

Lesson plan on tackling obesity (Jigsaw activity)
University of Limerick
Chain Reaction

Lesson Number: 1
Date:
Time: 1 hour 15 minutes

Lesson Number: 2
Date:
Time: 45 minutes
Subject: Science

Topic: Tackling obesity

Previous knowledge/experience:

- Students will have a basic understanding of energy, extending to its transformation and conservation.
- Students will be aware of the major food groups, their functions and illustrative foods from each group.
- Students will have conducted lab based experiments on testing foods for starch, sugar, fats and protein
- Students will be aware of the importance of a balanced diet based on the types and portions of foods in the food pyramid
- Students will have encountered media stories referring to the increasing obesity epidemic worldwide and may have also seen similar stories directly linked to Ireland
- Students will be health conscious from participating in PE and SPHE class

Impact of previous lesson

The previous series of classes will have introduced the topic of food, the food groups and tests and the importance of a balanced diet.

Aim(s) of lesson

1. I want students to be able to critically analyse the issues related to obesity in terms of its definition and causes, its occurrence in Ireland, its impact and how to prevent/treat it.
2. I want students to be able to work collaboratively to present this argument clearly.

Objectives and Assessment

Aim	Objectives	Assessment
1	Students will be able to define and outline the causes of obesity	Item 2; observation
	Students will be able to calculate the BMI score of an overweight adult and manipulate the BMI equation to determine the weights of the same person if they were obese or at optimum weight	Item 2; observation
	Students will be able to represent the statistics for obesity occurrence in Ireland using bar and line graphs	Item 3; observation
	Students will be able to identify some of the potential health risks of being obese based on documented evidence	Item 4; observation
	Students will be able to define basal metabolic rate (BMR) and to discuss its importance in obesity prevention	Item 5; observation

	Students will be able to identify ways to both prevent and treat obesity based on informed evidence	Item 5; observation
	Students will identify possible deficiencies in their argument	Whole class discussion on completion of task
2	Students will take responsibility for their Items and communicate them effectively to the group	Completion of items 2-5; observation
	Students will synthesise the understandings of Items 2-5 to make	Item 7
	Students will take responsibility to complete their work independently	Observation

Subject matter: Obesity, BMI, calculation, graphical representation, BMR, communicating science

Resources: Print out of Item 1 (x4), Items 2-5 (single); A3 sheets for advertisement; Pens, Whiteboard markers

Organisation of lessons

Time	Teacher activity	Student activity
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L1 0-10	<p>Lesson 1 - Put students into 'home' groups</p> <ul style="list-style-type: none"> • Introduce today's task • Assign captains to each group • Describe the jigsaw learning technique 	<p>Asking questions to clarify purpose.</p> <p>Form into 4 groups of 4 students. One person will agree to take on the role of Captain.</p>
10-15	<p>Students are put in the place of developing an argument for the Health Trust to persuade people about the dangers of obesity and how to prevent against them. We are using a learning approach called "Jigsaw" that mimics teams of scientists working towards a common goal.</p> <p>Form students into expert groups focused on each Item (2-5). There will be 4 people per group (+1) for where Captain joins group.</p> <p>Distribute Meeting notes, agenda and Items 2-5.</p>	<p>Captain goes through agenda in home group, including timing. He/she then delegates responsibility for Items 2-5 to members of group. Captain joins one of the expert groups.</p> <p>Students form experts groups</p>
15-25	<p>Teachers observe group work only for accuracy and to address issues of clarity. Where there is confusion prompts are used rather than giving the answer away. Remind groups of time.</p>	<p>Experts work to develop accurate and complete answers to their item, taking notes and drawing graphs/tables as needed.</p>
25-60	<p>Students return to their original groups to complete task. Manage groups and address questions/concerns.</p>	<p>Captain leads group through agenda to complete task and discuss plan of action to complete/present advertisement during the next class.</p>
60-70	<p>Questions/discussion on the task and the nature of inquiry embedded within the class (See sample questions below)</p>	<p>Students record all information and make a note of responsibilities for Lesson 2.</p>
70-75	<p>Summary. End Class 1.</p>	<p>Students engage in questioning/discussion about the task.</p>
L2 0-10	<p>Lesson 2 - Introduction of today's task.</p>	<p>Lesson 2 - Students collect into their home groups, gather all required materials and make</p>

Bank of Prompt Questions

Lesson 1:

1. What aspects of scientific inquiry did we engage in today?
2. As a) scientists, b) members of the public, how do you think we could determine the quality of the advertisements to be presented in the second class (Suggestion of peers to develop a rubric at end of class if time allows or else for homework)

