

Chapter 8

Critical Thinking Across Disciplines in University General Education: Obesity as a Socioscientific Issue



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Abstract Arguably, we are now living in a post-scarcity era. Production is geared towards human desire rather than towards fulfilling basic needs. For the first time in human history, there are more people who are overweight than underweight. Conventional school science has often portrayed obesity as a biological problem; the way to avoid obesity is to eat a healthy diet and to lead a healthy lifestyle. Implicitly, obesity is regarded as a self-inflicted problem. Such a view, however, ignores social, political, marketing, technological, cultural and economic factors that shape an environment that determines individual eating and lifestyle patterns. This chapter reports on our university general education course that aimed to develop in students a more sophisticated view of obesity as an interdisciplinary and socioscientific issue, with the particular intention of engaging critical thinking on all these factors. We start by making the case that obesity is more than just a biological problem. A critical understanding of obesity demands thinking across disciplines. Then, we expound on our course structure and pedagogy. This is followed by a report on students' learning outcomes ($n = 114$) in terms of the overall changes they made in their thinking about obesity. Implications for our course development and interdisciplinary learning in the form of STEM education are also discussed.

Keywords Cross-disciplinary thinking · Issue-based learning · Conceptual change · University education · Health education

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8.1 Introduction

Preparing citizens who are able to make informed decisions about their lives, society and the environment is arguably a goal of science education. A strategy to achieve this goal involves the use of socioscientific issues (SSI). By contrast with teaching that portrays science as a value-free pursuit of truth, the teaching of science via SSI has the following characteristics (Zeidler, 2015, p. 998):

- Controversial and ill-structured problems that require scientific evidence-based reasoning to inform decisions about such topics.
- Deliberate use of scientific topics with social ramifications that require students to engage in dialogue, discussion, debate, and argumentation.
- Tend to have implicit and explicit ethical components and require some degree of moral reasoning.

We believe that to engage students in SSI, it is important that the issues are also relevant to their interests. With this consideration in mind, we introduced the issue of ‘obesity’ into a general programme available to all undergraduates at one university, and did so by positioning obesity as an issue in relation to which students should inquire about its complexity. Young adults tend to pay extensive attention to their physical bodies, which may shape a part of their self-esteem. Their interest can be reflected in the popularity of competitive reality shows such as *The Biggest Loser* (in which contestants compete to lose most weight within a given period of time, with the ‘biggest loser’ [of weight] becoming the winner) and in the blooming of the slimming/weight loss industry around the world. Obesity is not only a personal issue for young people, but also a phenomenon at the global level. For example, 60% of adults in OECD countries are overweight, more than 40% of these overweight adults are obese (Organisation for Economic Co-operation and Development [OECD], 2019). In short, obesity is an SSI that is pertinent to students’ personal interest and is relevant for them as an issue for which citizens need to develop scientific literacy in the changing world.

8.1.1 What Causes Obesity?

From the scientific perspective, obesity refers to a situation in which body fat accumulates to the extent that it exerts adverse impact(s) on the individual’s health. It is the result of prolonged positive energy balance where the energy input from food intake is larger than the energy output by the body. Excess energy is stored in the form of body fat, leading to obesity in the long term. Many hold the conception that the positive energy balance is a result of a lack of willpower in controlling one’s diet and lifestyle. Studies related to students’ understanding of obesity have adopted this scientific perspective (Allen et al., 2019; Ozbas & Kilinc, 2015; Weissová & Prokop, 2019). Nevertheless, when asked what causes teenage pregnancy, few would be

satisfied with an explanation that is limited to our knowledge of the human reproductive system. In a similar way, biology and willpower do not provide adequate explanations of how obesity occurs or what the solutions are to obesity. For example, the worldwide prevalence of obesity has nearly tripled since 1975 (World Health Organization, 2018). Lack of willpower alone cannot explain the escalated prevalence of obesity in recent decades because there is no evidence that our willpower has changed so drastically within this short timeframe. There are factors beyond biology and willpower that contribute to our explanation of the obesity epidemic.

Food choice, for example, is not only determined by our willpower, but also by food availability, convenience, social and cultural norms, health beliefs, personal preferences, social interactions and taste. Consider one common circumstance: in some underprivileged locations in many countries, fast food outlets are more easily accessible than shops or supermarkets where nutritionally high-quality food is more readily available and affordable. Although the cost of transportation involved in shopping is not an issue for all people, it is a concern for some. Similarly, the assumption that people know how to select nutritionally high-quality food may not hold for those of low socioeconomic status (or, of course, more broadly). These people may not have the adequate education to support their knowledge and practice of living a healthy lifestyle.

