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Science on the Move 2019

Understanding through models

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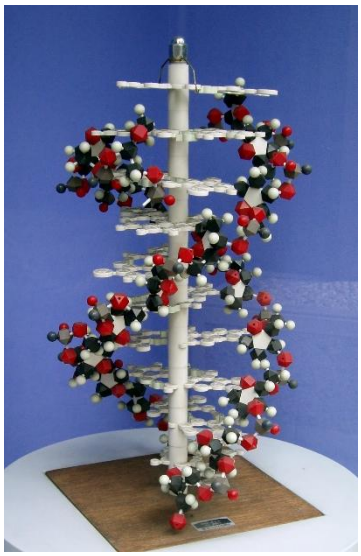
No Imagination Without Models

What is it all about?



Our brain has been trained over thousands of years to analyze situations we detect with our senses. Since the invention of telescopes and microscopes, we can observe objects that are too far away or too small to investigate with the naked eye. Nevertheless, to understand or at least to try to explain a chemical or biological process or structure, we need models.

Models help us to find explanations by transferring a particular situation into a world we feel familiar with. For example, most of us have never seen a DNA molecule, but we all have a picture of it in our heads: a double-helix. When we talk about DNA we think about a model, not the real structure.

We need models in order to understand a structure or a process, but we need them as well to explain something. Thinking about the characteristics that make the difference between a good and a bad model, we realize that simplification of a complex process or structure is tricky. Models might lead to misconceptions. In addition, the value of a model depends on the person using and explaining it.

Models force us to think twice. Models might be challenging. Models let us discover aspects we never thought about. Models may be enlightening.

The Task – Overview

Your task consists of three subtasks:

1. **The Model:** Build a non-digital 3D model of a chemical/biochemical/biological process or structure.

2. **The Poster:** What is the theoretical background of your model? Explain which aspect can be shown by the model and which not. Make a construction sketch.

3. **The Video Clip:** Make a short video clip (max. 2 minutes) that presents the model in operation.

Please read all instructions until the very end! It is crucial for you to know what will be judged and how many points you may get for each subtask! See also page 10.

The Model

What you have to do…

You have to transfer a well-known chemical/biochemical/biological structure or process into a model which should be helpful to simplify, explain and to understand the chosen structure/process. To understand means to realize and to discuss which aspects of the topic can be explained by the model and which cannot.

Before you start building the model or even choose a topic, please take your time to discuss the task with your biology or chemistry teacher. This intensive and profound discussion is essential in order to find out which topic is worth representing in a model. This decision-making process must be described in the Progress Report (see below).

In order to make a good decision, you have to think about the criteria by which we will assess your model (see also "Scoring List"):

1. **Comprehensibility:** A model must – at least after a moment – be **comprehensible**. Maybe the user must first study your poster in order to get the basic concept. After a while you should detect a smile on the lips of the person playing around with your model and you might hear: 'Aha! NOW I see and now I understand!' (10P)
2. **Appropriate Complexity:** The model should describe the process or structure in an elegant way. Maybe, there are elements that can be modified by playing around with the model and thereby explain different situations and interactions. If yes, do these elements make the model more complex in a reasonable way or are they just unnecessary gadgets? Please note: Complex and simple models can be equally valuable depending on what you want to show! (5P)
3. **Engineering / Functionality:** To what extent was the theoretical knowledge transferred into a functioning model? For this you need **engineering skills**. (An engineer does not know only in theory how to build a bridge; he can instruct a construction-company how to do it. That's what we call 'engineering'.) The model should work smoothly. Furthermore, it should be easy to handle, should be built-up of well-thought materials and it should be stable (and not fall apart after touching once). (7.5P)
4. **Appearance:** To entice interested people to play with the model, it should be attractive, creative and fun. (7.5P)

Please note that your model will be judged only on basis of the video clip. The model itself will not be available to the jury during the evaluation!

