



Solar energy curriculum test report

Introduction

The testing of the **Solar energy curriculum** took place in all 6 partner institutions in the period between December 2025 and January 2026. In the testing activities of the Solar Energy curriculum, at least 266 students and at least 63 teachers participated. However, it should be noted that these figures may not be entirely accurate, as some participating institutions may have encountered difficulties in collecting responses from all of the involved students and teachers due to technical issues or language barriers. Additionally, there was a reported incident in which an incorrect survey was used to collect data. This was taken into account, and efforts were made to adjust the data to ensure its accuracy.

The number of collected responses from the testing activities indicates that the Solar Energy curriculum was tested thoroughly and reached a sufficiently wide audience. Additionally, it should be noted that, due to the previously mentioned issues, the reported number of participants is likely a minimum estimate; the actual number is probably higher. This assumption is supported by other indicators, such as photographic evidence and statements from the involved parties. Nevertheless, the collected data will be more than enough to allow the creation of a qualitative and representative test report.

The test report is divided into two main sections. The first analyzes data collected from participating students, while the second examines responses from the teachers involved in the testing activities. The report concludes with a summary of key findings and conclusions.

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Solar energy curriculum evaluated by students

All six Solar Energy curriculum chapters were evaluated by students through Google Forms surveys. All students had to fill in the same survey for each chapter, which was developed by Riga Technical University (RTU) and was approved by representatives from the whole project consortium. The students were asked a total of 5 questions. 4 Questions asked students to simply evaluate the solar energy curriculum through a Likert scale (1 - 5). One being the worst and five being the best available grade. These questions are as follows:

1. **How would you rate the content, materials, and teaching methods used in this lesson?**
2. **Did this lesson increase your knowledge about renewable energy and sustainability?**
3. **Did this lesson increase your interest in renewable energy and sustainability?**
4. **Do you think the knowledge gained from this lesson will positively influence your behaviour regarding climate change?**

The last question in the survey was an open-ended one:

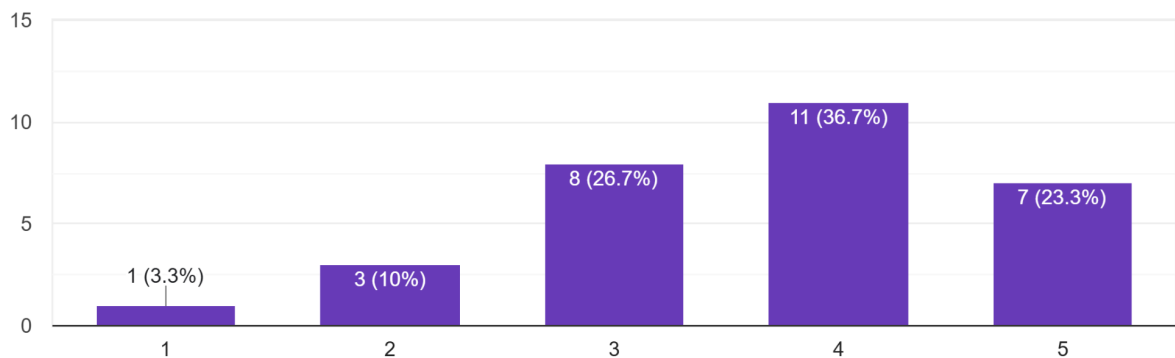
5. **Do you have any suggestions for improving the content, materials, or teaching methods used in this lesson?**



1. How would you rate the content, materials, and teaching methods used in this lesson?

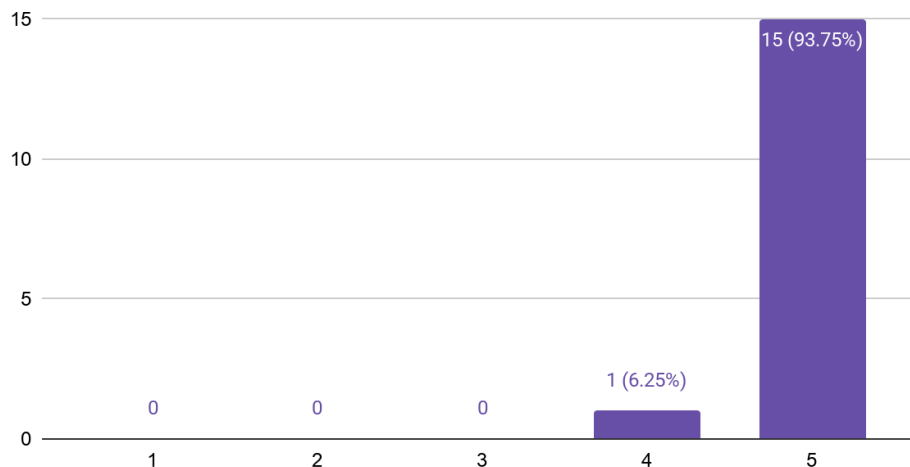
2.1. Solar Energy and the Science of Light - How would you rate the content, materials, and teaching methods used in this lesson?

30 responses



The average rating comes out to - 3.67.

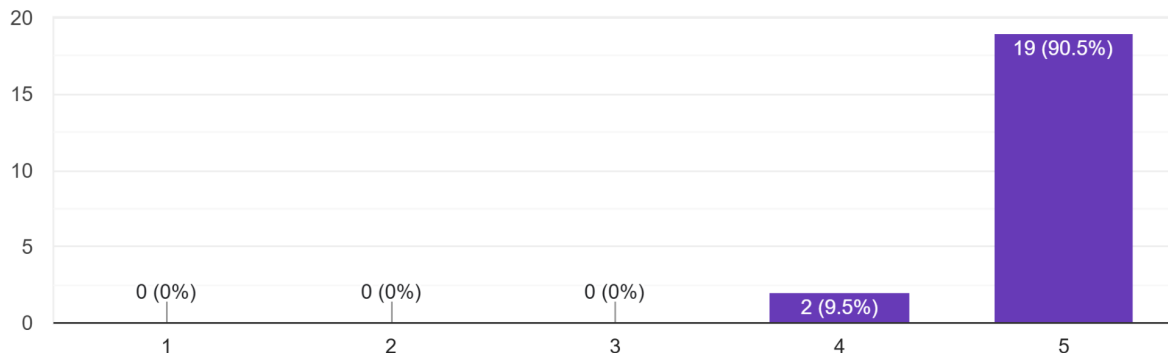
2.2. Designing and Building a Solar-Powered Device - How would you rate the content, materials, and teaching methods used in this lesson?



The average rating comes out to - 4.94.

2.3. Artistic Expression Through Solar Energy - How would you rate the content, materials, and teaching methods used in this lesson?

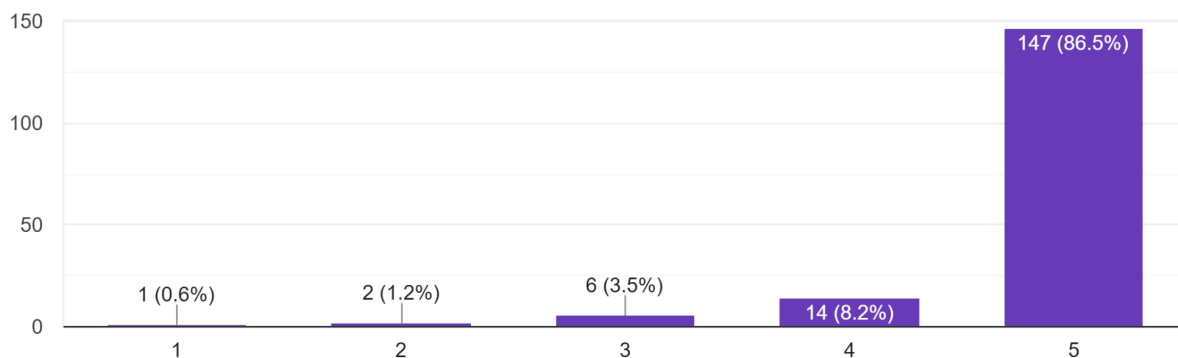
21 responses



The average rating comes out to - 4.9.

2.4. Exploring Solar Energy through Mathematics - How would you rate the content, materials, and teaching methods used in this lesson?

170 responses

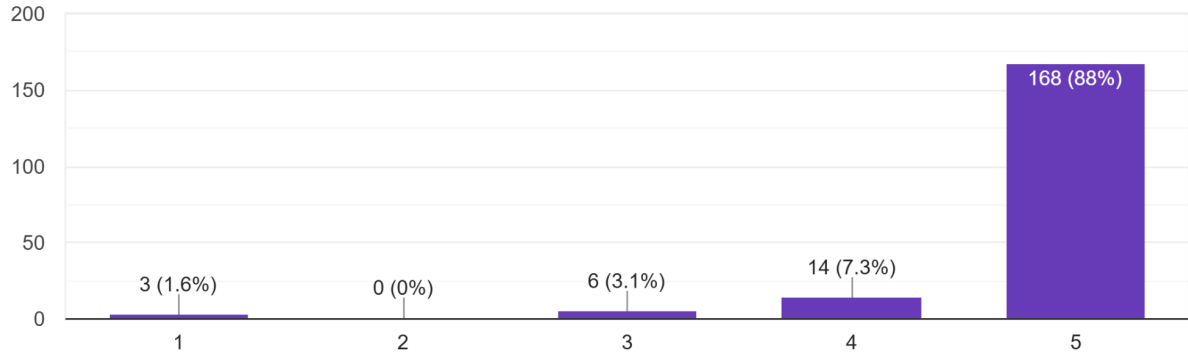


The average rating comes out to - 4.79.



2.5.Engineering a Solar-Powered Device - How would you rate the content, materials, and teaching methods used in this lesson?

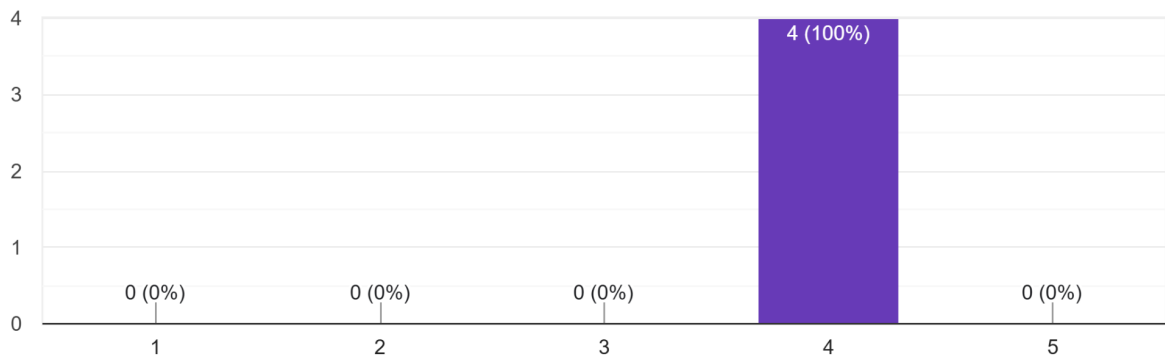
191 responses



The average rating comes out to - 4.8.

2.6.Renewable Energy and Sustainability in Technology and Society - How would you rate the content, materials, and teaching methods used in this lesson?

4 responses



The average rating comes out to - 4.

Summary of responses for each chapter for the question: How would you rate the content, materials, and teaching methods used in this lesson?

The students overall evaluated the content, materials, and teaching methods for all chapters positively:

1. “Solar Energy and the Science of Light” average rating - 3.67.
2. “Designing and Building a Solar-Powered Device” average rating - 4.94.
3. “Artistic Expression Through Solar Energy” average rating - 4.9.
4. “Exploring Solar Energy through Mathematics” average rating - 4.79.
5. “Engineering a Solar-Powered Device” average rating - 4.8.
6. “Renewable Energy and Sustainability in Technology and Society” average rating - 4.

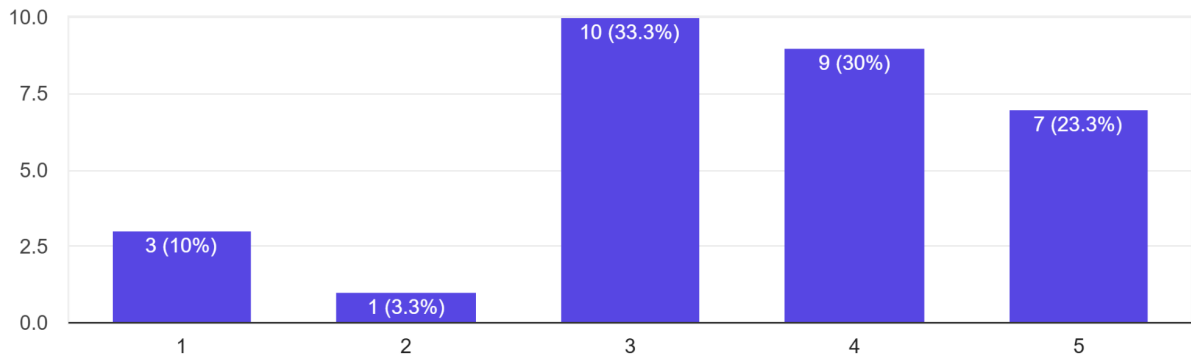
For most chapters, the average rating is **4.0 or higher**, indicating that the content, materials, and teaching methods are well developed and ready for wider implementation without significant modifications. The chapter “**Designing and Building a Solar-Powered Device**” received the highest average rating (**4.94**), suggesting a very high level of satisfaction among respondents. However, “**Solar Energy and the Science of Light**” received the lowest average rating (**3.67**). While this still represents a positive evaluation overall, the feedback suggests that further refinements to the content, materials, and teaching methods within this chapter could enhance its effectiveness and improve participants’ learning experience.



