Content and Form: How one manipulates the other

1

DAY 5:

WHAT DID WE LEARN?

EVALUATION OF THE DATA OF THE EYETRACKING EXPERIMENTS

HNU

Andrea Kohlhase
Neu-Ulm University of Applied Sciences
Andrea.Kohlhase@hs-neu-ulm.de

FAU

Michael Kohlhase
Friedrich-Alexander-University Nürnberg-Erlangen
Michael.Kohlhase@fau.de

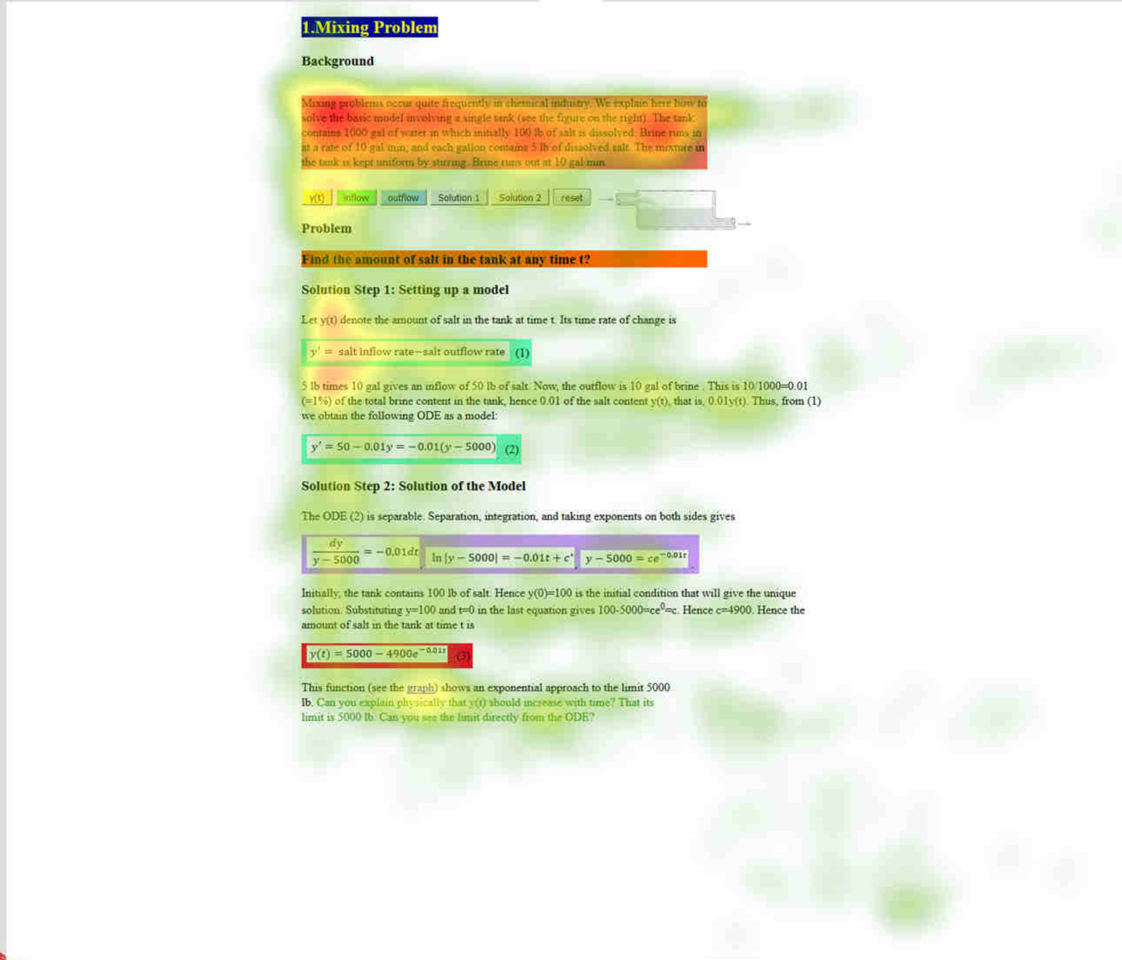
SRINAKHARINWIROT UNIVERSITY

Usability Issues to be solved by Usability Testing

- If users don‘t see things that they should see
- If users don‘t do things that they should do
- If users go in the wrong direction
- If users falsely think they are doing the right thing
- If users miss out on something you considered a rule

Find out
what you‘re users particularly liked,
what they were confused about,
what they did wrong!

