

Module 2



REASONING, ARGUMENTATION, & CRITICAL THINKING

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Worksheets



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Activity 1.1: Is Mr Briggs guilty of speeding?



Individual work



5 mins

Please read this text and fill out the table individually by writing the claim, counter claim and the evidences that support them.

Sunday, March 7th, was a cold, sunny day. At 11.46 am Mr Briggs was observed driving along Water Street. A speed camera measured his speed at 65 km/h. This is 15 km/h above the speed limit. Mr Briggs denies that he was speeding.

<u>Claim/Explanation</u>	<u>Evidence that supports the claim (Data)</u>
<u>Counter Claim/Explanation</u>	<u>Evidence that supports the counter claim (Data)</u>

Guilty?



Work in groups



5 + 15 mins



After students work individually for a few minutes, the teacher calls them to share their thinking with the rest of the class.

At the end of this activity, the teacher emphasizes differences among opinion, speculation, data, evidence, claim, counter claim and fact.

Opinion	Someone's viewpoint. May not be based on evidence/data.
Speculation	What someone thinks will happen. Usually based on evidence/data.
Evidence	Information that is linked to the issue. (A speed camera measured his speed at 65 km/h.) Data (evidence, grounds, support) can be observations, facts, physical evidence or experimental results that are used for to support or refute a given claim.
Explanation (Claim or Counter Claim)	Explanation: An idea to explain some evidence/data. A claim (assertion or proposition) is "an assertion put forward publicly for general acceptance." (Claim: Mr Briggs is guilty of speeding) (Counter claim: Mr Briggs is not guilty of speeding)
Fact	An idea most people accept because it hasn't been disproved. (This is 15 km/h above the speed limit.)

Information not linked to the issue? ... was a cold, sunny day.



Activity 1.2: What are the features of a scientific argument?



Discussion in groups



10 + 20 mins

- What are the differences between explanation and argument?
- What are the features of a scientific argument?

Argumentation

- Scientific knowledge is characterised by proper scientific explanations or arguments.
- While an **explanation** should make sense of a phenomenon and explain the phenomena or event based on other scientific facts; in an **argument**, however, there is not so much a feature or behaviour to be explained but a claim to be justified (Osborne & Patterson, 2011).
- A **scientific argument** involves the coordination of evidence (data) and theory (claim) (product of observation vs. product of interpretation of those observations) to support or refute an explanatory conclusion, model or prediction (Osborne et al., 2004a).
- In IO2, Toulmin's model of argumentation, among others, will be used to analyse media reports of scientific research related to environmental SSI. Based on this model, the nature of an argument can be framed in terms of claims, data, warrants, backings, rebuttals, and qualifiers (Toulmin, 1958) (see Figure 1).

Figure 1. Toulmin's model of argumentation (Toulmin, 1958)

