Bibliography


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Section A: Sources of technological knowledge

INDICATE YOUR ANSWER WITH AN X IN THE APPROPRIATE BLOCK.

1. To what extent did you make use of knowledge from theoretical science (e.g. transfer knowledge from science, reformulate or adapt) in the design and making of your artefact?

<table>
<thead>
<tr>
<th>Transfer from science</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

An example of the kind of knowledge I transferred from theoretical science to design and make my artefact was …

2. To what extent did you discover (and use) “new” knowledge (e.g. operating principles) during the invention (designing and making process) of your artefact?

<table>
<thead>
<tr>
<th>Invention</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

Concepts, such as the operating principles or best design/shape that best embody the operational principle, contrived (or come upon coincidentally), due to my invention include …

3. To what extent did you make use of theoretical research to acquire the necessary knowledge which enabled you to design and make your artefact?

<table>
<thead>
<tr>
<th>Theoretical research</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

3.1 The main sources I used to do my theoretical research include (e.g. Internet, textbooks) …

3.2 The knowledge I produced via theoretical activity (research) is, for example …

4. To what extent did you make use of experimental research (e.g. testing of various products and materials), to acquire the necessary knowledge which enabled you to design and make your artefact?

<table>
<thead>
<tr>
<th>Experimental research</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

4.1 I performed my experimental (evaluating/testing) research by means of (e.g. test facilities,
4.2 The knowledge I gained through experimental research is, for example …

5. To what extent did you make use of knowledge from design practice (e.g. design process, design aspects, etc.)?

<table>
<thead>
<tr>
<th>Design practice</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

Design practice reveals problems that call for research in order to solve these problems. An example of knowledge acquired in this way is …

6. The making (production) of your artefact can result in practical considerations which were not comprehended during theoretical research, design, etc. (e.g. material is too thin and too large, which can lead to cracking). To what extent did you make use of such practically discovered knowledge?

<table>
<thead>
<tr>
<th>Production</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

Practical knowledge I gained during the production (making) of my artefact includes …

7. A proof test can be performed to determine whether a device (artefact) performs as intended. To what extent did you evaluate (test) your artefact in order to determine whether it does what it was designed to do?

<table>
<thead>
<tr>
<th>Direct trial</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

7.1 During this direct trial I discovered that …

7.2 To what extent did you use the knowledge acquired about the artefact’s shortcomings during the direct trial to improve the design or at least make suggestions to improve the design?

<table>
<thead>
<tr>
<th>Direct trial</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>
Section B: Categories of technological knowledge

1. Fundamental design concepts are part of a technologist’s knowledge and have to be learned deliberately to form part of a technologist’s essential knowledge. This knowledge includes:
   • operating principles of artefacts (i.e. how does it work); and
   • the general shape and arrangement of the artefact that are commonly agreed to best embody the operational principle.

In designing and making your artefact, indicate the extent to which you drew knowledge from fundamental concepts.

<table>
<thead>
<tr>
<th>Fundamental design concepts</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

2. To design a device, a designer must have specific requirements (e.g. a customer’s needs and wants) in terms of the device. These qualitative (non-technical requirements/needs) goals/data from the customer must be translated to quantitative goals/data (concrete technical terms).

In designing and making your artefact, indicate the extent to which you:
   • made use of criteria and specifications (such as the customer’s needs and wants); and
   • translated these qualitative criteria and specifications into technical terms.

<table>
<thead>
<tr>
<th>Criteria and specifications</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

3. Technologists make use of a wide range of theoretical tools to accomplish their design task. These include:
   • mathematical methods and theories for making design calculations - mathematical methods and theories may vary from elementary formulas for simple calculations to complex calculative schemes; and
   • intellectual concepts for thinking about design - intellectual concepts provide the language for articulating the thought in people’s minds.

In designing and making your artefact, indicate the extent to which you made use of theoretical tools.

<table>
<thead>
<tr>
<th>Theoretical tools</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

4. Mathematical tools will be of little value without data for the physical properties or other quantities required in the formulas. Two types of knowledge/data can be distinguished, namely descriptive and prescriptive knowledge.

Descriptive data includes data such as physical constants, properties of substances, strength of materials, etc. (i.e. how things are).

4.1 In designing and making your artefact, indicate the extent to which you made use of descriptive knowledge.

<table>
<thead>
<tr>
<th>Quantitative data: descriptive knowledge (how things are)</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>
Prescriptive knowledge, on the other hand, is knowledge of how things should be to in order to obtain the desired result (e.g. data or process specifications that manufacturers issue for guidance to assist designers and other workers).

4.2 In designing and making your artefact, indicate the extent to which you made use of prescriptive knowledge.

<table>
<thead>
<tr>
<th>Quantitative data: prescriptive knowledge (how things should be)</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

5. Some knowledge can be learned mostly in practice (e.g. learning from accidents, experience in practice, tricks of the trade) rather than through training or textbooks.

In designing and making your artefact, indicate the extent to which you made use of knowledge derived from practical experience.

<table>
<thead>
<tr>
<th>Practical considerations</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

6. In order to carry out a given task, you need to “know how” to carry out the task (e.g. follow the design process). The instrumentalities of the process include the procedures, ways of thinking and judgmental skills by which it is done.

In designing and making your artefact, indicate the extent to which you made use of this “know how” or procedural knowledge.

<table>
<thead>
<tr>
<th>Design instrumentalities</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

7. To what extent did you consider the interrelationship that exists between technical objects (e.g. your artefact), the natural environment (e.g. learning outcome 3: impact of technology) and social practice (e.g. learning outcome 3: biases created by technology) during the design and making process of your artefact?

<table>
<thead>
<tr>
<th>Socio-technological understanding</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>

8. To what extent did you make use of knowledge acquired from other members in your group (if you were in a group)?

<table>
<thead>
<tr>
<th>Collaborative design knowledge</th>
<th>Not at all</th>
<th>To a limited extent</th>
<th>To a fairly large extent</th>
<th>Extensively</th>
</tr>
</thead>
</table>