebrew University of Jerusalem. In December 2014, the committee held its third round of visits of evaluation, and visited Weizmann Institute of Science, the Technion, and the University of Haifa. During the visits, the Committee met with various stakeholders at the institutions, including management, faculty, staff, and students.

This report deals with the Department of Science Teaching at the Weizmann Institute of Science. The Committee's visit to the Institute took place on December 14, 2014.

The schedule of the visit is attached as **Appendix 2**.

The Committee thanks the senior management of the Feinberg Graduate School and the Department of Science Teaching for their self-evaluation report, and for the hospitality extended to the committee during its visit at the institution.

Chapter 3:

Evaluation of Science Teaching Study Program at the Weizmann

Institute of Science

This Report relates to the situation current at the time of the visit to the institution, and does not take account of any subsequent changes. The Report records the conclusions reached by the Evaluation Committee based on the documentation provided by the institution, information gained through interviews, discussion and observation as well as other information available to the Committee.

1. Executive Summary

The mission of the Department of Science Teaching at the Feinberg Graduate School (FGS) is to conduct high quality research on the teaching of science and mathematics, as well as to improve how these subjects are taught in Israeli schools. The Department achieves both goals to an admirable degree. The Department is committed to both theory and practice, and connects the two in ways that are worthy of emulation. The Department should be commended for striving to attract people with deep subject matter knowledge to the profession of teaching, something that is rare not only in Israel but also worldwide. The Department's clarity of mission and shared purpose were evident in our meetings with representatives at all levels of the Institute.

The Rothschild-Weizmann (R-W) program, an M.A. degree for practicing teachers that deepens their subject matter knowledge for teaching, is particularly impressive. The program is slated to end in 2018. The Committee feels strongly that every effort must be made to put this program on a solid financial footing so that it can continue to thrive.

The Department has a talented faculty, but many faculty members are nearing retirement. It is crucial for the Department to develop a plan for recruiting new faculty that moves beyond informal contacts and the recruitment of former students. Advertisements for new positions should be posted widely, and recruitment efforts should reach out to talented candidates with current positions in North America and

Europe. The Department plays a unique role in Israeli education, and every effort should be made to guarantee its vitality into the future.

Given the centrality of science and mathematics teaching to the Institute's mission, the committee was surprised at the lack of representation from the Department on key committees, such as the advisory committee for promotion and tenure and the board of the Davidson Institute. The Committee believes that the Department of Science Teaching should be represented on these decision-making bodies.

Our report is organized topically, with a brief summary of each topic followed by the committee's recommendations.

2. Mission and Goals

Observations and Findings

The Department of Science Teaching in the Feinberg Graduate School (FGS) at the Weizmann Institute has a mission to advance the field of science and mathematics teaching at large, as well as to shape science and mathematics teaching in Israel through basic and applied academic research. It trains researchers who will work at other colleges and universities, and practitioners, who will work as teachers, supervisors, curriculum developers, and policy makers.

The committee felt that faculty members understand this mission and are committed to carrying it out. They take seriously the impact of their research on mathematics and science teaching. This synergy between research and practice at an elite institution, particularly a collective understanding that research must be used to improve teaching, is rare and commendable. This clarity of mission and sense of purpose seemed to be shared at all levels of the institution. While teaching is not mandatory, we learned that faculty members regularly teach one or more courses, an expression of commitment to the Department's mission. The committee noticed a tangible feeling of collegiality among faculty and students at all levels. It is a model that other universities and institutions in Israel should strive to emulate.

3. Organizational Structure

Observations and findings

In terms of its organizational structure, the committee found the Department to be highly functional. In general, programs are coherent and thoughtfully planned. The relatively small size of the Department and the fact that it seems to have adequate resources allows it to achieve its goals. We were impressed with the close connections between academic research and outreach to the field. Faculty members are committed to world-class scholarship but take the extra step to see that such scholarship influences how math and science are taught in Israeli schools.

However, given the centrality of science and mathematics teaching to the Institute's mission, we were surprised at the lack of representation from the Department on key Institute committees such as the advisory committee for promotion and tenure. Moreover, the committee was not clear about the precise relationship between the Department and the Davidson Institute. For example, how much involvement should new faculty have in the Davidson Institute? Since involvement in the Institute can make heavy time demands, should new faculty be partially exempt? Furthermore, given that the Davidson Institute has a large board, it seems odd to us that this board included no members from the Department of Science Teaching.