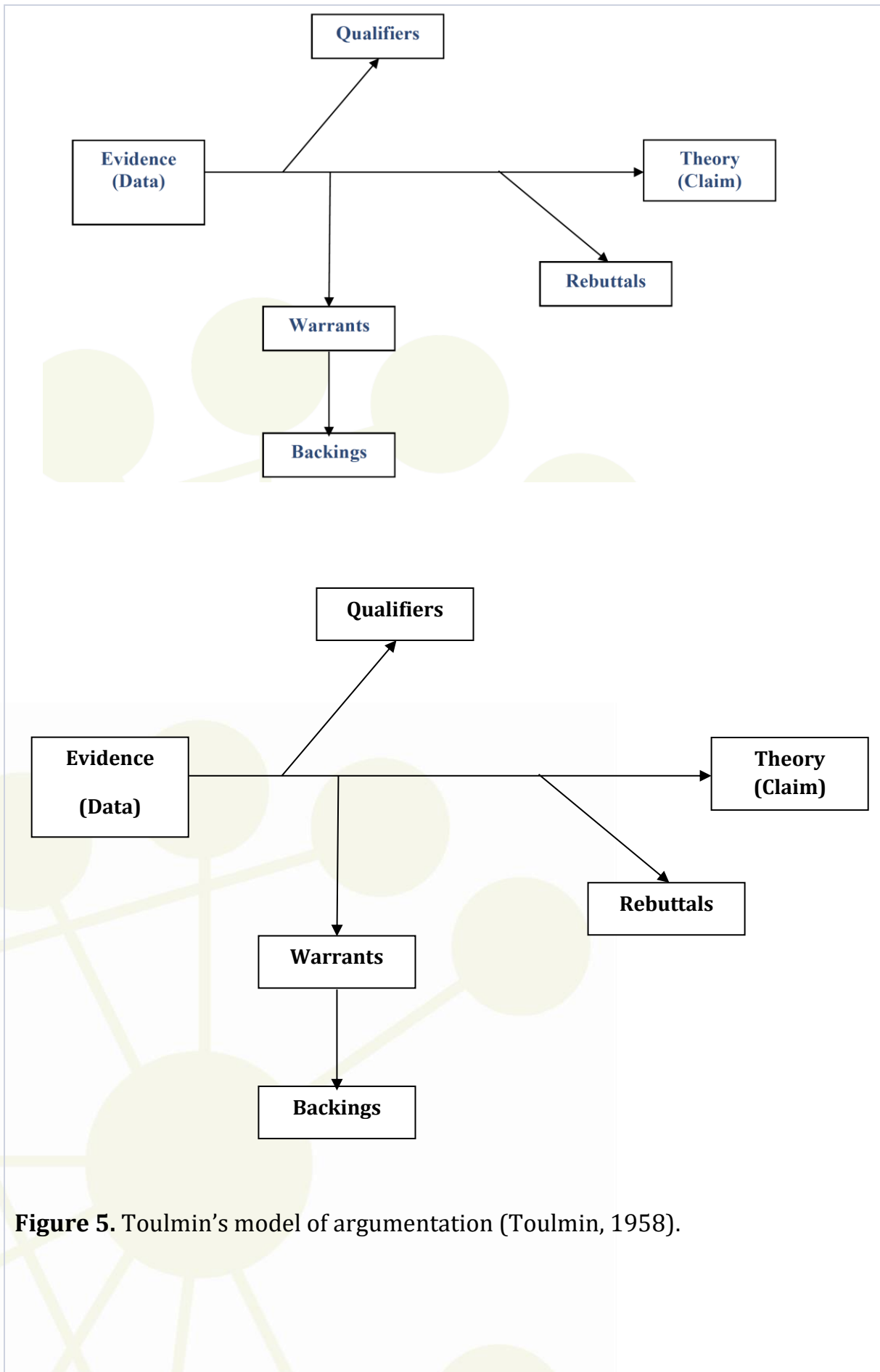
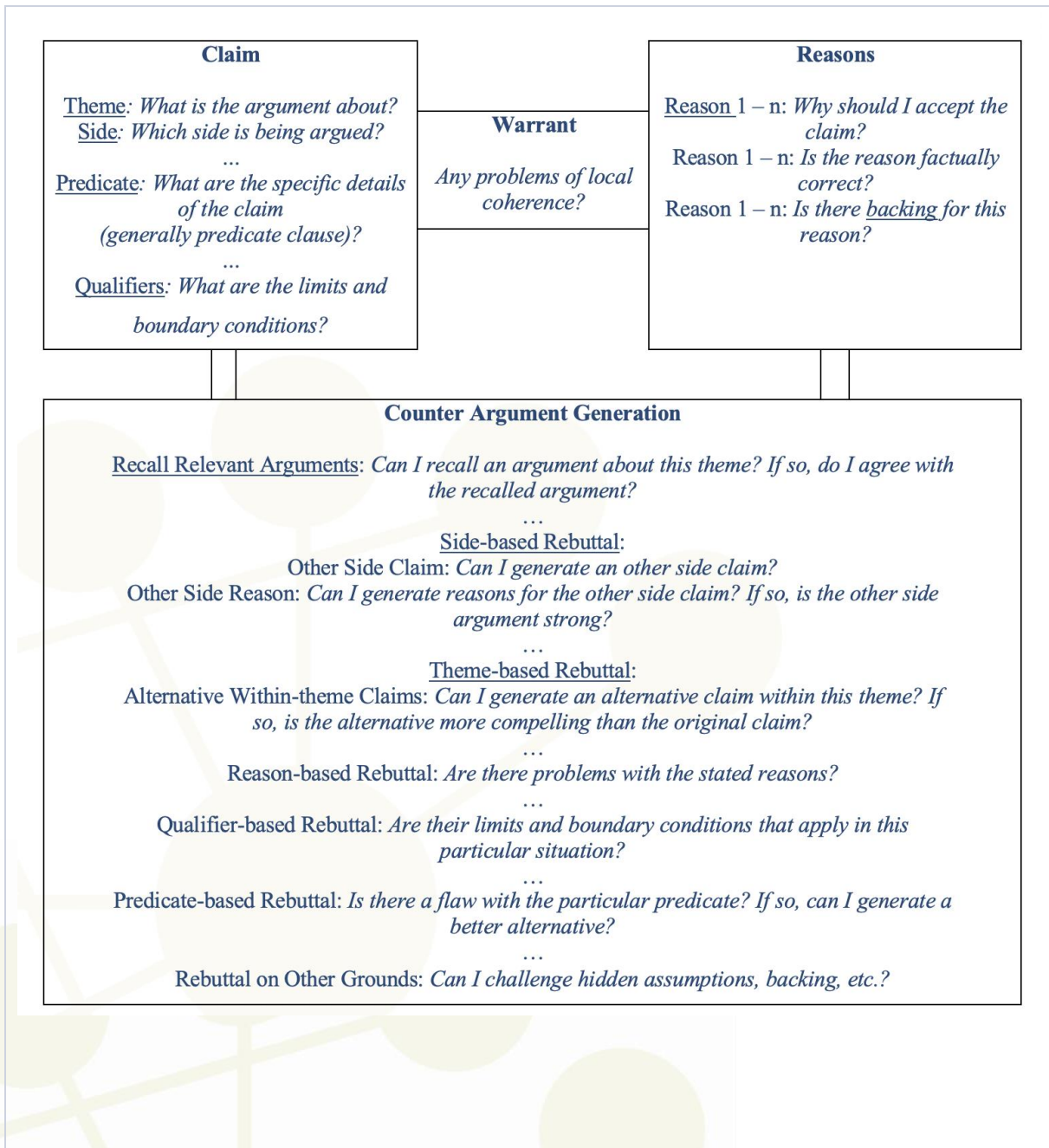




