Actividad 2: *Do you know what we breathe?*

PROPÓSITO

Se pretende que los estudiantes conozcan otro tipo de artículo, de naturaleza científica y con vocabulario específico. Esto busca acercarlos a textos de contenido especializado, relacionados con futuras elecciones vocacionales.

OBJETIVOS DE APRENDIZAJE

OA 3 Utilizar su conocimiento del inglés en la comprensión y producción de textos orales y escritos breves y claros, con el fin de construir una postura personal crítica en contextos relacionados con sus intereses e inquietudes.

OA 4 Producir y comprender con fluidez textos orales y escritos breves y claros en situaciones comunicativas que involucren otras visiones de mundo y la propia, con el fin de interactuar y tomar conciencia de su propia identidad.

ACTITUDES

- Participar asumiendo posturas razonadas en distintos ámbitos: cultural, social, político, medioambiental, entre otros.

DURACIÓN

3 horas pedagógicas

DESARROLLO

Lectura de artículos científicos

- El docente escribe el título de la actividad en la pizarra y formula preguntas para que realicen conexiones: *Have you ever read a scientific article? What was the article about? What's the main purpose of scientific articles?*
- Si algún alumno no puede hacer conexiones, porque sus respuestas son negativas, se podría plantear las siguientes interrogantes: *Which scientific topics have you read or listened to at school? Why did you read/listen to them?*
- El profesor escribe en la pizarra: *How is information organized in a scientific article? (its structure)* y ellos desarrollan una lluvia de ideas al respecto.
- Luego entrega las siguientes instrucciones: *Now you will read a scientific article. Individually, skim the text to identify the structure of a scientific article and write it on your notebook to check previous predictions.*

Conexión interdisciplinar
Ciencias para la Ciudadanía
OA 1
Analizar, sobre la base de la investigación, factores biológicos, ambientales y sociales que influyen en la salud humana.

- Los jóvenes anotan la estructura de un artículo científico en sus cuadernos y luego comparan la información en grupos o con todo el curso.
- En grupos de 3 o 4, eligen el mismo artículo científico u otro según sus intereses. (https://www.curriculumnacional.cl/link/https://www.sciencejournalforkids.org). El docente indica: *Use the scientific article used previously, or choose another one from the webpage provided, according to your interests. Scan the text to fill in with information to complete the following chart:*

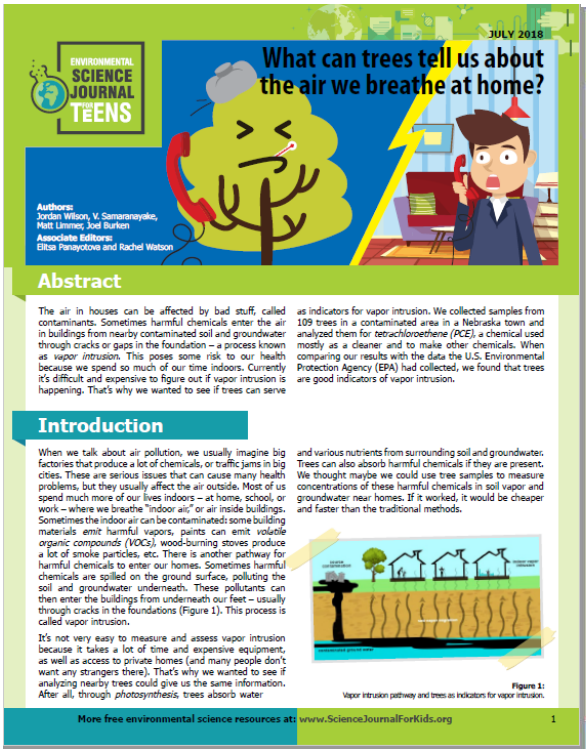
Main Purpose	*How information is organized*	*Main characteristics (Syntactic/Lexical)*	*What I need to know (unknown words, concepts)*
To investigate and inform about a certain phenomena. *To explain, understand, describe, predict, obtain views, solve a problem and/or to contribute about a specific topic/phenomena.*	*Title* *Abstract* *Introduction* *Methods* *Results* *Discussion* *Conclusion* *References*	*Academic writing features* *Cohesive and Coherent* *Formal language* *Passive voice* *Past tenses* *etc.*	*Prior knowledge about the topic* *Academic language*

- Completan la tabla y comparan información con otros grupos, según lo que el profesor les indica: *Now find other group and compare your charts. Highlight similar information and discuss about the differences.*

Conectando con un artículo propio

- Resumen información del artículo científico escogido mediante la creación de afiches y presentaciones orales. El docente indica: *You will have to provide a summary of the scientific article you read. For this, you can summarize it by creating a poster plus an oral presentation.*
- En grupos, presentan su *poster* al curso.