Lesson 2:

1. Is our argument a strong one? Is it missing anything? How would we improve our argument? Could we carry out an investigation to strengthen our argument?
2. Why is it important for scientists to make arguments the public can understand?
3. What would be the major positives of producing such an advertisement?
4. Are there any negative concerns you might have about your argument? If so, what are they and why do they cause you concern?
5. How could we extend this activity to have a broader impact? (possible suggestions):
 - a. Request advertisements to be displayed on LCD TV in school canteen
 - b. Create a FB page for advertisements.
 - c. Email to local newspapers
 - d. Link in with work being done in other subjects as part of healthy eating week
 - e. Develop advertisement into a SciFest/BTYSTE/ 'one good idea' or YSI project with a research element on students/adults perceptions or perhaps a statistical analysis of BMIs across the school/the local community.
 - f. Link in with other subjects such as geography, SPHE and PE

Tackling obesity in

You are a team of researchers in Ireland acting as consultants to the Health Trust, a committee whose mission it is to promote healthier living amongst Irish people. Your brief (i.e. your job described) is to come up with an advertisement to inform the Irish public about the dangers of obesity and the ways they can tackle it. You will present information on specific aspects of obesity, including causes, Irish statistics on the matter and measures people can take to prevent it

Science you should know before you start this activity:

- ⇒ The functions of different food groups in the body
- ⇒ How to have a balanced diet based on the types and portions of foods in the food pyramid
- ⇒ The role of food additives and the types of food additives

Science you will learn about in this activity:

- ⇒ The basal metabolic rate (BMR) of the human body
- ⇒ Definitions and causes of obesity
- ⇒ What a BMI score is and how to calculate it
- ⇒ How to visually represent statistics using bar charts and/or line graphs

Checking your learning:

You will produce a newspaper advertisement informing the public about the dangers of obesity in Ireland and the ways this can be tackled. You should make sure you produce the following items as you work through the activity:

Item 1

Information on obesity- definition and causes
How to calculate a Body Mass Index (BMI) value for an average adult male/female

Item 2

Obesity in Ireland - Occurrence and statistics in Ireland

Item 3

Impacts of obesity - associated health problems

Item 4

Prevention and treatment of obesity



An Irish healthy living committee

Meeting Agenda

Item	Description	Suggested times	Presenter
1	Captain's introduction in your 'HOME' group	5 mins	
	SPLIT INTO EXPERT GROUPS AFTER CAPTAIN'S INTRODUCTION. Then spend 10 minutes in your expert groups . After this – RETURN FROM EXPERT GROUPS, HOME GROUPS FORM AGAIN	10 mins	
	Items 2-5 below: in home groups: each expert has 5 minutes to present their expert knowledge to the home group		
2	What is obesity?	5 mins	
3	Obesity in Ireland	5 mins	
4	Impacts of obesity	5 mins	
5	Prevention and treatment of obesity	5 mins	
6	Discussion about newspaper advertisement (class 1)	30-35 mins	
7	Presentation of the final draft of newspaper advertisement (Class 2)	5 mins	

Committee meeting notes for the Captain

Item 1 Starting the meeting - introduction

- Welcome the members who will be acting as consultants to the committee
- Outline the purpose of the meeting:

The Health Trust is a committee whose mission it is to promote healthier living amongst Irish people. Your brief (i.e. your job described) is to come up with an advertisement to inform the Irish public about the dangers of obesity and the ways they can tackle it. You will present information on specific aspects of obesity, including causes, Irish statistics on the matter and measures people can take to prevent it

- Read out the items on the agenda
- BREAK UP THE TEAM MEMBERS INTO THEIR EXPERT GROUPS. THEN GO TO YOUR OWN EXPERT GROUP
- **PEOPLE STAY IN EXPERT GROUPS FOR 10 MINUTES, GAINING THEIR EXPERT KNOWLEDGE TO BRING BACK TO THE HOME GROUP**
- **AFTER TEN MINUTES**, EVERYONE RETURNS TO THE HOME GROUP FROM THEIR EXPERT GROUPS

Items 2 – 5 – IN THE HOME GROUP

- Invite each member to give her/his presentation in turn based on their expert knowledge
- After each presentation ask if anyone has a question
- **Try to make sure each item lasts no more than the 5 MINUTES of time allotted on the agenda**

Items 6 - 7

- Chair the discussion about the style and content of the newspaper advertisement (**it should be no more than 80 words and include an eye-catching graphic**)
- Oversee the final draft of the advertisement.
- Decide on presenters of different sections – THIS SHOULD BE A TEAM PRESENTATION WITH THE CAPTAIN AS THE LEADER

Item 2 Information on obesity - definitions and

Notes for experts

Please read this before proceeding:

You are going to give a brief presentation on this topic in your home group (approx. 5 minutes)

- ⇒ Prepare yourself by studying the information in the box
- ⇒ Use the pictures and graphics provided to help you
- ⇒ It might be useful to calculate the BMI values for the example male and female adult provided

In rich, industrialised countries like Britain and USA, more people suffer from overeating than from eating too little. If a person takes in more energy in food than they use up, then the excess is stored as fat. Taken to extremes, people can put on so much weight that they become **obese**.