Figure 5. Toulmin's model of argumentation (Toulmin, 1958).

- **A claim (assertion or proposition)** is “an assertion put forward publicly for general acceptance.”
- **Data (evidence, grounds, support)** can be observations, facts, physical evidence or experimental results that are used for to support or refute a given claim.
- **Warrant (inferential leap)** is the principle, provision or chain of reasoning that provides a link between the data and the claim.
- **Backings** are “generalizations making explicit the body of experience relied on to establish the trustworthiness of the ways of arguing applied in any particular case.” For example, *An Inconvenient Truth* is a wonderful documentary on climate change [**claim**], because it won two Oscars [**data**]. Being nominated for and winning *Academy Awards* are reliable indicators for a good documentary [**warrant**], because the majority [**qualifiers**] of the public likes documentaries with Academy Awards [**backings**].
- **Rebuttals** are “the extraordinary or exceptional circumstances that might undermine the force of the supporting arguments.” Example, Newton's law of universal gravitation only applies in weak gravitational fields; it does not apply in strong gravitational fields [**rebuttals**].
- **Qualifiers** are “phrases that show what kind of degree of reliance is to be placed on the conclusions, given the arguments available to support them.” Phrases like “probably”, “definitely”, “it depends”, “possibly”, “usually” express the degree of conditionality asserted.
- In the context of media reports of environmental SSIs, a set of expectations and questions evoked by the written text would help the reader to learn argumentation structure.
- Wolfe et al. (2009)’s argumentation scheme would be useful for doing so (see Figure 2).