RECURSOS Y SITIOS WEB



ENVIRONMENTAL SCIENCE JOURNAL FOR TEENS

JULY 2018

What can trees tell us about the air we breathe at home?

Authors:
Jordan Wilson, V. Samaranayake, Matt Limmer, Joel Burken
Associate Editors:
Elitsa Panayotova and Rachel Watson

Abstract

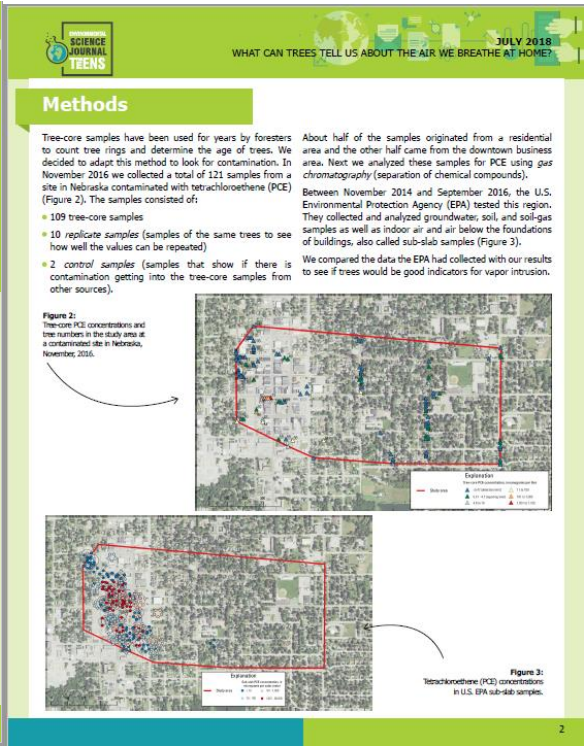
The air in houses can be affected by bad stuff, called contaminants. Sometimes harmful chemicals enter the air in buildings from nearby contaminated soil and groundwater through cracks or gaps in the foundation – a process known as *vapor intrusion*. This poses some risk to our health because we spend so much of our time indoors. Currently it's difficult and expensive to figure out if vapor intrusion is happening. That's why we wanted to see if trees can serve as indicators for vapor intrusion. We collected samples from 109 trees in a contaminated area in a Nebraska town and analyzed them for *tetrachloroethene (PCE)*, a chemical used mostly as a cleaner and to make other chemicals. When comparing our results with the data the U.S. Environmental Protection Agency (EPA) had collected, we found that trees are good indicators of vapor intrusion.

Introduction

When we talk about air pollution, we usually imagine big factories that produce a lot of chemicals, or traffic jams in big cities. These are serious issues that can cause many health problems, but they usually affect the air outside. Most of us spend much more of our lives indoors – at home, school, or work – where we breathe "indoor air," or air inside buildings. Sometimes the indoor air can be contaminated: some building materials *emit* harmful vapors, paints can emit *volatile organic compounds (VOCs)*, wood-burning stoves produce a lot of smoke particles, etc. There is another pathway for harmful chemicals to enter our homes. Sometimes harmful chemicals are spilled on the ground surface, polluting the soil and groundwater underneath. These pollutants can then enter the buildings from underneath our feet – usually through cracks in the foundations (Figure 1). This process is called vapor intrusion.

It's not very easy to measure and assess vapor intrusion because it takes a lot of time and expensive equipment, as well as access to private homes (and many people don't want any strangers there). That's why we wanted to see if analyzing nearby trees could give us the same information. After all, through *photosynthesis*, trees absorb water and various nutrients from surrounding soil and groundwater. Trees can also absorb harmful chemicals if they are present. We thought maybe we could use tree samples to measure concentrations of these harmful chemicals in soil vapor and groundwater near homes. If it worked, it would be cheaper and faster than the traditional methods.

Figure 1:
Vapor intrusion pathway and trees as indicators for vapor intrusion.