Food and catering industries (and their marketing) play an important role in our lives. The food industry has developed diverse strategies to increase sales. By developing a 'bliss point' using the trio of salt, sugar and fat where the saltiness, sweetness and richness are experienced to be most appealing, the processed food industry is able to make its products irresistible to consumers. Furthermore, food advertising has permeated every aspect of daily life. Food advertisements (including for fast foods, sugared drinks and snacks) targeting children often include some kind of 'health' messages (Castonguay et al., 2013). In addition to the more traditional means of information dissemination like television and printed media, the use of digital technologies, including the Internet and mobile devices, has enabled the food industry to share unprecedented volumes of information about their products in customised messages to their consumers. Even if consumers are smart enough to identify the persuasive intent underlying such information, they may not be aware that their consumption decisions are subconsciously influenced.

The relationship between the food industry and governments is also intriguing. As a result of lobbying by the food industry, dietary advice issued by governments has never been based purely on the consideration of public health, and it continues to promote outdated research (Nestle, 2018). In market-driven economies, governments may hesitate to propose policies such as restricting the advertisement of certain food products that are potentially against the value of free markets and consumers' free choice.

In short, we suggest that obesity involves a network of complicated and inter-related causes. To address the phenomenon, it is not adequate to merely consider the biology of obesity. Stigmatising the obese is also unlikely to impact on the issue (Tomiyama et al., 2018), not only because this approach has profound moral

implications, but also because it creates another hurdle for the obese to overcome before seeking appropriate support. It is important to go beyond the scientific perspective and consider how our broader social, cultural and political environments shape obesity. Causes of obesity and measures to address this phenomenon are controversial, and involve ethical considerations and a degree of moral reasoning. For these reasons, 'obesity' is an exemplar socioscientific issue that provides an opportunity for students to engage in a critical scrutiny of their thinking and of the information they come across in relation to this issue.

8.2 Critical Thinking About Obesity

Critical thinking is a recurrent theme in school education and in different disciplines in tertiary education (Davies & Barnett, 2015). We take the idea of Corrigan, Panizzon and Smith (Chap. 6, this volume) that there are four integrated components of critical thinking: (1) evaluation of evidence, (2) analysis and synthesis of evidence, (3) acknowledging alternative explanations and (4) drawing conclusions. We make two remarks on the concept of evidence in relation to exercising critical thinking in understanding obesity:

- (i) Evidence both exists and is interpreted in a disciplinary matrix, and what counts as evidence varies in different disciplines. Therefore, disciplinary knowledge plays an important role in analysing, synthesising and evaluating evidence, and in drawing conclusions. Critical thinking about complex phenomena such as obesity demands the informed use of knowledge from different disciplines. This is an important issue because it reminds us of the need to consider alternative forms of evidence and hence alternative explanations.
- (ii) Disciplines help us to focus on what counts as evidence. In the science discipline, energy input and output is a piece of strong evidence for the cause of obesity. Beyond the science discipline, food industry marketing strategies and the low availability of high quality food in less affluent residential areas are regarded as evidence of differing contributors to obesity. If we were to fixate only on the science discipline, we would not be able to identify other factors as evidence and hence would not be able to acknowledge causes of obesity other than those from the energy balance perspective. Suggestions for addressing obesity would then focus solely on changing individuals' eating habits and levels of physical activity.

As Toomath, an endocrinologist and past president of the New Zealand Society for the Study of Diabetes, put it when she commented on the effectiveness of dieting and doing exercise, "No other therapeutic strategy employed in medicine has such poor results... Not only was the treatment... ineffective but it [induces] a sense of guilt or hopelessness [among the obese]" (Toomath, 2016, p. 3). This reinforces our argument that we also need to examine contributors to obesity at the societal level and the ethical considerations of treatments for the obese (Zeidler et al., 2016).

Therefore, critical thinking about obesity would involve consideration of evidence and factors from both science and other disciplines such as sociological studies and ethics (components (1) and (2) of Corrigan, Panizzon and Smith's four interrelated components of critical thinking, see Chap. 6, this volume), such that multiple explanations of the issue can be conceived of (components (3) and (4)). In this connection, we suggest there are two dimensions of thinking of thinking about, particularly, SSI that are relevant to science education, namely the technocratic dimension and the emancipatory dimension (after Fernandez-Balboa, 2004). It is probable that people can engage in both dimensions of thinking about obesity. However, as we discussed above, the existing studies on students' understanding of obesity and school biology have tended to focus on only at the technocratic dimension. We are arguing such a dimension is limited.

8.2.1 The Technocratic Dimension of Obesity

The technocratic dimension of critical thinking about a socioscientific issue focuses on evaluating the rigour of scientific claims in terms of the theoretical underpinnings of the issue, and the methodologies used and the validity of the conclusions drawn based on the available scientific data. Scientific phenomena are often multi-causal. When speaking about obesity, there are other contributing scientific causal factors besides excessive energy input and low energy output, issues such as biological factors like gut flora and epigenetics. In this connection, critical thinking involves evaluating the various factors or sources of evidence that are in play.

