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Educational Illusions

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Abstract

Optical illusions are systematic errors of perception and interpretation, based on some sensory or mental process, consistently experienced by most individuals. By analogy, we understand educational illusions as erroneous perceptions of teachers' classroom behaviour and/or their estimation of students' perceptions. In the first part of this article, we focus on illusions teachers experience when they teach in the classroom, on the basis of empirical research that has provided similar results for more than 30 years. Time allotted to students for answering questions during the lessons is often very short, considerably shorter than teachers think. The kind of questions teachers ask is often of a lower complexity level, again lower than teacher think. In the second part we presents results of a survey of 15-years-old students conducted in Geneva about the perceived authenticity and interest in PISA-science units. Teachers answering the same survey show, as expected, greater interest. When asked about students' perceptions of authenticity and interest, they adjust their own perceptions to lower values, but still quite strongly overestimate students' perceptions. We conclude by proposing the need to consider these illusions in teacher training in order to avoid teacher disappointment and students disinterest.

Keywords: *Wait time, Questioning, Authenticity, Interest, PISA-science;*

1. Introduction

Optical illusions are systematic errors of perception and interpretation, based on some sensory or mental process [1]. They are consistently experienced by most people, and are studied as "characteristic errors of the visual system that may give us clues to underlying mechanisms" [2]. Educational illusions are understood in this contribution in analogy to optical illusions in this technical sense (to be distinguished from individual beliefs or hopes in something that are in fact not true (see e.g. [3]). In the following, we discuss three examples on the basis of existing and own recent results.

2. What is really going on in classroom?

2.1 Talking time

The Current understanding of learning is as an active, contextualized process of constructing knowledge rather than passively acquiring it (see e.g. [4]). That does not mean that teachers should not tell students the contents of the taught topics, but it emphasize the necessity of time and verbalization for students to integrate the new knowledge [5, 6]. In contradiction to these ideas, speaking time is often "stolen" by teachers. Empirical results show a strong domination of "teacher talk", also in science (Fig. 1). On the other hand, the perception by teachers of their own talking time tends to be much lower.

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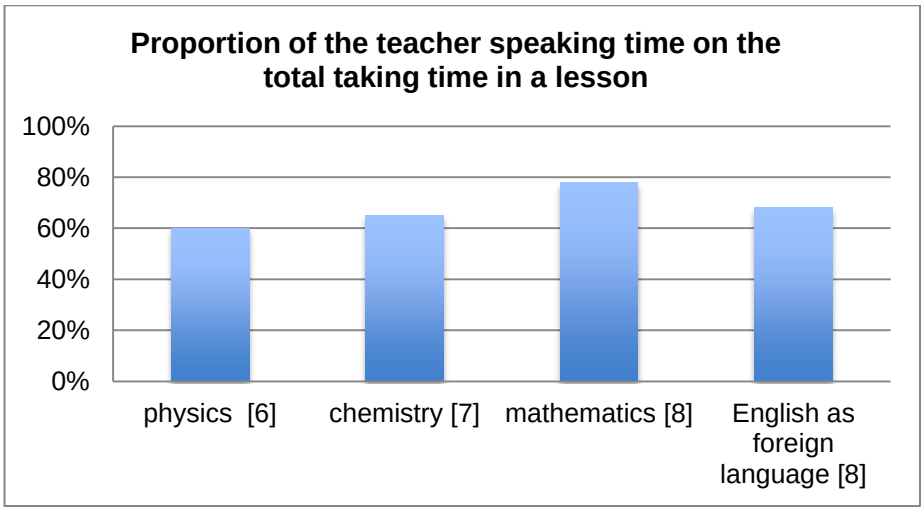
Fig.1. Proportion of teacher speaking time in a lesson, [7, 8, 9]



2.2 Classroom questioning (wait time and level)

A similar discrepancy is found in wait time and level of the questions. "Wait time" after a teacher question is found to be lower than 3 seconds (often of the order of 1 second), with solid evidence accumulated across disciplines over 30 years [10, 11]. When a student does not answer in the allotted very short time, the teacher repeats the question, rephrases it or asks another student. When the expected answer is given, most teachers ask another question, not allowing the whole class to think about the answer. This is in strong contradiction with the current understanding of learning in general, theories (see above), and the important role of time in particular has been emphasized by substantive research: see e.g. the notion of "chronogenèse", that means the necessity to take in account the difference between teaching and learning time [12], or the broad treatment in [13]. When asked, teachers are convinced to allow enough thinking time for their students. Moreover, empirical results show that sufficient wait time has strong positive effects on learning (Cohen *d*=0.9, [14]).
Another characteristic of teacher questions, which shows an educational illusion, is the kind and the level of the questions asked during the lesson. As Hastings [15] points it,

> "*questions serve many purposes. They can help students to reflect on information and commit it to memory. They can develop thinking skills, encourage discussion and stimulate new ideas. Questions allow teachers to determine how much a class understands and enable them to pitch lessons at an appropriate level. They are an important tool for managing the classroom, helping to draw individuals into the lesson and keeping them interested and alert. And questions have a symbolic value - sending a clear message that students are expected to be active participants in the learning process*".