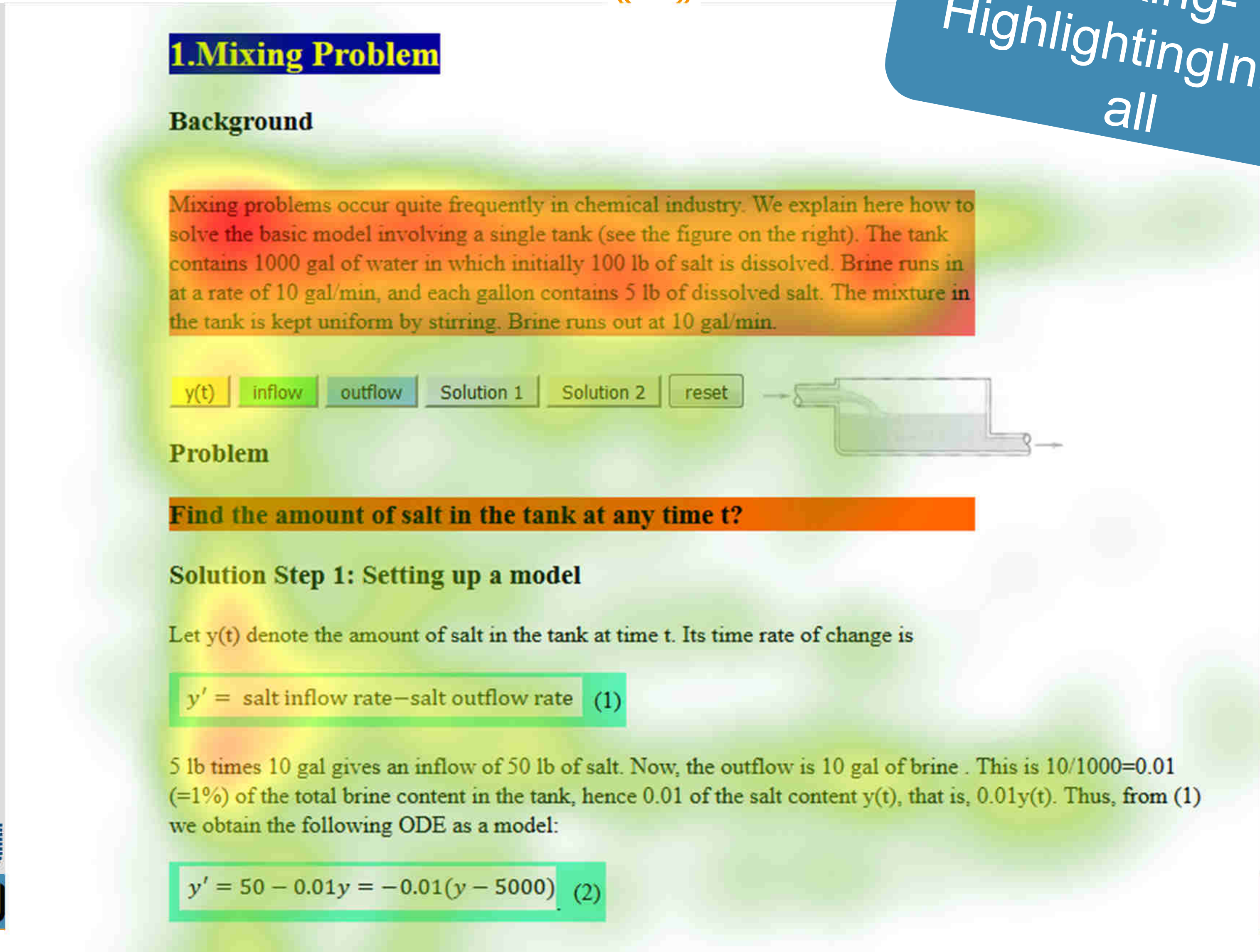
Let us look at some of the data



visiting

Let us look at some of the data

Mixing-HighlightingInfos: all



Let us look at some of the data

Accordion: All

Let us look at some of the data

Accordion: P18

1 Mixing Problem

Background

Mixing problems occur quite frequently in chemical industry. We explain here how to solve the basic model involving a single tank (see the figure on the right). The tank contains 1000 gal of water in which initially 100 lb of salt is dissolved. Brine runs in at a rate of 10 gal/min, and each gallon contains 5 lb of dissolved salt. The mixture in the tank is kept uniform by stirring. Brine runs out at 10 gal/min.

Problem

Background Summarize. Click here

Outflow	Run Rate	10 gal/min
Water	1000	gal
Salt	100	lb
Inflow	Run Rate	10 gal/min
Salt	5	lb

Solution Step 1: Setting up a model. Click here

Solution Step 2: Solution of the Model. Click here

Let us look at some of the data

Accordion: P18

1 Mixing Problem

Background

Mixing problems occur quite frequently in chemical industry. We explain here how to solve the basic model involving a single tank (see the figure on the right). The tank contains 1000 gal of water in which initially 100 lb of salt is dissolved. Brine runs in at a rate of 10 gal/min, and each gallon contains 5 lb of dissolved salt. The mixture in the tank is kept uniform by stirring. Brine runs out at 10 gal/min.

Problem

Background Summarize. Click here

Solution Step 1: Setting up a model. Click here

Let y(t) denote the amount of salt in the tank at time t. Its time rate of change is

