Communication training that facilitates subject understanding

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Abstract— **In this presentation we use concrete exercises, authentic student texts and teacher response to illustrate the potential of popular science communication to reach a widened perspective and a deeper understanding of the subject. We also discuss how the exercises can be integrated in subject studies, and this way provide a tool to facilitate the progression of skills through the education.**

Index Terms—**Popular science writing, communication, learning, science education**

I. Introduction

ONE of the highest valued skills in working life is the ability to explain complex matter to non-specialists. This was confirmed by an alumn survey carried out at the Faculty of Science in Lund (1). Students therefore need systematic communication training during their studies, not only with experts in their own field, but also with a wider audience. Hence, the ability to communicate subject matter in various contexts makes an important learning outcome. In addition, communication training may as well facilitate the students' understanding of their subject, an effect that we highlight in a new book on teaching and learning in higher education (2). The aim of this presentation is to illustrate how communication skills can be trained throughout the studies – and also bring about a deeper understanding of the subject.

II. Science students' writing skills

In an earlier study we investigated how well biology students succeed in writing an article about their degree project to a wider circle of readers (3). Through text analysis we identified strengths and weaknesses of the students – their major strength being the capability to catch the reader. The outcome varies, though, and the weaknesses are generally due to the students' lacking ability to widen the perspective on their project and their subject. In the study we state that the students' ability to communicate with a wider audience reflects their understanding of the subject. We also suggest that popular science communication, consequently, may serve as a tool for learning.

III. Writing to learn

It is well-known that language not only expresses, but also helps us to form our thoughts (4). Rhetoric, as a tool for choosing, hence helps us as well in our thinking (5). Popular science rhetoric, where the ability to illustrate the subject from various viewpoints is crucial, therefore offers a tool for the change of perspectives. A different perspective may in turn add a deeper understanding of the subject. The idea that popular science writing can bring about a wider perspective and a deeper understanding is supported by the students' own experiences. This was shown by a study based on a questionnaire addressed to undergraduate biology students. (6). Many of the students experience that writing about their degree project to a non-specialist audience has helped them to put the project into a wider context, and to develop a more holistic view of the subject. One student comments the difficulty in grasping the aim of the project before writing the popular science article about it. Others point out that the writing made them aware of their own competence and of what they had actually learned. Some students compare popular science writing with teaching, where they have to explain their subject to someone who is not an expert in the field. This means that the writing, just like teaching, contributes to the writer's own understanding of the discipline.

IV. Integral communication training

So, how could we make the students develop their popular science writing? There are alternative ways in which generic skills training may be designed in education. It has been shown that communication skills are most successfully developed in a specific context (7). This is an example of how the integration of generic skills and subject matter will mutually enhance the development of each other (8). Skills that are especially promoted by integrated training are the ability to accommodate diversity and alternative perspectives, the ability to create and defend ideas, and the ability to use communication as a vehicle for learning (9). This is in line with the idea that popular science communication should make an integral part of the subject studies.

The integration of popular science writing with the subject-specific studies means that the regular teachers of the subject will be responsible for the writing skills training as well. It is not unusual for teachers within the field of natural sciences to feel insecure with regard to the task of teaching skills that are associated with language and communication. Yet these teachers are of pivotal importance for the successful integration of communications training in subject-specific contexts. With only teachers from the field of linguistics this would not be doable. Our experience tells us that the insecurity of the natural science teachers often stems from the lack of clearly formulated outcomes that the students are

meant to attain and be assessed against, or that it is not clear what is expected from the examining teacher in conjunction with, for example, a writing assignment. This is a problem that is often brought to light in connection with courses on teaching and learning in higher education, especially by doctoral students who also teach.

If the qualitative requirements are unclear and the response of the teachers arbitrary, there is a risk that the fulfillment of the outcome will be jeopardised and that the assessment will be inconsistent. It is thus a matter of high priority that there is a consensus regarding the purposes of communications training and the methods used by the active teachers, as well as how the exercises are to be supervised, reviewed and assessed. This presupposes a pedagogical leadership that raises these questions above the course level so that they become a common concern for the entire programme and so that all of the teachers become engaged. Furthermore, it is important to appreciate the teachers' initiatives concerning the students' communication skills. The teaching of general competencies is often underestimated in academic contexts, which does not correspond to their enormous significance for the quality of the education (8).

V. Communication exercises

As a support for the individual teachers who would like to have their students exercise their communication skills within the context of their main field of study we have compiled, in our book, a number of communication exercises that can be varied and integrated into the studies of the specific subjects. We also discuss what the criteria for feedback and assessment might be for each of these exercises. Some examples are also given in our conference presentation.

The first example is a so called elevator pitch, an exercise where a project is to be presented in 30 seconds. The exercise trains the students' ability to see the whole picture, to highlight the central thought, and to make the project appeal to the intended recipient. The second one is an exercise in writing a popular science introduction to a scientific article. Here, the student is trained in journalistic thinking and in choosing information and a disposition model with regard to the perspective of the reader. The third example is a debate article, which focuses one of the most important activities of the researcher: to add new knowledge to the social debate. In this exercise the students train their ability to choose an attitude and to argue for the relevance of research in society.

The three exercises are examples of how communication training can be designed – from simple and basic to more advanced and complex exercises. The aim is that the integrated training will lead to a progression of the students' communication skills through their education. We emphasise the significance of constructive feedback during the exercises, where especially positive response will help students to become aware of what characterises successful rhetoric. We also argue that such an awareness will favour the students' scientific writing skills as well.

VI. Conclusion

Within higher education students are not only required to develop subject-specific skills but also general skills, among these communications skills. Therefore there need to be clear goals for these skills on the levels of both courses and programmes. It is advantageous to train communication integrated with the main field of studies and under the leadership of the subject teachers. However, this demands a consensus among the teachers of the programmes regarding the training and assessment of communication. It must also be evident how each student is to attain progression in his or her skills.

In this presentation we show examples from our book (2), which provides exercises that serve as an inspiration for how communication training can be integrated with subject-specific studies.

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