Examining obesity solely through the technocratic dimension of thinking can be likened to epistemological thinking of an absolutist nature (Kuhn, 1999), in which critical thinking involves "comparing assertions to reality and determining their truth or falsehood" (p. 24). Thinking of obesity at the personal level (that is, the level of the individual) from this dimension narrows the focus of solutions down to the accurate prescription of appropriate and balanced diets, and the design of exercise plans to suit individual needs. Technocratic considerations at the societal level are limited to estimations of costs incurred by the healthcare system and by the loss of workforce numbers and hours due to issues related to obesity, as well as to estimations of savings in healthcare expenditure that can be made through reducing the number of people with obesity. At both the personal and the societal levels, thinking within the technocratic dimension strives to attain solutions that work best (i.e., the extent to which individuals lose weight) or estimations that best fit reality (i.e., in terms of expenditure and cost saving).

Generally speaking, while the technocratic dimension of thinking acknowledges biological factors that are beyond one's control, it also views the 'fight' against obesity as one in which the obese should assume responsibility for their condition and eat less, exercise more, and live a healthier lifestyle. Specifically, obesity costs society in terms of medical and health care services, and also lost work days and productivity. Therefore, according to the technocratic view, it is important to fight

against obesity as an epidemic to develop a more efficient and economically viable society. To tackle the obesity, the moral responsibility then is seen to rest on the obese (their obesity is unfair to society as society has to pay the price of consequent health problems etc.). This dimension, in general, lacks moral sensitivity towards the obese in terms of morality of justice and morality of care (Sadler, 2004; Zeidler & Keefer, 2003).

In short, the technocratic dimension has components of critical thinking – it does involve evaluation of evidence and forming an explanation of obesity. But it is based mainly on the energy balance perspective, and by extension, tends to regard obesity a result of personal-level problems. It does not consider other disciplines such as sociological studies and ethics, or their evidence and alternative explanations.

8.2.2 *The Emancipatory Dimension of Obesity*

The emancipatory dimension of any socioscientific issue does not preclude scientific understanding. However, this dimension has less to do with the technical examination of a phenomenon and more to do with challenging the *status quo* through an ethical and political scrutiny of the issue. The emancipatory dimension of obesity focuses on broader social institutions, and examines power relationships, inequality and social justice. These foci entail the consideration of a number of institutional factors. These include educational factors, such as whether the obese are well informed as to what it is to have a healthy lifestyle. If it is found that the obese are not well informed, the question arises as to how this educational issue should be tackled. Other institutional factors include power relationships, such as whether it is just and fair to permit direct-to-child marketing, in which commercial advertisements create associations between the promotion of nutritionally poor food and feelings of joy and fun. Finally, the socioeconomic status of people is also a factor, such as whether people living in neighbourhoods of a low socioeconomic level have easy and affordable access to nutritionally high-quality food, and whether these neighbourhoods have many fast food outlets. In this way, emancipatory thinking problematises and questions the *status quo* rather than solely interpreting obese individuals as being the problem. Such a problematisation of the *status quo* challenges us to reconsider the possibilities of creating a society that values justice, equality and moral virtues. Table 8.1 provides a summary of the technocratic and emancipatory dimensions of obesity.

We believe that both the technocratic and emancipatory dimensions are essential to science education. Thinking in the technocratic dimension through examining scientific evidence provides a unique view, but a limited view in that it only benefits from scientific understanding and reasoning. Just as science alone cannot solve all the world's problems, the technocratic dimension does not encompass all potential problems in the broader socio-political context, for example problems of equality or social justice. It is only through the emancipatory dimension, in which knowledge and evidence from other disciplines such as sociological studies and ethics are

Table 8.1 Obesity from a technocratic dimension and an emancipatory dimension

	Technocratic dimension	Emancipatory dimension
Focus	The rigour of scientific claims	The complexity of broader socio-political environments
Causes of obesity	Overeating, sedentary lifestyle, gut flora, epigenetics, endocrine disorder etc.	Institutional factors (educational factor, food industry marketing, power relationship, socioeconomic status)
Consequences of obesity	Personal health risks and their economic implication to the society	Morally inappropriate treatment of the obese
Solutions to obesity	Maintaining healthy diet and lifestyle	Re-shaping the obesogenic environment
Attitudes to obesity	Taking the obese individuals as being the problem	Problematising and questioning the status quo; reconsidering possibilities to create a society that values justice, equality and ethical-moral virtues

considered, that these problems are scrutinised. In other words, it is essential that thinking within both technocratic and emancipatory dimensions is pursued together to tackle issues such as the worldwide phenomenon of obesity.