Figure 2. Argumentation Scheme (Wolfe, Britt & Butler, 2009)



	Activity 2.1: Voters decide not to water down wolf protection	
<p>Individual work Work in groups Discussion</p>		55 mins

Teaching points and possible teaching sequence:

The following teaching sequence (Think-Pair-Share) is provided as a suggestion for teacher educator. Four alternative worksheets are provided below and at the appendices. Depending on time constrain and priorities, the teacher educator can decide which one(s) to use.

1. Distribute the news article to future teachers and ask them to read the article on their own. Then they will fill in the table and answer the questions on the worksheet.



THINK: The teacher distributes the news article to the students and asks them to read the article on their own and fill the given worksheet.

2. Ask students to work in groups to talk the answers each came up with.



PAIR: Students pair up to talk about the answer each came up with. They compare their written responses.

3. After students complete the analysis, a classroom discussion may follow. During this activity encourage students to comment on the article.



SHARE: After students talk in pairs for a few minutes, the teacher calls for pairs to SHARE their thinking with the rest of the class.

News article: Voters decide not to water down wolf protection

Source: <https://www.swissinfo.ch/eng/swiss-wolf-hunting-law-vote-results/46050398>

1 Voters decide not to water down wolf
2 protection **SWI** swissinfo.ch



The amended hunting law would have made it easier to shoot a wolf. Keystone / Alexandra Wey. *Image: swissinfo.ch*

3 More than half of Swiss voters (51.9%) have
4 rejected parliament's changes to the hunting
5 laws. The regulation of the wolf, a protected
6 species, was at the centre of the debate.

7
8 *September 27, 2020*
9 Susan Misicka

10 "The result shows that the Swiss population wants
11 to strengthen and not weaken species protection,"
12 said Gabor von Bethlenfalvy, large carnivore
13 specialist at WWF Switzerland, in a press release on
14 Sunday.

15 He added that by saying no to the revised law, voters
16 were saying yes to a compromise between hunting,
17 regulation and protection. His group was one of
18 many conservation and animal welfare groups to
19 launch the referendum challenging Swiss
20 lawmakers' revisions to the law.

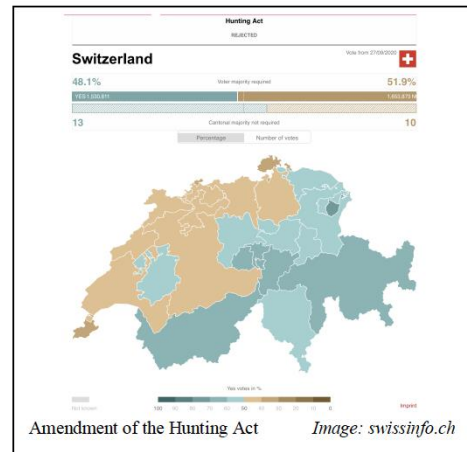
21 "Now parliament gets the chance to draft a
22 progressive hunting and protection law that will
23 continue to protect threatened animals such as lynx
24 and beavers and not put them under even greater
25 pressure," von Bethlenfalvy said.

26 The results reflect a missed chance, counter those
27 who were in favour of the amended law.

28 "With this decision, the voters have missed the
29 opportunity to strengthen animal and species

30 protection and to set clear rules for the coexistence
31 of wolves and farm animals," stated the Swiss
32 farmers' and hunters' associations and the
33 committee for mountain regions in a joint press
34 release.

35 They blamed the result on the "million-franc
36 campaign" of their opponents. "A progressive
37 hunting law is now a long way off," they wrote.



38 Lukas Golder, a political scientist from the leading
39 GfS Bern research institute, pointed out an urban-
40 rural divide on the issue. "But even in cantons
41 Graubünden and Valais, a relatively large number
42 of 'no' votes were cast," Golder told Swiss public
43 television, SRF. Voter turnout was 59.4%, which is
44 much higher than usual.

45 As Environment Minister Simonetta Sommaruga
46 remarked on Sunday evening, rural cantons such as
47 Aargau and Jura had also rejected the law.

48 "The debate about this law has often been
49 emotional. For the government it is important that
50 the 'no' vote is not directed against mountain
51 regions or alpine farmers. No region should be left
52 behind," said Sommaruga, adding that nature
53 protection was a joint concern. The Swiss
54 government had recommended that voters agree to
55 the amendments.