2. Did this lesson increase your knowledge about renewable energy and sustainability?

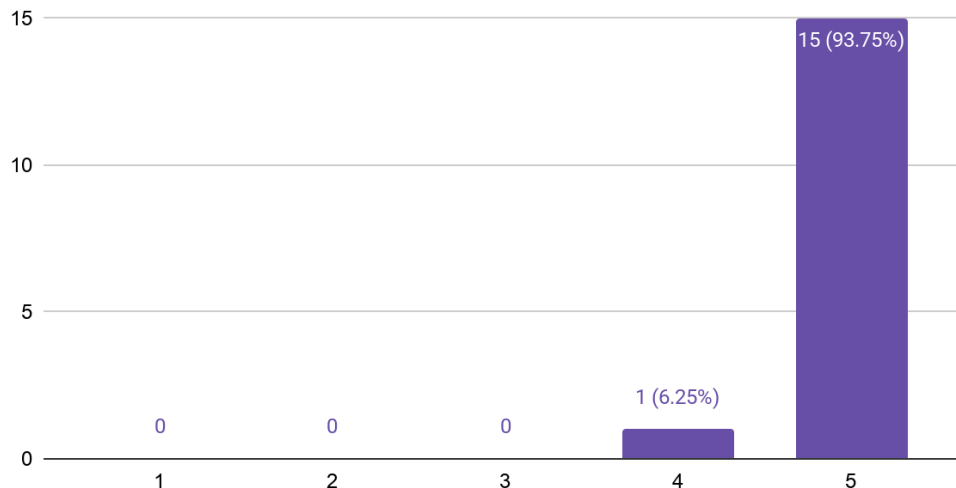
2.1. Solar Energy and the Science of Light - Did this lesson increase your knowledge about renewable energy and sustainability?

30 responses



The average rating comes out to - 3.53.

2.2. Designing and Building a Solar-Powered Device - Did the lesson increase your knowledge about renewable energy and sustainability?



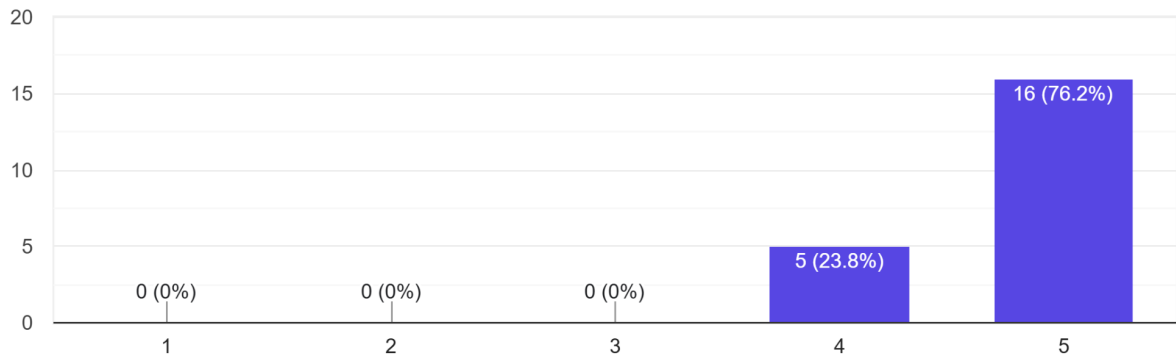
The average rating comes out to - 4.94.

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2.3. Artistic Expression Through Solar Energy - Did this lesson increase your knowledge about renewable energy and sustainability?

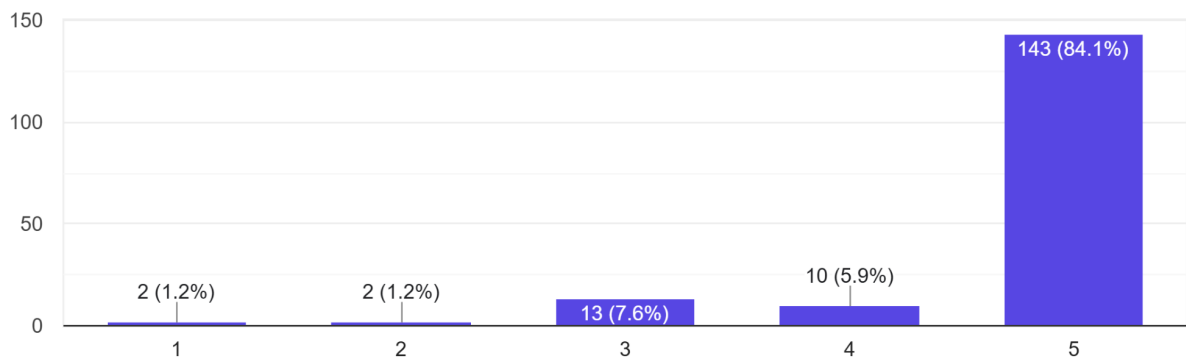
21 responses



The average rating comes out to - 4.76.

2.4. Exploring Solar Energy through Mathematics - Did this lesson increase your knowledge about renewable energy and sustainability?

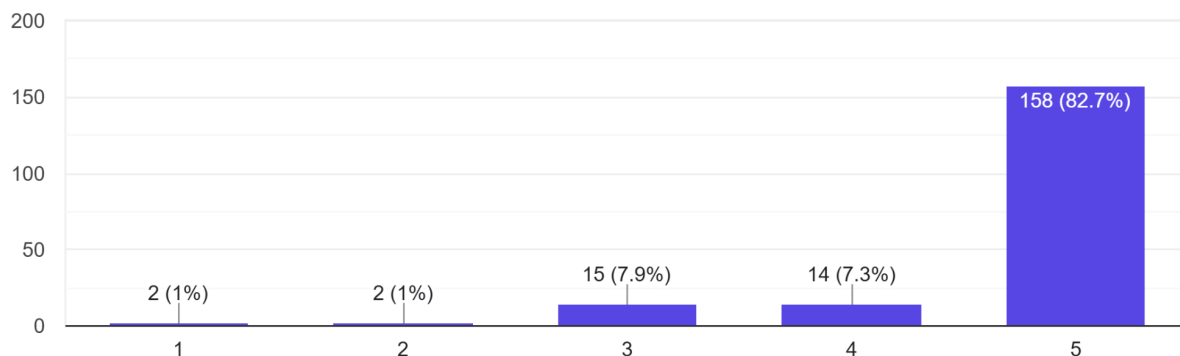
170 responses



The average rating comes out to - 4.71.

2.5.Engineering a Solar-Powered Device - Did this lesson increase your knowledge about renewable energy and sustainability?

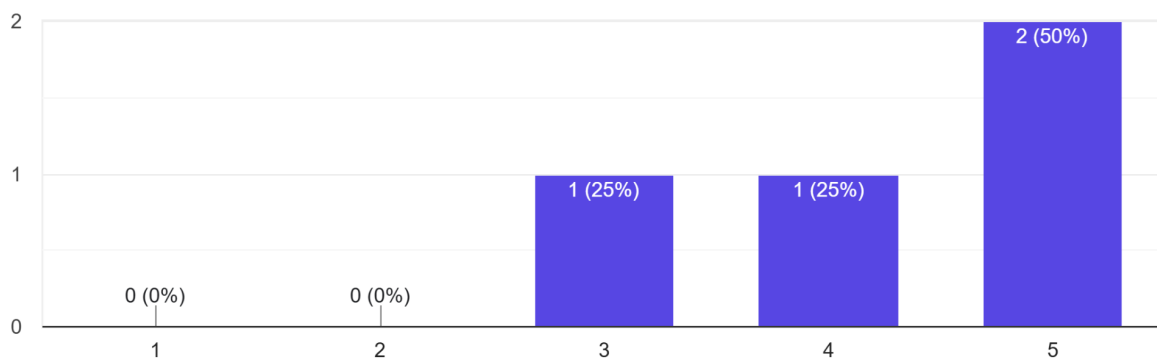
191 responses



The average rating comes out to - 4.7.

2.6.Renewable Energy and Sustainability in Technology and Society - Did this lesson increase your knowledge about renewable energy and sustainability?

4 responses



The average rating comes out to - 4.25.

Summary of responses for each chapter for the question: Did this lesson increase your knowledge about renewable energy and sustainability?

Overall, students consistently reported that participation in the lesson plans improved their understanding of renewable energy and sustainability:

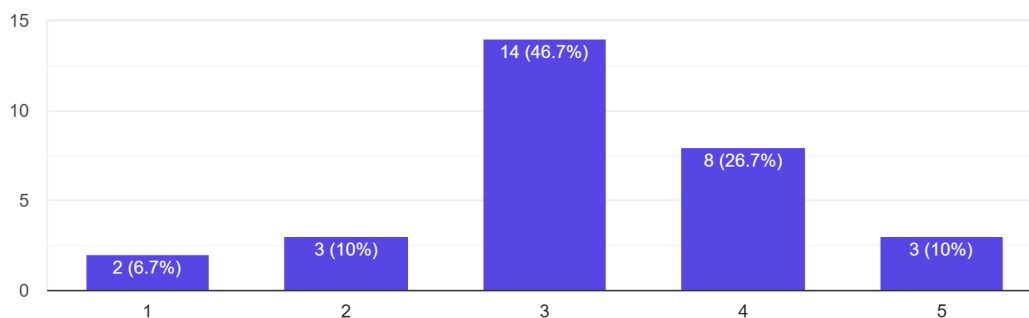
1. “Solar Energy and the Science of Light” average rating - 3.53.
2. “Designing and Building a Solar-Powered Device” average rating - 4.94.
3. “Artistic Expression Through Solar Energy” average rating - 4.76.
4. “Exploring Solar Energy through Mathematics” average rating - 4.71.
5. “Engineering a Solar-Powered Device” average rating - 4.7.
6. “Renewable Energy and Sustainability in Technology and Society” average rating - 4.25.

When asked whether the lesson increased their knowledge and understanding of renewable energy, respondents awarded average ratings above **4** out of **5** for most chapters. This suggests that the lesson plans largely succeeded in achieving one of their primary objectives. The chapter **“Designing and Building a Solar-Powered Device”** received the highest average rating (**4.94**), while **“Solar Energy and the Science of Light”** received the lowest (**3.53**). Although the latter scored lower than the other chapters, it still represents a generally positive evaluation, indicating that the lesson was effective in increasing students’ knowledge overall. These ratings suggest that the content, materials, and teaching methods used during the testing phase were central factors influencing student perceptions. When students found these elements engaging and effective, the lesson plans were more likely to achieve their broader educational objectives, and vice versa.

3. Did this lesson increase your interest in renewable energy and sustainability?

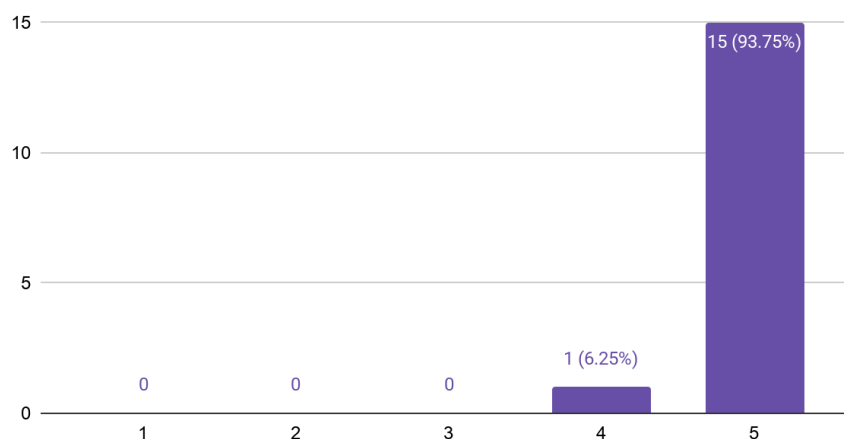
2.1. Solar Energy and the Science of Light - Did this lesson increase your interest in renewable energy and sustainability?

30 responses



The average rating comes out to - 3.23.

2.2. Designing and Building a Solar-Powered Device - Did this lesson increase your interest in renewable energy and sustainability?

