

A study of translated scientific explanations (TSE): Utilizing public scientific lectures in teaching contemporary physics

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Advances in physics and the milestones of 20th century physics are hardly ever included in most high school curricula, mainly because of the hierarchical nature of the knowledge of physics. How can we explain deep, sophisticated, and innovative scientific ideas to audiences that lack sufficient prior knowledge? Practicing scientists, who are acknowledged as excellent public scientific lecturers, succeed in 'translating' scientific explanations, making them intelligible to the public without corrupting their meaning. We regard these lecturers as experts in crafting TSEs, Translated Scientific Explanations.

The first goal of this study is theoretical, aiming to understand the nature of TSEs and their crafting. Seven exemplary public lectures from six different domains of physics have been selected and examined from three perspectives: the lecture, the lecturer, and the audience (high school physics teachers and students). The second goal is practical, aiming to characterize the nature of learning that these lectures induce in formal learning settings. For this purpose a limited intervention study has been conducted. Public lectures in physics, given by practicing scientists, and accompanied by student-centered activities, have been integrated, as additional enrichment material, into the formal high school physics curricula.

The preliminary results indicate that the goals of the lecturers and the audiences only partially coincide (e.g. different attitudes towards the Nature of Science - NOS). The analysis of explanations formed the basis for a grounded theory explanatory framework for TSEs consisting of four explanatory clusters: conceptual blending, story, knowledge organization, and content. In addition, we found a need for mediation activities when formal learning was expected. A preliminary characterization of the learning process in the intervention study suggests features such as argumentative thinking, and highlights the strengths and weaknesses of analogical explanations in terms of how the listener gauges the appropriateness of these explanations (how well the explanation addresses the needs of the listener).