56 A year ago, parliament adapted the national
57 legislation on hunting. The changes – inspired in
58 particular by concerns about Switzerland’s growing
59 wolf population – would have allowed the cantons
60 to cull wild animals that they considered
61 problematic without asking for federal permission.

62 This could also have affected species such as lynx,
63 beaver, ibex, swan, grey heron and Eurasian otter.
64 At the same time, the amended law would nearly
65 have doubled the annual federal budget – to CHF4
66 million (\$4.3 million) – for Switzerland’s 80
67 wildlife reserves and bird sanctuaries.

68 In response, environmentalists and animal rights
69 activists launched the referendum calling for a
70 nationwide vote challenging the parliamentary
71 decision. Groups such as Pro Natura, WWF
72 Switzerland and BirdLife said that the amendments
73 made it too easy to kill animals that should be
74 protected for the sake of biodiversity – including
75 animals that have neither attacked livestock nor
76 caused any other damage.

77 *Against and for*

78 Several political parties campaigned against the
79 reformed law, among them the leftwing Social
80 Democrats and Green Party and the centrist Liberal
81 Greens. They said that the existing legislation
82 already provided sufficient options for dealing with
83 problem animals – including the option to shoot
84 them if need be. They also pointed out that the
85 revised law did not increase protection for
86 threatened species such as grouse, woodcock, and
87 hare.

88 Proponents of the proposed reform – the
89 conservative right Swiss People’s Party and most
90 branches of the centrist Christian Democrats and the
91 centre-right Radical-Liberals – had argued that the
92 Swiss wolf population was growing too quickly.
93 There are currently about 80 wolves living in
94 Switzerland, compared to a handful between 1995
95 and 2000 – and none in 1986, when the original law
96 was drafted. The Swiss farmers’ and hunters’
97 associations were in favour of the reform, as was the
98 committee for mountain regions.



Wolves remain a worry for mountain farmers with livestock.
Keystone / Peter Klauzner *Image: swissinfo.ch*

99 They had pointed out that the wolf would remain a
100 protected species despite its numbers being
101 regulated at the local level. They also noted that the
102 reform would have required farmers to build better
103 fences or engage livestock guarding dogs to qualify
104 for compensation in the event of a fatal wolf attack.
105 Wolves kill 300-500 sheep and goats per year,
106 according to the KORA foundation, which monitors
107 carnivores in Switzerland. In comparison, each year
108 thousands of sheep die after falling down mountains
109 or becoming ill.

110 About a third of Swiss animal and plant species are
111 under threat. Many, including the wolf, are
112 protected under the Council of Europe’s Bern
113 Convention on the Conservation of European
114 Wildlife and Natural Habitats. Current Swiss law
115 allows a wolf to be shot if it kills more than 25
116 livestock.

117 Source: <https://www.swissinfo.ch/eng/swiss-wolf-hunting-law-vote-results/46050398>
118

Alternative 1

First read the news article. Then fill in the table below.

The news article discusses a recent Swiss referendum results. Write on the following table what are the claim and counter claim discussed in the news article and "evidence for" and "evidence against" those claims.

	Evidence for (Data)	Evidence against (Data)
<p>The Main Claim</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
<p>Counter Claim</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

Alternative 2

First read the news article and then answer the following questions.

If you were a Swiss citizen, which option would you chose at the referendum?

.....

.....

.....

.....

Using only the news article, make a list of arguments against your decision.

.....

.....

.....

.....

Using only the news article, make a list of arguments for your decision.

.....

.....

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.....

How would you convince someone who are against your argument?

.....

.....

.....

.....



Alternative 3

First read the news article and then answer the following questions.

- If you were a Swiss citizen, which option would you chose at the referendum?
- Using *only* the news article, make a list of arguments *against* your decision.
- Using *only* the news article, make a list of arguments *for* your decision.
- Do you think the story is "balanced", that is, do you think the newspaper is trying to show its readers both sides of the arguments?
- If not, what side of the argument do you think the newspaper might support?
- If so, do both sides of the arguments appear to be fairly represented? Are positive words and images used to describe one point of view and negative words and images used to describe the other point of view?
- Do you think the newspaper is trying to encourage readers to take a particular standpoint, or side, in the argument?
- If so, what evidence do you have? Can you find at least two that might indicate that the newspaper is trying to persuade its readers to take a particular point of view?
- Why might an the news correspondence/editor decide that the newspaper will take a particular standpoint, or side, in an argument?