Methods

Tree-core samples have been used for years by foresters to count tree rings and determine the age of trees. We decided to adapt this method to look for contamination. In November 2016 we collected a total of 121 samples from a site in Nebraska contaminated with tetrachloroethene (PCE) (Figure 2). The samples consisted of:

- 109 tree-core samples
- 10 *replicate samples* (samples of the same trees to see how well the values can be repeated)
- 2 *control samples* (samples that show if there is contamination getting into the tree-core samples from other sources).

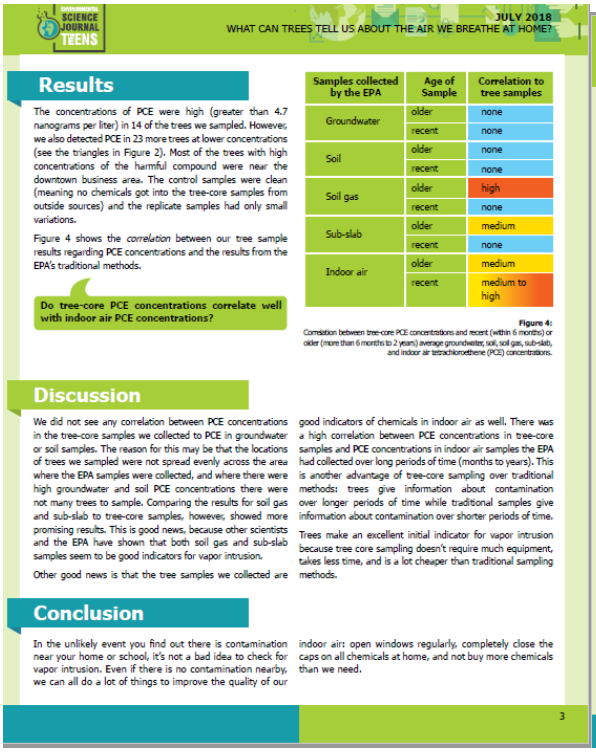
About half of the samples originated from a residential area and the other half came from the downtown business area. Next we analyzed these samples for PCE using *gas chromatography* (separation of chemical compounds).

Between November 2014 and September 2016, the U.S. Environmental Protection Agency (EPA) tested this region. They collected and analyzed groundwater, soil, and soil-gas samples as well as indoor air and air below the foundations of buildings, also called sub-slab samples (Figure 3).

We compared the data the EPA had collected with our results to see if trees would be good indicators for vapor intrusion.

Figure 2:
Tree-core PCE concentrations and tree numbers in the study area at a contaminated site in Nebraska, November, 2016.

Figure 3:
Tetrachloroethene (PCE) concentrations in U.S. EPA sub-slab samples.



Results

The concentrations of PCE were high (greater than 4.7 nanograms per liter) in 14 of the trees we sampled. However, we also detected PCE in 23 more trees at lower concentrations (see the triangles in Figure 2). Most of the trees with high concentrations of the harmful compound were near the downtown business area. The control samples were clean (meaning no chemicals got into the tree-core samples from outside sources) and the replicate samples had only small variations.

Figure 4 shows the *correlation* between our tree sample results regarding PCE concentrations and the results from the EPA's traditional methods.

Do tree-core PCE concentrations correlate well with indoor air PCE concentrations?

Samples collected by the EPA	Age of Sample	Correlation to tree samples
Groundwater	older	none
	recent	none
Soil	older	none
	recent	none
Soil gas	older	high
	recent	none
Sub-slab	older	medium
	recent	none
Indoor air	older	medium
	recent	medium to high

Figure 4:
Correlation between tree-core PCE concentrations and recent (within 6 months) or older (more than 6 months to 2 years) average groundwater, soil, soil gas, sub-slab, and indoor air tetrachloroethene (PCE) concentrations.