In addition, your model:

- Could be made of wood, carton, metal, plastic, … there are no limits considering the materials you use
- Should not be dangerous or fragile
- Should be relatively easy to assemble and disassemble
- Should be portable (1-2 persons should be able to carry it, it should fit through a normal doorway and on a normal table, it should be possible to send it per Swiss post)

Further expected documentation

Progress Report

You are expected to describe and explain precisely **what happened between your team's initial discussions and the final constructed model**. Track your first ideas and discussions as you go along. For us it is crucial to ***understand the process*** you went through during this part of the task.
Mention **three suggestions** that were made and give a short **explanation** why you decided to choose the particular topic. Give arguments for and against choosing a certain topic including the one you finally selected as the most promising one.

Hint: Take your time to ask experts. Get inspired by talking with different teachers about your project. They all used or still use their beloved and favored models. It is not forbidden to ask for hints or inspirations. Check carefully the criteria we use to assess your model. As soon as you start to build your model, your teacher is only allowed to act as a coach in the background.

Activity List

Each class needs to report which member was or is responsible for which portion or aspect of the work. Each person in the class must have participated at least once during the experimental task (no matter what kind of work she/he did).
Take **one picture** showing the class involvement. Place it next to the activity list.

Combine those two documents in one PDF file (**max. 2 A4 pages**) and name it, strictly following these conventions:

▶ Name of School
▶ Name of Class (same as on application form or on simplyscience.ch)
▶ Name of file (ProgressActivity)
▶ Date (year/month/day)
→ **Please use underlines instead of spaces!**

Here is an example:
Gymnasium_Muster_Class3b_ProgressActivity_20190405.pdf

Please note! If we don't get the Progress Activity file or of it is incomplete, points will be deducted from your score!

The Poster

What you have to do…

The poster should explain the biochemical, physiological or anatomical background of the process or the structure you have chosen to explain by your model. It should include a sketch of the model, showing and describing the used materials and how the model was built. The poster should also be attractive and make people want to read it.

For judging your poster, the following aspects will be taken into consideration:

5. **Layout:** Readability, quality, labelling and numbering of the tables, graphics and pictures (2P)
6. **Attractiveness:** Is the poster eye-catching? (1P)
7. **Density of information:** Too much or not enough information may be an issue (2P)
8. **Theoretical background of the topic:** Is the complex theoretical background of the topic successfully explained? Is it correct? Is it obvious which aspect of the theory is illustrated by the model? (2P)
9. **Construction sketch:** is the sketch informative and accurately drawn? (3P)

Additional information

- To create the poster, use our PowerPoint template which will be available on our website next to the experimental task. **Feel free to adapt the whole layout** according to your taste but **do not change** the format (A0, **portrait** format) and the font size for the main text. Save your poster as a **PDF file.**
  The size of the PDF file must not exceed **6 MB**. (if you need to compress your file you can use online tools such as https://pdfcompressor.com/de/)

- Your poster should include:
  ▶ Title, name of school, name of class
  ▶ Theoretical background of the topic including text and images (photos, drawings, sketches, etc.) illustrating the selected process or structure
  ▶ Construction sketch (sketch of the model including materials and construction method)
  ▶ References (see PowerPoint template for further specifications)

- Use **at least font size 24 for the main text**.
  You are free to choose the font, but it should be easily readable (e.g. Arial, Calibri).

- Name the PDF file strictly following these conventions:
  ▶ Name of School
  ▶ Name of Class (same as on application form or on simplyscience.ch)
  ▶ Name of file (Poster)
  ▶ Date (year/month/day)
  → **Please use underlines instead of spaces!**

Here is an example:
Gymnasium_Muster_Class3b_Poster_20190405.pdf

The Video Clip

What you have to do…

The 1-2-minute video clip, first of all, presents the model in action. One or several persons of your team must explain the model while working with it. During a discussion between members of your class (which might happen simultaneously or following the explanations), you should try to ask meaningful questions and provide well thought-out answers leading to a deeper understanding of the model.

