



PART 1

Read the text below and answer questions 1–14.

Students' Ideas About Antibiotic Resistance and the Implications for Teaching

In recent years, adults and children have been repeatedly exposed to dramatic statements about “superbugs” and the threat of antibiotic resistance. A striking comparison sometimes used in news reports is that resistant infections could soon cause “a plane crash’s worth of deaths every day”, a vivid image that is easy to remember and easy to repeat. With documentaries, short-form videos, and headlines that favour worst-case scenarios, many teenagers arrive in science lessons with pre-formed views about antibiotics—what they are, where resistance happens, why it matters, and who is at fault—before any systematic teaching begins. Some of these ideas are broadly sound, but others are inaccurate, oversimplified, or stitched together from unrelated concerns about pollution, hygiene, and disease.

A substantial body of research shows that students often hold misconceptions in areas of “pure” curriculum science, and these misunderstandings rarely sit as isolated facts waiting to be corrected. Instead, they become integrated into an organised cognitive network of beliefs about germs, medicines, immunity, and cleanliness. Once a belief is embedded in such a framework, it may feel explanatory even when it conflicts with evidence: new information is interpreted through existing assumptions, and contradictory details are ignored or reinterpreted. However, cognitive organisation is not only a barrier; it can also be a resource. When students are encouraged to articulate their reasoning, compare competing explanations, and revise ideas through structured discussion, the network that once stabilised error can be reorganised toward more coherent understanding.

Much of what young people “know” about antimicrobials is absorbed outside school. Media messages may be correct in their general warning yet inaccurate in detail, for instance by treating all microbes as interchangeable, blending resistance with general environmental contamination, or implying that drugs become weaker “in the air”. If classroom activities do not invite students to express what they already believe, misconceptions may remain invisible and therefore unchallenged. Despite heavy public attention, there is relatively little formal evidence describing what secondary students actually believe about antimicrobial resistance and how those beliefs vary across groups. The purpose of the present study was to begin providing such evidence so teachers can design lessons that build on correct ideas, displace erroneous beliefs, and plan coherent programmes in health and environmental education.



To capture students' thinking, the researchers used a questionnaire composed of five open-form questions, allowing respondents to write explanations rather than select fixed-choice options. Participants were drawn from two year groups within the same school system, enabling the study to explore whether older students expressed more differentiated ideas. Importantly, open responses can reveal the “logic” behind misconceptions: students may use scientific-sounding language while relying on everyday meanings of words like “strong”, “immune”, or “dirty”. This methodological choice therefore aimed to illuminate not just what students answered, but how they constructed explanations.

When asked to describe antibiotic resistance in their own words, many students relied on surface phrases familiar from popular reporting—such as “strong germs”, “new diseases”, or “medicines that stop working”. These phrases sometimes captured the seriousness of the issue while obscuring the underlying mechanism. In scientific terms, resistance is a property of microbes, shaped by selection pressure: when antibiotics are used, susceptible bacteria are more likely to be eliminated while resistant variants survive and spread. By contrast, several student explanations implied a general weakening of medicine, as if drugs lose power through overuse in the abstract rather than through differential survival among microbes. Such reasoning is not trivial, because it shapes how students interpret responsibility and solutions.

Students were also asked where resistance is most likely to be found. The most frequent responses were specific settings rather than countries. Hospitals were named by 46% of respondents, doctors' clinics by 21%, and “crowded places” by 18%. A smaller number wrote broad locations such as “everywhere”, while very few mentioned reservoirs outside healthcare, including farms and waterways. Older students were slightly more likely to provide a specific setting, whereas younger students more often used vague phrases like “where people are sick”. Taken together, these findings suggest that many students treat resistance as a primarily hospital-based phenomenon, with limited awareness of transmission across community and agricultural contexts.

When explaining why resistance matters, the dominant response (63%) focused on the need for effective antibiotics to treat serious infections and keep routine medical care safe. Far fewer students mentioned broader consequences such as longer hospital stays, higher costs, or the loss of protective effects for surgery and cancer treatment. The survey also revealed group differences in framing. Students who reported watching science documentaries were more likely to refer to system-wide impacts, for example pressure on hospitals and healthcare capacity, whereas those relying mainly on social media tended to emphasise personal risk, such as the fear of catching “something unstoppable”. Older



students more often distinguished bacteria from viruses, although confusion remained common, indicating partial but incomplete conceptual development.