Major causes of obesity include:

- High intake of fatty foods and refined foods containing a lot of added sugar
- Too little exercise
- Social and emotional stress, leading to 'comfort eating'

The overwhelming influences of obesity in 99% of the population are environmental and include marketing, advertising, increasing portion sizes, accessibility and availability of foods and facilities, increased automation and increased car use among other factors

There are two ways in which a person can identify being obese:

- ⇒ Being 20% above the recommended weight for his or her height
- ⇒ Having a **Body Mass Index (BMI)** greater than 30
 - The **body mass index (BMI)** is a measure for human body shape based on an individual's mass and height.
 - Devised between 1830 and 1850 by the [Belgian polymath Adolphe Quetelet](#), it is defined as the individual's body mass divided by the square of their height - with the value universally being given in [units](#) of kg/m².
 - An adult with a BMI of less than 20 is underweight, between 25 and 30 is overweight and more than 30 is obese.
 - If an adult has a BMI of 20-24 they are at an optimum (ideal) weight

$$\text{Body Mass Index} = \frac{\text{Weight (in kg)}}{\text{Height}^2 \text{ (in m)}}$$

Eg - an average adult male/female- if they are 5 ft 7 inches tall (1.7 metres tall) and weigh 14 stone (90kg) - what would their BMI be? Based on their BMI score - how would we classify them? What would their optimum weight need to be for a healthy BMI?

Item 3 Obesity in Ireland - occurrence and statistics

Notes for experts

Please read this before proceeding

You are going to give a brief presentation on this topic in your home group (approx. 5 minutes)

- ⇒ Prepare yourself by studying the information in the box
- ⇒ Use the facts and figures provided to help you
- ⇒ It might be useful to create bar charts or line graphs to visually represent the information given below

Obesity is the most common nutritional disorder in the world. The prevalence of overweight and obesity has increased with alarming speed over the past twenty years. It has recently been described by the World Health Organisation as a 'global epidemic'. In the year 2000 more than 300 million people worldwide were obese and it is now projected that by 2025 up to half the population of the United States will be obese if current trends are maintained. The disease is now a major public health problem throughout Europe.

In Ireland at the present time 39% of adults are overweight and 18% are obese. Of these, slightly more men than women are obese and there is a higher incidence of the disease in lower socio-economic groups.

Statistics related to obesity for Irish adults (source - Irish Heart foundation):

Irish adults (18 years and older)

Two out of five Irish adults - 39% (45% of men; 33% of women) are overweight

- One in four - 25% (24% of men; 26% of women) is obese.
- The trend towards obesity in Ireland is increasing. Between 1990 and 2000 the prevalence of obesity increased by 67% overall, up 1.25 fold in women (from 13%) and up 2.5 fold in men (from 8%)
- Ireland has the fourth highest prevalence of overweight and obesity in men in the EU and the seventh highest prevalence among women

Irish Teenagers (13-17 years)

- One in five teenagers is overweight or obese (11% overweight and 8% obese)
- There has been a significant increase in teenage obesity since 1990 with an 8-fold increase in males (1% to 8%) and a 2-fold increase in females (3% to 6%)

Economic Burden

- Costs for treating obesity in Ireland is estimated at €0.4 billion. The number of premature deaths annually attributable to obesity currently approximates to 2,000

Item 4 Impacts of obesity

Notes for experts

Please read this before proceeding

You are going to give a brief presentation on this topic in your home group (approx. 5 minutes)

Obesity has a far-ranging negative effect on health. Each year obesity-related conditions cost over 150 billion dollars and cause an estimated 300,000 premature deaths in the US. The health effects associated with obesity include, but are not limited to, the following:

