HIGH SCHOOL STUDENTS’ PERCEPTION OF UNIVERSITY STUDENTS AS STEM REPRESENTATIVES - ROLE MODELS OR DEFINERS?

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POULSEN, Eva Lykkegaard
Centre for Science Education, Science and Technology, University of Aarhus, Denmark
eva@cse.au.dk

Abstract

The Danish government has an ambition to recruit more high school students into STEM educations (science, technology, engineering and/or mathematics). The students’ choice of further education is based on the people and jobs they have knowledge of. Therefore, to recruit more students into STEM studies, it is important to introduce high school students to good STEM representatives to make possible the development of potential STEM identities.

A potential identity within a specific subject area relies on at least a situation bound relationship to the subject area or the person representing it. Some representatives transmit information and are thereby definers, whereas other representatives illustrate as personal examples and are thereby models.

This study focuses on high school students’ views on STEM representatives and the impact these representatives have on the high school students’ potential identities. It shows that the students preferred STEM representatives resembled themselves in some aspects (primarily social and health aspects) and fit their perceptions of a typical person working in STEM in other aspects (knowledge seeking, hard-working etc.).

At least two different representative roles (the definers and the models) can influence the students’ potential identities. It is, however, likely that most representatives are not pure definers or models and they will probably also be perceived differently by different students. Some representatives will not affect one student’s potential identity, others will do so only after prolonged contact, while others again will be able to influence the students potential identity and thus educational choices after just a brief meeting.

Keywords: Enrolment in STEM studies, potential identities, role models and definers.
1. Theoretical Background and Research Questions

The Danish government has an ambition to meet the Lisbon objectives and thereby recruit more Danish high school students into STEM educations (science, technology, engineering and/or mathematics) (Gago et al., 2004). The students’ choice of further education (in STEM or not) is entangled with considerations about their potential future identities. The students’ potential identities are based on the people and jobs they have knowledge of. Therefore, to recruit more students into STEM studies, it is important to introduce high school students to people from STEM. These people must be good STEM representatives to have an impact on the high school students and hopefully make them see potential STEM identities for themselves (Jensen & Henriksen, 2011).

To theoretically acknowledge a potential identity within a specific subject area (as one within STEM), there has to be at least a situation bound person-object relationship. If a subject area or the representative of that area is perceived as attractive or if a person can see similarities with the representative, the situated relation could influence the way the person sees himself (his potential identity) and/or the way he sees the specific subject area (Williams, 1980). Those representatives that transmit information about themselves and their subject area act as definers of that area, whereas those representatives that illustrate their subject area and themselves by virtue of their personal behavior are called models of that subject area (Haller, Woelfel, & Fink, 1968).

This study focuses on high school students’ views on STEM representatives (university students) and the impact these representatives have on the high school students’ educational considerations. The first research question descriptively elucidates the students’ vision of a good STEM representative whereas the second research question deals with how the actual representatives have influenced the students’ potential selves.

1. What characterizes a good STEM representative according to the students?
2. Which impact do the STEM representatives have on the high school students’ potential identities? I.e. do they function as role models, definers or something else entirely?

2. Design and Methods

The participants in this study were 68 high school students at their last year at high school with skills and interest in STEM. They had all chosen Mathematics at an A-level, which is mandatory for admission to higher STEM educations in Denmark. They were also all enrolled in a prolonged (1½ year) university based recruitment project. Here the students were each assigned two mentors (university STEM students) and they met several other STEM representatives for shorter or longer terms during their visits to STEM educations at Aarhus University.

The students’ views of the STEM representatives and the impact they had on the high school students’ potential identities were investigated based on a mixed methods design. Three main sources of empirical data were collected: descriptive surveys, reflexive surveys and personal qualitative interviews.

In the descriptive surveys the students each described 3-5 STEM representatives as well as themselves based on 13 characteristics, whereas they in the reflexive survey assessed what they believed characterized a good STEM representative based on the same characteristics.
The characteristics were chosen from a pre-study to take into account both the distinction and the similarities between the high school students’ perceptions of themselves and their perceptions of typical persons working in STEM. After conducting the surveys, 15 students were subsequently interviewed (25 to 70 minutes depending on the student’s reflections) based on stimulated recall with pictures of the STEM representatives. The interviews were semi-structured, going from descriptive questions about the STEM representatives to self-reflexive questions about the students’ potential identities and reasons for identifying (or not identifying) with the different STEM representatives.

The quantitative descriptive as well as reflexive measures were complemented and triangulated against the qualitative follow-up interviews (Greene, Caracelli, & Graham, 1989) based on the theory of definers and models to analyze the students’ views on the STEM representatives and the impact they have on the students’ potential identities.

3. Results and discussion

Analyses of the empirical survey data gave a quantitative description of the students’ views of a preferred STEM representative as in Figure 1.

![Figure 1: The standard deviation band for the high school students’ characterization of the STEM definer. 1 indicates an unimportant characteristic and 5 a very important characteristic for the good STEM representative.](image)

The students perceived all the listed characteristics to be important to some extent or highly important for a good STEM representative. At first glance that is unexpected since the first five characteristics from the left were not characteristics the students in the pre-study associated with persons working in STEM. However, these characteristics were important for the students themselves. Thus it turns out that the high school students prefer STEM representatives that resemble themselves in some aspects (social and health aspects) and fit their perceptions of a typical person working in STEM in others (knowledge seeking, hard-working etc.).

Based on Figure 1 it is not possible to deduce whether the students’ preferred STEM representative is a definer or a model. In order to comment on which impact the different types of STEM representatives have on the high school students’ potential identities, the survey data together with the transcribed and coded interviews were analyzed in an iterative process based on the definer and model concepts. Here a single focus students different perceptions of two
The first STEM representative is John, who is in his fourth year of studying physics. The focus student Peter has met John at several occasions where John has represented physics. The first time was just before Peter had to choose his major which turned out to be physics just as Johns “when I left, I was fairly certain that it was going to be physics” and already here it was obvious that Peter saw John as a role model.

“In some way, I can identify with him […] He seems just as committed to physics as I am […] in his way of explaining and defining things, […] I like it when people use relevant terminology and firmly support the notion that when you discuss a subject, you use the terminology related to that subject.”

The other STEM representative is Sophia, who is Peter’s mentor and in her third year of studying biology. Peter likes Sophia very much; he describes her as fun, open, easy to work with and helpful. But he does not see her as a STEM role model in the same way as he does John. He describes Sophia as a counselor several times, ”She has been a good counselor when it comes to understanding the level at university, especially in the beginning” and thereby sees her more as a definer.

“She has not influenced my choice of education directly since she is a biologist and therefore does not know much about physics. She has, however, helped make me more certain that the university was a place for me to be.”

At least two different STEM representatives have thus influenced Peter’s potential identity, one as a physics model and one as a definer of the life as a STEM student. It is likely that most representatives are not pure models or definers. And they will probably also be perceived differently by different students. Some representatives will not affect one student’s potential identity, others will do so only after prolonged contact (like the one Peter had with Sophia), while others again will be able to influence the student’s potential identity after just a brief meeting (as was the case with Peters initial meeting with John). All this depends on the situation-bound attractiveness of the representative and his subject area as well as the perceived attractiveness of the representative.

Further analysis could reveal other important STEM representative roles in Peter’s and the other high school students’ developments of potential identities and thus in their educational choice.

References