Handboek natuurkundedidactiek | hoofdstuk 1: Natuurkunde

**1.2 Aard van natuurwetenschap**

**Cursusactiviteit**

**Nature of Science: stellingen**

**1** **Oriënteren**

 In de bijlage staan eenentwintig kaartjes met uitspraken (in het Engels) over de aard van natuurwetenschap. Print de bijlage, en knip de kaartjes uit.

**a** Sorteer de kaartjes door ze in twee kolommen op tafel te leggen: ‘eens’ (linkerkolom) en ‘oneens’ (rechterkolom) met de uitspraak.

**b** Leg de kaartjes per kolom op volgorde van ‘meest mee eens’ tot ‘minst mee eens’ (linkerkolom, van boven naar onder) en van ‘minst mee oneens’ tot ‘meest mee oneens’ (rechterkolom, van boven naar onder).

**2** **Uitwisselen**

 Wissel je ervaringen met het sorteren van de kaartjes bij opdracht **1** onder­ling uit (in groepen van minimaal twee tot maximaal vier). Bespreek de onderlinge overeenkomsten en verschillen tussen de twee kolommen en tussen de volgorde in de twee kolommen.

**3 Analyseren**

 Analyseer de onderlinge overeenkomsten en verschillen van opdracht **2** door vast te stellen welke kaartjes wel en niet passen bij welke aspecten van de *Nature of Science* uit de tabel hieronder (ontleend aan Schwartz, Lederman & Crawford, 2004).

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| **NoS Aspect** | **Description** |
| Tentativeness | Scientific knowledge is robust, but subject to change due to new observations and technology. Also reinterpretations of existing data can lead to change. |
| Empirically based | Scientific knowledge is based on and/or derived from observations of the natural world. |
| Subjectivity | Current scientific theories and laws influence science. Also personal subjectivity due to personal values, agendas, and prior experiences of scientists. |
| Imagination/creativity | Scientific knowledge is created from human imagination. This involves the invention of explanations as well as how data is interpreted. |
| Sociocultural embeddedness | Science is a human endeavor and is influenced by society and culture. The values of the culture determine what and how science is conducted, interpreted, accepted, and utilized. |
| Distinction between observation and inference | Science is based on both observations and inferences. Observations are collected through the human senses or extensions of those senses. Inferences are interpretations of these observations. The perspective of the scientist and current culture guide both observations and inferences. |
| Relationships between scientific theories and laws | Theories and laws are both different types of scientific knowledge. Laws describe relationships observed or perceived from phenomena in nature. Theories are inferred explanations for natural phenomena. A theory or law may be created with the accumulation of substantial supporting evidence and acceptance in the scientific community. Furthermore, laws and theories do not progress from one another, there is no hierarchy, because laws and theories are fundamentally different and function differently from one another. |

**Literatuur**

Schwartz, R.S., Lederman, N.G. & Crawford, B.A. (2004). [Developing views of Nature of Science in an authentic context: An explicit approach to bridging the gap between Nature of Science and Scientific Inquiry](https://onlinelibrary.wiley.com/doi/abs/10.1002/sce.10128). *Science Education 88*(4), 610-645.

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**1.2 Aard van natuurwetenschap**

**Cursusactiviteit | Bijlage**

**Nature of Science: stellingen**

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| **1**Science gets closer and closer to the truth. | **2**Science and its methods can answer all questions. | **3**A scientist should not allow preconceived theoretical ideas to guide observation and experimentation. |
| **4**Careful observation gives us the truth about the world around us. | **5**Evidence accumulated carefully will result in knowledge. | **6**Hypotheses become theories, which become laws. |
| **7**A general and universal scientific method is used by all scientists. | **8**Scientific observations of the same object or process lead to identical interpretations. | **9**Facts do not speak for themselves, they must be interpreted by theory. |
| **10**Experiments are the principle route to scientific knowledge. | **11**Science is one of several ways of knowing. | **12**All work in science is reviewed to keep the process honest. |
| **13**Theories serve to give direction to observations, they tell one where to look. | **14**Scientific concepts are invented. | **15**Science and its methods provide absolute proof. |
| **16**Scientific concepts are discovered. | **17**Scientists are particularly objective. | **18**Historically, science has been dominated by white Europeans and North American males. |
| **19**Theories change when new conceptualizations account for anomalous data. | **20**Science deals with testable questions. | **21**What scientists choose to study reflects the social values and views of the time. |