

“Because I now know and understand this term too”

WHAT PRETEENS TAKE AWAY FROM CHAPTERS OF THE DICTIONARY OF CLIMATE CRISIS

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An IZI reception study investigated how German preteens (aged 9-12) assess 5 chapters of the format *Dictionary of Climate Crisis* and which images and content were particularly easy to remember.

In the “For Us – No Planet B!” initiative, 13 formats were developed and piloted. The first format, which is available in several chapters, is the *Dictionary of Climate Crisis*. The aim is to explain key terms relating to the climate crisis in 1.00 to 1.30 minutes. Each chapter ends with the sentence “The more we know, the better we can choose, and every little change (towards less CO₂) helps.”¹

In the reception study presented here, the questions of how German preteens (aged 9-12) assess individual chapters and which images and content are particularly easy to memorise were investigated. The specific test material was 5 chapters of the *Dictionary of Climate Crisis*, 2 of which were available in different versions and were tested against each other.

THE STUDY

In April 2024, n=128 preteens (aged 9-12) took part in the study, 61% of whom were girls and 39% boys from 3 primary school classes (4th grade) and 3 5th grade classes each from grammar school and secondary general school. The average age was 10.2 years.

Two questionnaires were used to obtain feedback and evaluate the learning potential of the programmes. In a pretest, the pupils’ existing knowledge was tested before the programme. In the main questionnaire, the pupils then described their assessment and what they learnt from the video directly after watching each programme.

Before: Learning the unknown

Dictionary chapter: The Paris Agreement

The aim of the dictionary is to work through special terms that are regularly used in the context of the climate crisis for preteens and young people in such a way that they at least begin to understand the meaning or, more precisely, memorise the meaning of the term.

The basic problem is briefly visualised in the chapter *The Paris Agreement*: The temperature on Earth is rising. A girl can be seen “measuring” the temperature of the Earth with a thermometer. It is also visualised that in 2015, politicians from 195 countries came together in Paris and signed the Paris Agreement. They pledged to stop the further increase in global warming. Instead of fossil fuels such as oil, coal and natural gas, more renewable energy sources such as solar energy and wind power are to be used. They also agreed to share knowledge and support poorer countries. In 1.33 minutes, the animation from Bolivia visualises the content in an artistic aesthetic and combines animated and real

images. The voice-over was generated using AI and is intended to sound like a young man.

How did you like the chapter?

The programme was well received by the pupils (average score 1.96; 1=super good, 4=not good at all). When giving reasons for a very good rating, the pupils emphasised that it dealt with an important topic, was explained in a way that was easy to understand and had an aesthetically pleasing design. Critical comments came mainly from the younger respondents, who did not understand all details. “Boring” was another key point of criticism, as was the narrator’s voice, which Mina (10 years), for example, found “very, very funny”.

What do the preteens take away with them?

Only very few (4%) were familiar with the term “Paris Agreement” before the study. After looking at the relevant chapter, more than half (59%) knew about this agreement and half (50%) were able to explain parts of it correctly. With a learning gain of 50 percentage points, this chapter can be categorised as extremely successful. At the same time, it is important to bear in mind that over 40% of respondents have no or an incorrect idea of the term even after watching the chapter.

The most memorable image from this chapter was not a visualisation of the Paris Agreement itself, but the girl walking to the globe and taking the

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temperature of the globe like a sick creature and then hugging it. This is a further indication that childlike protagonists who actively deal with problems are well memorised.

Explaining with strong images and dealing with incorrect prior knowledge

Dictionary chapter: Climate Justice

In the chapter *Climate Justice*, the animation, which was also produced in Bolivia, first explains the basic problem in 1.15 minutes and then the effects of global warming using extreme weather events such as severe storms, flooding, and extreme drought. It is then explained that countries with a lot of industry and trade produce far more greenhouse gases than poorer countries. These rich countries, which are the biggest perpetrators of the climate crisis, are mostly located in the so-called “Global North”. However, the countries most affected by the climate crisis are mainly in the “Global South”. Climate justice means that the main polluters, the countries of the Global North, should help the countries in the Global South that are most affected by climate change (Ill. 1).

