**ACTIVITY: Exploring cancer screening**

**and diagnosis** **webquest**

**Activity idea**

In this activity, students use text, diagrams, images and video clips to answer questions about cancer screening and diagnosis.

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

* gather, evaluate and synthesise information across a range of texts and media
* use content-specific vocabulary to understand texts
* discuss ways in which cancer cells differ from normal cells
* discuss different methods of screening and diagnosing some types of cancer
* consider some of the advantages and disadvantages of the various methods used to screen for breast cancer.

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**Introduction/background**

A webquest is an investigative activity in which students are given a task to find specific information from the internet. Webquests have these general characteristics:

* Classroom-based activity.
* Involves group work.
* Emphasises information use as well as information gathering.
* Focuses on developing higher-order thinking (analysis, creativity, criticism).
* Relies on internet sources preselected by the teacher.

This webquest uses mostly Science Learning Hub resources. It requires students to use text, diagrams, images and video clips to carry out particular tasks. Three levels of questioning are included:

* Level 1 (literal) – reading ‘on the lines’ to find what is actually said on the page.
* Level 2 (interpretive) – reading ‘between the lines’ to infer what the author might mean.
* Level 3 (applied) – reading ‘beyond the lines’ to relate the information to other knowledge and situations.

**What you need**

* Copies of the student handout: [Exploring cancer screening and diagnosis](#handout)
* Access to the Science Learning Hub resources listed on the student handout.
* Access to the websites BreastScreen Aotearoa ([www.nsu.govt.nz/current-nsu-programmes/breastscreen-aotearoa.aspx](http://www.nsu.govt.nz/current-nsu-programmes/breastscreen-aotearoa.aspx)) and the New Zealand Breast Cancer Foundation ([www.nzbcf.org.nz/BREASTCANCER/Mammograms.aspx](http://www.nzbcf.org.nz/BREASTCANCER/Mammograms.aspx))

**What to do**

1. Organise students to work in pairs or small groups.
2. Hand out copies of the student handout [Exploring cancer screening and diagnosis](#handout) and ask students to work together to complete the 3 levels of questions.
3. Discuss the answers to the questions as a class, asking each group to contribute. (See [Exploring cancer screening and diagnosis answers](#answer).)

**Extension idea**

* This webquest could be run by setting the following scenario.

Imagine you’re a journalist working for an online newspaper and the editor has asked you to find out more about medical imaging for an article on the screening and diagnosis of breast cancer. The editor has recommended certain articles/video clips to find out what scientists and doctors are working on.

Your task is to work through the questions and use the answers as the basis for your article.

The article should begin with an overview on what is a cancerous cell. It should discuss some of the advantages, disadvantages and precautions concerning medical imaging. Finish the article with comments involving the level 3 questions.

Your article should be limited to 600 words.

**Student handout: Exploring cancer screening and diagnosis**

***Level 1***

Use these resources to answer the questions:

* [How do people find out that they have cancer?](https://www.sciencelearn.org.nz/resources/1012-how-do-people-find-out-that-they-have-cancer)
* [Cells and cancer](https://www.sciencelearn.org.nz/videos/527-cells-and-cancer)
* [What is the DIET project?](https://www.sciencelearn.org.nz/videos/520-what-is-the-diet-project)
* [Digital camera technology](https://www.sciencelearn.org.nz/resources/995-digital-camera-technology)
1. How do cancer cells differ from normal cells?
2. What is the difference between screening and diagnosis of cancer?
3. Describe the tomography (DIET) technique that is being used at the University of Canterbury to screen for breast cancer.

***Level 2***

Use these resources to answer the questions:

* [X-ray imaging](https://www.sciencelearn.org.nz/resources/985-x-ray-imaging)
* [Computed tomography (CT)](https://www.sciencelearn.org.nz/resources/994-computed-tomography-ct)
* [Improving breast cancer detection](https://www.sciencelearn.org.nz/resources/984-improving-breast-cancer-detection)
* [Screening for breast cancer](https://www.sciencelearn.org.nz/videos/550-screening-for-breast-cancer)
1. What makes it difficult to detect lumps or tumours in breasts?
2. What are the limitations of using X-rays for screening for cancer?
3. What safety precautions are necessary when using X-rays?
4. What other medical imaging techniques could be used for diagnosing any cancerous tissue?

