**ACTIVITY: Ethics in fire science**

**Activity idea**

In this activity, students develop critical thinking through ethical discussion of the question: Should chemical fire retardants be added to furniture?

By the end of this activity, students should be able to:

* use developing science knowledge of fire to develop critical thinking when considering issues involved in adding chemical fire retardants to furniture
* explore issues in adding chemical fire retardants to furniture and make decisions about possible actions
* understand that technology (the development of chemical fire retardants) has an effect on society – people in New Zealand have a choice whether or not to buy fire retardant furniture.

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**Introduction/background**

In this activity, students look at the science and stories behind an ethical issue: Should chemical fire retardants be added to furniture? They discuss their ideas within an ethical framework and make decisions based on these discussions.

**What you need**

* [Slowing the burning](https://www.sciencelearn.org.nz/resources/739-slowing-the-burning)
* [PMI worksheet](#pmi)
* [What do you think?](#think) (self-assessment worksheet)

**What to do**

1. Have students read the article [Slowing the burning](https://www.sciencelearn.org.nz/resources/739-slowing-the-burning). As a class, discuss any terminology that they do not understand.
2. Display the question: Should chemicals be added to furniture to make it fire retardant? Ask students what the science is that you need to know about before you can answer the question and discuss:

* Why do we need fire retardants? (Basically it is about saving people’s lives. People need time to evacuate safely. Fire behaviour is such that people don’t often get the time they need to get out in time. Fire is unpredictable, can be very fast and can lead to a flashover. People need time to evacuate from a fire safely. Chemical fire retardants have been shown to slow burning down and save lives by giving people the time they need to evacuate.)
* What are chemical fire retardants? (They are chemicals that help delay or prevent combustion. Different chemicals delay combustion in different ways.)
* What effect do chemical fire retardants have when burning? (Some chemical fire retardants (such as halon and phostrex) interrupt the chemical reaction in the gas phase of combustion. However, in some situations, the released gas produced from adding these retardants increases the toxicity. Some chemical fire retardants break down the polymers in the solid phase of combustion so that they melt and flow away from the flame. Other chemical fire retardants cause a layer of carbon char to form on a polymer surface, in the solid phase of combustion. The carbon char layer is very difficult to burn. Intumescents are materials that have chemicals that cause swelling up behind the protective char layer, providing even more insulation from the fire.)
* What are the environmental problems involved in producing chemical fire retardants? (There is concern that the production of chemical fire retardants can result in risk to human health and the environment. Studies have shown that some toxic chemicals have been found in human tissue and the environment where the chemicals are produced (not in New Zealand). There is concern about human contact during the production of the chemicals and over the disposal of waste products.)
* What are some potential problems with using chemical fire retardants in furniture? (Some of the chemicals are toxic and may be dangerous for small children who might suck on furniture. Some scientists have expressed concern that fumes may be emitted from the chemical fire retardants even without a fire.)

1. Research some articles from the internet about the issues involved in using chemical fire retardants. (See the article [Chemical fire retardants](https://www.sciencelearn.org.nz/resources/765-chemical-fire-retardants) for some ideas and view the video clip [Comparison burning of two sofas](https://www.sciencelearn.org.nz/videos/200-comparison-burning-of-two-sofas).) Students could research in small groups and report back to the class. Try to find some arguments for and against.
2. Ethical discussions need an ethical framework or approach to work from. Using some of the questions described in the [common ethical approaches](#ethical), as a class, develop a list of who is involved in this issue and what some of the benefits and harms are.
3. Use the [round robin teaching approach](#ROUND) for students to investigate adding fire retardants to foam or material in furniture. The PMI worksheet could be used (A3 size) in the round robin activity or as a consolidation activity after it. As a consolidation activity, each group chooses a stakeholder, completes a [PMI worksheet](#pmi) and shares with the class the best two ideas for harms and the best two ideas for benefits. Each group could work with the PMI worksheet and place the consequences in order of most important to least important. The top 2–4 of each group’s list can then be recorded on the whiteboard or another list. Students could then use this information to create a written report, a poster, an advertisement and so on.
4. Divide the class into groups of three and have them prepare a debate – half the groups should argue for the use of chemical fire retardants in furniture and half argue against. Have debates between sets of opposing groups. The class could comment on which group had the strongest argument and why.
5. Use the [What do you think?](#think) self-assessment worksheet, or for a group assessment activity, perform a drama/role-play to show the issues and decision-making involved, for example:
   * A city council group has to decide if a chemical fire retardant plant should be built in their city.
   * Owners of a furniture factory in New Zealand have been asked by the New Zealand Fire Service if they would produce furniture that includes chemical fire retardants in the foams and coverings. They need to make a decision on this.
   * A new movie theatre is being built. The owner needs to make a decision whether or not to add seating that has been treated with chemical fire retardants.