How did you like the chapter?

The chapter was rated the best in this study with an average score of 1.61. “I think the video is really well made and I think the topic is really important”, wrote Ana (11 years), like many other children. In addition, the topic was, as Svenja (10 years) puts it, “simply mega explained!” Criticism came from those who didn’t understand it, as well as a single comment from Samira (9 years), for whom the chapter was “too gloomy [and] a bit complicated”.

What is memorised?

Asked before watching the dictionary chapter whether they had ever heard the

word “climate justice”, 25% of respondents answered “yes”. However, 23% of respondents are unable to explain the term as it is used in the discourse. Jonas (10 years), for example, like many others, thinks that climate justice means “acting in a climate-friendly way”. It is reasonable to assume that the pupils have constructed a meaning from the parts of the word “climate” and “justice” that is not what the term actually means. After watching the video, 42% of respondents knew the term and were able to explain it correctly, such as Paula (11 years): “The rich countries should help the poorer countries! And not produce so much CO₂ themselves.” Ten pupils who stated that they knew the term in the pretest, but then used an incorrect definition of the term, were able to categorise the term correctly after watching the chapter. Seven respondents stuck to their wrong idea. For example, Younes (11 years) wrote in the pretest that “the climate has rights”. In the main questionnaire after the programme, he wrote exactly the same. Three other children who were wrong before watching the chapter wrote nothing in the post-test questionnaire. The problem known from learning psychology here is that an already existing (or spontaneously developed) concept has to be changed, which is obviously not always successful. Further studies are important here in order to explore the chances of superimposing factually incorrect knowledge.



Ill. 1: “The countries that emit the most greenhouse gases are mostly in the Global North. The countries that suffer most from the climate crisis are mostly in the Global South.”

Dictionary chapter: Carbon Footprint

Are childlike characters and an exaggeration of children useful?

For a children’s programme, the inclusion of the children’s perspective is fundamentally important. We tested whether this is also necessary and possible in a relatively brittle genre such as a dictionary in a few chapters produced in Brazil.

The protagonists of this chapter are a girl, a turtle and Frodo the dog. One chapter of the *Dictionary of Climate Crisis* was only available in a preliminary form (animatic) at the time of the study, i.e. central images in black and white and initial animations can be seen. The explanation begins with a direct address to the viewers and a link to their everyday experiences: “Have you ever gone for a walk on a beach and left footprints in the sand? Our carbon footprint is very similar, except that it can’t simply be washed away from the beach.” The film explains that almost everything we do in our daily lives leaves a carbon footprint. The scenes shown are probably familiar to children from everyday life: playing video games in the living room, travelling by car and drying Frodo the dog after a bath. The size of the carbon footprint is explained, as travelling by plane, for example, creates a huge carbon footprint, while cycling has a very small one. Finally, the following is stated directly: “The larger your carbon footprint, the more you

contribute to the climate crisis. But if we make more conscious decisions and take care of our environment, the footprint will also become smaller.”

How did you like the chapter?

The preteens rated the animatic version with an average score of 2.05. They liked it “because I now know and understand this term” (Nadira, 12 years).

The aesthetics were rated as “cutely drawn” (Ada, 11 years) and “funny” (Lina, 11 years). Preteens perceive the design and address as clearly intended for children. Some found the content of the chapter “a bit complicated” (Jana, 10 years) or wrote: “I didn’t understand it.” (Fynn, 11 years) These are clear indications that the explanation should be even more precise and easier to understand in terms of visual design and the logical structure. The aesthetics, which preteens have probably never seen in this form, were criticised in particular. It was interesting to hear Linda (10 years), who was a little indignant: “One thing was wrong: cycling causes CO₂, it does NOT cause CO₂!” This points out once again that preteens have prior knowledge, which should, if possible, be incorporated and expanded. One way of doing this would be to include an explanatory half-sentence that the production costs of objects are also included in the carbon footprint.