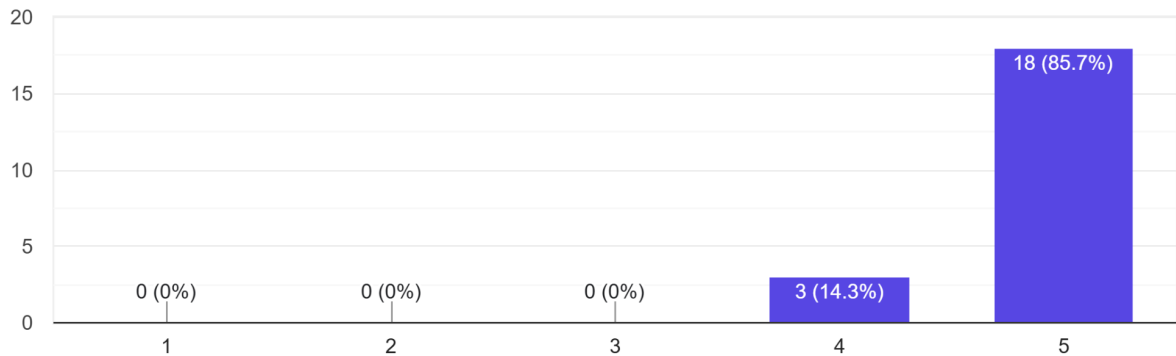


The average rating comes out to - 4.94.



2.3. Artistic Expression Through Solar Energy - Did this lesson increase your interest in renewable energy and sustainability?

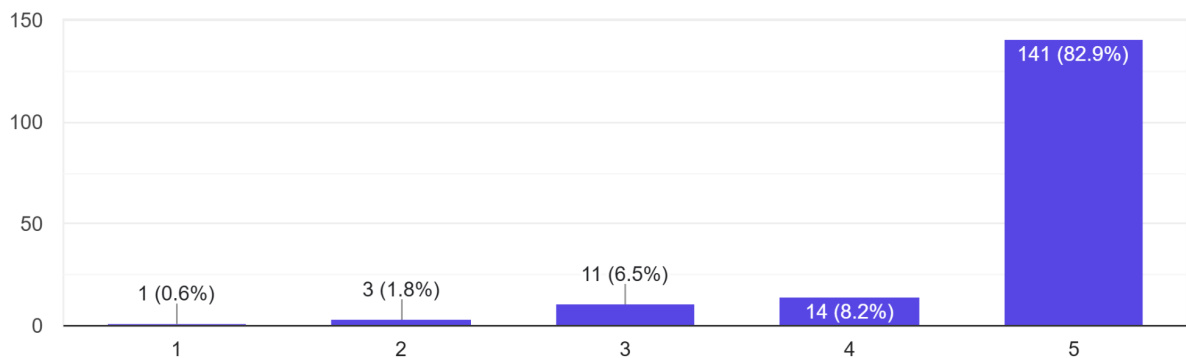
21 responses



The average rating comes out to - 4.86.

2.4. Exploring Solar Energy through Mathematics - Did this lesson increase your interest in renewable energy and sustainability?

170 responses

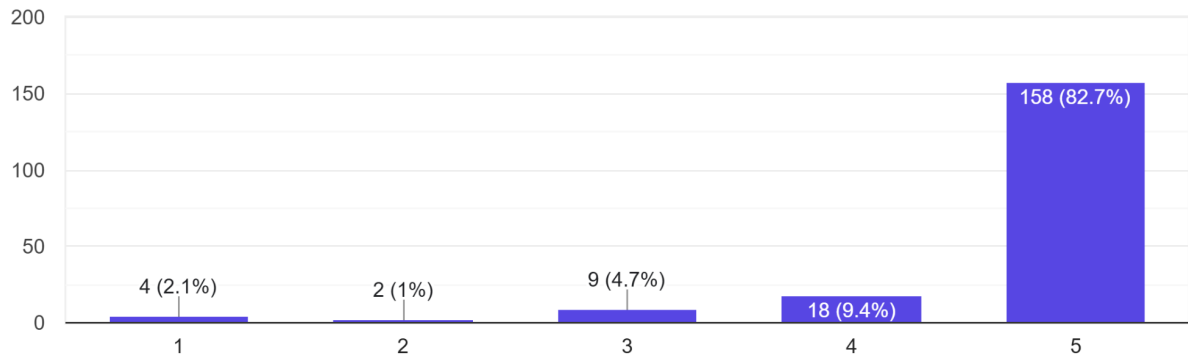


The average rating comes out to - 4.71.



2.5.Engineering a Solar-Powered Device - Did this lesson increase your interest in renewable energy and sustainability?

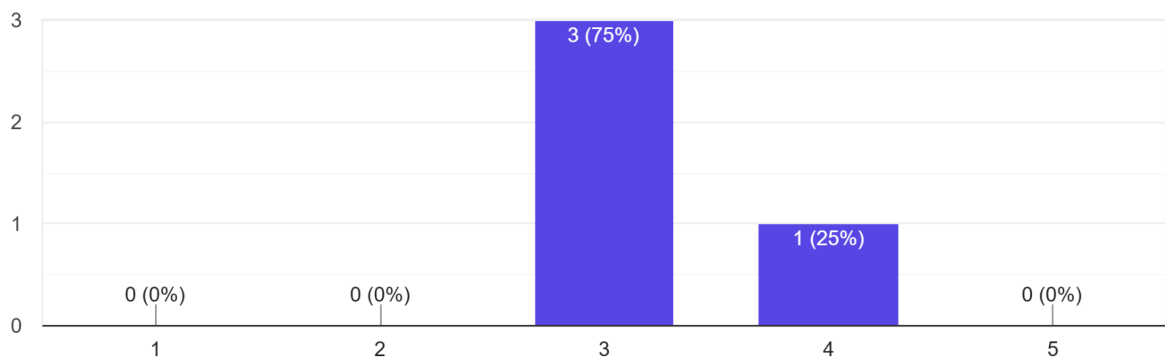
191 responses



The average rating comes out to - 4.7.

2.6.Renewable Energy and Sustainability in Technology and Society - Did this lesson increase your interest in renewable energy and sustainability?

4 responses



The average rating comes out to - 3.25.

Summary of responses for each chapter for the question: Did this lesson increase your interest in renewable energy and sustainability?

Overall, students consistently reported that participation in the lesson plans increased their interest in renewable energy and sustainability:

1. “Solar Energy and the Science of Light” average rating - 3.23.
2. “Designing and Building a Solar-Powered Device” average rating - 4.94.
3. “Artistic Expression Through Solar Energy” average rating - 4.86.
4. “Exploring Solar Energy through Mathematics” average rating - 4.71.
5. “Engineering a Solar-Powered Device” average rating - 4.7.
6. “Renewable Energy and Sustainability in Technology and Society” average rating - 3.25.

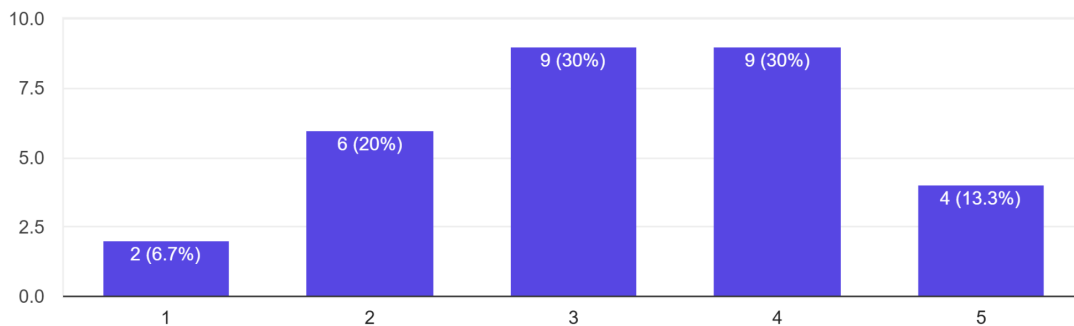
When asked whether the lessons increased their interest in renewable energy and sustainability, respondents gave all chapters ratings that were well above average. This suggests that the lesson plans were successful in stimulating student interest in these topics. This is a particularly important outcome, as personal interest is a key motivator for further learning and exploration. Since the lesson plans were largely effective in fostering such interest, there is a strong possibility that the project will have a positive long-term impact on the students who participated in the testing phase by encouraging continued exploration of renewable energy and sustainability issues. The chapter **“Designing and Building a Solar-Powered Device”** once again received the highest average rating (4.94). Meanwhile **“Solar Energy and the Science of Light”** received the rating (3.23) and **“Renewable Energy and Sustainability in Technology and Society”** received the rating (3.25). This suggests that two of the lesson plans were less successful in stimulating student interest in renewable energy and sustainability issues and could be improved to enhance their effectiveness in this regard.



4. Do you think the knowledge gained from this lesson will positively influence your behaviour regarding climate change?

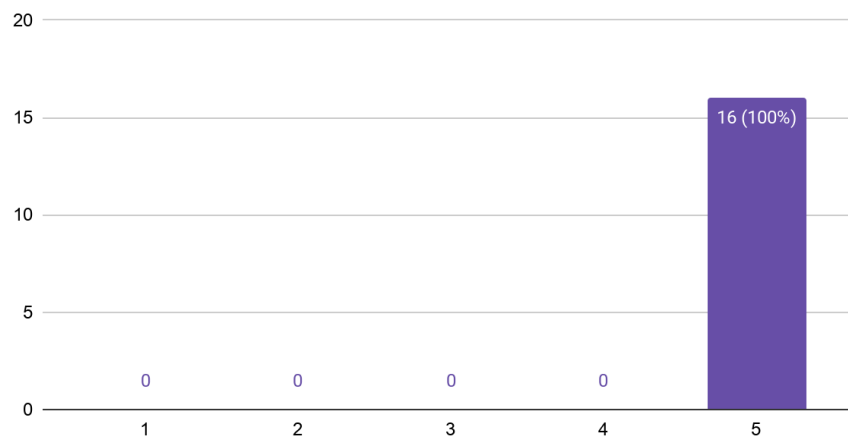
2.1. Solar Energy and the Science of Light - Do you think the knowledge gained from this lesson will positively influence your behaviour regarding climate change?

30 responses



The average rating comes out to - 3.23.

2.2. Designing and Building a Solar-Powered Device - Do you think the knowledge gained from this lesson will positively influence your behaviour



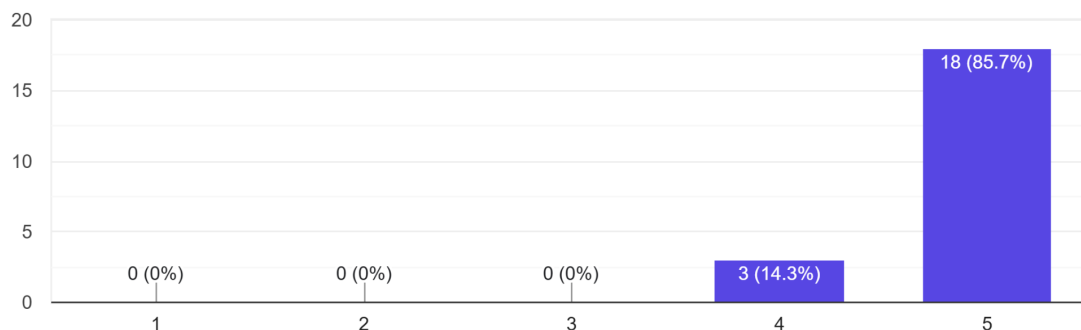
The average rating comes out to - 5.

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2.3. Artistic Expression Through Solar Energy - Do you think the knowledge gained from this lesson will positively influence your behaviour regarding climate change?

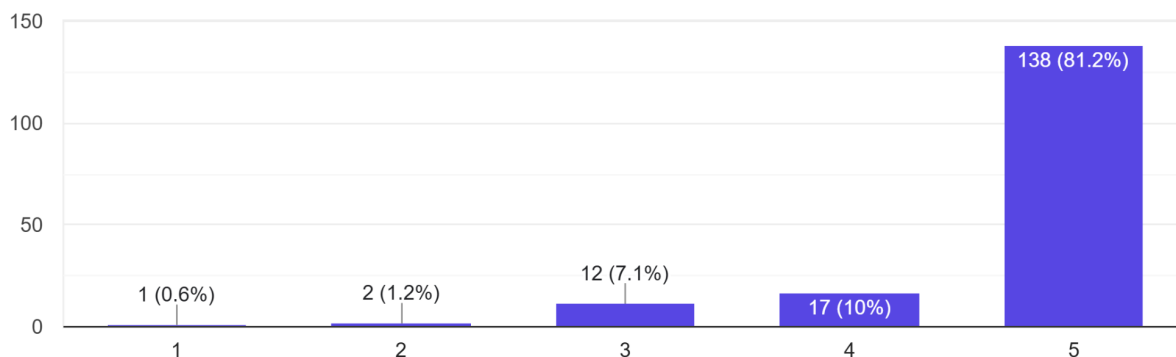
21 responses



The average rating comes out to - 4.86.