$$y' = \text{salt inflow rate} - \text{salt outflow rate} \quad (1)$$

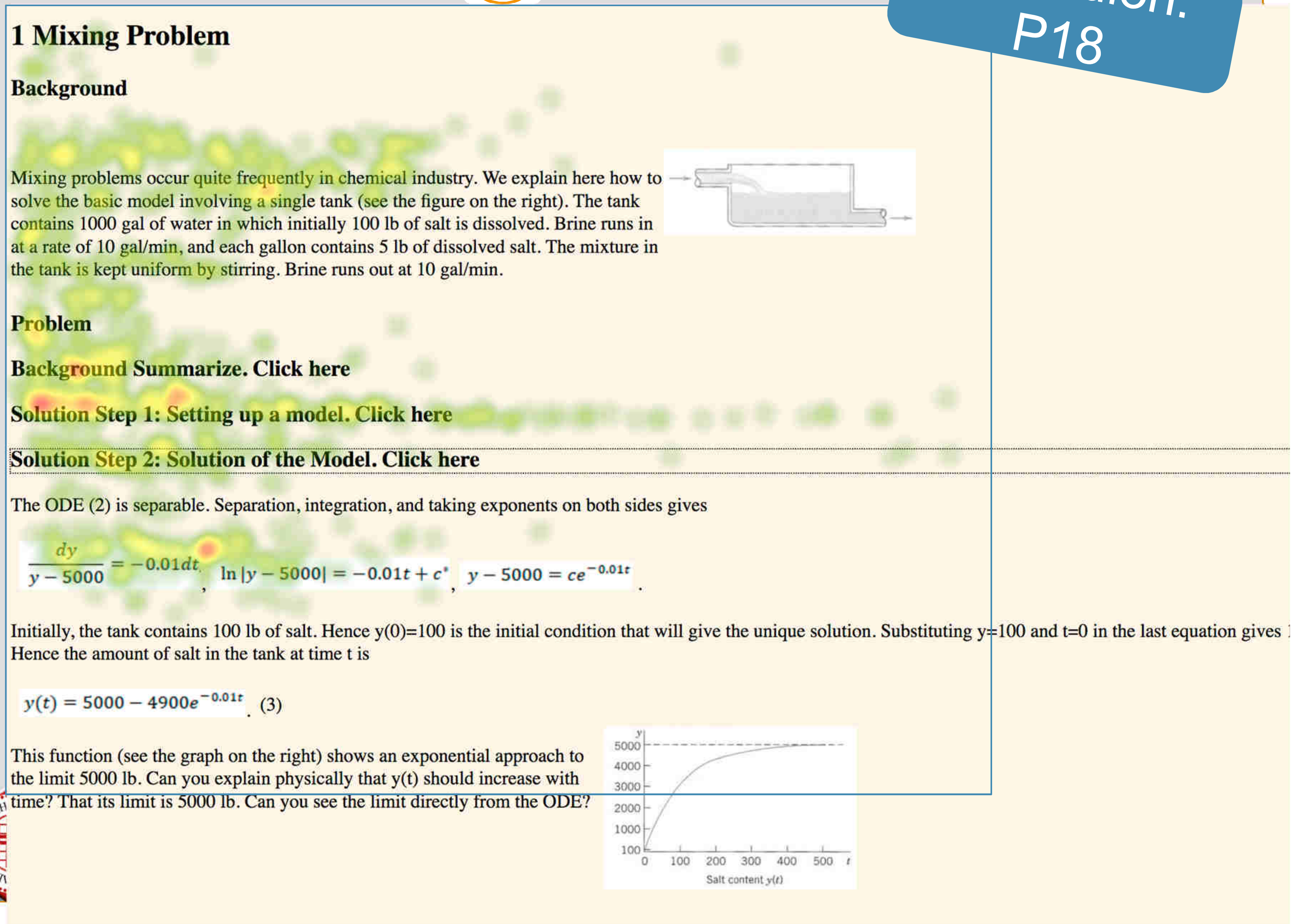
5 lb times 10 gal gives an inflow of 50 lb of salt. Now, the outflow is 10 gal of brine. This is 10/1000=0.01 (=1%) of the total brine content in the tank, hence 0.01 of the
Thus, from (1) we obtain the following ODE as a model:

$$y' = 50 - 0.01y = -0.01(y - 5000) \quad (2)$$

Solution Step 2: Solution of the Model. Click here

Let us look at some of the data

Accordion: P18



1 Mixing Problem

Background

Mixing problems occur quite frequently in chemical industry. We explain here how to solve the basic model involving a single tank (see the figure on the right). The tank contains 1000 gal of water in which initially 100 lb of salt is dissolved. Brine runs in at a rate of 10 gal/min, and each gallon contains 5 lb of dissolved salt. The mixture in the tank is kept uniform by stirring. Brine runs out at 10 gal/min.

Problem

Background Summarize. Click here

Solution Step 1: Setting up a model. Click here

Solution Step 2: Solution of the Model. Click here

The ODE (2) is separable. Separation, integration, and taking exponents on both sides gives

$$\frac{dy}{y-5000} = -0.01dt, \quad \ln|y-5000| = -0.01t + c^*, \quad y - 5000 = ce^{-0.01t}.$$

Initially, the tank contains 100 lb of salt. Hence y(0)=100 is the initial condition that will give the unique solution. Substituting y=100 and t=0 in the last equation gives
Hence the amount of salt in the tank at time t is

$$y(t) = 5000 - 4900e^{-0.01t}. \quad (3)$$

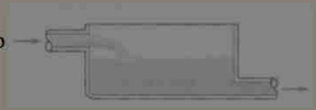
This function (see the graph on the right) shows an exponential approach to the limit 5000 lb. Can you explain physically that y(t) should increase with time? That its limit is 5000 lb. Can you see the limit directly from the ODE?

Let us look at some of the data

Accordion: P19

1 Mixing Problem

Background



Mixing problems occur quite frequently in chemical industry. We explain here how to solve the basic model involving a single tank (see the figure on the right). The tank contains 1000 gal of water in which initially 100 lb of salt is dissolved. Brine runs in at a rate of 10 gal/min, and each gallon contains 5 lb of dissolved salt. The mixture in the tank is kept uniform by stirring. Brine runs out at 10 gal/min.