What do the children take away with them?

Before the programme, 8 out of 10 children say they do not know the term carbon footprint. After the programme, 43% have at least a partial understanding of what the term means. Eva (10 years), for example, has learnt that “the smaller the CO₂ footprint, the better”. With a 43 percentage point gain in knowledge despite the very early stage of realisation, this is a successful chapter.

The pictures of the 3 protagonists as superheroes in the last picture of the chapter were particularly well memorised, even better memorised was the footprint and especially “the picture on the beach with the carbon footprint” (Dina, 9 years) and “the huge footprint” (Oscar, 10 years), in front of which the 3 protagonists are standing. Another well-memorised motif is the scene in which Frodo the dog is blow-dried “and then he was so fluffy” (Mara, 11 years, Ill. 2). Protagonists who are close to children, who are also shown and exaggerated in a humorous way, are well received.



Ill. 2: “Even blow-drying Frodo after his bath uses energy.”

How much detail makes sense?

Dictionary chapter: Solar panels (in 2 variants of the technical explanation)

A basic understanding of physical relationships is helpful for an energy transition, e.g. on the question of what actually happens with photovoltaics. We tried out 2 versions of the corresponding chapter to see how detailed the explanation needs to be.

In the chapter on solar panels, photovoltaic panels are introduced as devices that can convert sunlight into electricity. An extremely enlarged version shows how the 2 silicon layers inside the solar cell are constructed. Only the long version presents an explanation that the silicon is altered so that the top side has too many electrons and the bottom side too few. Does it make sense to include detailed explanations of how a solar panel works? Do preteens take any of this away with them?

How did you like the 2 variants?

The children’s average rating was 1.97 for the short version (n=59) and 1.94 for the long version (n=68). Mera (10 years) thought it was very good because “it was very well explained and the pictures were nice, it was interesting”, and Florian (10 years) thought it was “cute”. The comments on the content mainly related to the benefits of solar panels, “because there is a better way

to generate energy” (Julius, 10 years). Critical assessments related to understanding. It was often criticised that the explanations were much too fast and the various sound effects were distracting. Dilan (10 years) found it “well explained, but I don’t understand it”. In this respect, any further detailed explanation always bears the risk of adolescents seeing it but not being able to understand it and thus leaving the reception frustrated.

Increase in knowledge

The preteens took away content from both versions. There was an increase of 25 percentage points in the short form and 15 percentage points in the longer version. This is a very low figure compared to the other chapters. The topic was probably too complex overall. Since none of the respondents mentioned atoms, electrons, silicon layers or similar, it probably does not make sense to include even more details in a chapter, as this would exceed the children’s ability to understand the topic.

What’s more useful: a colourful illustration or a young explainer?

Dictionary chapter: Fossil Fuels (in 2 versions)

The chapters of the *Dictionary of Climate Crisis* should be translated into various languages. The pragmatic solution is not to have the protagonists speak themselves, but to use a comparatively simple translation of the voice-over. At the same time, the question remains as to whether it would not be particularly beneficial if a protagonist close to a child explained the context. This was tested in the study on the chapter on fossil fuels.

The chapter *Fossil Fuels* shows that we use the energy of fossil fuels such as coal, oil and natural gas for many things in our world. The chapter emphasises that we can decide to use less fossil fuels and switch to renewable energies. In one version of the chapter, the

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spoken explanation (voice-over) is visualised with very simple, colourful images. In the second version, a boy (around 17 years) speaks the text as he walks through the run-down streets of an industrial neighbourhood. Only at the end does he stop and emphasise that we can decide to use less fossil fuels and lists alternatives before moving on to a positive, ecologically better world.

How did you like the 2 variants?

