

Green roofs

- A** **Rooftops covered with grass, vegetable gardens and lush foliage are now a common sight in many cities around the world. More and more private companies and city authorities are investing in green roofs, reducing the risk of floods, making habitats for urban wildlife, tackling air pollution and even growing food.** These increasingly radical urban designs can help to combat the effects of climate change by reducing the amount of heat absorbed by the lack of green space due to development. But the involvement of city authorities, businesses and other institutions is crucial to ensuring their success – as is research investigating different options such as the variety of rooftop spaces found in cities. The UK is relatively new to the concept, but the local government has a major role to play in spreading the practice. London is home to much of the UK's green roof research, notably the forward-thinking policies such as the London Plan, which has paved the way to more than doubling the area of green capital.
- B** Ongoing research is showing how green roofs in cities can integrate with living walls' (vertical gardens) – walls which are partially or completely covered with greenery, including a growing medium, such as soil or water. Research also indicates that green roofs can be integrated with drainage systems on the ground, such as street trees, so that they can collect water and release it slowly. There is also evidence to demonstrate the social value of green roofs. Doctors are increasingly prescribing time spent gardening outdoors for patients dealing with anxiety and depression. And researchers have found access to even the most basic green spaces can provide a better quality of life for people.
- C** In North America, green roofs have become mainstream, with a wide array of expensive, accessible and food-producing roofs installed in buildings. Again, city leaders and authorities have helped push the movement forward – notably, San Francisco, USA, created a policy requiring new buildings to have green roofs. Canada, too, has policies dating from the early 1990s. The UK is still catching up, but there is a clear benefit from having newer buildings than in many parts of the world, which makes it easier to install green roofs. Being able to keep enough water at roof height and distribute it right across the roof is crucial to maintaining the function of any green roof – especially on 'green roofs' where plants are deeper. And the plants themselves are different. As well as sedum, which can typically hold greater weight, there are retrofit sedums. Having a stronger root system makes it easier to grow a greater variety of plants, since the soil can be deeper.

Questions 1–5

Reading Passage 1 has five paragraphs, A–E.

Which paragraph contains the following information?

Write the correct letter, A–E, in boxes 1–5 on your answer sheet.

NB You may use any letter more than once.

- 1 mention of several challenges to be overcome before a green roof can be installed
- 2 reference to a city where green roofs have been promoted for many years
- 3 a belief that existing green roofs should be used as a model for new ones
- 4 examples of how green roofs can work in combination with other green urban initiatives
- 5 the need to make a persuasive argument for the financial benefits of green roofs

The growth mindset

Over the past century, a powerful idea has taken root in the educational landscape. The concept of intelligence as something innate has been supplanted by the idea that intelligence is not fixed, and that, with the right training, we can be the authors of our own cognitive capacities. Psychologist Alfred Binet, the developer of the first intelligence tests, was one of many 19th-century scientists who believed that people's view and society's quantify one's intelligence based on one's innate, progressive thinking and one's personal responsibility to destiny. Instead, educators such as John Dewey argued that every child's intelligence could be developed, given the right environment.

"Growth mindset theory" is a relatively new – and extremely popular – version of this idea. In many schools today you will see hallways covered in motivational posters and signs on the student of the mind of great sporting heroes who simply believed their way to the top. A major focus of the growth mindset is the belief that intelligence is not a fixed trait, but rather a skill that can be developed through effort and persistence. When students believe in their ability, and towards seeing it as a chance to improve. As educationalist Jeff Howard noted several years ago: "Smart is not something that you just are, smart is something that you can get."

The idea of the growth mindset is based on the work of psychologist Carol Dweck in California in the 1990s. In one key experiment, Dweck divided a group of 10- to 12-year-olds into two groups. All were told that they had achieved a high score on a test but the first group was informed that they had done so because they were born with a "genius brain", while the second group – those who had been instilled with a "growth mindset" – were subsequently far more likely to put effort into future tasks. Meanwhile, the former took on only those tasks that would not risk exposing them as being stupid, while the second group had no fear of failure and took on more challenging tasks. This "fixed mindset" had led to a lack of effort and lack of effort. Perceived ability actually made the students perform worse, while praising effort emphasized that praise was possible.

One of the greatest impediments to successfully implementing a growth mindset, however, is the education system itself: in many parts of the world, the school climate is obsessed with performance in the form of constant testing, analysing and marking of students – a key characteristic of the fixed mindset. Nor is it unusual for schools to create a certain cognitive dissonance, whereby they apply the benefits of a growth mindset but then hand out fixed grade in lessons based on performance.

Apart from the implementation problem, the original growth mindset research has also received harsh criticism. The statistician Andrew Gelman claims that "vivid research designs have enough degrees of freedom that they can take data to support just about any theory."

Text 4

Questions 14–16

Choose the correct letter, A, B, C or D.

Write the correct letter in boxes 14–16 on your answer sheet.

14 What can we learn from the first paragraph?

- A when the growth mindset begins to happen
B how scientists have responded to changing views of intelligence
C why the growth mindset has been applied to business and technology
D the growth mindset has been applied to business and technology

15 The second paragraph describes how schools encourage students to:

- A identify their personal ambitions
B work harder than others
 C concentrate on where their particular strengths lie
D concentrate on where their particular strengths lie

16 In the third paragraph, it suggests that students use a fixed mindset:

- A tend to be less competitive.
B generally have a low sense of self-esteem.
 C will try very hard if they are given considerable encouragement.
 D are afraid to push themselves beyond what they see as their limitations.