***Level 3***

Use these resources to answer the questions:

* [What is the DIET project?](https://www.sciencelearn.org.nz/videos/520-what-is-the-diet-project)
* [Screening for breast cancer](https://www.sciencelearn.org.nz/videos/550-screening-for-breast-cancer)
* [Improving breast cancer detection](https://www.sciencelearn.org.nz/resources/984-improving-breast-cancer-detection)
* [How do people find out that they have cancer?](https://www.sciencelearn.org.nz/resources/1012-how-do-people-find-out-that-they-have-cancer)
* [BreastScreen Aotearoa website](http://www.nsu.govt.nz/current-nsu-programmes/breastscreen-aotearoa.aspx)
* [NZ Breast Cancer Foundation website](http://www.nzbcf.org.nz/BREASTCANCER/Mammograms.aspx)
1. Why do you think women might prefer to be screened for breast cancer using the digital tomography rather than mammography?

**Exploring cancer screening and diagnosis answers**

***Level 1***

1. How do cancer cells differ from normal cells?
* A cancer cell differs in its appearance and its behaviour.
* Cancer cells often have an enlarged nucleus.
* They are often proliferating in a very disorganised way.
* They tend to take over the body’s tissues and grow without being regulated.
1. What is the difference between screening and diagnosis of cancer?

Cancer screening involves regularly testing people who don’t otherwise have any symptoms.

Diagnosis is the identification of disease through the examination of the person’s symptoms.

1. Describe the tomography (DIET) technique that is being used at the University of Canterbury to screen for breast cancer.

Digital image-based elasto-tomography (DIET) uses digital cameras to image motion on the outside of the body to work out what is going on in the tissue underneath.

The DIET project is to develop a breast cancer screening technique. They’re looking at the idea of imaging elasticity. As cancer tissue is much stiffer than healthy tissue, if you can image elasticity, you should really see the cancer quite clearly.

***Level 2***

1. What makes it difficult to detect lumps or tumours in breasts?

Feeling the breasts (breast self-examination) for an unusual lump is tricky as it’s like feeling for a small marble in a wrapped present.

When you have a mammogram, you’re actually imaging radio density, and as radio density doesn’t necessarily vary a great deal between cancerous tissue and healthy tissue, you’re not actually looking for obvious image contrast. You’re looking at very subtle changes in the structure of the image itself, so you need highly trained experts – radiographers – to read these mammogram images and try and see if there is cancer in there.

Mammograms can also be uncomfortable for some women, and they avoid attending regularly. One of the key parts of any breast screening process is that the images are taken at regular intervals so that radiographers can compare this year’s image to last year’s. So if women are skipping appointments and images are not taken on a regular basis, then some of the benefits of a screening methodology are removed.

1. What are the limitations of using X-rays for screening for cancer?

X-rays are good for showing dense tissues that absorb the X-rays. They can be used for some soft tissue investigations (such as looking for lung disease). Sometimes dyes can be injected to help visualise other parts of the body (such as arteries) with X-rays.

However, X-rays are not useful when trying to look at other types of soft tissue, for example, muscle or the brain. Cancer in these tissues/organs must be visualised by other methods.

1. What safety precautions are necessary when using X-rays?

X-rays can causes illness in the people performing the X-ray and in the person receiving the X-ray. To keep everyone safe, steps have been taken to control the availability of X-ray equipment, to make sure all radiographers are trained and find out what the safe levels of exposure are.

1. What other medical imaging techniques could be used for diagnosing any cancerous tissue?

CT (computed tomography or computed axial tomography) is a way of scanning the whole body, or part of the body, slice by slice, using the principles of X-ray. CT is able to differentiate between different types of tissues. CT scans offer far more detailed images of lungs, bones, blood vessels and other body tissues than a conventional X-ray. They can be used to screen for cancer, tumours and blood clots and also investigate heart disease.

***Level 3***

1. Why do you think women might prefer to be screened for breast cancer using digital tomography rather than mammography?

Screening mammograms are provided free for all New Zealand women between the ages of 45 and 69. Some women find mammograms uncomfortable as the breast is pressed firmly between two plates to get a good image, and they avoid regular mammograms because of this discomfort. Also, for women under 50, screening mammograms pick up fewer lumps because of their relatively denser breast tissue.

The DIET should be a relatively comfortable imaging process, so there wouldn’t necessarily be any reason for a woman to avoid going. The DIET project developers also propose that, because this screening process is cheap, the screening could be done once or twice a year rather than every 2 years (as with screening mammograms). This may make it a more effective screening programme for breast cancer detection than mammograms.