There is a small difference in terms of intuitive appeal. The version with the boy is rated slightly better with an average score of 1.7 than the version with “voice-over text only”, which has an average score of 1.9. In the version without the protagonist, “the many colours” and that it is “colourful” are mentioned more frequently as reasons for a (very) good rating. If the children have seen the version with the protagonist, one reason for a (very) good rating is that the connections were “explained quite precisely” (Aron, 10 years) and they were shown what they could do, or as Felia (11 years) puts it: “The video got me going and you get the feeling that you can do something!”

The preteens criticised the weaknesses in the animation, especially in the version with the protagonist. “The boy didn’t move his mouth in time. Sometimes you couldn’t understand him”, reports Svenja (10 years), and Gabriela (10 years) has a suggestion for improvement: “Maybe it could look more like the person is really talking.”

In both versions, the voice was also perceived as unpleasant on several occasions. “The voice wasn’t good, it was so scratchy”, describes Gina (11 years), and Paula (11 years) calls it “very robotic”, which she found “not so good”. She is correct in this perception, as it was an AI voice that was not well crafted.

These are clear indications that preteens notice technical weaknesses and find them annoying. The amount of rubbish on the street, which is unfamiliar to children in Germany, was also

disturbing, “because you could hardly concentrate on the character” (Iva, 11 years).

Increase in knowledge

Before watching the chapter, 93% (version “voice over only”) and 78% (with protagonist) do not know what fossil fuels are. Among respondents in the first version, 47% were able to explain the term afterwards, compared to 41% in version 2. The version with the young man was therefore slightly better but did not necessarily result in more learning gains. In view of the great effort involved in adapting language and lip movements if the chapter is to be available in different languages, it is probably more efficient not to have protagonists speak.

SUMMARY AND CONCLUSION

Preteens take something away from the content of the one-minute explanations in the *Dictionary of Climate Crisis*. The percentage depends on several variables. It is advantageous if the pupils do not know the term beforehand and only develop an initial (partial) understanding of the term through the reception. Some terms, such as “The Paris Agreement”, are easier because they describe an event that was previously unknown. For terms where preteens can make up (construct) their own meaning, such as “climate justice”, existing patterns of interpretation have to be superimposed, which is probably not easy for everyone.

The function of terms such as “solar panels” is easy to describe in one sentence, but as soon as it gets into the details, the basic physical principles are too complex, at least for the children in this study. Further differentiating this complexity tends to be of no benefit to the learners.

The chapters in the *Dictionary of Climate Crisis* mostly work with voice-over as the central explanatory author-

ity in order to be able to offer them cost-effectively in as many languages as possible. However, the chapter on fossil fuels was used to test whether there is a need for a connecting character that explains terms in a spoken form. This is slightly more appealing than a version with only colourful illustrations, but at the same time preteens – at least in Germany – are bothered by technical inaccuracies, such as language that is not lip-synced. The AI-developed voice-over was also rated as unpleasant and “robotic” in some cases. This is an important indication of how important aesthetic details can be.

The rough version of the animation (animatic) of the chapter *Carbon Footprint* also causes some of the preteens to resist reception. Those who are able to engage with the images enjoy the much more childlike realisation with protagonists (a girl, a dog and a turtle) and the way the audience is addressed. This is also reflected in the question about the best memorised images. On the one hand, images with a strong explanatory power are well memorised, on the other hand images that become representatives of the viewers, such as the girl in the first scene of *The Paris Agreement* or the 3 protagonists in the chapter *Carbon Footprint*.

The study shows the importance of evaluation by the target group, because opportunities and unexpected difficulties arise. Overall, it is an important project, which is also the view of the respondents. The challenge now is to further increase the maximum learning gain of 50% of respondents achieved with these chapters. Because the more we know, the better we can choose, and every little change helps. ■

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NOTE

¹ The phrase “towards less CO₂” was only used if this was clear from the respective content.