Discussion

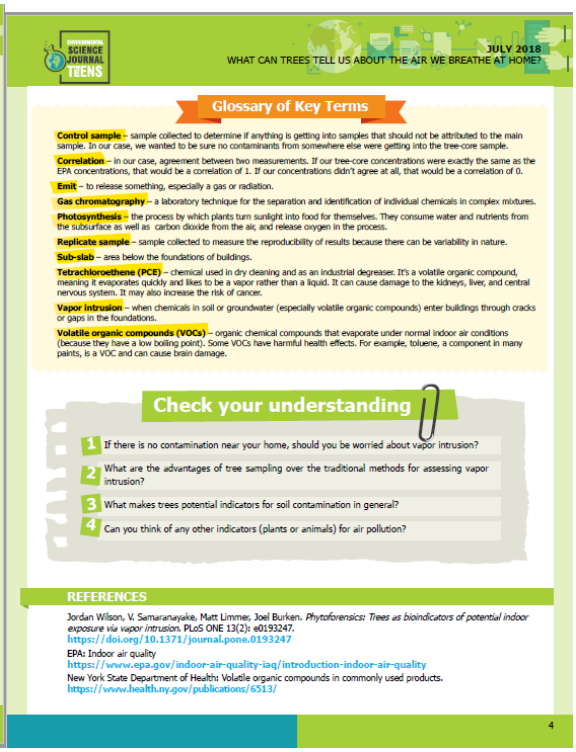
We did not see any correlation between PCE concentrations in the tree-core samples we collected to PCE in groundwater or soil samples. The reason for this may be that the locations of trees we sampled were not spread evenly across the area where the EPA samples were collected, and where there were high groundwater and soil PCE concentrations there were not many trees to sample. Comparing the results for soil gas and sub-slab to tree-core samples, however, showed more promising results. This is good news, because other scientists and the EPA have shown that both soil gas and sub-slab samples seem to be good indicators for vapor intrusion.

Other good news is that the tree samples we collected are good indicators of chemicals in indoor air as well. There was a high correlation between PCE concentrations in tree-core samples and PCE concentrations in indoor air samples the EPA had collected over long periods of time (months to years). This is another advantage of tree-core sampling over traditional methods: trees give information about contamination over longer periods of time while traditional samples give information about contamination over shorter periods of time.

Trees make an excellent initial indicator for vapor intrusion because tree core sampling doesn't require much equipment, takes less time, and is a lot cheaper than traditional sampling methods.

Conclusion

In the unlikely event you find out there is contamination near your home or school, it's not a bad idea to check for vapor intrusion. Even if there is no contamination nearby, we can all do a lot of things to improve the quality of our indoor air: open windows regularly, completely close the caps on all chemicals at home, and not buy more chemicals than we need.



Glossary of Key Terms

Control sample – sample collected to determine if anything is getting into samples that should not be attributed to the main sample. In our case, we wanted to be sure no contaminants from somewhere else were getting into the tree-core sample.

Correlation – in our case, agreement between two measurements. If our tree-core concentrations were exactly the same as the EPA concentrations, that would be a correlation of 1. If our concentrations didn't agree at all, that would be a correlation of 0.

Emit – to release something, especially a gas or radiation.

Gas chromatography – a laboratory technique for the separation and identification of individual chemicals in complex mixtures.

Photosynthesis – the process by which plants turn sunlight into food for themselves. They consume water and nutrients from the subsurface as well as carbon dioxide from the air, and release oxygen in the process.

Replicate sample – sample collected to measure the reproducibility of results because there can be variability in nature.

Sub-slab – area below the foundations of buildings.

Tetrachloroethene (PCE) – chemical used in dry cleaning and as an industrial degreaser. It's a volatile organic compound, meaning it evaporates quickly and likes to be a vapor rather than a liquid. It can cause damage to the kidneys, liver, and central nervous system. It may also increase the risk of cancer.

Vapor intrusion – when chemicals in soil or groundwater (especially volatile organic compounds) enter buildings through cracks or gaps in the foundations.

Volatile organic compounds (VOCs) – organic chemical compounds that evaporate under normal indoor air conditions (because they have a low boiling point). Some VOCs have harmful health effects. For example, toluene, a component in many paints, is a VOC and can cause brain damage.

Check your understanding

1. If there is no contamination near your home, should you be worried about vapor intrusion?
2. What are the advantages of tree sampling over the traditional methods for assessing vapor intrusion?
3. What makes trees potential indicators for soil contamination in general?
4. Can you think of any other indicators (plants or animals) for air pollution?