Recommendation

Advisable: The Science Teaching Department should have representation on the advisory committee for promotion and tenure, as well as on the board for the Davidson Institute.

4. Study Programs

Observations and findings

All three study programs: (1) the teaching certificate (TC), (2) both the Masters of Science with a thesis and the Rothschild-Weizmann (R-W) program (MSc without a thesis), and (3) the PhD, attract high quality students, most of whom arrive with deep subject matter knowledge. We believe that these programs have been successful in

achieving the Department's goals, with graduates holding tenure-track and tenured positions across universities and teacher colleges in Israel, as well as non-academic leadership positions in science education. We consider each of the study programs separately.

Teaching Certificate (TC)

The TC program makes an impressive effort to turn scientists into educators. They make this transition in a supportive environment that acquaints them with research on the teaching and learning of their subject matters. The program succeeds in producing teachers with deep knowledge of subject matter and pedagogic knowledge and placing them in schools. The core courses are of high quality and seem to reflect best practices in science and mathematics teaching.

The committee felt that one area for improvement was the TC practicum. We learned that in some of these practicums, future teachers do not see the pedagogic "best practices" that they learn about in their coursework. There seems to be wide variation in quality for students' practicums. There also seemed to be considerable variation across different TC courses in terms of how students' were assessed.

Recommendations

Advisable:

- a. The Department should identify schools where TC students can see and experience the kind of STEM teaching that they learn about in their TC courses.
- b. The Department should develop a common sequence of learning activities linked to concrete learning outcomes during the practicum.

Rothschild-Weizmann (R-W) program (MSc without thesis)

The committee learned that funding for the Rothschild-Weizmann (R-W) program is slated to run out in 2018. We found the students in this track especially impressive. Yet, despite assurances that the Institute will find a way to underwrite the R-W

program going forward, at the present there seemed to be no definitive plan. The committee was worried about the viability of what seems to be a stellar program.

Recommendation

Essential: The Weizmann Institute must find a stable funding base to maintain on-going support for the R-W program.

MSc with thesis

This program strives to connect coursework with both research and outreach. From what we could tell, it succeeds to a great degree. The committee learned of a new policy that allows additional scholarships to be funded by faculty grants. Given the high quality of MSc program and the rather small number of students, the committee thought that more MA students could be accommodated. We also learned that some students had difficulty selecting courses due to limited offerings and conflicts in course scheduling.

Recommendation

Advisable: The faculty should expand the program and mentor more MA students per faculty member.

PhD

The relationships between faculty members and and PhD students reflect an apprenticeship model in the truest sense. Allowing PhD students to teach 8 hours a week in schools is laudable, as are the tailor-made classes, funding for attending conferences, and generous maternity leaves. The committee felt that the number of PhD students could be increased.

Recommendation

Advisable: The faculty should explore the possibility of adding more students to the PhD program.

5. Human Resources / Faculty

Observations and findings

The current faculty is of high quality, including scholars with international reputations. The faculty is productive in terms of the standard metrics of research, publishing, and generating external funding. However many faculty members are nearing retirement. We are concerned about the lack of a cadre of mid-career academics with the same potential for recognition on the international research scene. Moreover, we learned that there is no formal connection between hiring and retirement. That is, from what we could tell, there are no targeted tenure lines reserved for particular specializations. Rather, the focus for new hires seems to be on finding the person of the highest quality; if no such person can be found, a hire is not made, even to the detriment of the Department's programs. It also seemed that the most common method for the recruitment of new faculty depended on personal acquaintances and existing social networks. While this approach can sometimes succeed, more systematic ways of recruiting new faculty must be explored, including the active recruitment of talented candidates currently teaching in North America and Europe.

Furthermore, the current approach to faculty selection seems to be one in which a well-trained scientist or mathematician, who has displayed some interest in education, is transformed into an educational researcher. Two equally valid approaches would be either to hire outstanding graduates of Israeli Science Education departments, towards the end of a postdoctoral fellowship in Europe or in the United States, or, to take highly-skilled teachers and create a path for them to become leading researchers in science and mathematics education.