- ⇒ **high blood pressure** - Additional fat tissue in the body needs oxygen and nutrients in order to live, which requires the blood vessels to circulate more blood to the fat tissue. This increases the workload of the heart because it must pump more blood through additional blood vessels. More circulating blood also means more pressure on the artery walls. Higher pressure on the artery walls increases the blood pressure. In addition, extra weight can raise the heart rate and reduce the body's ability to transport blood through the vessels.
- ⇒ **diabetes** - Obesity is the major cause of type 2 diabetes. This type of diabetes usually begins in adulthood but, is now actually occurring in children. Obesity can cause resistance to insulin, the hormone that regulates blood sugar. When obesity causes insulin resistance, the blood sugar becomes elevated. Even moderate obesity dramatically increases the risk of diabetes.
- ⇒ **heart disease** - Atherosclerosis (hardening of the arteries) is present 10 times more often in obese people compared to those who are not obese. Coronary artery disease is also more prevalent because fatty deposits build up in arteries that supply the heart. Narrowed arteries and reduced blood flow to the heart can cause chest pain (angina) or a heart attack. Blood clots can also form in narrowed arteries and cause a stroke.
- ⇒ **joint problems, including osteoarthritis** - Obesity can affect the knees and hips because of the stress placed on the joints by extra weight. Joint replacement surgery, while commonly performed on damaged joints, may not be an advisable option for an obese person because the artificial joint has a higher risk of loosening and causing further damage.
- ⇒ **sleep apnea and respiratory problems** - Sleep apnea, which causes people to stop breathing for brief periods, interrupts sleep throughout the night and causes sleepiness during the day. It also causes heavy snoring. Respiratory problems associated with obesity occur when added weight of the chest wall squeezes the lungs and causes restricted breathing. Sleep apnea is also associated with high blood pressure.
- ⇒ **psychosocial effects** - In a culture where often the ideal of physical attractiveness is to be overly thin, people who are overweight or obese frequently suffer disadvantages. Overweight and obese persons are often blamed for their condition and may be considered to be lazy or weak-willed. It is not uncommon for overweight or obese conditions to result in persons having lower incomes or having fewer or no romantic relationships. Disapproval of overweight persons expressed by some individuals may progress to bias, discrimination, and even torment.

- ⇒ Prepare yourself by studying the information in the box
- ⇒ It might be useful to make a bullet-pointed summary of these different conditions and to rank them according to seriousness

Item 5 Prevention and treatment of obesity

Notes for experts

Please read this before proceeding

You are going to give a brief presentation on this topic in your home group (approx. 5 minutes)

- ⇒ Prepare yourself by studying the information in the box
- ⇒ It might be a good idea to compile a list of do's and don'ts in terms of food and activities to prevent and treat obesity

The food you eat in a day should provide you with enough energy to get through that day, to keep your heart beating, your lungs working, your body temperature and all the chemical reactions in your body going. The 'ticking over' speed at which our bodies work is called the **basal metabolic rate (BMR)**. The BMR varies from person to person, but roughly it uses 7000kJ per day. So even if you lie around doing nothing you still need this amount of energy. People with a low BMR are more likely to get overweight.

So, how do we prevent this? : A balance of food intake and physical activity is necessary for a healthy weight. The foods we individually consume and our participation in physical activity are the result of a complex supply and production system. **The growing research evidence that energy dense foods promote obesity is impressive and convincing.** These are the foods that are high in fat, sugar and starch. Of these potentially the most significant promoter of weight gain is fat and foods from the top shelf of the food pyramid including spreads (butter and margarine), cakes and biscuits, and confectionery, when combined are the greatest contributors to fat intake in the Irish diet.

In company with their adult counterparts **Irish children are also consuming large amounts of energy dense foods outside the home.** A recent survey revealed that slightly over half of these children ate sweets at least once a day and roughly a third of them had fizzy drinks and crisps with the same regularity. Sugar sweetened carbonated drinks are thought to contribute to obesity and for this reason the World Health Organisation has expressed serious concerns at the high and increasing consumption of these drinks by children.

Physical activity is an important determinant of body weight. It is now widely accepted that adults should be involved in 45-60 minutes, and children should be involved in at least 60 minutes per day of moderate physical activity in order to prevent excess weight gain.

Treating obesity?

Obesity is caused by lifestyle choices, and these habits need to be broken if an obese person is to stand a good chance of losing weight. There are no quick fixes. Your GP can refer you to a dietician or a nutritionist who will draw up a personal diet plan to help you lose weight. There are a number of **drugs** which can cause rapid weight loss results, often by stimulating the body's metabolism while suppressing the appetite. However, taking a drug for weight loss is a short-term treatment, as it does not confront the underlying behaviour that leads to gaining weight. **Surgical treatment** for obesity is not pleasant and is only considered for people who have a BMI level well over 30, and for whom diet and exercise has proved unsuccessful in shifting the weight. Options include stapling the stomach or wiring the jaw shut to reduce the potential for food intake by the obese person