To develop their ability to critically think about obesity as a social phenomenon, students have to appreciate that both the exact causes of obesity and precise solutions to this problem are not directly knowable, and that there must always be a degree of uncertainty about knowledge claims (after Kuhn, 1999). Thinking critically about obesity entails not only critical scrutiny of scientific evidence, but also consideration of different types of evidence and acknowledgement of alternative explanations of the issue. Such interdisciplinary thinking involves the comparison and evaluation of judgements based on both the technocratic and emancipatory dimensions of thinking (please refer to Fig. 8.1 for a representation of critical thinking within and across these two dimensions). This requires students to focus not only on one of these dimensions, but rather to take into account different types of evidence and arguments, as well as ethical and moral considerations.

8.3 Developing the Emancipatory Dimension of Critical Thinking

The teaching we conducted about obesity took place in a university's general education course. Based on students' extremely likely forms of exposure to the media and ideas and opinions learned from their peers and views in secondary school, we assumed that the students joining our course would already have well-developed views about obesity, its contributing factors and ways to address it. Given the likely sources of their views, we predicted that their thinking prior to the course would be inclined towards the technocratic dimension. As there was little discussion either in

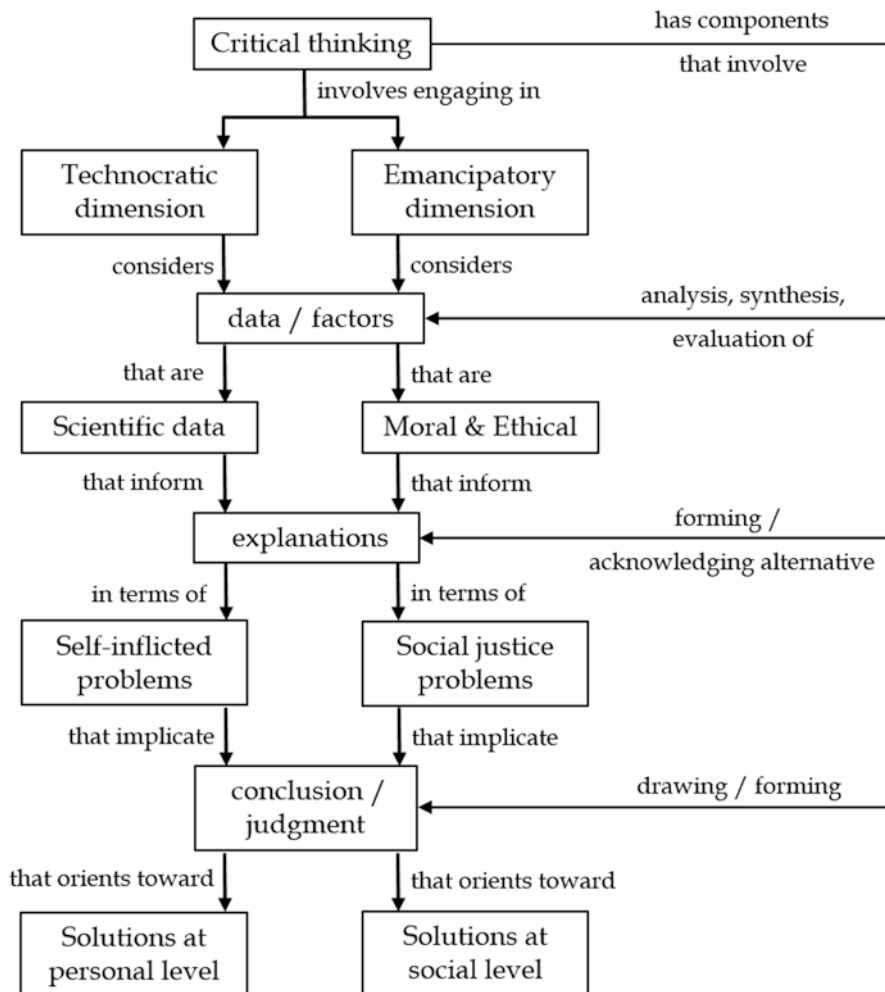


Fig. 8.1 Critical thinking involves engaging in both technocratic dimension and emancipatory dimension of the SSI, which demand thinking across disciplines

school or in the media about obesity in terms of the emancipatory dimension, our core teaching goal was to develop students’ thinking in this latter dimension.

Although we sought to develop students’ emancipatory thinking, it was certainly not our wish for them to completely abandon the technocratic dimension. We believed that thinking in both these two dimensions could, and should, co-exist. In what follows, we present the ideas that underpinned our belief.