Consider the following questions:

- Which aspects of the process or the structure does this model highlight?
- In which sense is the model convincing, which aspects are not or just weakly represented?
- What could lead to a misconception?

By asking meaningful questions and giving precise answers you will prove that you are able to critically review your model and maybe even suggest what could be done better.

Please note that your model will be judged only on basis of the video clip. The model itself will not be available to the jury during the evaluation!

For judging your video clip, we will take into consideration:

1. **Content:** How well does the video clip explain the model in action in its full complexity? (2.5P)
2. **Questions and answers:** Are the questions and answers meaningful? Do they help to embed the model in a broader context? (2.5P)
3. **Technical aspects:** How sophisticated is the script, the camera work and the sound quality? (2.5P)
4. **Entertainment value:** Is the video clip interesting, entertaining and engaging? (2.5P)

The filename extension should be .mp4. If your original file has a different extension, you can use freeware such as VLC (http://www.videolan.org/vlc/) to convert your video.
The size of the PDF file must not exceed 100 MB and it must not be longer than 2 minutes.

Name the video file strictly following these conventions:

▶ Name of School
▶ Name of Class (same as on application form or on simplyscience.ch)
▶ Name of file (VideoClip)
▶ Date (year/month/day)
→ **Please use underlines instead of spaces!**

Here is an example:
Gymnasium_Muster_Class3b_VideoClip_20190405.mp4

Scoring List

Subtask	Judging criterion	Score (P)
Model		**30**
1	**Comprehensibility** Is the model comprehensive? Does it make sense? Is the model self-explanatory for a person who has read the poster? Is the model delivering what it should, namely, to illuminate a specific aspect?	**10**
2	**Appropriate Complexity** How well and elegantly does the model describe the process or the structure? Are there elements one can modify playing around with the model and thereby explain different situations and interactions? Is the model complex in a reasonable way?	**5**
3	**Engineering, Functionality** Does the model work smoothly? Is it easy to handle? Is the model built up of well-thought materials?	**7.5**
4	**Appearance** How creative is the model? How attractive is it and does it invite people to try it out? Is it fun?	**7.5**
Poster		**10**
1	**Appearance** **Layout** (Readability, quality, labelling and numbering of the tables, graphics and pictures.) **Attractiveness** (Is the poster eye-catching?) **Density of information** (Too much or not enough information may be an issue.)	**5**
2	**Content** **Theoretical background of the topic** (Is the complex theoretical background of the topic successfully explained? Is it correct? Is it obvious which aspect of the theory is illustrated by the model?) **Construction sketch** (is the sketch informative and accurately drawn?)	**5**
Video clip		**10**
1	**Content** How well does the video clip explain the model in action in its full complexity?	**2.5**
2	**Questions** Are the questions and answers meaningful? Do they help to embed the model in a broader context?	**2.5**
3	**Technical aspects** How sophisticated is the script, the camera work and the sound quality?	**2.5**
4	**Entertainment value** Is the video clip interesting, entertaining and engaging?	**2.5**
Total		**50**

The top 10 classes who will proceed to phase 2 will be evaluated as follows: The model will count 30%, the poster and the video clip each 10% and the live performance 50%.

To submit

1. ProgressActivity file: .pdf, max. 6 MB
2. Poster: .pdf, max. 6 MB
3. Video clip: .mp4, max. 2 minutes, max. 100 MB

Hint: If you need to compress your file you can use online tools such as https://pdfcompressor.com/de/.

Send all 3 files together
via **WeTransfer** (https://wetransfer.com) to:

scienceonthemove@simplyscience.ch

Don't forget to add the name of your school and class in the message field!

Closing Date of the experimental task:

Friday, 05.04.2019, 13:00

Questions? E-Mail: scienceonthemove@simplyscience.ch

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