

TRAFFIC-JAM-EXAMPLE

(Quelle: Siller, Reichenberger, Gassner: Endlich am Ziel! PM Heft 50 / 55. Jahrgang / 2013.)

Abstract: Traffic jam in front of a tunnel on a highway – who doesn't know about that?

To increase fluency of traffic and therefore to minimize the length of traffic jams often the stop-and-go-system is applied. But how can a tunnel be passed within a certain time span by a maximum number of vehicles?

This question should be discussed and developed through mathematic models and by using technologies by students.



Overview	
Curriculum	functions, differential calculation (not necessary)
Age of Students	16
Previous knowledge	Interpretation of functions (graphs and formulas)
Educational skills	finding and interpreting formulas, gathering and valuating information
Period of Time	2 hours
Special Requirements	student computer (one computer for two students), internet

Web address to materials	http://ggbtu.be/c4996/m45714/ylyy
---------------------------------	---

Description of Lesson / Project

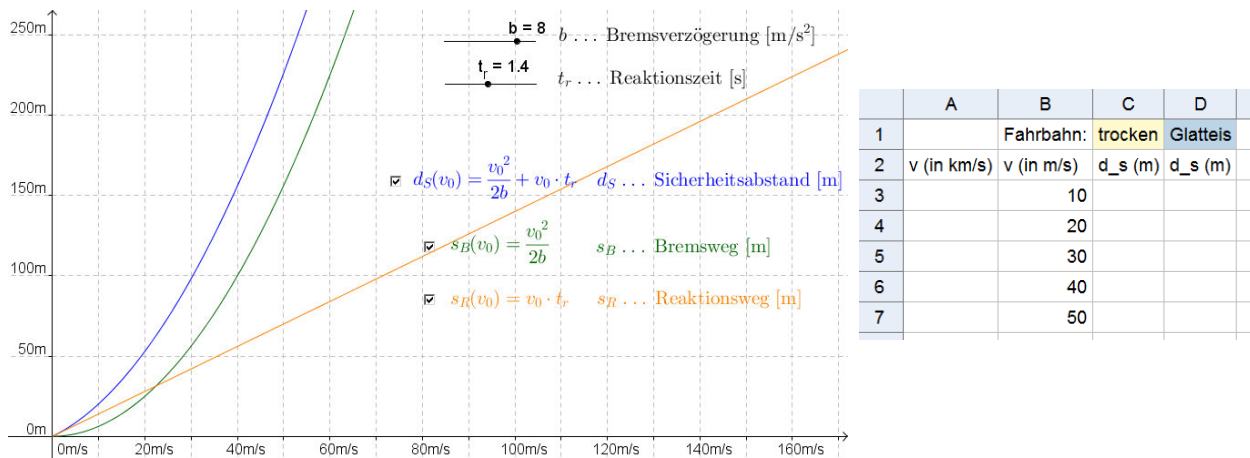
By answering the question of the optimum speed to achieve a maximum number of vehicles through a tunnel within a certain time span, the following factors must be considered: observing of safety distances, traffic frequency, traffic density

Worksheet 1: Safety distance between two vehicles (45 minutes)

The safety distance depends decisively on the starting speed, the reaction speed, brake retardation.

GeoGebra: With the help of the applet „safety distance“ different interrelations (brake distance at different speeds, reaction time at different reaction skills, ...) can be examined by a variation of parameters.

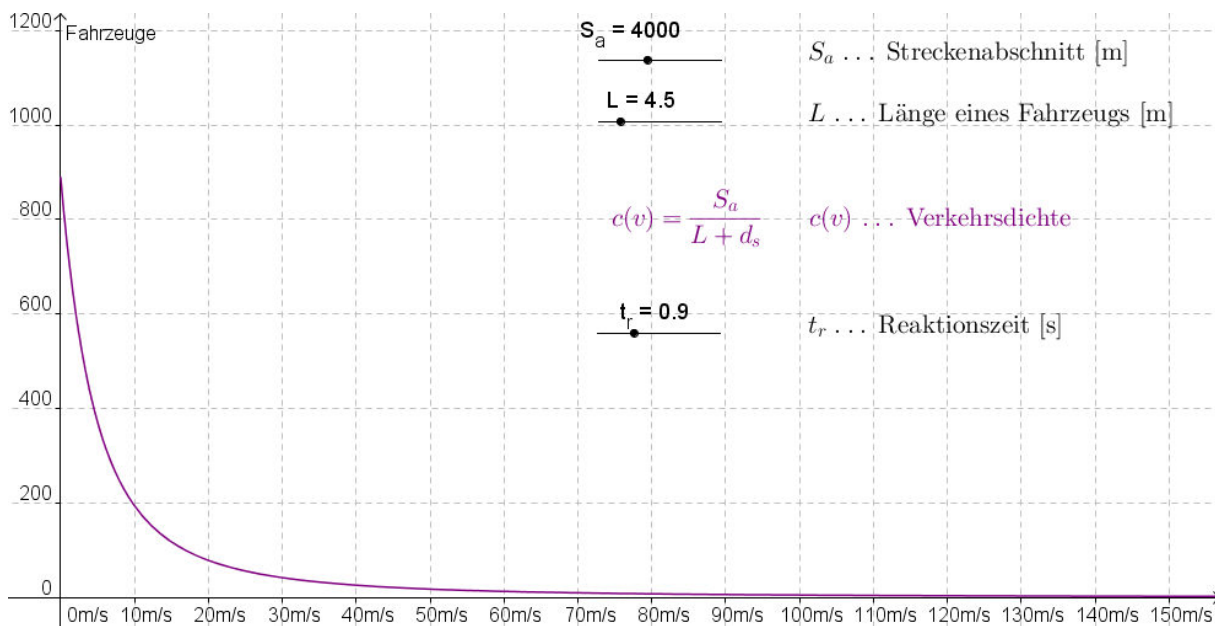
The influence of brake retardation and the reaction time on the graph of safety distances can easily be recognised. For a better overview the collected results should be put together in the calculation view.



Worksheet 2: Traffic density (25 minutes)

First according to a figure a formula for traffic density should be found.

GeoGebra: With the help of the applet „traffic density“ the changes of parameters (e.g. the length of the tunnel section or vehicle length) the effects on traffic density can be shown.



Worksheet 3: Traffic frequency (20 minutes)

The students should be able to understand the formula of the traffic frequency (number of vehicles that pass the check point within an hour) and eventually find the speed at which traffic frequency reaches its maximum.

GeoGebra: The maximum can either be read on the graph of the function or the solution can be calculated with methods of differential calculation.

Your Experiences

Overview	
Teachers	Lindenbauer Edith, Reichenberger Sandra
Type of School	HBLA Lentia, Gymnasium Dachsberg
Number (Age) of Students/Class	24 (17 years) / 35 (17 years)

The students focus on individual tasks. The application of technologie does not cause any difficulties as no distinct GeoGebra-knowledge is necessary for the solution of the tasks.

The students found the example interesting and meaningful. As many students currently attend classes for the driving license they could see in these tasks the application of math in reality and especially in their own life.

By applying the dynamic worksheets interrelations can better and often faster be discovered and analysed.