1. Research studies on conceptual change and students’ learning have shown that the learning of new ideas does not necessarily involve abandoning pre-existing ideas. It has been frequently shown that pre-existing and new ideas (even when

they are contradictory) can co-exist, despite students having demonstrated success in acquiring new ideas. In fact, this phenomenon occurs not only among students, but also among adults including professional scientists, as demonstrated when scientists were asked to exhibit their knowledge of a variety of science and mathematics concepts (Shtulman & Harrington, 2016).

2. Ideas that co-exist can complement each other in explaining a phenomenon. Over time, a learner might change their commitment to the pre-existing and the new ideas. Such changes in commitment depend on various factors, including the learner's recent learning experience, opportunities to make use of these ideas and different contexts where these ideas are triggered (Taber, 2019).
3. Conceptual change thus involves a shift in commitment to different ideas, rather than a replacement of one idea with another. Potvin and Cyr (2017) conceptualised these shifts in commitment as changes in different *adherence* to different ideas in specific contexts. *Adherence* to an idea is defined as the credibility status of that idea in a specific context in relation to other ideas that an individual has. In a particular context, when the *adherence* of an idea is superior to other possible competing ideas, it has a *prevalence* status. Accordingly, conceptual change is seen to involve a shift in *adherence* to various ideas and/or to involve giving *prevalence* to a particular idea in a particular moment.

Based on the above discussion of conceptual change, our teaching aimed at enhancing students' *adherence* to the emancipatory dimension of thinking, such that they would be able to develop critical thinking and evaluative judgements of issues related to obesity. In other words, we did not expect students to desist from thinking in the technocratic dimension. Rather, we were interested in shifting students' *adherence* and *prevalence* in relation to particular possible causes of obesity. In this sense, a 'conceptual change' would involve a shift from a predominantly technocratic stance about the causes of obesity to the consideration of the emancipatory dimension. This process would involve critical thinking, in which students would have to consider evidence and knowledge claims in different disciplines.

To gauge the effectiveness of our teaching, we sought answers to the following question:

What were the changes in students' *adherence* and *prevalence* to the technocratic and emancipatory dimensions of thinking after they took our course?

We now outline our course design and then discuss how we operationalised the measurement of students' *adherence* and *prevalence*.

8.3.1 Course Design

The general education course 'Obesity: Beyond a Health Issue' was open to all undergraduate students at the university where the study was conducted. The course was an option in The General Education Programme at the university. This

programme consisted of courses in four areas of inquiry (AoI): *Global issues*, *Scientific and technological literacy*, *Humanities* and *China: Culture, state and society*. Students were required to enrol in at least one of the courses from each AoI to fulfil their credit requirement. ‘Obesity: Beyond a Health Issue’ was categorised under the AoI of *Global issues* because of its emphasis on obesity as a global issue, also known as *globesity*. Most students made their course selections based on interest and schedule availability. As a general education course, our Obesity course had no science pre-requisites. This meant that students enrolled in this course might be intending majors in Arts, Business Administration, Education, Journalism, Law or the Social Sciences. This also meant that some students, those who were doing a major in Science, Medicine, Pharmacy or Engineering, would have had a background in Science, whereas others would not. Nevertheless, as our course focused on developing students’ emancipatory critical thinking, we realised that a prior understanding of science, or a lack of such understanding, should not hamper their learning in this course.

The course lasted for 12 weeks. It was delivered in the form of a two-hour weekly lecture and a two-hour bi-weekly tutorial. The lectures were conducted by the second author and a professor of nutritional science from the Faculty of Science. The tutorials were conducted by lecturers from the Faculty of Science. The course design was informed by the Socioscientific Issues Teaching and Learning (SSI-TL) model of Sadler, Foulk, and Friedrichsen (2017). This model seeks to engage students in the following reasoning that is appropriate for the evaluation of both technocratic and emancipatory dimensions of thinking:

1. accounting for the inherent complexity of SSI,
2. analysing issues from multiple perspectives,
3. identifying aspects of issues that are subject to ongoing inquiry,
4. using scepticism in analyses of potentially biased information, and,
5. exploring how science can contribute to the issues and the limitations of science’ (Sadler et al., 2017, p. 80).

The course structure and content are summarised in Table 8.2.