Recommendations:

Essential: The Department must develop a strategic plan for faculty searches that takes into account upcoming retirements in areas of existing strength and international renown. Recruitment efforts should be expanded to include possible candidates currently in positions outside of Israel, for example, in North America and Europe, or postdoctoral fellows who graduated from a Science Education department in Israel.

6. Students

Observation and findings

The Department of Science Teaching attracts highly motivated students. The committee was particularly impressed by the caliber of students in the R-W program and their potential to impact science teaching in Israel. The committee learned that faculty members are approachable and create a positive learning environment for students. We perceived a genuine teacher-scholar culture with both MSc and PhD students deeply involved in research.

7. Teaching and Learning Outcomes

Observations and findings

Although teaching is not mandatory at the Institute, the committee learned that many faculty members regularly teach one or more courses, yet another indication of the faculty's commitment to its mission and goals. However, the committee also learned that there is considerable variability in how individual courses are constructed and aligned with the overall learning outcomes of the program.

Recommendations

Advisable:

- a. The Department should articulate a shared vision for course design.
- b. The Department should align individual course learning outcomes with the general learning outcomes of the program.

8. Research

Observation and findings

The quality of faculty research is reflected in external funding and the prestige of the outlets in which this research is published. Faculty research is consistent with the Weizmann Institute's mission and the goals of the Department: to see that research leads to the betterment of STEM teaching in Israel. That said, the committee believes the Department should consider, as part of its research agenda, the question of how scientists and mathematicians learn to become educators, especially in venues such as

the R-W program.

Recommendation

Advisable: The Department should encourage research into the process of preparing scientists and mathematicians to become educators. This is an issue worthy of focused research, with potential implications not only for Israel, but internationally as well.

9. Infrastructure

Observation and findings

The committee was impressed with the Institute's infrastructure and facilities. The attention to the aesthetics of the physical space conveys the Institute's sense of the importance of education to the future of the State of Israel.

10. Self-Evaluation Process

Observation and findings

The self-evaluation report was clear and concise. It articulated an institutional mission and a set of departmental goals consistent with what we heard and observed throughout. The faculty members and students we met were able to articulate a clear and convincing collective mission. Admirably, the report reflected an honest appraisal of the Department's strengths and weaknesses.

Chapter 4: Summary of Recommendations

Essential:

1. The Weizmann Institute must find a stable funding base to maintain on-going support for the R-W program.
2. The Department must develop a strategic plan for faculty searches that takes into account upcoming retirements in areas of existing strength and international renown. Recruitment efforts should be expanded to include possible candidates currently in positions outside of Israel, for example, in North America and Europe.

Advisable:

1. The Science Teaching Department should have representation on the advisory committee for promotion and tenure, as well as on the board for the Davidson Institute.
2. The Department should identify schools where TC students can see and experience the kind of STEM teaching that they learn about in their TC courses.
3. The Department should develop a common sequence of learning activities linked to concrete learning outcomes during the practicum.
4. The faculty should expand the program and mentor more MA students per faculty member.
5. The faculty should explore the possibility of adding more students to the PhD program
6. The Department should articulate a shared vision for course design.
7. The Department should align individual course learning outcomes with the general learning outcomes of the program.
8. The Department should encourage research into the process of preparing scientists and mathematicians to become educators. This is an issue worthy of focused research, with potential implications not only for Israel, but internationally as well.

Signed by:



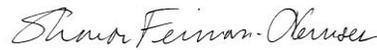
Prof. Sam Wineburg
Committee Chair



Prof. Patricia Alexander



Prof. Yehudit Judy Dori



Prof. Sharon Feiman-Nemser



Prof. Stephen Jacobson



Prof. R. Malatesha Joshi



Prof. Jeremy Kilpatrick



Prof. Alan Lesgold



Prof. Arie Wilschut



Prof. Anat Zohar

Appendix 1: Letter of Appointment



February 2014

Prof. Sam Wineburg
Graduate School of Education
Stanford University
USA

Dear Professor Wineburg,

The Israeli Council for Higher Education (CHE) strives to ensure the continuing excellence and quality of Israeli higher education through a systematic evaluation process. By engaging upon this mission, the CHE seeks: to enhance and ensure the quality of academic studies, to provide the public with information regarding the quality of study programs in institutions of higher education throughout Israel, and to ensure the continued integration of the Israeli system of higher education in the international academic arena.