2.4. Exploring Solar Energy through Mathematics - Do you think the knowledge gained from this lesson will positively influence your behaviour regarding climate change?

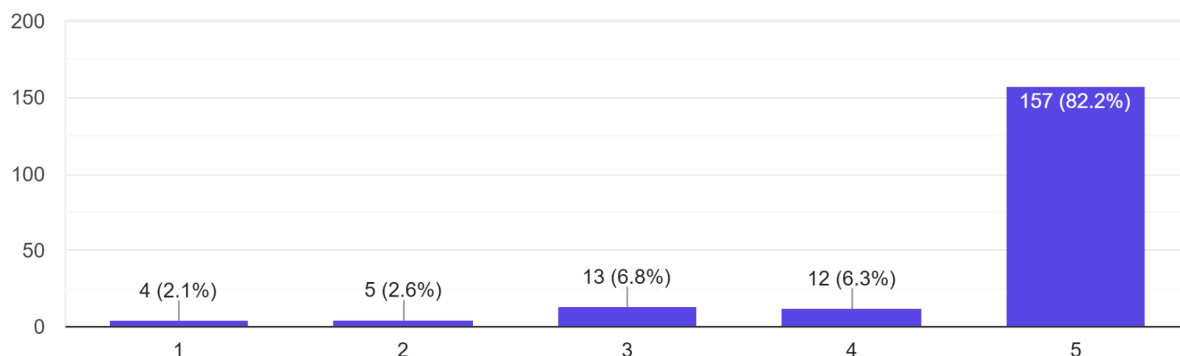
170 responses



The average rating comes out to - 4.7.

2.5.Engineering a Solar-Powered Device - Do you think the knowledge gained from this lesson will positively influence your behaviour regarding climate change?

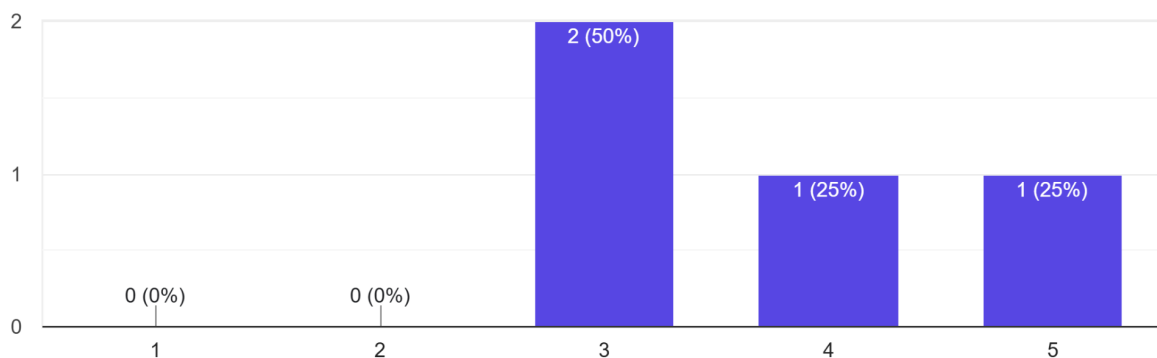
191 responses



The average rating comes out to - 4.7.

2.6.Renewable Energy and Sustainability in Technology and Society - Do you think the knowledge gained from this lesson will positively influence your behaviour regarding climate change?

4 responses



The average rating comes out to - 3.75.

Summary of responses for each chapter for the question: Do you think the knowledge gained from this lesson will positively influence your behaviour regarding climate change?

Overall, students consistently reported that the knowledge gained from the lessons would positively influence their behaviour in relation to climate change:

1. “Solar Energy and the Science of Light” average rating - 3.23.
2. “Designing and Building a Solar-Powered Device” average rating - 5.
3. “Artistic Expression Through Solar Energy” average rating - 4.86.
4. “Exploring Solar Energy through Mathematics” average rating - 4.7.
5. “Engineering a Solar-Powered Device” average rating - 4.64.
6. “Renewable Energy and Sustainability in Technology and Society” average rating - 3.75.

When asked whether the knowledge gained from the lesson plans would positively influence their behaviour regarding climate change respondents gave all chapters ratings that were well above average. The chapter “**Designing and Building a Solar-Powered Device**” once again received the highest average rating (5). Meanwhile “**Solar Energy and the Science of Light**” received the rating (3.23). Once again, the results confirm previously observed trends, demonstrating that while the lesson plans may not necessarily inspire students to pursue careers in this field, they have had a positive impact on their attitudes and awareness, encouraging more climate-conscious thinking and behaviour.



5. Do you have any suggestions for improving the content, materials, or teaching methods used in this lesson?

As a large number of students participated in testing the Solar Energy Curriculum, numerous responses and suggestions were collected. For the sake of conciseness and practicality, only the most detailed and substantive suggestions have been selected for inclusion in this report:

2.1. Solar Energy and the Science of Light - Do you have any suggestions for improving the content, materials, or teaching methods used in this lesson?

1. Exploring and analysing research papers written by competent people.
2. I didn't fully understand the goal of the experiment
3. The lesson was very good and engaging; I've got no suggestions for improvements.
4. More pictures and humour
5. The task is quite useless.
6. The experiment is lacking in complexity and it is very obvious what the outcome will be.
7. Include another topic into the mix if possible.
8. I think the experiment could be better, it wasn't very entertaining.
9. Compare 2 resources in debate
10. compare different types of renewable energy and not pros and cons of a single source of energy
11. The content should be more in-depth.
12. The experiment didn't seem entertaining enough

13. arguing for/against a solution isn't very rational as for every negative of solar panels there is some energy source that counters it, but arguing for many different energy sources and simply against one achieves nothing. It would make much more sense for each side to support 1 specific energy source and debate on which of the 2 is better.
14. The experiment was too simple for the target age group.
15. Do some research and discuss more technical, not widely known questions.
16. Make the tasks clearer, encourage participation from everyone, not just a few speakers
17. The talk was interesting, but the experiment wasn't up to my standard and I thought this could be better

Summary: Students generally found the lesson interesting, but several suggested improving the experiment by making it more complex, engaging, and age-appropriate. The experiment in question is **“The Light Waves in Praxis”**. The experiment will not be excluded from the Solar Energy Curriculum. Other recommendations included providing clearer task instructions, incorporating more visual and interactive elements, exploring topics in greater depth, comparing multiple renewable energy sources, encouraging broader participation, and integrating research-based or more technical discussions.

Improvements: Another more complex experiment has been created and added to the Solar Energy Curriculum **“Classroom Experiment - Solar panel optimization lab”** to cater to more diverse needs. Two worksheets have been created to further improve this lesson plan. They aim to provide more structure and depth to the discussion activities **“Solar Power Courtroom”** and **“Solar Energy Park – Decision Matrix.”** Both of these worksheets will be added as annexes to the Solar Energy Curriculum document.

2.2. Designing and Building a Solar-Powered Device - Do you have any suggestions for improving the content, materials, or teaching methods used in this lesson?

1. It's my first time here, I really enjoyed it.
2. It was an amazing experience and I am happy to say that I have learned a lot of new things.
3. It was great and we had a great mentor.
4. It was a great experience. It was my first time working with 3D models and circuits in Tinkercad, and me and my partner did great today. We have learned a valuable lesson on solar energy.
5. I loved the lesson, I learned something new and I increased my knowledge about this topic
6. I loved this lesson. I learned something new and upgraded my knowledge.
7. I loved this lesson, the teachers were helpful and kind. Also I learned a lot about solar panels and how they work.

Summary: Feedback was overwhelmingly positive, with students highlighting the engaging learning experience, supportive teachers, and the opportunity to gain new knowledge and practical skills related to solar energy, circuits, and 3D design.

Improvements: In addition to the positive comments in the suggestion section, this lesson plan was also rated the highest in all other aspects. Thus, at least based on the responses gathered from the student perspective, no further improvements are necessary.

2.3. Artistic Expression Through Solar Energy - Do you have any suggestions for improving the content, materials, or teaching methods used in this lesson?

1. I think we should've just organised the materials per group or per person.
2. More International groups and team work
3. More work in groups especially mixed groups, one person from every country
4. Everything was perfect!!!
5. No, everything was beautiful!!!
6. It was great
7. No i don't have any suggestions

Summary: Feedback was largely positive, with most students expressing satisfaction with the lesson. Suggestions for improvement focused on better organization of materials and increasing collaborative work through more mixed international group activities.

Improvements: The “Artistic Expression Through Solar Energy” lesson plans were tested in Italy with students from all partner countries. Although the activities were conducted successfully, participants worked mainly within their own teams, limiting opportunities for international interaction. In future iterations, if the lesson plan were set in a similar international setting, it would be preferred for the teams to be mixed to foster a stronger sense of international cooperation. In regard to other aspects of the lesson plan, it was rated very highly and does not demand further improvements, at least from the student perspective.

2.4. Exploring Solar Energy through Mathematics - Do you have any suggestions for improving the content, materials, or teaching methods used in this lesson?

1. Everything was perfect
2. more activities about the lesson so we learn it easier
3. To be more attractive and fun
4. To interact more with students (maybe some educational games)
5. I don't have any suggestions. Everything was excellent.
6. I don't have any suggestions, everything was perfect
7. Some more interactive content or games with the students
8. more interactive

Summary: Feedback was overwhelmingly positive, with students expressing satisfaction with the lesson. Suggested improvements focused on incorporating more interactive activities, educational games, and engaging content to enhance student participation and learning.

Improvements: As this lesson plan covers a highly technical subject, the inclusion of mathematical problems is both appropriate and necessary. The lesson already incorporates a variety of interactive elements, which were positively received by students. To further enhance engagement, instructors may consider reducing the number of mathematical exercises and focusing on one or two problems rather than completing all of them. Nevertheless, student feedback indicates that the lesson plan was very well received overall.

2.5. Engineering a Solar-Powered Device - Do you have any suggestions for improving the content, materials, or teaching methods used in this lesson?

9. The material is very interesting.
10. I don't want to change anything because the lessons are fun and interactive
11. No, our teacher is the best and it doesn't need improvement.
12. No, the content is very interesting and it definitely increased my curiosity
13. The material is interesting and complete.
14. The material is very interesting!
15. having a special content for the science teachers
16. No, the content is very interesting and complete
17. More pictures/videos
18. It was an interesting material and full of new and useful information.
19. The content was very interesting, I don't think it should be improved.
20. Add more examples and activities.
21. More interactive content with the viewers
22. No, our teacher is the best. It doesn't need improvement.
23. The material is very good
24. I don't think the material needs improvements
25. It should be more interactive.
26. No, our teacher is the best and it doesn't need improvement.
27. No, all materials were well structured and attractive.
28. I really liked the presentation and I have no further suggestions
29. I don't have one because the teaching methods are good.
30. The content it's very interesting and very complete, so I don't have any suggestions.
31. Incorporate multimedia materials, or micro online courses would be amazing
32. To include more pictures

33. The content, materials and teaching methods were excellent, and no improvements are necessary.
34. no, the material was complete and very well made
35. The material presented was really interesting
36. no, the content is already really good and complete
37. No,i think it was complex and easily understandable
38. In my opinion, the material is complete and quite impressive already.
39. Movies,trips
40. The material is very well done
41. No , the material was complete and very well made
42. having special materials for language teachers or non science teachers
43. I would have done it more interesting and engaging
44. The content seems very complex to me, which I appreciate.
45. The material is complete and well made.
46. The lesson was very clear and interesting.I have no suggestions for improvement.
47. The material is very interesting.
48. I liked the material. It was very interesting!
49. The content is very interesting and complete.

Summary: Feedback was overwhelmingly positive. Most participants found the lesson interesting, engaging, well-structured, complete, and easy to understand, with many stating that no improvements were needed. Only a small number of students suggested improvements, such as including more pictures, videos, multimedia resources, interactive activities, practical examples, educational trips or films, and tailored materials for non-science or language teachers. Overall, the feedback was highly positive, with students expressing strong appreciation for both the lesson content and the teaching methods.

Improvements: Overall, students were highly satisfied with the lesson plans, and the majority felt that no improvements were necessary. This positive perception is reflected in the evaluation results, where all key aspects of the lessons received average ratings above 4.5. Nevertheless, the suggestions provided by some students remain valuable and should be taken into consideration. For example, the instructor could incorporate more videos and multimedia resources to present the topics in a more interactive and engaging manner, further enhancing the learning experience.

2.6. Renewable Energy and Sustainability in Technology and Society - Do you have any suggestions for improving the content, materials, or teaching methods used in this lesson?

1. No, I am very happy with the project. I liked the model about solar energy. It taught me about solar energy and also It was a funny elaboration.
2. No, everything is alright.
3. Yes, because that's how we take care of the environment.
4. No, I think it's fine.

Summary: The feedback was overwhelmingly positive. Students were satisfied with the project, highlighting its educational value, enjoyable activities, and contribution to environmental awareness. No suggestions for improvement were provided, and most respondents felt the project was well designed as it was.