Problem

Background Summarize. Click here

Outflow	Run Rate	10	gal/min
Water	1000		gal
Salt	100		lb
Inflow	Run Rate	10	gal/min
Salt	5		lb

Solution Step 1: Setting up a model. Click here

Solution Step 2: Solution of the Model. Click here

Let us look at some of the data

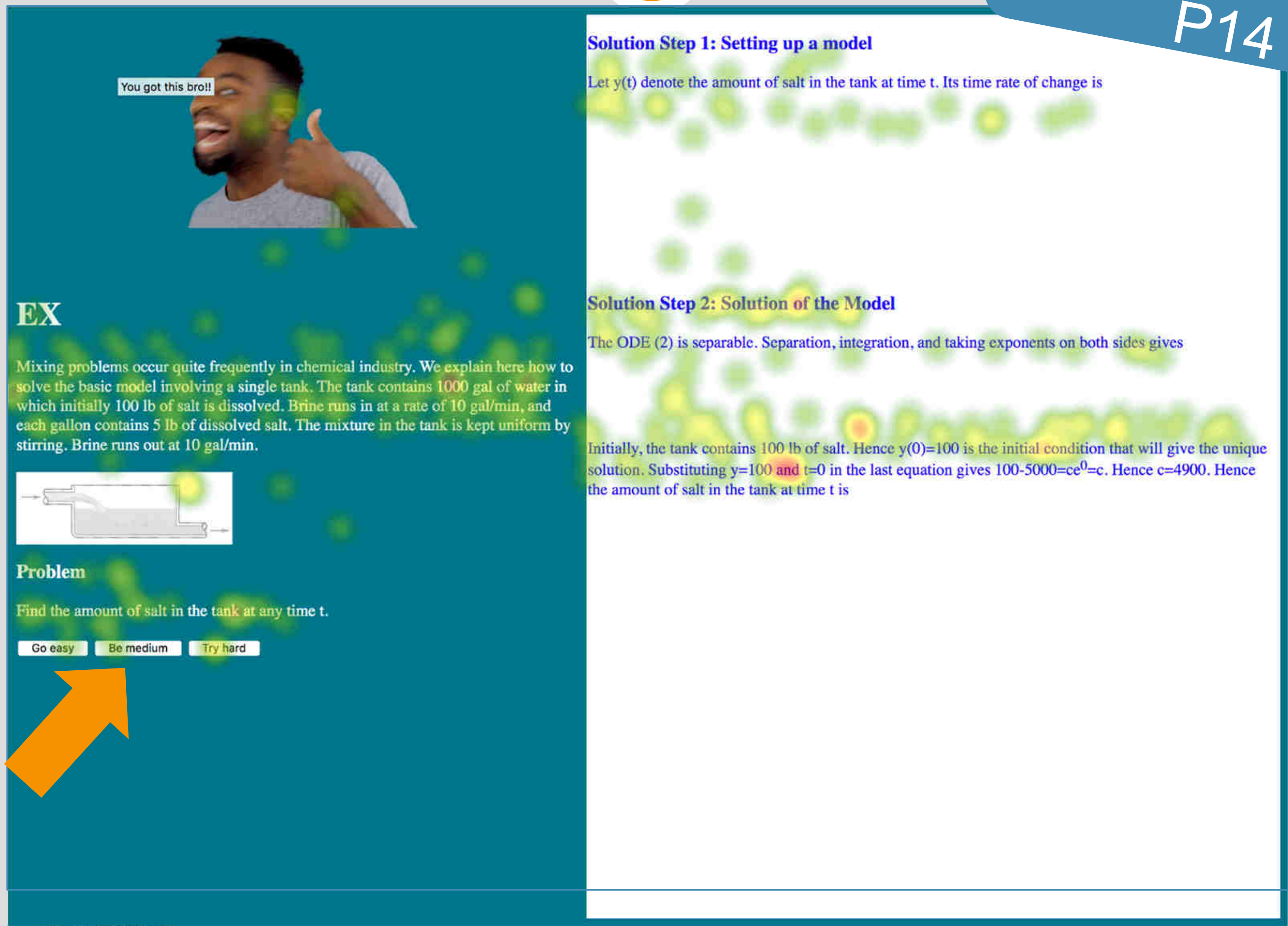
VeryAnimated: P13

Let us look at some of the data

VeryAnimated: P14

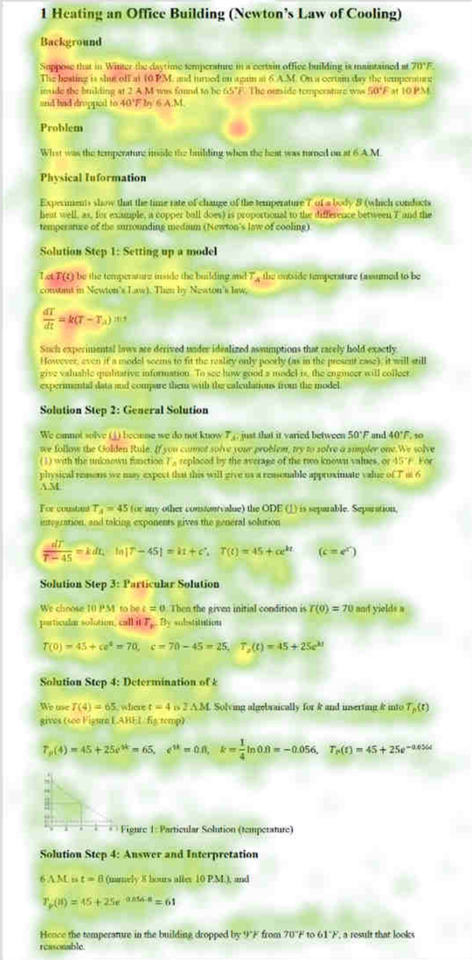
Let us look at some of the data

VeryAnimated: P14



Let us look at some of the data

Heating-Highlighting: all



1 Heating an Office Building (Newton's Law of Cooling)

Background

Suppose that in Winter the daytime temperature in a certain office building is maintained at 70°F. The heating is shut off at 10 P.M. and turned on again at 6 A.M. On a certain day the temperature inside the building at 2 A.M was found to be 65°F. The outside temperature was 50°F at 10 P.M and had dropped to 40°F by 6 A.M.