Alternative 4.1

<u>The Main Claim</u>	<u>Evidence that supports the claim (Data)</u>
<u>Counter Claim</u>	<u>Evidence that supports the counter claim (Data)</u>

Wolves

Alternative 4.2

First read the news article and then answer the following questions.
If you were a Swiss citizen, which option would you chose at the referendum?
Do you think the writer of this news article supports the argument made for the main claim or the counter claim? Explain your answer. What are the sentences from the text that show the writer's viewpoint on this issue?
Write up to 5 questions, which come into your mind after reading the news article.
How would you briefly describe (in 3-4 sentences) to your friend what this news article is about?



Activity 3.1: Insecticide harmful to bees temporarily allowed in France



Individual work
Work in groups
Discussion



55 mins

Teaching points and possible teaching sequence:

The following teaching sequence (Think-Pair-Share) is provided as a suggestion for teacher educator. The worksheets are provided below and at the appendices.

1. Distribute the news article to future teachers and ask them to read the article on their own. Then they will fill in the table and answer the questions on the worksheet.



THINK: The teacher distributes the news article to the students and asks them to read the article on their own and fill the given worksheet.

2. Ask students to work in groups to talk the answers each came up with.



PAIR: Students pair up to talk about the answer each came up with. They compare their written responses.

3. After students complete the analysis, a classroom discussion may follow. During this activity encourage students to comment on the article.



SHARE: After students talk in pairs for a few minutes, the teacher calls for pairs to SHARE their thinking with the rest of the class.

News article: Insecticide harmful to bees temporarily allowed in France

Source: <https://www.connexionfrance.com/French-news/French-law-approves-insecticide-deadly-for-bees>

1 **Insecticide harmful to bees temporarily**
2 **allowed in France**



3
4 **Neonicotinoids have been approved for three**
5 **years to be used in growing sugar beet despite**
6 **having previously been banned, mainly due to**
7 **evidence that they are toxic for bees**



Neonicotinoids are used to kill aphids which destroy sugar beet crops, but they are also deadly for bees.

Image: connexionfrance.com

8 *7 October 2020*
9 *By Joanna York*

10 French MPs have voted through a law allowing
11 temporary use of a controversial insecticide in a bid
12 to help the struggling sugar beet industry.

13 The bill was approved by the Assemblée Nationale
14 yesterday (October 6), despite opposition from
15 environmentalists. There were 313 votes in favour,
16 158 against, and 56 abstentions.

17 The vote follows a [campaign from French beet](#)
18 [farmers](#), who want to use the insecticides to protect
19 their crops. They say the ban has left their crops
20 vulnerable to jaundice caused by aphids, and some
21 had lost half of this year's crop.

22 They say there is a danger to the future of the French
23 sugar sector, which employs some 46,000 people in
24 France.

25 **Other methods available, more support needed**
26 **for farmers**

27 Neonicotinoids are particularly effective in fighting
28 against the problem and the MPs based their
29 decision on an EU rule that an unauthorised
30 substance may be used under certain conditions
31 where there is a danger to production of a crop and
32 the problem cannot be resolved by other 'reasonable
33 means'.

34 The authorisation is not for spraying of the
35 substances but only for the planting of seeds treated
36 with them, a method that was very widely used until
37 the neonicotinoid ban in France in 2018. The law
38 also comes with other safeguards such as creating a
39 special council to oversee the use of the substances
40 and a ban on planting anything likely to attract bees
41 near to the treated sugar beet fields.

42 However a researcher from national scientific
43 research centre CNRS, Jean-Marc Bonmatin, told
44 news source [FranceInfo](#) that the insecticide is not
45 necessary.