In the first unit of the course, we aimed to help students develop connections between science and the societal perspective of understanding the issue of obesity. We addressed scientific factors such as the thrifty gene hypothesis, endocrine disturbances due to sleep deprivation, epigenetics, food addiction and maternal nutrition. In units 2–6, we confronted the issue via a consideration of social, economic, cultural, political, ethical and moral factors with the intent of cultivating students’ critical thinking in the emancipatory dimension. In this way, we planned to facilitate an appreciation of the complexity of the issue, in which solutions to these problems depended on *how* people framed obesity as a ‘problem’. We also challenged common conceptions such as ‘obese individuals are usually less healthy due to their accumulated fat’ and ‘significant long-term weight loss is a practical goal and will improve health’, through which scepticism was exhibited in analysing potentially biased information and aspects of issues that were subject to ongoing inquiry were identified. We acknowledged that interactions among peers in different contexts

Table 8.2 The course structure of ‘Obesity: Beyond a Health Issue’

Unit focuses/activity
1. Obesity: Issue overview
2. Causes of obesity: Uncovering the science of obesity (scientific perspective)
3. Causes of obesity: The plot of the multinational food industry? (marketing and political perspectives) Tutorial debate: Should soft drinks be banned at school?
4. Causes of obesity: The social construction of fat (social, cultural & economic perspectives) Tutorial debate: Should the media be responsible for fat oppression?
5. Challenging the science legitimating the battle against fatness
6. Consequences of obesity: What does fatness bring to our life and our world? Tutorial debate: Should large passengers pay for two airline tickets?
7. The way forward: Actions and attitudes towards fatness Tutorial debate: Does the fat acceptance movement encourage unhealthy lifestyles?

were key to facilitating conceptual changes and a shift in the dimension of thinking (Chi & Wylie, 2014). We therefore assigned students to engage in debates on various issues. They were encouraged to search for information on the Internet and to interpret and analyse information, and to construct arguments, counter-arguments and rebuttals based on evidence from various disciplines. These activities aimed to support students in the development of practices for making informed decisions about other SSI they may encounter in the future.

The final unit of the course was aimed at facilitating the development of students’ capacity to synthesise various ideas through their engagement in a case study. Students pursued collaborative inquiries on obesity-related issues. They were free to choose issues according to their interests. The issues they chose included, but were not limited to, ‘fat tax’ and ‘direct-to-child marketing’. We hoped that in reaching their conclusions, students would become aware of the power and limitations of science in solving these issues.

8.3.2 *Measuring Shift in Dimensions of Critical Thinking*

We measured students’ shift in their *adherence* to and *prevalence* of the technocratic and emancipatory dimensions of thinking about obesity through the following data sources:

1. *Rating of factors contributing to obesity*

At the beginning and at the end of the course we asked students to rate their perceived importance of the contribution of different factors to obesity on a Likert scale (‘5’ being extremely important; ‘4’, very important; ‘3’, moderately important; ‘2’, somewhat important; ‘1’, not at all important). The factors included were regarded to be the key contributors of obesity (Foster et al., 2003; Puhl et al., 2015): (1) high fat diet, (2) overeating, (3) lack of willpower, (4) repeated dieting (weight cycling),

(5) endocrine disorder, (6) psychological problems, (7) metabolic defect, (8) genetic factors, (9) marketing/advertising of unhealthy foods, (10) poor nutritional knowledge, (11) pricing of foods, (12) physical inactivity, (13) food addiction, and (14) restaurant eating.

Factors (1) to (8) are manifestations of a technocratic dimension of thinking. More specifically, factors (1) to (4) ascribe obesity to biological factors that individuals are often thought to be able to control. Factors (5) to (8) are biological in nature but seen to be beyond the individual's control. Factors (9) to (11) address obesity at a broader societal level, and are factors that often make people of low SES more likely to gain weight. Being able to acknowledge the importance of these factors implied that the students recognised issues of social inequality within the larger issue of obesity. We thus associated these factors as manifestations of the emancipatory dimension of thinking. Factors (12) to (14) could potentially relate to either of the dimensions (e.g., low 'physical activity' may be a result either of 'laziness' or of excessive long hours of office/seat work; 'food addiction' may refer to a personal choice to indulge in food or be a result of manipulation by the food industry; 'restaurant eating' may refer to an individual's undisciplined ordering of food, or to restaurants' excessive use of fat in their dishes and their strategies of serving big portions of dishes). We thus did not categorise factors (12) to (14) as belonging to either of the two dimensions.

To determine any shift in *adherence* between the technocratic and the emancipatory dimensions, we compared the class average rating of each of these factors using a *t-test*. To determine any shift in the *prevalence* of factors that were seen to contribute to obesity, we identified the factor that received the highest class average rating in Week 1 and Week 12 of the data collection. We also identified the factors that most students decided were 'extremely important' in their rating. A comparison of these factors in Week 1 and Week 12 would reveal to us any shift in *prevalence* of factors.