A major section of the questionnaire examined perceived causes and drivers.

Encouragingly, 60% of respondents identified human behaviour—especially unnecessary antibiotic use—as a main driver, with some explicitly accepting shared responsibility by writing “we overuse them”. Around 19% mentioned stopping a course early or sharing leftover tablets. Nevertheless, misconceptions were widespread. About 12% claimed that “the body becomes resistant”, treating resistance as if it were personal immunity rather than microbial change, and a similar proportion implied that antibiotics routinely cure viral illnesses such as colds. Some students also blended resistance with general cleanliness or pollution, suggesting “dirty streets” or “chemical pollution” as primary causes—an overextension of ideas from other environmental topics rather than an explanation grounded in selection and transmission.

In response to what should be done, most students wrote that antibiotics must be protected because “people need them to survive”, often without explaining how prescribing norms, regulation, agricultural practice, healthcare access, and pharmaceutical investment shape the problem. Only a small minority (6%) mentioned antibiotic use in livestock or food production—an unexpectedly low figure given the visibility of stewardship debates in farming. A few students dismissed the threat by assuming scientists would “just invent a new drug”, suggesting limited awareness of the cost, time, and uncertainty of drug development. Overall, the findings indicate that a small set of simplified ideas dominates student thinking: resistance as mainly a hospital issue, caused by “strong germs”, solved by “using fewer antibiotics”. The pedagogical implication is that teaching must go beyond slogans, making selection mechanisms explicit, broadening students’ map of where resistance emerges, and helping learners evaluate evidence-based claims about policy and practice.

Questions 1–8

Choose **TRUE** if the statement agrees with the information given in the text, choose **FALSE** if the statement contradicts the information, or choose **NOT GIVEN** if there is no information on this.

1 The passage suggests that many students form opinions about antibiotics before receiving formal instruction.

2 The passage states that misconceptions are easy to remove because they remain separate from other ideas.



- 3** The study used only multiple-choice questions so that answers could be easily compared.
- 4** The passage provides information about the exact number of schools from which participants were drawn.
- 5** Older students were reported to be slightly more likely to identify a particular location where resistance occurs.
- 6** The text reports that students who watch documentaries are more likely to focus on system-wide impacts than personal risk.
- 7** The passage claims that most students believed antibiotic resistance is primarily caused by chemical pollution.
- 8** The passage indicates that most students showed strong awareness of the social and economic factors shaping prescribing and drug replacement.

Questions 9–13

Match each question with the correct response, **A–P**, below.

NB You may use any letter more than once.

List of Responses

- A** Doctors' clinics are the main setting where resistance occurs.
- B** Crowded places are the main setting where resistance occurs.
- C** Resistance can be found everywhere.
- D** Farms and waterways are important reservoirs of resistance.
- E** Without effective antibiotics, serious infections and routine medical care become risky.
- F** Resistance matters because it can lead to longer hospital stays and higher costs.
- G** Human behaviour, especially misuse or overuse of antibiotics, drives resistance.
- H** Sharing leftover tablets is the main cause of resistance.
- I** Resistance creates pressure on hospitals and healthcare capacity.
- J** Antibiotic use in livestock and food production contributes to resistance.
- K** Resistance occurs because germs become stronger.
- L** The human body becomes resistant to antibiotics.
- M** Hospitals are the main setting where resistance is thought to occur.
- N** Scientists will simply invent a new drug when existing antibiotics stop working.
- O** Resistance is the direct result of patients stopping a course early.
- P** Humans depend on antibiotics for their continuing existence.



9 What was the students' most frequent response when asked where resistance is most likely to be found?

10 What was the most common response about why the issue matters?

11 What did most students give as the main cause of resistance?

12 Why did most students think antibiotics should be protected?

13 Which response was cited as unexpectedly uncommon, considering media coverage?

Question 14

Select the correct answer.

14 Which of the following is the most suitable title for Reading Passage 1?

A How news reporting has exaggerated the dangers of antibiotics

B Students' ideas about antibiotic resistance and the implications for teaching

C A comparison of resistance rates across different continents

D A method for collecting scientific opinions using fixed-choice surveys

Answer Key

1. TRUE
2. FALSE
3. FALSE
4. NOT GIVEN
5. TRUE
6. TRUE
7. FALSE
8. FALSE
9. M
10. E
11. G
12. P
13. J



14. B