As part of this important endeavor we reach out to world renowned academicians to help us meet the challenges that confront the Israeli higher education by accepting our invitation to participate in our international evaluation committees. This process establishes a structure for an ongoing consultative process around the globe on common academic dilemmas and prospects.

I therefore deeply appreciate your willingness to join us in this crucial enterprise.

It is with great pleasure that I hereby appoint you to serve as the chair of the Council for Higher Education's Committee for the Evaluation of the study programs in **Education and Science Education**. In addition to yourself, the composition of the Committee will be as follows: Prof. Patricia Alexander, Prof. Yehudit Judy Dori, Prof. Sharon Feiman-Nemser, Prof. Stephen Jacobson, Prof. R. Malatesha Joshi, Prof. Jeremy Kilpatrick, Prof. Alan Lesgold, Prof. Arie Wilschut and Prof. Anat Zohar.

Ms. Maria Levinson-Or will be the coordinator of the Committee.

Details regarding the operation of the committee and its mandate are provided in the enclosed appendix.

I wish you much success in your role as the chair of this most important committee.

Sincerely,
Hagit Messer Yaron
Prof. Hagit Messer-Yaron
Deputy Chairperson,
The Council for Higher Education (CHE)

Enclosures: Appendix to the Appointment Letter of Evaluation Committees

cc: Ms. Michal Neumann, Deputy Director-General for QA, CHE
Ms. Maria Levinson-Or, Committee Coordinator

Appendix 1: site visit schedule

Sunday, December 14, 2014 - Musher Building conference room

Time	Subject	Participants
08:30-09:00	Opening session with the heads of the institution and the senior staff member appointed to deal with quality assessment	Prof. Irit Sagi Prof. Israel Bar Joseph Dr. Ami Shalit
09:00-09:45	Meeting with Head of the Department of Science Teaching	Prof. Bat-Sheva Eylon
09:45-10:45	Meeting with senior academic staff (representatives of relevant committees/programs)* (Tenured lecturers)	Prof. Nir Orion Prof. Anat Yarden Prof. Ruhama Even Prof. David Fortus Prof. Edit Yerushalmi
10:45-11:30	Meeting with Adjunct academic staff	Dr. Yael Shwartz Dr. Esther Bagno Dr. Zahava Schertz Dr. Alex Friedlander Dr. Ronnie Karsenty
11:30-12:00	Meeting with Junior academic staff	Dr. Michal Armoni
12:00-12:45	Lunch (in the same room)	Closed-door meeting of the committee
12:45-13:30	Tour of facilities: classrooms, library, labs, offices	The Feinberg Graduate School classrooms and seminar rooms (at the David Lopatie Hall of Graduate Studies) The Feinberg Graduate School teaching laboratory (Biology) The Davidson Institute Accompanied by Prof. Abraham Arcavi and Prof. Bat-Sheva Eylon
13:30-14:00	Meeting with MSc students**	
14:00-14:30	Meeting with PhD students**	
14:30-15:00	Meeting with Post-doctoral fellows	
15:00-15:20	Closed door meeting of the committee	Closed-door meeting of the committee
15:20-15:50	Meeting with teaching certificate students**	
15:50-16:20	Meeting with Alumni of the Rothschild-Weizmann program**	Ms. Avital Elbaum-Cohen Ms. Lea Yifrach Ms. Einat Filler Ms. Reut Keinan
16:20-16:50	Meeting with Alumni of Department	Dr. Michal Ayalon Dr. Dana Vedder-Weiss Dr. Shuli Kapon Dr. Hadas Gelbart

		Dr. Molat Tiruwork
16:50-17:00	Closed door meeting of the committee	Closed-door meeting of the committee
17:00-17:30	Closing meeting with the heads of the institution and the head of Department	Prof. Irit Sagi Prof. Israel Bar Joseph Prof. Bat-Sheva Eylon Dr. Ami Shalit

* The heads of the institution and academic unit or their representatives will not attend these meetings

** The visit will be conducted in English with the exception of students who may speak in Hebrew and anyone else who feels unable to do so in English.