Improvements: Although the students did not provide any specific suggestions for improvement, the ratings presented in the previous sections indicate that there is still room for further enhancement. However, it is difficult to identify which aspects require improvement, as the materials, content, and teaching methods all received consistently high evaluations. It is also important to note that not all students who participated in the testing completed the survey. A

higher response rate might have provided additional insights and revealed areas that could be further improved.

Overview of the Student Evaluation of the Solar Energy Curriculum

Overall, feedback for all six lessons was overwhelmingly positive. Students consistently described the activities as engaging, educational, well-structured, and enjoyable. Participants appreciated the supportive teaching methods, hands-on learning experiences, and the relevance of the topics, with many indicating that the lessons met their expectations and, in some cases, required no improvements.

Regarding improvements to the lesson plans from the students' perspective, only a few specific suggestions were made. For the lesson plan **“Solar Energy and the Science of Light,”** the main feedback concerned the experiment and discussion activities. Several students felt that these activities were too simple and lacked sufficient depth and challenge. In response to this feedback, an additional experiment has been created as well as two additional worksheets have been developed to enrich the activities, encourage deeper exploration of the topic, and provide a more engaging learning experience.

In regard to **“Artistic Expression Through Solar Energy,”** which was tested in an international setting, the students eluded that there was a lack of interaction among the different groups. While this suggestion emerged from this particular lesson, it could be applied across all lesson plans used in international contexts by adapting activities to foster greater international collaboration and intercultural exchange.

There was also some broader feedback collected. Although these suggestions were raised by only a minority of respondents, they should still be considered. The most common recommendations included making activities more engaging, increasing the use of audiovisual materials, and incorporating additional elements of gamification.

These aspects were already key considerations during the development of the Solar Energy Curriculum, and the project consortium made a conscious effort to integrate interactive, visual, and engaging learning approaches throughout the materials. The feedback largely reflects

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the diverse backgrounds, abilities, and learning preferences of the participants. While some students found certain activities or materials too demanding, others felt they were not sufficiently challenging.

Importantly, the overall feedback was overwhelmingly positive, demonstrating that the developed materials are of high quality and suitable for wider implementation. Nevertheless, educators delivering the lessons should remain attentive to the needs of different learner groups and be prepared to adapt activities, materials, and levels of complexity where appropriate to ensure an inclusive and effective learning experience for all participants.

Solar energy curriculum evaluated by teachers

All six Solar energy curriculum chapters were evaluated by teachers that participated in the testing of the lesson plans. The evaluation was collected through Google Forms surveys. All teachers had to fill in the same survey for each chapter, which was developed by Riga Technical University (RTU) and was approved by representatives from the whole project consortium. The teachers were asked a total of 5 questions. 4 Questions asked teachers to simply evaluate the solar energy curriculum through a Likert scale (1 - 5). One being the worst and five being the best available grade. These questions are as follows:

1. **How would you rate materials, content, and the suggested teaching methods developed for this lesson?**
2. **Has conducting this lesson increased your interest in renewable energy and sustainability?**
3. **Do you see yourself, because of this lesson, trying to incorporate the topics of renewable energy and sustainability more often in future lessons?**
4. **How beneficial do you think this lecture was for the students?**

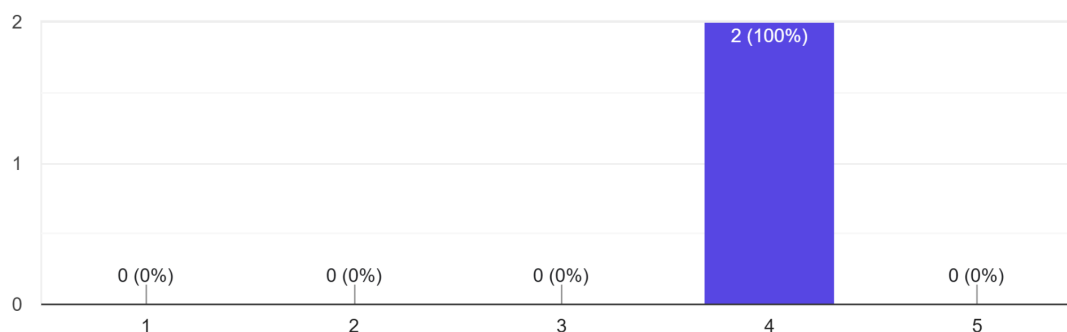
The last question in the survey was an open-ended one:

5. **Do you have any suggestions for improving the content, materials, or teaching methods proposed in the lesson plans?**

1. How would you rate materials, content, and the suggested teaching methods developed for this lesson?

2.1.Solar Energy and the Science of Light - How would you rate materials, content, and the suggested teaching methods developed for this lesson?

2 responses

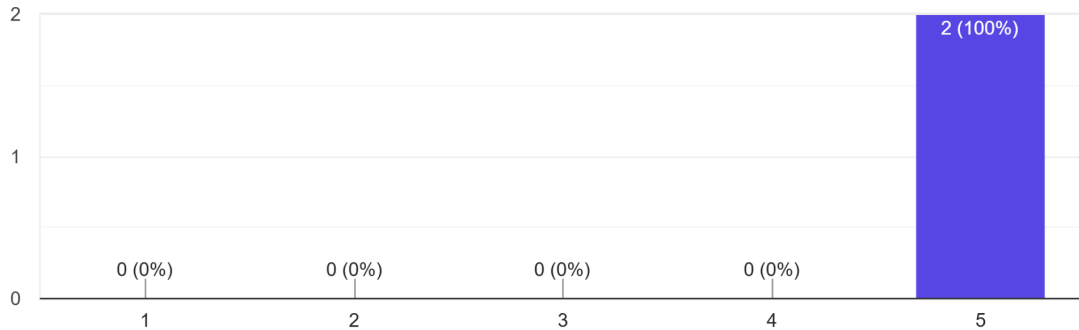


The average rating comes out to - 4.



2.2.Designing and Building a Solar-Powered Device - How would you rate materials, content, and the suggested teaching methods developed for this lesson?

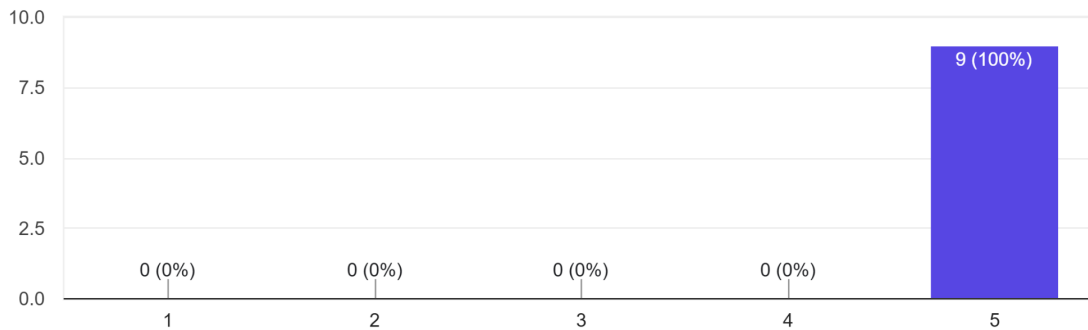
2 responses



The average rating comes out to - 5.

2.3.Artistic Expression Through Solar Energy - How would you rate materials, content, and the suggested teaching methods developed for this lesson?

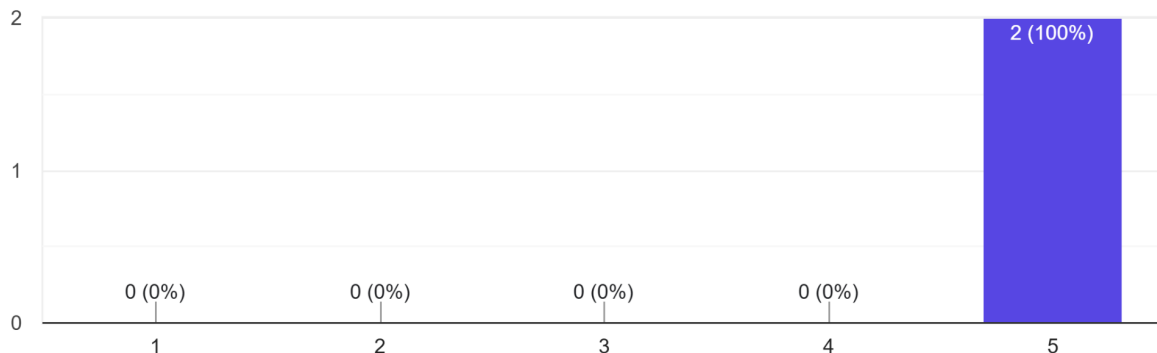
9 responses



The average rating comes out to - 5.

2.4.Exploring Solar Energy through Mathematics - How would you rate materials, content, and the suggested teaching methods developed for this lesson?

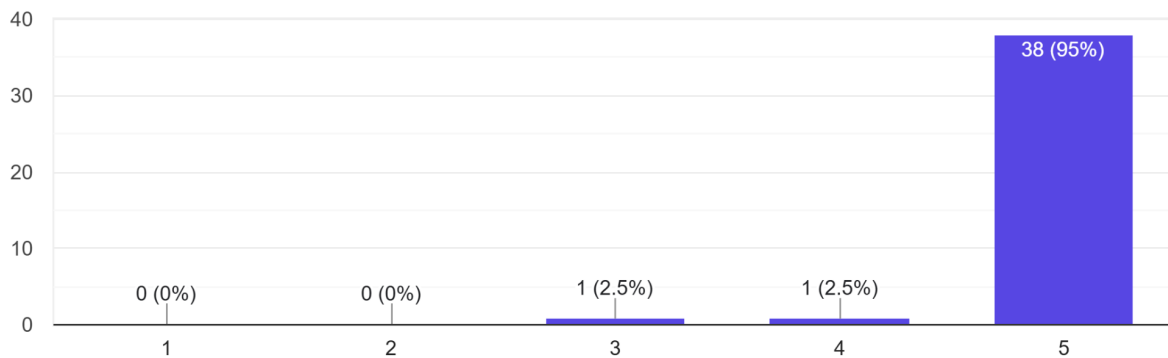
2 responses



The average rating comes out to - 5.

2.5.Engineering a Solar-Powered Device - How would you rate materials, content, and the suggested teaching methods developed for this lesson?

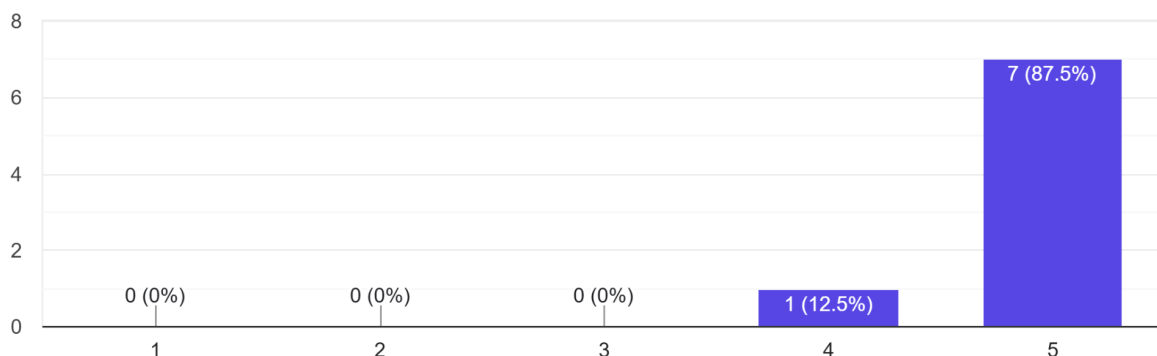
40 responses



The average rating comes out to - 4.92.

2.6.Renewable Energy and Sustainability in Technology and Society - How would you rate materials, content, and the suggested teaching methods developed for this lesson?

8 responses



The average rating comes out to - 4.88.

Summary of responses for each chapter for the question: How would you rate materials, content, and the suggested teaching methods developed for this lesson?

The teachers overall evaluated the content, materials, and teaching methods for all chapters positively:

1. “Solar Energy and the Science of Light” average rating - 4.
2. “Designing and Building a Solar-Powered Device” average rating - 5.
3. “Artistic Expression Through Solar Energy” average rating - 5
4. “Exploring Solar Energy through Mathematics” average rating - 5
5. “Engineering a Solar-Powered Device” average rating - 4.92.
6. “Renewable Energy and Sustainability in Technology and Society” average rating - 4.88.



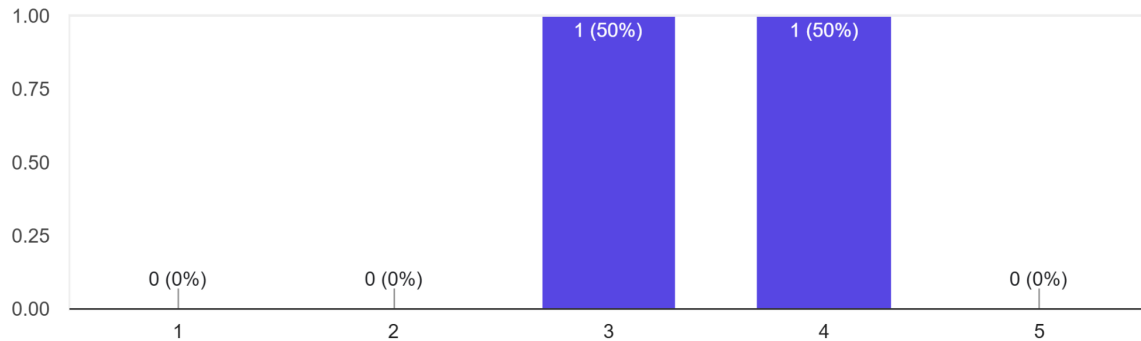
All of the chapters received the average rating which was **4.0 or higher**, indicating that the content, materials, and teaching methods are well developed and ready for wider implementation without significant modifications. Three chapters **“Designing and Building a Solar-Powered Device”**, **“Artistic Expression Through Solar Energy”** and **“Exploring Solar Energy through Mathematics”** received the maximum available rating (5). The chapter **“Solar Energy and the Science of Light”** received the lowest average rating (4). This indicates that all of the chapters are strong and in the participating teachers’ opinion would benefit only from minor adjustments. Regarding the lowest rated lesson plans this has already been addressed by worksheets and the additional experiment that has been created.

2. Has conducting this lesson increased your interest in renewable energy and sustainability?



2.1.Solar Energy and the Science of Light - Has conducting this lesson increased your interest in renewable energy and sustainability?

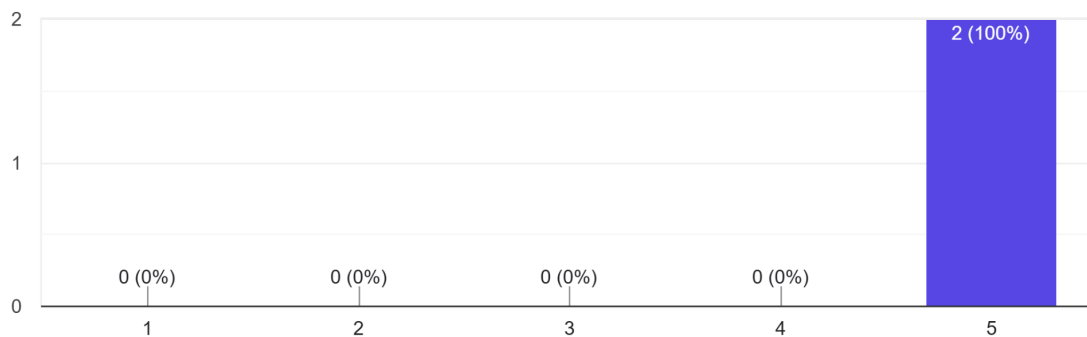
2 responses



The average rating comes out to - 3.5.

2.2.Designing and Building a Solar-Powered Device - Has conducting this lesson increased your interest in renewable energy and sustainability?

2 responses

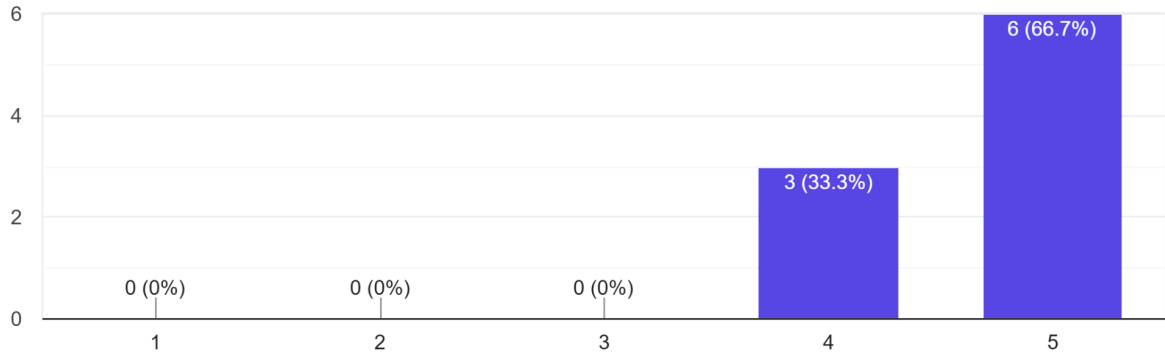


The average rating comes out to - 5.



2.3. Artistic Expression Through Solar Energy - Has conducting this lesson increased your interest in renewable energy and sustainability?

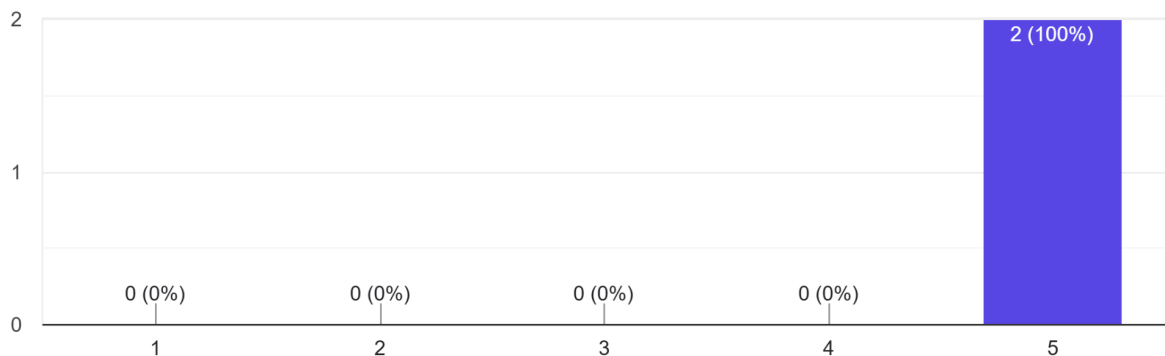
9 responses



The average rating comes out to - 4.67.

2.4. Exploring Solar Energy through Mathematics - Has conducting this lesson increased your interest in renewable energy and sustainability?

2 responses

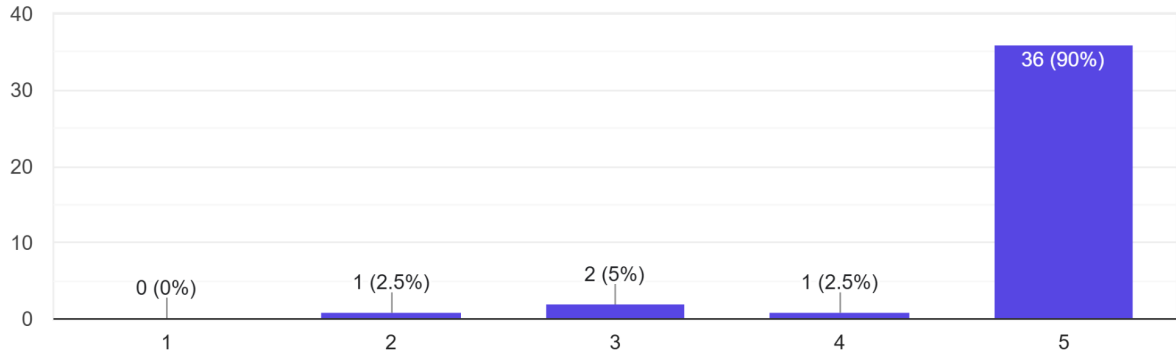


The average rating comes out to - 5.



2.5.Engineering a Solar-Powered Device - Has conducting this lesson increased your interest in renewable energy and sustainability?

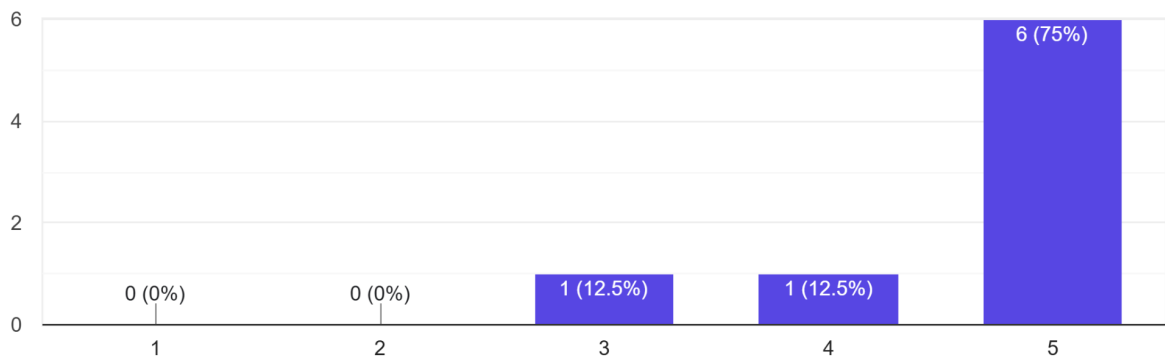
40 responses



The average rating comes out to - 4.8.

2.6.Renewable Energy and Sustainability in Technology and Society - Has conducting this lesson increased your interest in renewable energy and sustainability?

8 responses



The average rating comes out to - 4.63.

Summary of responses for each chapter for the question: Has conducting this lesson increased your interest in renewable energy and sustainability?

The teachers overall reported that conducting the lesson increased their interest in renewable energy and sustainability:

1. “Solar Energy and the Science of Light” average rating - 3.5.
2. “Designing and Building a Solar-Powered Device” average rating - 5.
3. “Artistic Expression Through Solar Energy” average rating - 4.67.
4. “Exploring Solar Energy through Mathematics” average rating - 5
5. “Engineering a Solar-Powered Device” average rating - 4.8.
6. “Renewable Energy and Sustainability in Technology and Society” average rating - 4.63.

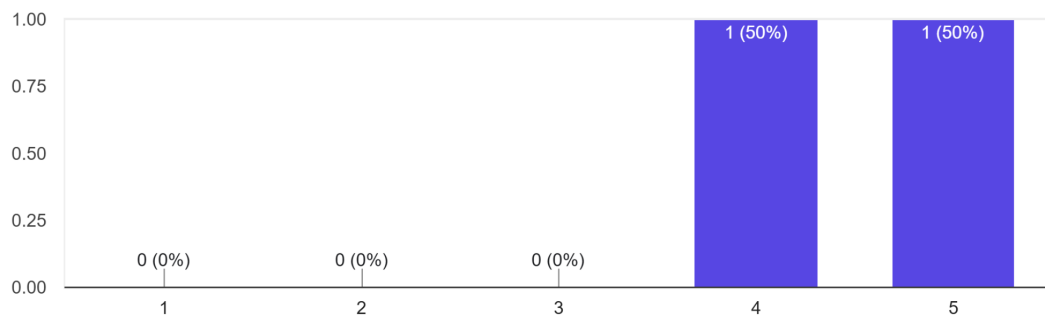
When asked whether conducting lessons increased their interest in renewable energy and sustainability, respondents on average gave an above average rating. This suggests that the lesson plans largely succeeded also in increasing teacher interest in these topics. Two chapters **“Designing and Building a Solar-Powered Device”** and **“Exploring Solar Energy through Mathematics”** received the highest possible rating (5), while **“Solar Energy and the Science of Light”** received the lowest (3.5). Although the latter scored lower than the other chapters, it still represents a generally positive evaluation, indicating that the lesson was effective in increasing conductors' interest in renewable energy and sustainability. These ratings suggest that also in regard to the teachers the content, materials, and teaching methods used during the testing phase were central factors influencing other important factors that determine the success of the developed materials. When teachers themselves found these elements engaging and effective, the lesson plans were more likely to achieve their broader educational objectives, and vice versa.



3. Do you see yourself, because of this lesson, trying to incorporate the topics of renewable energy and sustainability more often in future lessons?

2.1.Solar Energy and the Science of Light - Do you see yourself, because of this lesson, trying to incorporate the topics of renewable energy and sustainability more often in future lessons?

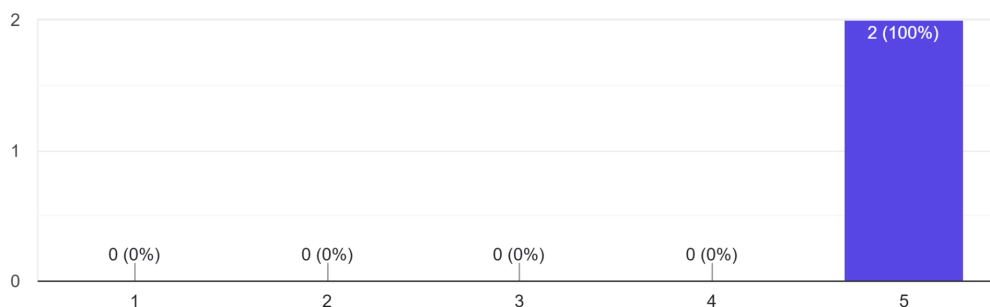
2 responses



The average rating comes out to - 4.5.

2.2.Designing and Building a Solar-Powered Device - Do you see yourself, because of this lesson, trying to incorporate the topics of renewable energy and sustainability more often in future lessons?

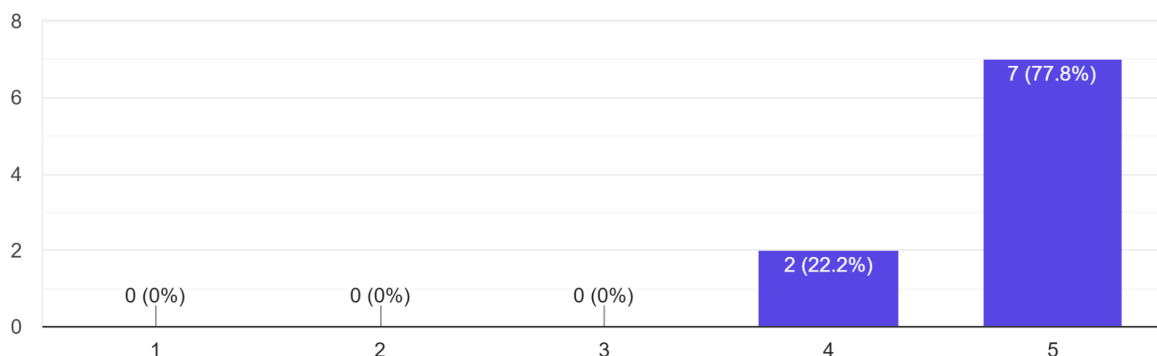
2 responses



The average rating comes out to - 5.

2.3. Artistic Expression Through Solar Energy - Do you see yourself, because of this lesson, trying to incorporate the topics of renewable energy and sustainability more often in future lessons?

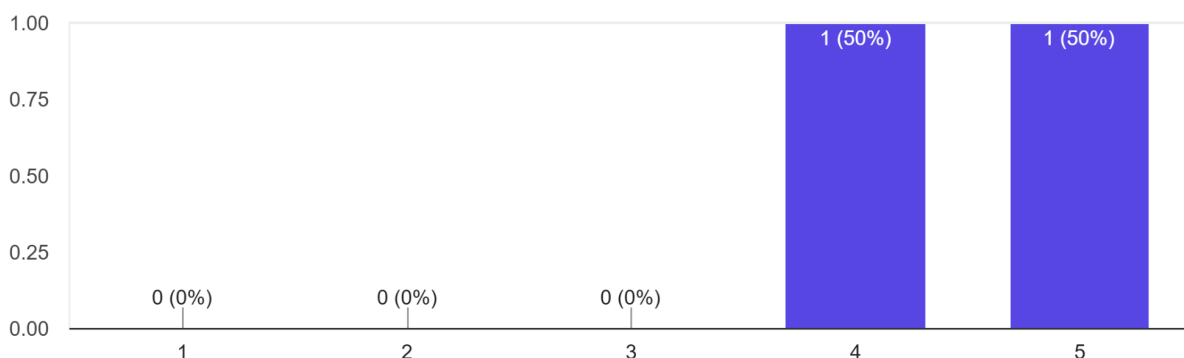
9 responses



The average rating comes out to - 4.78.

2.4. Exploring Solar Energy through Mathematics - Do you see yourself, because of this lesson, trying to incorporate the topics of renewable energy and sustainability more often in future lessons?

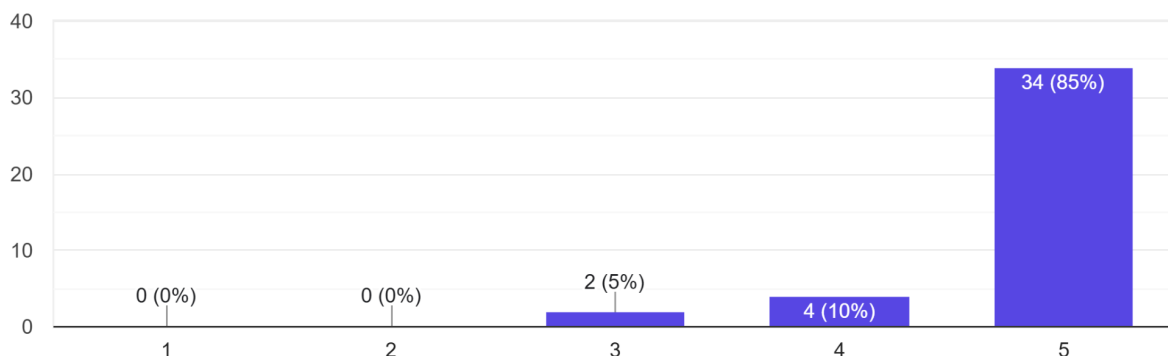
2 responses



The average rating comes out to - 4.5.

2.5.Engineering a Solar-Powered Device - Do you see yourself, because of this lesson, trying to incorporate the topics of renewable energy and sustainability more often in future lessons?

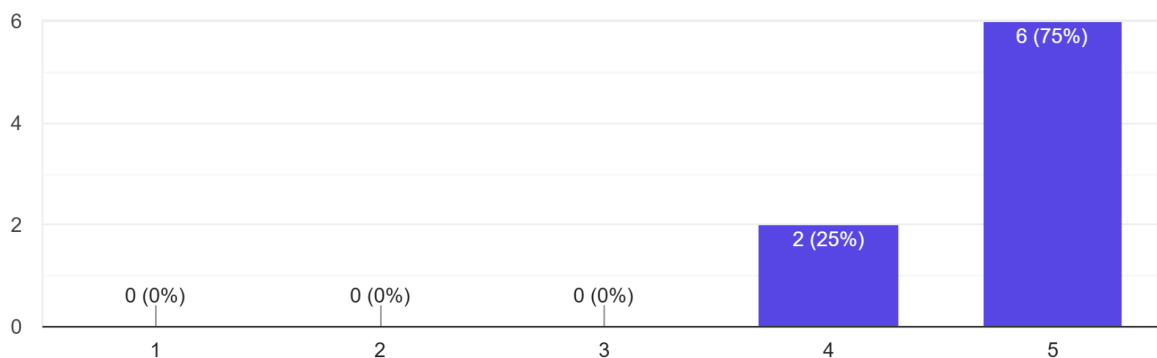
40 responses



The average rating comes out to - 4.8.

2.6.Renewable Energy and Sustainability in Technology and Society - Do you see yourself, because of this lesson, trying to incorporate the topics of r...rgy and sustainability more often in future lessons?

8 responses



The average rating comes out to - 4.75.

Summary of responses for each chapter for the question: Do you see yourself, because of this lesson, trying to incorporate the topics of renewable energy and sustainability more often in future lessons?

Overall, teachers strongly reported that, as a result of delivering these lessons, they would incorporate topics related to renewable energy and sustainability into their future teaching:

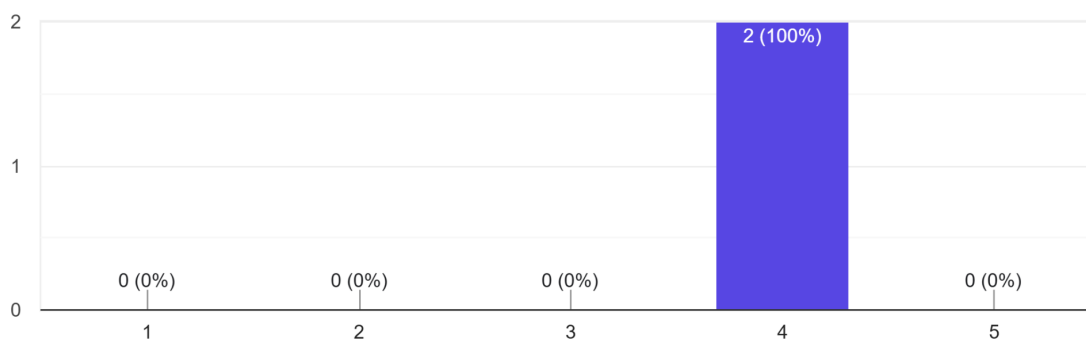
1. “Solar Energy and the Science of Light” average rating - 4.5.
2. “Designing and Building a Solar-Powered Device” average rating - 5.
3. “Artistic Expression Through Solar Energy” average rating - 4.78.
4. “Exploring Solar Energy through Mathematics” average rating - 4.5.
5. “Engineering a Solar-Powered Device” average rating - 4.8.
6. “Renewable Energy and Sustainability in Technology and Society” average rating - 4.75.

Teachers overwhelmingly reported that delivering these lessons would encourage them to incorporate topics related to renewable energy and sustainability into their future teaching. All lesson chapters received an average rating of **4.5 or higher**. Both **“Solar Energy and the Science of Light”** and **“Exploring Solar Energy through Mathematics”** received the lowest average rating of **4.5**, while **“Designing and Building a Solar-Powered Device”** achieved the highest possible average rating of **5.0**. These results suggest that the lesson plans were particularly successful in creating a lasting impact on teachers’ intentions to integrate renewable energy and sustainability concepts into their future educational practice.

4. How beneficial do you think this lecture was for the students?

2.1.Solar Energy and the Science of Light - How beneficial do you think this lecture was for the students?

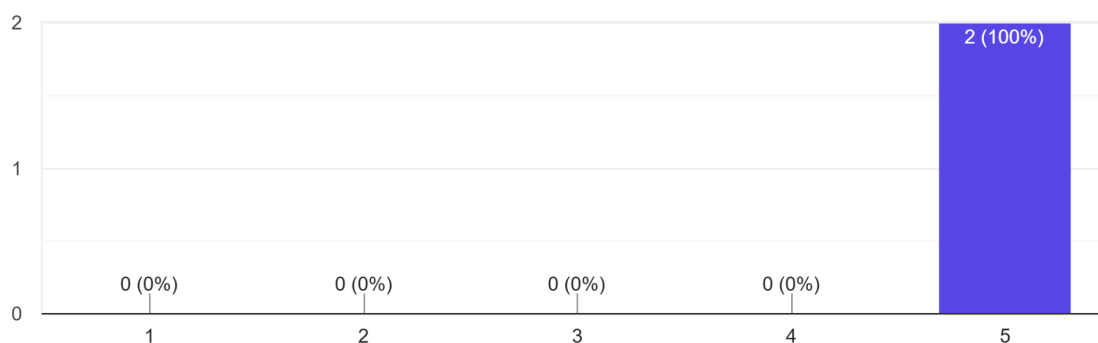
2 responses



The average rating comes out to - 4.

2.2.Designing and Building a Solar-Powered Device - How beneficial do you think this lecture was for the students?

2 responses

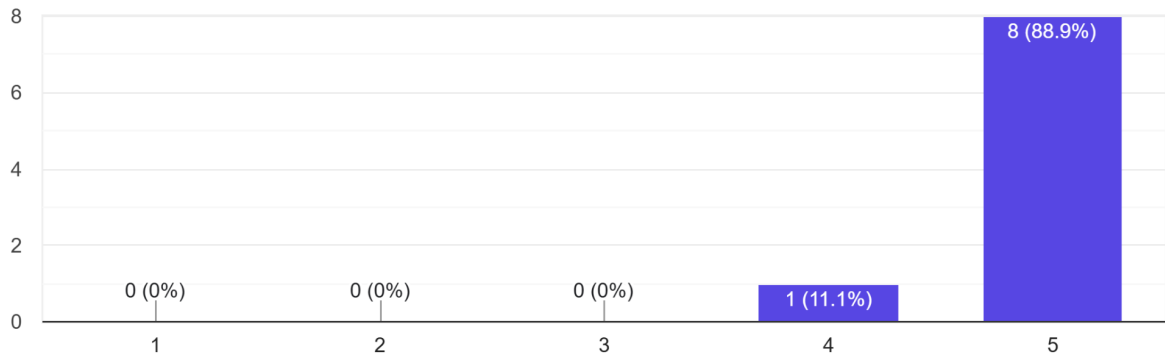


The average rating comes out to - 5.



2.3. Artistic Expression Through Solar Energy - How beneficial do you think this lecture was for the students?

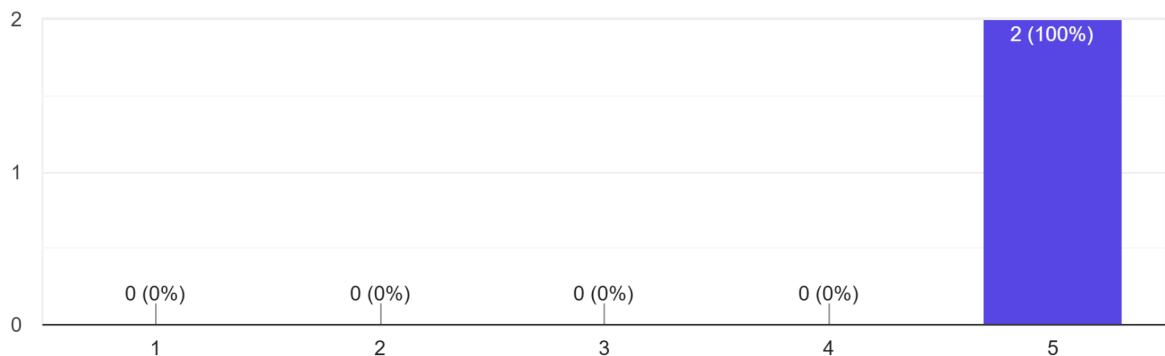
9 responses



The average rating comes out to - 4.89.