2. Guided essay writing

This task was administered at the beginning (Week 2) and at the end of the course (Week 12). The students were required to write about causes of obesity and were asked to provide supporting arguments, counterarguments, and rebuttals (Wu & Tsai, 2007). We coded their writing based on the 14 factors of the rating task. We then compared the occasions when the students discussed these factors and used a *t-test* to determine any shift in the factors they considered. In this way, we had two data sources to determine students' shifts in *adherence* and *prevalence* about causes of obesity.

8.3.3 Students' Learning: Shift in Adherence and Prevalence of Thinking

Of the 120 students on the course, 116 provided consent for the use of their data; of these 114 completed the essay writing task, and 97 completed both the pre-course and post-course rating tasks.

1. Rating task by scores

Pre-course, and without exception, all the causes belonging to the technocratic dimension had higher scores (ranging between 3.44 for 'repeated dieting (weight cycling)' and 4.24 for 'high fat diet') than those of the emancipatory dimension (ranging between 2.73 for 'pricing of foods' and 3.36 'marketing/advertising of unhealthy foods') (see Table 8.3). This suggested a stronger *adherence* to the technocratic dimension than to the emancipatory dimension. Among all the causes, 'high fat diet' (4.24) and 'overeating' (4.19), two factors thought to be under the individual's control, were the causes of obesity that the participants *adhered* to the most. In other words, these two technocratic factors had the *prevalence* status among students at the beginning of the course.

Post-course, 'marketing/advertising of unhealthy foods' became the most *prevalent* cause (3.82, compared with 3.36 at pre-course), followed by 'high fat diet' (3.81, cf. 4.24 at pre-course) and 'overeating' (3.70, cf. 4.19 at pre-course). All the

Table 8.3 Scores of the rating task

	Pre-course		Post-course			
	<i>M</i>	SE	<i>M</i>	SE	<i>t</i>	<i>p</i>
<i>Technocratic</i>						
High fat diet	4.24	0.08	3.81	0.08	-3.61	0.00**
Overeating	4.19	0.07	3.70	0.08	-4.38	0.00**
Lack of willpower	3.48	0.09	2.99	0.10	-3.52	0.00**
Repeated dieting (weight cycling)	3.44	0.09	3.38	0.08	-0.49	0.63
Endocrine disorder	3.81	0.09	3.44	0.09	-2.88	0.00**
Psychological problems	3.75	0.08	3.47	0.08	-2.38	0.02*
Metabolic defect	3.72	0.09	3.49	0.08	-1.78	0.08
Genetic factors	3.65	0.09	3.45	0.08	-1.57	0.12
<i>Emancipatory</i>						
Marketing/advertising of unhealthy foods	3.36	0.12	3.82	0.09	3	0.00**
Poor nutritional knowledge	3.26	0.10	3.45	0.1	1.29	0.20
Pricing of foods	2.73	0.13	3.40	0.09	4.05	0.00**
<i>Technocratic & emancipatory</i>						
Physical inactivity	3.9	0.08	3.57	0.08	-2.72	0.01*
Food addiction	3.72	0.08	3.62	0.08	-0.79	0.43
Restaurant eating	3.11	0.11	3.42	0.09	2.07	0.04*

Abbreviations:

* $p < .05$

** $p < .01$

causes belonging to a technocratic dimension exhibited a decrease in *adherence*; of these the decreases of ‘high fat diet’, ‘overeating’, ‘lack of willpower’, ‘physical inactivity’ and ‘psychological problems’ were statistically significant ($p < 0.05$). Meanwhile, all the causes belonging to an emancipatory dimension exhibited an increase in *adherence*, with the ‘increase of marketing/advertising of unhealthy foods’ and ‘pricing of foods’ being statistically significant ($p < 0.01$). These data suggest a shift in students’ thinking towards an emancipatory dimension by the end of the course. Fig. 8.2 highlights the shift in *adherence* of students’ thinking from the technocratic dimension that focuses on individual responsibility to the emancipatory dimension.

2. Guided essay writing

Pre-course, of those causes belonging to a technocratic dimension, participants *adhered* most to ‘genetic factors’ (87.7%), followed by ‘physical inactivity’ (64.0%) and ‘overeating’ (62.3%) (Table 8.4). Among those causes belonging to an emancipatory dimension, the causes most *adhered* to pre-course were ‘socioeconomic status’ (30.7%), ‘education’ (18.4%) and ‘marketing/advertising of unhealthy foods’ (15.8%). These corroborated the result from the rating task that indicated participants strongly adhered to a technocratic view at pre-course.

Of all the causes considered by the participants at post-course, ‘genetic factors’ continued to be seen as the *prevalent* cause of obesity (69.3%, cf. 87.7% at pre-course), followed by ‘socioeconomic status’ (61.4%, cf. 30.7% at pre-course) and ‘marketing/advertising of unhealthy foods’ (54.4%, cf. 15.8% at pre-course). The increased *adherence* to ‘socioeconomic status’ and ‘marketing/advertising of unhealthy foods’, coupled with the *prevalent* status of ‘genetic factors’, suggested the emergence of an emancipatory view that coexisted with a technocratic view.