REFERENCES

Jordan Wilson, V. Samaranayake, Matt Limmer, Joel Burken. *Phytoforensics: Trees as bioindicators of potential indoor exposure via vapor intrusion.* PLoS ONE 13(2): e0193247.
https://doi.org/10.1371/journal.pone.0193247

EPA: Indoor air quality
https://www.epa.gov/indoor-air-quality-iaq/introduction-indoor-air-quality

New York State Department of Health: Volatile organic compounds in commonly used products.
https://www.health.ny.gov/publications/6513/

- Finalmente, para que se expresen oralmente y generen una discusión en torno a un tema relevante en la actualidad, se propone que lean y entiendan la siguiente noticia, en parejas, y después respondan las preguntas que siguen.

TEENS AND ADULTS SAY THEY FEEL TETHERED TO PHONES

By Associated Press

August 31, 2018

Parents lament their teenagers' noses constantly in their phones. However, they might want ***to take stock*** *of their own screen time habits.*

A study out last week from the Pew Research Center found that two-thirds of parents are ***concerned*** *about the amount of time their teenage children spend in front of screens. But more than a third of parents expressed concern about their own screen time.*

Meanwhile, more than half of teens had an observation. They said they often or sometimes found their parents or caregivers to be distracted when the teens are trying to have a conversation with them. The study calls teens' relationship with their phones at times "hyperconnected." It notes that nearly three-fourths check messages or notifications as soon as they wake up. Parents do the same, but at a lower if still substantial rate — 57 percent.

Michael Erns, a thirteen-year-old boy, reported that his father was always playing games on the phone and then scolded his son when he saw him playing. "It's a bit incongruent", he said.

On the other hand, Joanne Smith, a fifteen-year-old girl, said that her mother and father had had lunch during the last weekend with their phones on top of the table and answering messages all the time without even trying to hide it from their parents." It was pretty annoying. "They cannot intend for us kids to stop with what they say, is our "cell phone addiction", if they are not the ones setting the example", she said.

Big tech companies face a growing ***backlash*** *against the addictive nature of their gadgets and apps, the* ***endless*** *notifications and other* ***features*** *created to keep people* ***tethered*** *to their screens.*

Many teens are trying to do something about it: 52 percent said they have cut back on the time they spend on their phones and 57 percent did the same with social media.

Experts say parents have a big role in their kids' screen habits and setting a good example is a big part of it.

"Kids don't always do what we say but they do as we do," said Donald Shifrin. He is a professor of pediatrics at the University of Washington School of Medicine. He was not involved in the Pew study. "Parents are the door that kids will walk through on their way to the world."

The study surveyed 743 U.S. teens and 1,058 U.S. parents of teens from March 7 to April 10. The margin of error is 4.5 percentage points.

Source: Adapted from:
https://www.curriculumnacional.cl/link/https://www.nytimes.com/aponline/2018/08/22/technology/ap-us-tec-growing-up-digital-teens-and-screens.html

Glossary:

- ✓ **To concern:** to cause worry to someone.
- ✓ **Caregivers:** someone who takes care of a person who is young, old or sick.
- ✓ **To scold:** to speak to someone angrily because you disapprove the behaviour.
- ✓ **To annoy:** to make someone angry.
- ✓ **Backlash:** a strong feeling among a group of people in reaction to a change or recent events in society or politics.
- ✓ **Tethered:** tied, closely connected with something.

- El professor les pide: *Answer the following Wh's questions after reading this piece of news. Use your dictionary if you have some problems with the vocabulary.*
  a. **What's** happening?
  b. **Who** is involved?
  c. **Where** is this happening?
  d. **When** is it happening?
  e. **Why** is it happening?
- Responden en parejas y luego se juntan en grupos de cuatro para discutir las implicancias de este problema actual que afecta tanto a los padres como a sus hijos. El profesor solicita*: Please answer the questions in pairs and then get together with another couple to discuss the implications of this current problem that affects parents and their children.*
- El docente apoya las discusiones de los grupos y les entrega sugerencias y observaciones.
- Dado el propósito de esta actividad, se incluye su rúbrica a continuación.