D For green roofs to become the norm for new developments, there needs to be support from public authorities and private investors. Those responsible for maintaining buildings may have to acquire new skills, such as landscaping, and in some cases, volunteers may be needed to help out. Other considerations include installing drainage paths, meeting health and safety requirements and perhaps allowing access for the public, as well as planning restrictions and disruption from regular activities in and around the buildings during installation. To convince investors and developers that installing green roofs is worthwhile, economic arguments are still the most important. The term 'natural capital' has been developed to explain the economic value of nature; for example, measuring the money saved by installing natural solutions to protect against flood damage, adapt to climate change or help people lead healthier and happier lives.

E As the expertise about green roofs grows, official standards have been developed to ensure that they are designed, constructed and maintained properly, and function well. Improvements in the science and technology underpinning green roof development have also led to new variations in the concept. For example, 'blue roofs' enable buildings to hold water over longer periods of time, rather than draining it away quickly – crucial in times of heavier rainfall. There are also combinations of 'green roofs' and 'brown roofs', which are wider in scope and maximise food production. If the trend continues, green roofs could create new jobs and a more sustainable and healthy food economy, alongside many other benefits. There are still barriers to overcome, but the evidence so far indicates that green roofs have the potential to transform cities and help them function sustainably long into the future. The success stories need to be studied and replicated elsewhere, to make green, blue, brown and food-producing roofs the norm in cities around the world.

Questions 6–9

Complete the summary below.

Choose ONE WORD ONLY from the passage for each answer.

Write your answers in boxes 6–9 on your answer sheet.

Advantages of green roofs

City rooftops covered with greenery have many advantages. These include lessening the likelihood that foods will occur, reducing how much money is spent on energy, and creating environments that are suitable for wildlife. In many cases, they can also be used for producing food.

There are also social benefits of green roofs. For example, the medical profession recommends gardening as an activity to help people cope with mental health issues. Studies have also shown that the availability of green spaces can prevent physical problems such as obesity.

4/4

Questions 10 and 11

Choose TWO letters, A–E.

Write the correct letters in boxes 10 and 11 on your answer sheet.

Which TWO advantages of newer buildings for green roofs are mentioned in Paragraph C of the passage?

- A a longer growing season for edible produce
 B more economical use of water
 C greater water-storage capacity
 D ability to cultivate more plant types
 E a large surface area for growing plants

2/2

Questions 12 and 13

Choose TWO letters, A–E.

Write the correct letters in boxes 12 and 13 on your answer sheet.

Which TWO aims of new variations on the concept of green roofs are mentioned in Paragraph E of the passage?

- A to provide habitats for a wide range of species
 B to grow plants successfully even in the wettest climates
 C to regulate the temperature of the immediate environment
 D to generate power from a sustainable source
 E to collect water to supply other buildings

2/2

Alfred Wegener: science, exploration and the theory of continental drift

by Matt T Green

Introduction

This is a book about the life and scientific work of Alfred Wegener, whose reputation today rests on his theory of continental displacement, better known as continental drift. Wegener proposed this theory in 1912 and developed it extensively for nearly 20 years. His book on the subject, *The Origin of Continents and Oceans*, was throughout four years the focus of an international controversy in the Atlantic and for some years after his death.

Wegener's basic idea was that many mysteries about the Earth's history could be solved if one supposed that the continents moved slowly, rather than supposing that they remained fixed in place. Wegener showed in great detail how such large movements could have occurred, and he provided a wealth of evidence from a large number of sciences, including geophysics, paleontology, and climatology. Wegener's theory – that the continents move – is at the heart of the theory that guides Earth sciences today. Interestingly, Wegener's theory of continental drift was not widely accepted at the time. It is hard to dispute that having faith in the capacity to change is a great attitude for students. Perhaps growth mindset works best as a philosophy and not all interventions.

As important as Wegener's work on continental drift is his *Thermodynamics of the Atmosphere*, which he wrote in 1911. This is a solid scientific book, but it is largely descriptive of the state of knowledge in 1911. Wegener's theory of continental drift is a "controversial drift book" only to the extent that Wegener's ideas were controversial at the time. His theory of continental drift is not controversial in the same way that modern evolutionary theory is very different from the ideas Darwin proposed in the 1850s about biological evolution. Yet plate tectonics, a descendant of Alfred Wegener's theory of continental drift, is quite the same way that modern evolutionary theory is a descendant of Darwin's theory of natural selection.

Wegener's basic idea was that many mysteries about the Earth's history could be solved if one supposed that the continents moved slowly, rather than supposing that they remained fixed in place. Wegener showed in great detail how such large movements could have occurred, and he provided a wealth of evidence from a large number of sciences, including geophysics, paleontology, and climatology. Wegener's theory – that the continents move – is at the heart of the theory that guides Earth sciences today. Interestingly, Wegener's theory of continental drift was not widely accepted at the time. It is hard to dispute that having faith in the capacity to change is a great attitude for students. Perhaps growth mindset works best as a philosophy and not all interventions.

Readers interested in the specific details of Wegener's career will see that he chose a path that was more likely to provide opportunity to rapidly shift interests by changing fields of study. He did not remain in one field for very long, and he reflected in the titles of the chapters that the index should be a sufficient guide for readers to find the focus of an interest in the field of study that interested him at the time. However, it is the parts do not make as much sense on their own as do all of the parts taken together. In this respect I urge readers to read the entire book. Wegener's life and work are more interesting than the individual parts, and it is through this entire book that the reader can gain a better understanding of the life and work of Alfred Wegener.

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