Problem

What was the temperature inside the building when the heat was turned on at 6 A.M.

Physical Information

Experiments show that the time rate of change of the temperature T of a body B (which conducts heat well, as, for example, a copper ball does) is proportional to the difference between T and the temperature of the surrounding medium (Newton's law of cooling).

Solution Step 1: Setting up a model

Let $T(t)$ be the temperature inside the building and T_A the outside temperature (assumed to be constant in Newton's Law). Then by Newton's law,

$$\frac{dT}{dt} = k(T - T_A) \quad (1)$$

Such experimental laws are derived under idealized assumptions that rarely hold exactly. However, even if a model seems to fit the reality only poorly (as in the present case), it will still give valuable qualitative information. To see how good a model is, the engineer will collect experimental data and compare them with the calculations from the model.

Solution Step 2: General Solution

We cannot solve (1) because we do not know T_A, just that it varied between 50°F and 40°F, so we follow the Golden Rule. *If you cannot solve your problem, try to solve a simpler one.* We solve (1) with the unknown function T_A replaced by the average of the two known values, or 45°F. For physical reasons we may expect that this will give us a reasonable approximate value of T at 6 A.M.

For constant $T_A = 45$ (or any other constant value) the ODE (1) is separable. Separation, integration, and taking exponents gives the general solution

$$\frac{dT}{T-45} = k\,dt, \quad \ln|T-45| = kt + c^*, \quad T(t) = 45 + ce^{kt} \qquad (c = e^{c^*})$$

Solution Step 3: Particular Solution

We choose 10 PM to be $t = 0$. Then the given initial condition is $T(0) = 70$ and yields a particular solution, call it T_p. By substitution

$$T(0) = 45 + ce^0 = 70, \quad c = 70 - 45 = 25, \quad T_p(t) = 45 + 25e^{kt}$$

Solution Step 4: Determination of k

We use $T(4) = 65$, where $t = 4$ is 2 A.M. Solving algebraically for k and inserting k into $T_p(t)$ gives (see Figure LABEL fig:temp)

$$T_p(4) = 45 + 25e^{4k} = 65, \quad e^{4k} = 0.8, \quad k = \frac{1}{4}\ln 0.8 = -0.056, \quad T_p(t) = 45 + 25e^{-0.056t}$$

Figure 1: Particular Solution (temperature)

Solution Step 4: Answer and Interpretation

6 A.M. is $t = 8$ (namely 8 hours after 10 P.M.), and

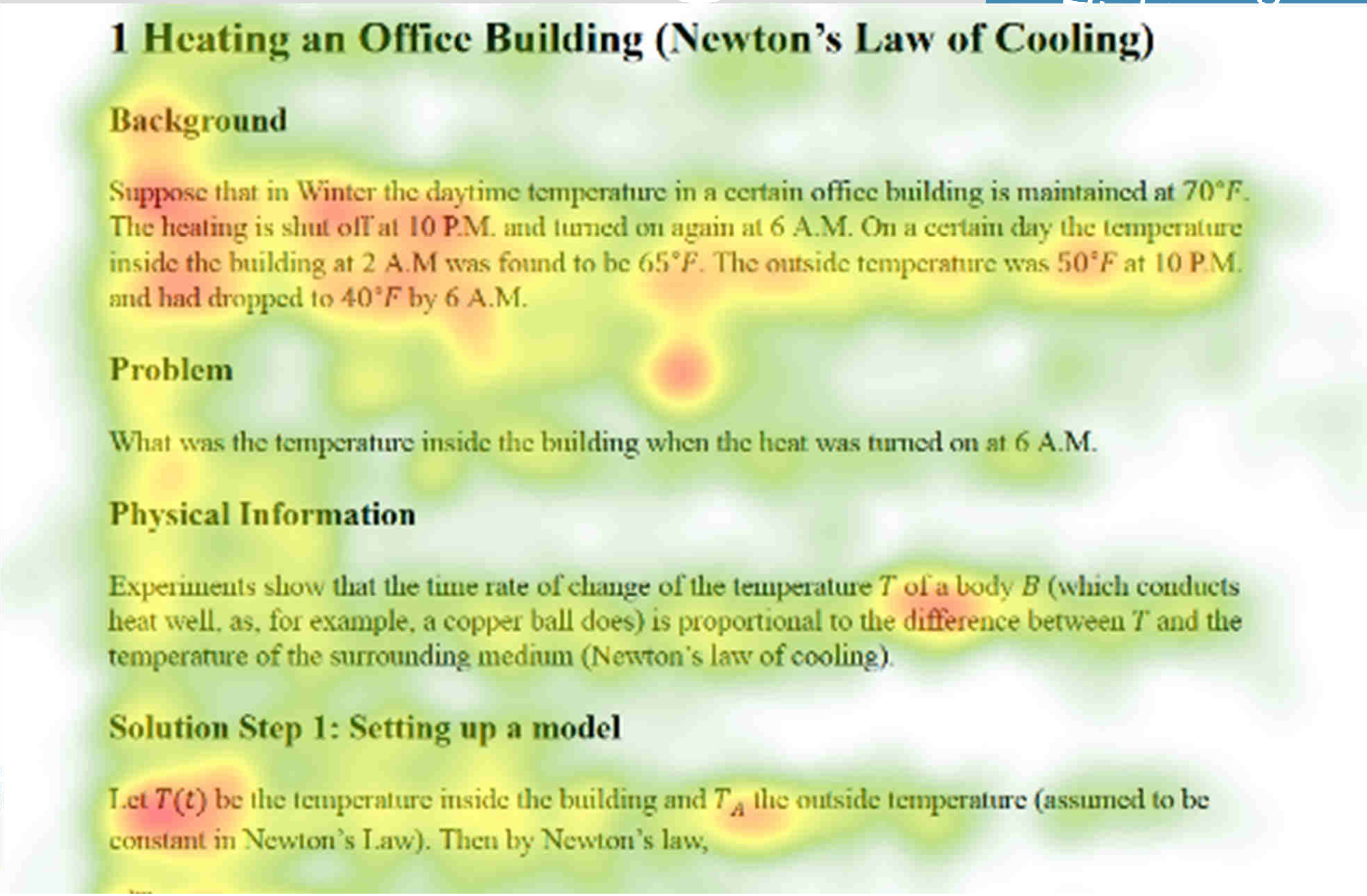
$$T_p(8) = 45 + 25e^{-0.056 \cdot 8} = 61$$