In accord with this, questioning time accounts for one third on the teaching time, second only after explaining time and students' learning is mostly based on the answers to teacher questions. Therefore, most teachers want to realize a kind of classroom questioning probing for understanding and higher order thinking. Again, empirical studies show 60 - 80% "surface thinking questions": repetition, one-word answers. In science and mathematics particularly, between 30% and 60% questions are procedural; again across all disciplines, and over 20 years [16]. And once more, empirical results show the importance of high order questioning for efficient learning (Cohen *d*=0.73 [17]).

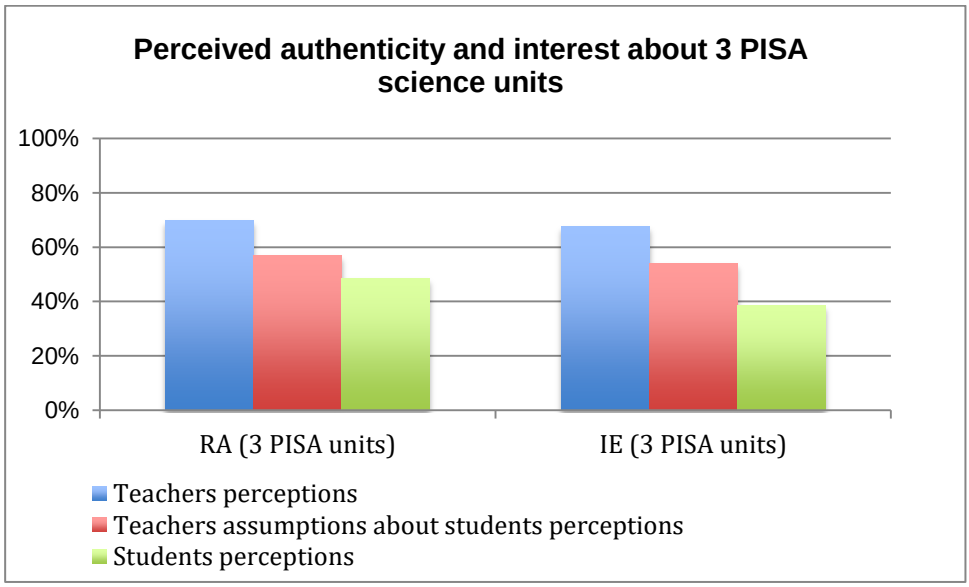
3. Students interest and teaching authenticity

There are also perceptual discrepancies regarding affective variables. The notion of "authenticity" – in the sense of a close relationship to actual and real (or at least realistic) contexts – is considered as

essential for supporting interest for and effective learning of science. These ideas belong to the large framework of context-based science education [18], which underlines the important role of authenticity for both interest and cognitive activation of learners. In the same line, the 2006 science PISA report [19, p36] insists on the "relevance to students' interests and lives" of the PISA units to assess young people scientific literacy. Looking at the PISA units, there can be no doubt about their factual authenticity, i.e. that they are indeed based on real-life contexts as stated above. The assumption that these situations are perceived by students as interesting and authentic is more arguable. A study about the perception of the reality connection/authenticity (RA) as well as of interest and engagement (IE) related to the PISA physical science units with a triple perspective was carried out: it inquires about students' and teachers' perceptions, and additionally teachers' assumptions about students' perceptions [20].

Results show that students perceive interest and authenticity of the PISA units as relatively low, contrary to the basic assumption of PISA, and that there is a large gap to the perceptions by teachers (RA: Cohen d=1.34; IE: d=1.60; p<0.001 for both). Furthermore, teachers adjust their own perceptions to lower values, but still considerably overestimate students' interest and perceived authenticity (RA: d=0.66, p<0.05; IE: d=0.85, p<0.01).

Fig.2. Perceived authenticity and interest [16]



While the difference between students and teachers perceptions is not unexpected, the difference between teachers' assumptions about students' perceptions and their actual perceptions is another example of the perceptual discrepancies discussed in this contribution: teachers project their own interest on students and are therefore overestimating the real perceptions of students.

4. Conclusion

Teachers thus tend – often to the best of their knowledge and conscience – to overestimate certain characteristics of classroom quality. This has consequences: of course, in view of the above findings about talking time, wait time, and level of classroom questioning, there is not much hope to achieve a good level of cognitive activation. Another kind of consequence is when a teacher prepares a nice new context-based teaching sequence, and she or he then is facing a disappointing reception by the students. Here knowledge of the educational illusion described above can protect from frustration, too negative self-attributions and too pessimistic conclusions.

Purkinje remarked that "visual illusions reveal visual truths", which we translate in the present context as "educational illusions reveal educational truths", with "truths" to be understood as widespread (and quite powerful) mechanisms of producing incorrect perceptions of classroom processes. In the spirit of this idea, and based on the above findings, we propose to take account of these "educational illusions" in a more conscientious and systematic way, not at all with the purpose of criticizing teachers, but in order to improve teaching practice and teacher education.

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