46 Dr Bonmatin said: "There are many alternative
47 methods for cultivating beets".

48 "Cultivating sugar beets is not dependent on
49 neonicotinoids. Sugar beets are an ancient,
50 traditional crop."

51 The problem for French growers, in his eyes, is
52 external market pressure.

53 He said: "Beet growers today face unbridled
54 competition, from eastern Europe and Latin
55 America. They are steered towards producing the
56 cheapest product possible, and neonicotinoids allow
57 for this kind of intensive farming.

58 "I think it would be more worthwhile to help
59 farmers overcome this difficulty, rather than
60 reintroducing neonicotinoids." The ban had been
61 based on 20 years of research, he said.

62 The researcher claimed that jaundice presented a
63 threat to only around 10-15% of French sugar beet
64 crops, in which he said production has grown by
65 "two or three times" in the past 30 years.



66 **Risks to biodiversity**

67 While neonicotinoids are effective in getting rid of
68 aphids, they have been found to have a detrimental
69 effect on biodiversity and to be especially harmful
70 to bee populations, Dr Bonmatin said.

71 However he added that the pesticides are difficult to
72 avoid today because they have been so widely used
73 around the world, and traces of them can remain in
74 crops years after they are last used.

75 **Insecticide used to be banned in France**

76 Environmentalists have been against the use of
77 neonicotinoids for years, and their use was
78 originally banned in France in a 2016 law
79 (effective in 2018).

80 This made them a talking point on President
81 Macron's campaign trail that same year.

82 Politician Barbara Pompili, who was minister for
83 biodiversity in 2016, oversaw an initial progressive
84 ban and a definitive ban earlier in 2020.

85 As minister for ecological transition in Mr Macron's
86 government, Ms Pompili is now overseeing the
87 reintroduction of the insecticides.

88 Source: [https://www.connexionfrance.com/French-](https://www.connexionfrance.com/French-news/French-law-approves-insecticide-deadly-for-bees)
89 [news/French-law-approves-insecticide-deadly-for-](https://www.connexionfrance.com/French-news/French-law-approves-insecticide-deadly-for-bees)
90 [bees](https://www.connexionfrance.com/French-news/French-law-approves-insecticide-deadly-for-bees)

First read the news article. Then fill in the table below and answer the questions on following pages.

Write on the following table what are the claim and counter claim discussed in the news article and "evidence for" and "evidence against" those claims.

	Evidence for (Data)	Evidence against (Data)
<p>The Main Claim</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
<p>Counter Claim</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>



If you were a French Member of Parliament (MP), which option would you chose at the voting?

.....
.....

How would you convince someone who are against your decision?

.....
.....
.....

In order to make an informed decision-making on this issue, what would you like to know and investigate? What would you like to ask the researchers in this field (write up to three questions) and the MPs who voted for the law (write up to three questions) ?

.....
.....
.....
.....

While there are different explanations available for the same set of data or phenomena how can we decide which explanation is better? What are the criteria for a good explanation?

.....
.....
.....
.....

Clarify: Copy down words, phrases, or sentences in the passage that are unclear or you don't know their meanings. Then make a research to clarify their meaning.

Words or Phrase	Meaning



Activity 3.2: What do students learn when dealing with media reports of environmental SSIs ?



Work in groups



(15' +10')

This is an exemplary task for students. After Activity 3.1, discuss the following questions:

- What do students learn when dealing with such a task (Activites 2.1 & 3.1)?
- Should media reports of environmental SSIs be included in science and mathematics lessons? Why?
- What from this module was most valuable for you? If you had to tell someone else the three most significant from this module, what would they be?





Activity 3.3: How to design a lesson on the use of media reports of environmental SSIs?



Homework



**90 mins + 45 mins
presentations of
homework and discussion
session.**

- Teacher students are expected to plan a lesson which deals with the use of media reports of environmental SSIs they worked on before. Later they are supposed to present the task to the overall group.
- Plan a science lesson on the use of media reports of environmental SSIs to promote students competences on reasoning, argumentation and critical thinking. Future teachers may use different media sources on a similar topic and compare how the news is presented in different sources. Two presentation (each in 15 mins) can take place with 15 mins discussion at the end (45 mins presentations of homework and discussion session).