Hence the temperature in the building dropped by 9°F from 70°F to 61°F, a result that looks reasonable.

FAU visiting HNU

Let us look at some of the data

Heating-



1 Heating an Office Building (Newton's Law of Cooling)

Background

Suppose that in Winter the daytime temperature in a certain office building is maintained at $70°F$. The heating is shut off at 10 P.M. and turned on again at 6 A.M. On a certain day the temperature inside the building at 2 A.M was found to be $65°F$. The outside temperature was $50°F$ at 10 P.M. and had dropped to $40°F$ by 6 A.M.

Problem

What was the temperature inside the building when the heat was turned on at 6 A.M.

Physical Information

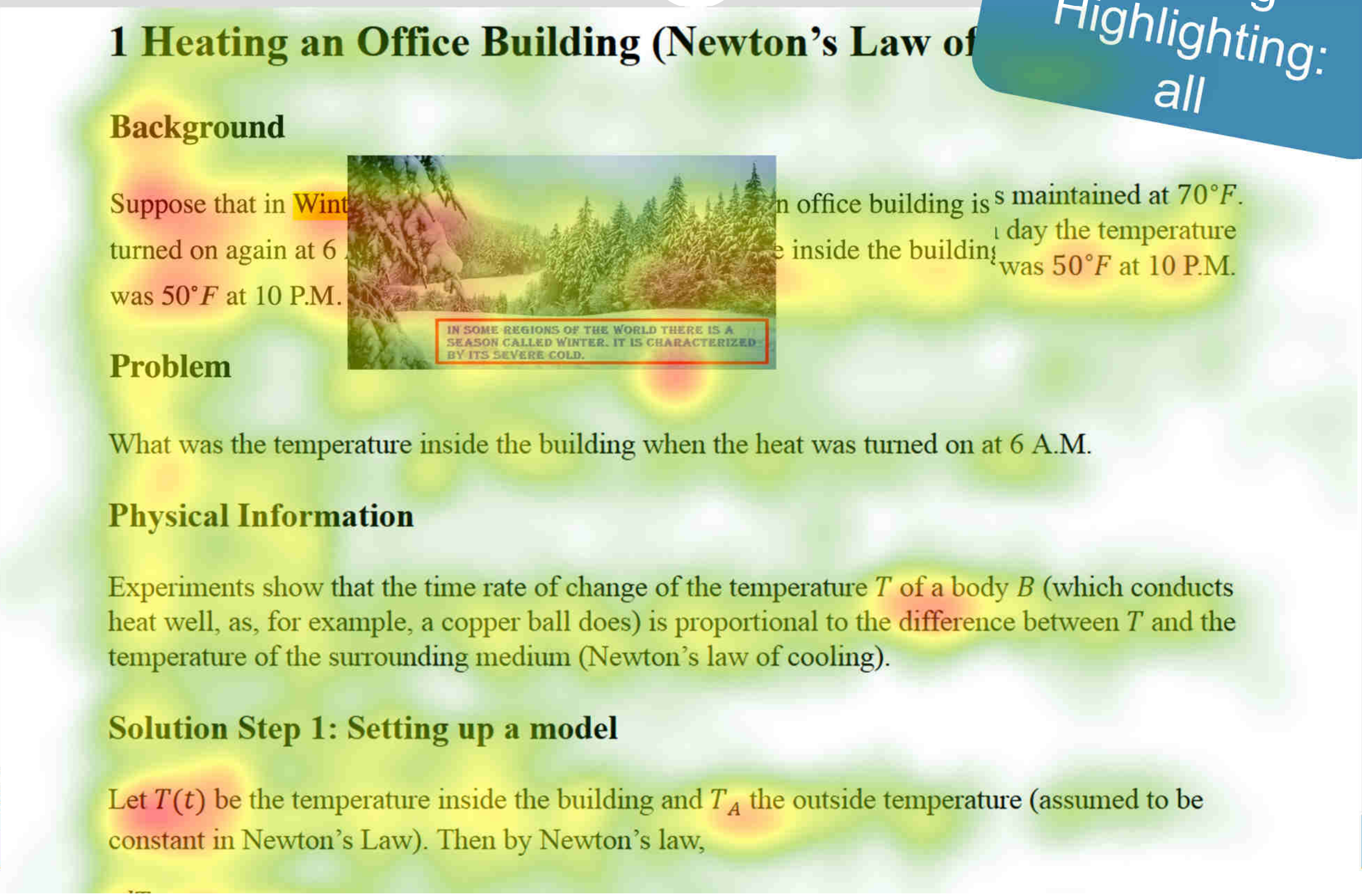
Experiments show that the time rate of change of the temperature T of a body B (which conducts heat well, as, for example, a copper ball does) is proportional to the difference between T and the temperature of the surrounding medium (Newton's law of cooling).

Solution Step 1: Setting up a model

Let $T(t)$ be the temperature inside the building and T_A the outside temperature (assumed to be constant in Newton's Law). Then by Newton's law,

Let us look at some of the data

Heating-Highlighting: all



1 Heating an Office Building (Newton's Law of

Background

Suppose that in Wint n office building is s maintained at $70°F$.
turned on again at 6 e inside the buildin day the temperature
was $50°F$ at 10 P.M. was $50°F$ at 10 P.M.

Problem

What was the temperature inside the building when the heat was turned on at 6 A.M.

Physical Information

Experiments show that the time rate of change of the temperature T of a body B (which conducts heat well, as, for example, a copper ball does) is proportional to the difference between T and the temperature of the surrounding medium (Newton's law of cooling).

Solution Step 1: Setting up a model

Let $T(t)$ be the temperature inside the building and T_A the outside temperature (assumed to be constant in Newton's Law). Then by Newton's law,

Recommendations for Report Writing

- KISS (Keep it short and simple; 10-15 pages)
- Include an executive summary
- Include empirical data only as attachments
- Communicate with screen shots (of subject or visual analysis tools)
- Include positive observations ← Don‘t fall for „negativity bias“!
- Include quotes (makes it seem less interpretative)
- Don‘t be arrogant or harsh
- Differentiate between user and observer opinions
- No blabbing

Executive Summary

[The Executive Summary should describe when and where the usability test took place. Describe the purpose of the test. Include the number of participants and the length of the sessions. Provide any additional information about the test.

Provide a brief overview of the results. Include a glimpse of the overall ease of use and some of the participant demographic information. Provide a bulleted list of the problems.

Provide a paragraph describing what is included in the document.]

For example:

The AIDS.gov project team conducted an onsite usability test at the HIV Prevention Leadership Conference (HPLA) in New Orleans on May 21st and May 22nd, 2007. HPLA is the country's largest HIV/AIDS prevention conference. The purpose of the test was to assess the usability of the web interface design, information flow, and information architecture.

Seven conference attendees participated in Test 1 and six in Test 2. Typically, a total of eight to 10 participants are involved in a usability test to ensure stable results. Each individual session lasted approximately one hour. Test scenarios differed over the two test days to meet OMB guidelines.

In general all participants found the AIDS.gov web site to be clear, straightforward, and 92% thought the web site was easy to use. Ten of the 13 participants (77%) used federal government web sites at least once a month to find HIV/AIDS information.

The test identified only a few minor problems including:

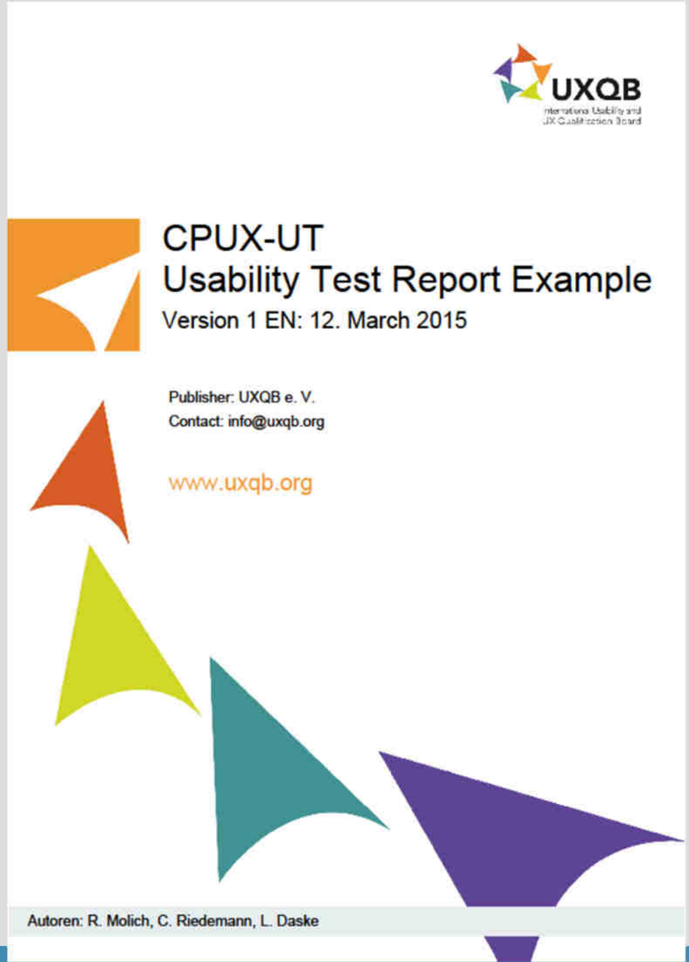
- The lack of categorization of topics on the funding pages.
- Lack of a fact sheet/brochure category section.
- Lack of HIPAA category section.
- Lack of a Mental Health category section.
- Lack of a site index.
- Lack of any categorization of news items on the news page.
- Lack of a section for HIV+ data (e.g., number of individuals infected)