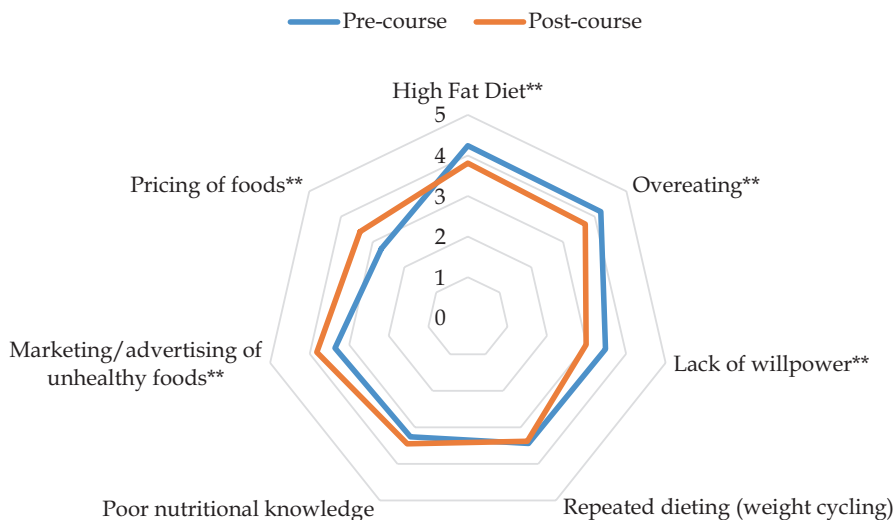


Fig. 8.2 Sources of rating tasks

Table 8.4 Causes of obesity considered by the participants in their essay writing (n = 114)

Causes of obesity	Pre-course essay		Post-course essay		
	No. of participants	% of participants	No. of participants	% of participants	% change
<i>Technocratic</i>					
Genetic factors	100	87.7	79	69.3	-21.0
Physical inactivity	73	64.0	53	46.5	-27.4
Overeating	71	62.3	39	34.2	-45.1
Endocrine imbalance	59	51.8	49	43.0	-17.0
Epigenetics	23	20.2	21	18.4	-8.7
Psychological problems	19	16.7	12	10.5	-36.8
<i>Emancipatory</i>					
Socioeconomic status	35	30.7	70	61.4	100.0
Education	21	18.4	49	43.0	133.3
Marketing/ advertising of unhealthy foods	18	15.8	62	54.4	244.4
Activity environment	9	7.9	16	14.0	77.8
Culture	8	7.0	33	29.0	312.5
Weight bias	3	2.6	30	26.3	900.0
Food lobbying	0	0.0	16	14.0	n/a
<i>Technocratic & emancipatory</i>					
Restaurant eating	24	21.1	10	8.8	-58.3
Food addiction	16	14.0	22	19.3	37.5

Furthermore, all the technocratic causes exhibited a decrease in *adherence* whereas all the emancipatory causes exhibited an increase in *adherence*. This further illustrated participants' shift in *adherence* from the technocratic dimension to the emancipatory dimension.

8.4 Conclusion

This chapter examines the shifts in undergraduate student *adherence* to and *prevalence* of the technocratic and emancipatory dimensions of thinking about obesity over the time of participation in a general education course on 'obesity'. In general, students exhibited a significant shift towards the emancipatory dimension. Such a shift demanded the development of critical thinking, in which students had to consider different types of evidence and alternative explanations from different disciplines. By the end of the course students demonstrated their consideration of evidence and knowledge claims beyond science, where they now also ascribed obesity to factors at the social level.

We are aware that our teaching focused on discussing causes of obesity, which left little room for students to consider measures to address obesity as a broader social phenomenon. The causes of an issue implicate the possibility of distinctive solutions, just as the means of addressing an issue are intractably linked to its

causes. In our next round of teaching this course, we would like to challenge students to consider and debate measures to address obesity. We hope more students exercise emancipatory thinking with respect to the broader social, cultural and political environment and to moral reasoning about social justice and equality problems.

To end this chapter, we would like to quote a student's comment on the value of this course. It motivates us to further develop our work and to invite more students to engage in critical inquiry of SSI:

Overall, this course provided a rewarding learning experience for me to know more about [how] individual, societal and global levels could all play a role in affecting the obesity issue. This course also enhanced my *critical thinking skills* [emphasis added] as well as the knowledge regarding obesity, it allowed me to look at the obesity epidemic in a wider lens and encouraged me to enquire more... regarding this worldwide phenomenon.

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