2.4. Exploring Solar Energy through Mathematics - How beneficial do you think this lecture was for the students?

2 responses

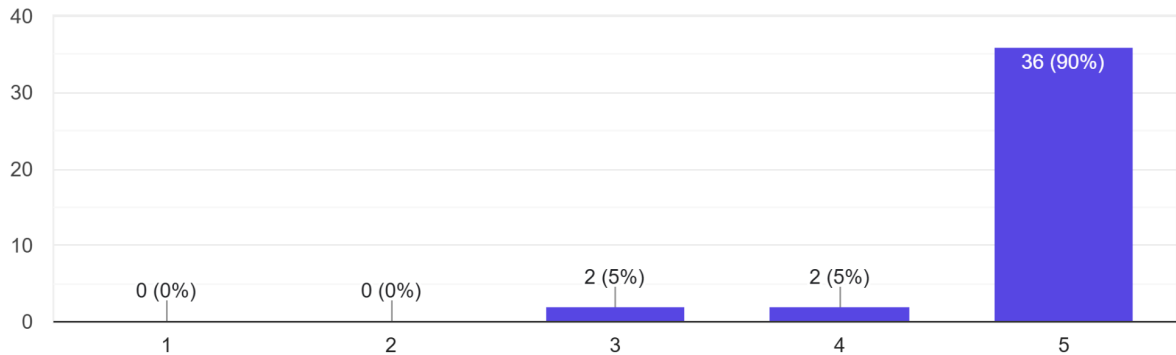


The average rating comes out to - 5.



2.5.Engineering a Solar-Powered Device - How beneficial do you think this lecture was for the students?

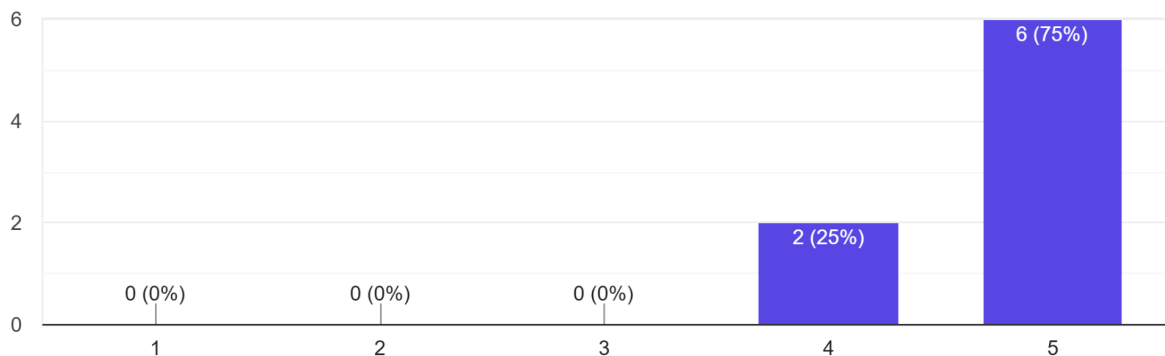
40 responses



The average rating comes out to - 4.85.

2.6.Renewable Energy and Sustainability in Technology and Society - How beneficial do you think this lecture was for the students?

8 responses



The average rating comes out to - 4.75.

Summary of responses for each chapter for the question: How beneficial do you think this lecture was for the students?

Overall, teachers reported that from their perspective, the lectures were beneficial for the students:

1. “Solar Energy and the Science of Light” average rating - 4.
2. “Designing and Building a Solar-Powered Device” average rating - 5.
3. “Artistic Expression Through Solar Energy” average rating - 4.89.
4. “Exploring Solar Energy through Mathematics” average rating - 5.
5. “Engineering a Solar-Powered Device” average rating - 4.85.
6. “Renewable Energy and Sustainability in Technology and Society” average rating - 4.75.

All chapters received an average rating of **4.0 or higher**, indicating that teachers considered the lessons beneficial for the students who participated in the pilot testing. Two chapters, “**Designing and Building a Solar-Powered Device**” and “**Exploring Solar Energy through Mathematics**,” received the highest possible average rating of **5.0**. “**Solar Energy and the Science of Light**” received the lowest average rating of **4.0**, which still represents a strong and favorable assessment. Nevertheless, this chapter has been further enhanced through the addition of supplementary worksheets, new experiments, improved visual materials, and information to further strengthen its quality and educational value.

5. Do you have any suggestions for improving the content, materials, or teaching methods proposed in the lesson plans?

Suggestions from teachers were also collected to identify any specific recommendations for improving the lesson plans. It is important to note, however, that for some lesson plans, the teachers who implemented them did not provide any suggestions for improvement or additional comments regarding their quality. This likely indicates that these teachers considered the lesson plans to be of good quality at their current form and did not perceive any need for further adjustments.

2.1 Solar Energy and the Science of Light - Do you have any suggestions for improving the content, materials, or teaching methods proposed in the lesson plans?

1. Students argued that this issue of renewable energy is more complex than it was stated in the material and that it needed to be looked at from other or more perspectives.
2. I suggest making a more structured lesson with more guiding points!

Summary: Teachers rated the lesson plans more positively than the students who participated in testing, although the overall perceptions of the lesson plans were broadly similar across both groups. The teachers also suggested that certain parts of the lesson plans could be made more challenging and that a clearer structure would further enhance their effectiveness.

Improvements: Issues with the structure and complexity have been addressed with the development of the worksheets and the new experiment.

2.2.Designing and Building a Solar-Powered Device - Do you have any suggestions for improving the content, materials, or teaching methods proposed in the lesson plans?

1. All good
2. Everything was interesting and innovative to our pupils.

Summary: Teachers who conducted the lessons state that everything went well. They also constantly evaluated the lesson plans with the maximum grade in all of the aspects.

Improvements: From the teachers' perspective, no additional adjustments or improvements are necessary for this lesson plan.

2.3.Artistic Expression Through Solar Energy - Do you have any suggestions for improving the content, materials, or teaching methods proposed in the lesson plans?

1. Everything was fine
2. No, I don't have any suggestions

Summary: The teachers did not identify any specific issues that needed to be addressed and rated the lesson plans very highly. In particular, they awarded the highest possible ratings for the developed materials, content, and teaching methods. However, in some of the other evaluated aspects, a few teachers indicated that there was minor room for improvement.

Improvements: It is difficult to identify specific improvements that should be made to elevate the lesson plans to an excellent level. The areas identified as needing improvement may be related to the way the lesson plans were conducted rather than to the lesson plans themselves. As implementation is highly dependent on the teacher and classroom context, this factor can vary considerably from one lesson to another.

2.4. Exploring Solar Energy through Mathematics - Do you have any suggestions for improving the content, materials, or teaching methods proposed in the lesson plans?

No comments

Summary: The teachers did not provide any specific comments regarding the lesson plan. They also awarded the highest possible ratings in almost all evaluated aspects. The only aspect that received a slightly lower rating concerned the question, **“Do you see yourself, as a result of this lesson, incorporating topics related to renewable energy and sustainability more frequently in future lessons?”** Nevertheless, this aspect still received a very high average rating of **4.5**. This result may be influenced by individual factors; for example, that specific teacher may have already been actively integrating sustainability-related topics into their teaching prior.

Improvements: From the teachers’ perspective, largely no additional adjustments or improvements are necessary for this lesson plan.

2.5.Engineering a Solar-Powered Device - Do you have any suggestions for improving the content, materials, or teaching methods proposed in the lesson plans?

1. My suggestion is to make it more fun
2. To include more examples.
3. They need a global view of renewable energy and sustainability
4. I satisfied this method
5. I don't have any suggestions , the lessons are already fantastic
6. My suggestion is to make the content more fun to learn from
7. No, it is perfect
8. I don't think this lesson needs more improvements its perfect
9. All of them are adequate

Summary: Many teachers commented that the lesson plan is well developed and does not require any significant improvements. However, a recurring suggestion was to make the activities more engaging and enjoyable for students. Furthermore, ratings for the various aspects of the lesson plan consistently exceeded 4.8 out of 5, indicating a very high level of satisfaction among respondents. Overall, the lesson plan received exceptionally positive evaluations.

Improvements: The main concern raised by some teachers was that the lesson could be made more engaging and enjoyable for students. It is difficult to identify a single specific cause, but the feedback suggests that the volume of theoretical content may have felt somewhat overwhelming, or that some teachers may have lacked confidence when delivering the lesson. While the materials can be effectively implemented by teachers from a variety of backgrounds, their impact may be enhanced when delivered by educators with expertise in related fields, such as Mathematics or Physics, who may feel more comfortable explaining the underlying concepts and facilitating the activities.

2.6. Renewable Energy and Sustainability in Technology and Society - Do you have any suggestions for improving the content, materials, or teaching methods proposed in the lesson plans?

1. Lesson plan is perfectly developed
2. At the moment all the lesson plan are nice
3. Everything was perfect
4. Lesson plan is perfect developed
5. I have not any suggestions
6. Lesson plan os perfect developed
7. I have not any suggestions

Summary: Teachers either reported having no additional comments or expressed positive views about the lesson plans. However, it is important to note that, despite the praise received, the lesson plans did not consistently receive the highest possible ratings. Nevertheless, the average ratings remained notably high, with all evaluated aspects scoring 4.63 or above, indicating a strong overall level of satisfaction.

Improvements: It is difficult to identify specific improvements to the lesson plans themselves. The areas needing improvement may be related more to how the lessons were delivered, which can vary depending on the teacher and classroom context.

Overview of the Teacher Evaluation of the Solar Energy

Curriculum

Overall, feedback for all six lessons was overwhelmingly positive, even more so than the feedback received from students. One possible explanation is that teachers engage with the materials more actively, as they are responsible for delivering the lessons, so they don't have the option of passive participation. This deeper involvement may help them better recognize the value and potential of the materials.

The feedback from teachers largely mirrored that of the students, highlighting many of the same areas for improvement. These included increasing the complexity of certain activities, providing clearer structure for some tasks, and making the lesson plans more engaging through enhanced visual materials, the development of additional visuals, and the greater use of audiovisual content during lessons. All of these issues have already been addressed in the section discussing student feedback.

One aspect that became more apparent during the review of the feedback was that the lesson plans tended to be more effective when delivered by teachers whose subject expertise closely aligned with the lesson content. For example, the chapter “**Artistic Expression Through Solar Energy**” was particularly well suited to art teachers, while “**Exploring Solar Energy through Mathematics**” benefited from being taught by mathematics teachers. The lessons were designed to be accessible and deliverable by teachers from a wide range of subject areas. However, the feedback suggests that the quality of implementation may be slightly lower when teachers are less familiar with the topic, as this can affect their confidence and depth of understanding during lesson delivery.

Importantly, the feedback collected from teachers reaffirmed the quality of the developed lesson plans. Teachers' views largely aligned with those of the students who participated in the testing, and they identified similar areas for improvement. The main difference was in the degree of emphasis placed on certain issues.

Summary of the report

Overall, both student and teacher feedback indicate that the Solar Energy Curriculum is of high quality, with all six lesson plans being well received. Teachers were slightly more positive than students, likely due to their more active engagement with the materials.

Both groups identified similar areas for improvement, including increasing the complexity of certain activities, improving structure, and enhancing engagement through stronger visual and audiovisual materials. Students also suggested greater interaction, particularly in international settings.

A key finding was that lesson delivery was more effective when taught by teachers whose subject expertise closely matched the content, although the materials were designed to be accessible across disciplines.

Overall, the feedback confirms that the lesson plans are strong and suitable for wider implementation, while also indicating that they would benefit from some adjustments. The analysis of the feedback has helped identify specific improvements and recommendations that will be implemented into the final version of the **Solar Energy Curriculum**:

- Two worksheets have been created to further improve the “**Solar Energy and the Science of Light**” chapter.
- A new more complex experiment has been created - “**Classroom Experiment - Solar panel optimization lab**”.
- Additional visual schemes have been created, and some of the existing visuals have been improved.
- Lesson plans benefit when delivered by teachers whose subject expertise is closely aligned with the lesson content.
- In international settings, teachers should actively encourage interaction and collaboration between different groups.
- Teachers should be prepared to adapt the lesson plans to different classroom contexts as needed.



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- Teachers can incorporate more audiovisual materials during lessons to foster understanding among students.