This document contains the participant feedback, satisfactions ratings, task completion rates, ease or difficulty of completion ratings, time on task, errors, and recommendations for improvements. A copy of the scenarios and questionnaires are included in the Attachments' section.

http://www.usability.gov/how-to-and-tools/resources/templates/report-template-usability-test.html

Example for a Complete UX-Report

Google Keywords: CPX-UT Usability Test Report Example



Problem Severity Rating

- Classic

  Level 1: Prevents Task Completion
  Level 2: Creates significant delay and frustration
  Level 3: Problems have a minor effect on usability
  Level 4: Subtle and possible enhancements/suggestions

  [Dumas & Redish, 1993]

- Modern

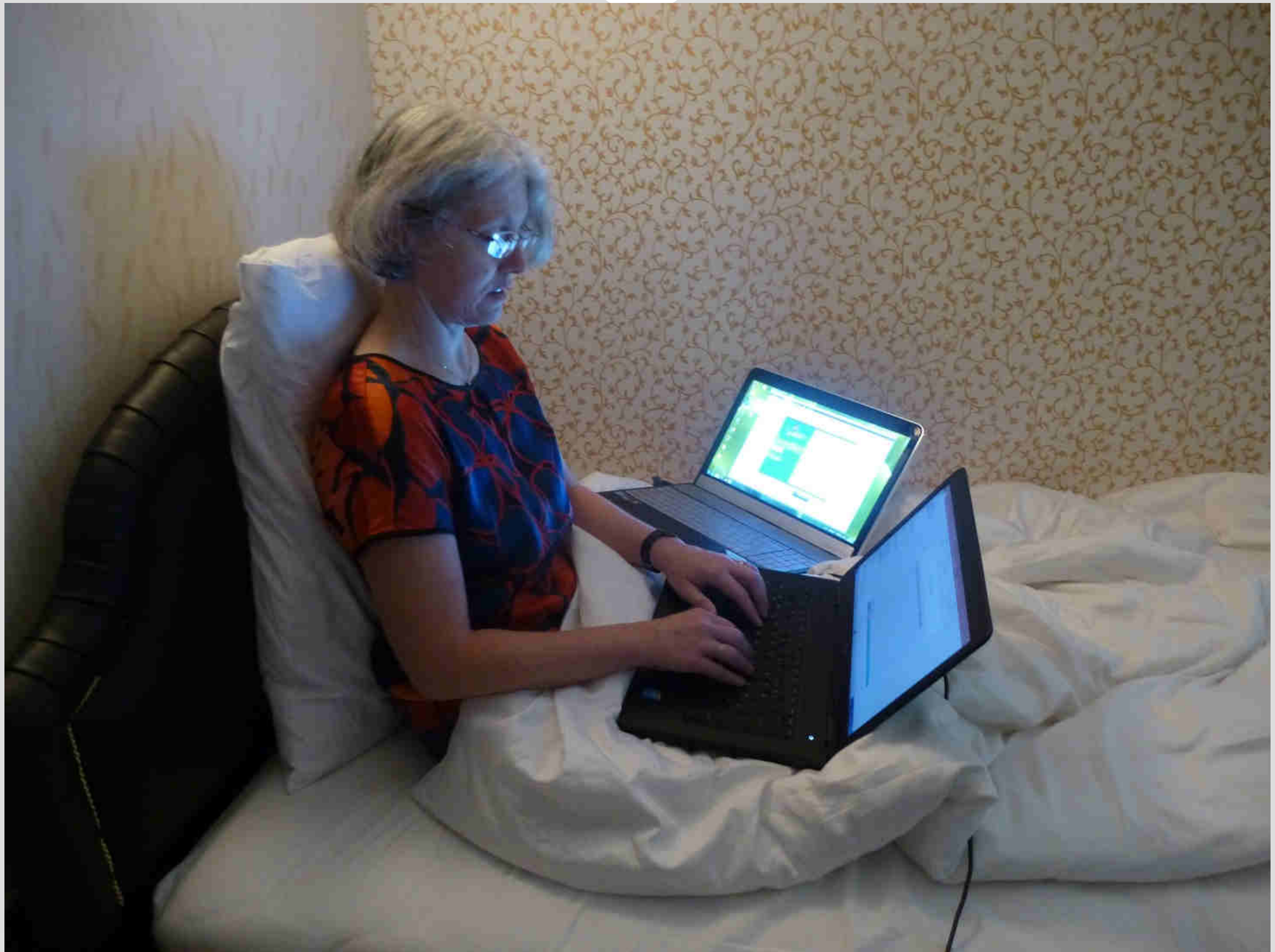
  Minor: delays user briefly.
  Serious: delays user significantly but eventually allows them to complete the task.
  Catastrophic: prevents user from completing their task.

  [Molich & Jeffries]

See [https://measuringu.com/rating-severity/] for variants

All of us worked hard …


All of us worked hard …



At the End …

Thank you for being such an attentive, enthusiastic, welcoming, interactive, friendly, punctual, simply great class!

At the End …

Thank you for being such an

- attentive,
- enthusiastic,
- welcoming,
- interactive,
- friendly,
- punctual,
- simply great

class!