RÚBRICA RESUMEN DE ARTÍCULO CIENTÍFICO

Points	***7-6***	***5-4***	***3-2***	***1***	
			POSTER		
Format/ Appearance	*All information on the poster is in focus and can be easily viewed and identified. Visual support is included and relates to the content.*	*Most information of the poster is in focus and can be easily viewed and identified Visual support is included and relates to the content.*	*Some information of the poster is in focus and some of the content is easily viewed and identified. Visual support is included and somewhat related to the content.*	*Much of the information is unclear and not easily viewed & identified. Visual support is included but does not relate to the content, or no visual support included.*	
Content	*All key concepts of the structure of a scientific article is included and summarized properly.*	*Most key concepts of the structure of a scientific article is included and summarized properly.*	*Some key concepts of the structure of a scientific article is included and summarized using too much or too little information.*	*Few or no key concepts of the structure of a scientific article is included and summarized using too much or too little information.*	
Grammar & Mechanics	*Correct use of grammar, punctuation and spelling. Minor or no mistakes.*	*Mostly correct use of grammar, punctuation and spelling. Some mistakes are made but they don't interfere with meaning.*	*Somewhat correct use of grammar, punctuation and spelling. Mistakes made interfere with meaning.*	*Incorrect use of grammar, punctuation and spelling. A lot of mistakes made that interfere with meaning.*	
Total					

ORAL PRESENTATION					
Points	*7-6*	*5-4*	*3-2*	*1*	
Non-verbal Skills	*Student makes eye-contact with the audience, standing up straight, and moving his/her hands for emphasis.*	*Student makes eye-contact but most of the time looks at the teacher instead of the audience, standing up straight.*	*Student occasionally makes eye-contact with the audience and sways or fidgets during presentation.*	*Student doesn't make eye-contact with the audience, reading while presenting. He/she slumps or lean during presentation.*	
Oral Skills	*Student uses a clear voice and tone and pronounces everything clearly and properly.*	*Student uses a clear voice and tone, but some pronunciation mistakes are made.*	*Student voice and tone cause part of the audience has some difficulty hearing the presentation properly. Some pronunciation mistakes are made.*	*Student voice and tone are too low, causing most of the audience unable to hear the presentation properly. A lot of pronunciation mistakes are made.*	
Presentation	*Use of poster as visual aid during the whole presentation.*	*Use of poster as a visual aid during most part of presentation.*	*Use of poster as a visual aid during some part of presentation.*	*No poster used as visual aid during presentation*	
Team Work	*Team shows coordination with clear guidelines about each member's role. Everyone participates during the presentation.*	*Team shows coordination but with no clarity about each member's role. Everyone participates during the presentation.*	*Team shows coordination but there's not clarity about each member's role and some of them participate during the presentation.*	*Teams shows lack of coordination and not clarity about each member's role. Only one or two members participate during the presentation.*	
Total					

Orientaciones para el docente

Se sugiere los siguientes indicadores para evaluar formativamente los aprendizajes:

- Escriben un artículo científico siguiendo las convenciones del género.
- Presentan oralmente un artículo de interés científico.

RECURSOS Y SITIOS WEB

- **CHARLAS TED SUGERIDAS** (de menos de 6 minutos y adecuadas al nivel de inglés para 3° medio):
  - https://www.curriculumnacional.cl/link/https://www.ted.com/talks/burcin_mutlu_pakdil_a_rare_galaxy_that_s_challenging_our_understanding_of_the_universe?language=en#t-18419
  - https://www.curriculumnacional.cl/link/https://www.ted.com/talks/diy_neuroscience_reading_the_mind_is_hard_to_do?language=en#t-46840
  - https://www.curriculumnacional.cl/link/https://www.ted.com/talks/diy_neuroscience_how_you_can_make_a_fruit_fly_eat_veggies?language=en
  - https://www.curriculumnacional.cl/link/https://www.ted.com/talks/katlego_kolanyane_kesupile_how_i_m_bringing_queer_pride_to_my_rural_village?language=en

- **PARA REDACTAR NOTICIAS**
  - *Writing headlines*:
    - https://www.curriculumnacional.cl/link/http://www.bbc.co.uk/schoolreport/19055226
    - https://www.curriculumnacional.cl/link/http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/21_07_11_headline_activity.pdf
  - *Reported speech in the news*:
    - https://www.curriculumnacional.cl/link/http://downloads.bbc.co.uk/worldservice/learningenglish/witn/pdfs/witn_plan_080319_shin_bet.pdf
    - https://www.curriculumnacional.cl/link/http://learnenglishteens.britishcouncil.org/grammar/intermediate-grammar/reported-speech

- **PARA REDACTAR UN INFORME**
  - https://www.curriculumnacional.cl/link/http://www.bbc.co.uk/bitesize/standard/english/lit_form/newspaper/revision/1/