**Common ethical approaches**

There are a number of ethical approaches (developed over time) used for discussing ethical issues. Below are three common ones that could easily be used to discuss the issues around chemical fire retardants – consequentialism, rights and responsibilities, and autonomy. The questions are examples of what might be asked within each approach. To explore the issue of chemical fire retardants, you may wish to use one or more approaches, depending on the ability of the students and the time you have to explore the issue.

***Consequentialism***

Consequentialism is to do with the consequences of actions. Using this ethical approach, we weigh the benefits and harms resulting from our actions:

* Who/what is affected by this issue?
* What are the benefits for those involved?
* What are the harms for those involved?
* Are some consequences greater or lesser than others?
* If one is harmed and another benefits, how do you decide who or what matters most?

***Rights and responsibilities***

Rights and responsibilities are closely related – the rights of one imply the responsibilities (or duties) of another to ensure those rights.

* Who/what is affected by this issue?
* What groups have rights associated with this issue? What are their rights?
* Do these same groups also have responsibilities? What are their responsibilities?
* Do we value some rights more than others? Whose rights do we want to protect?
* Do any codes, declarations and/or conventions relate to this issue?

***Autonomy***

Autonomy recognises the right to choose for yourself.

* Who/what is affected by this issue?
* What effects might my choice have on others?
* Is there a public cost associated with my choice?
* What effects might others’ choices have on me?
* Does everyone have to do the same thing? Will this cause problems?
* Is informed consent important?

**Round robin teaching approach**

1. Divide the class into small groups (3–5), spread them out around the room and give each a large sheet of paper (or A3-sized PMI worksheet) headed up with different people/things that may be affected by the addition of chemical fire retardants to furniture.

Lead in statements:

* How might **having chemical fire retardants** in furniture affect (harm or benefit)…
* How might **not** **having chemical fire retardants** in furniture affect (harm or benefit)…

People/things affected:

* me?
* other people (my family and others)?
* scientists?
* children?
* furniture factory and store owners?
* workers at the factory where chemical fire retardants are made?
* the environment? (think about the production of the chemicals)
* firefighters?
* homes and buildings in the event of a fire?

1. When you say ‘fire’ (or some other word that gives the signal), the students have 2–3 minutes to discuss and think of an idea or two (harms and benefits) for the statement on the sheet/PMI worksheet. A writer for the group records the idea(s) on the sheet. When you call ‘fire’ again, the groups move to the next piece of paper (the paper stays at each station) and so on until they have added to all of the sheets. Ideas cannot be repeated so students cannot copy what is already there.

**PMI worksheet**

|  |  |  |
| --- | --- | --- |
| **Our group represents (people/thing affected)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**  **Adding/Not adding fire retardants to foam or material in furniture means we may face the following:** | | |
|  |  |  |
| **Benefits (PLUS):** |  | **Harms (MINUS):** |
|  |  |  |
| **An INTERESTING thought or idea (possible outcomes of taking the action):** | | |

**What do you think?**

Most western countries in the world have a regulation that says that fire retardant chemicals must be added to the foams and fabrics in furniture. New Zealand does not. Do you think New Zealand should have such a regulation?

YES ❑ NO ❑

Give at least two reasons:

If New Zealand did have such a regulation, should we manufacture the chemicals needed to put into foams and fabrics for furniture?

YES ❑ NO ❑

Give at least one reason: