

Teacher Handbook



Solar for Schools
- The App -

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The Solar for Schools app aims to teach the next generation about energy, solar power and sustainability.

The S4S app contains educational content, as well as access to the unique Solar for Schools solar panel design tool to encourage school students to push for change with their teachers, whilst considering real life logistical and engineering challenges of installing a new system on an older building.

The target cohort is KS3 students.

The S4S app is aimed at pupils who are engaged with climate action and want to make a real change in their environment. Suitable for whole school lessons or homework, supporting science teaching or extra-curricular enrichment. Ideal to extend your talented KS2 pupils and equally robust enough to support aspects of the foundation science GCSE.



Diversify your in class teaching material on renewable energy, with material designed to complement the science curriculum and beyond.

The S4S app can be used in numerous ways to support your students, from setting homework tasks to supporting distanced and blended learning, all for free.

Project work

Curriculum Enhancement

Eco Group Work

Home Learning

Extension Activities

Extracurricular Activities

Science Homework

Learn beyond the classroom with two learning journeys that explore topics in Science, English, Maths, Geography and History.

Allow your pupils to jump across specialist knowledge boundaries as technologies and disciplines converge, through a blend of technical training and 'softer', collaborative skills.

The Solar for Schools app contains learning journeys that guide students through the topics of Energy, Electricity, Efficiency, Environment, and Solar Energy.

Learning beyond the classroom has never been as high a priority as now. Are you looking for something to reinforce your teaching, add real life situations to the content? The Solar for Schools app applies science curriculum knowledge to up to date, relevant sustainable practice. Providing self-directed, bite-sized learning as well as encouraging peer-to-peer learning through social action.

Getting Started

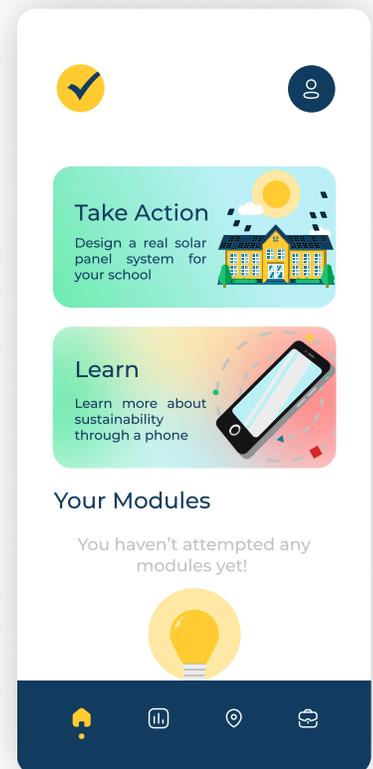
Currently there are two learning journeys within the app, accessible via the home screen. One branches off into investigating the very item the children hold in their hand; the smart phone. One journey explores the science behind the main components, which underpin sustainability, and the other learning journey focuses on solar power.

The completion of these modules culminates in a final quiz, and students have the chance to win medals along the way after completing individual units. Inside these modules, users can choose to be guided through the units with a continue button, or they can go back and explore another module at every interval between units.

Employability

In this fast-paced, quickly changing world, give your students the edge in the employment market. We are training children for the jobs of the future.

Focus on development of key skills and attributes that will be at a premium in the future, including resilience, adaptability, resourcefulness, enterprise, cognitive skills (such as problem solving), and the core business skills for project based employment.

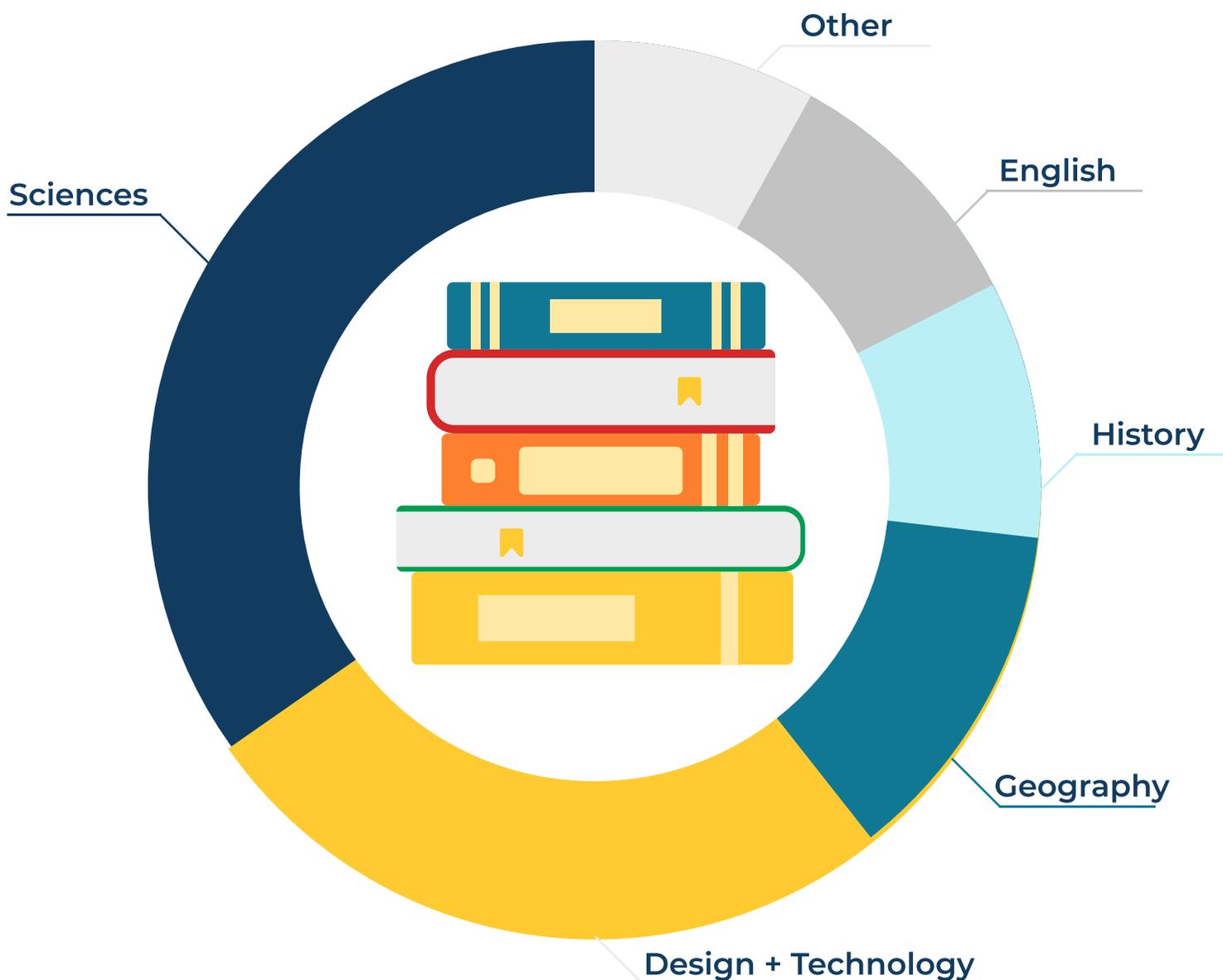


Written for teachers, by teachers

Enhancement

The S4S app aims to develop scientific knowledge and conceptual understanding of the energy aspect of the physics national curriculum, as well as significant elements of chemistry and biology. Skills from the English and maths curricula are utilised. DT, Geography, history, RE and citizenship strands reinforce the cross curricular nature of the world's energy problem.

Equip young people with the scientific knowledge required to understand the uses and implications of science, today and in future.



Key: Subject Area, Curriculum topics, *Extensions*

Physics

For the science teacher

Fuels and energy resources are investigated.

Domestic energy cost comparisons *using real life examples*.

Power ratings of appliances in watts (W, kW) *and the historical context of James Watt*.

School/ domestic fuel bills, fuel use and costs.

Energy changes and transfers

Use of insulators *in the context of a mobile phone*.

Energy transfer examples

Changes in systems

Energy is introduced as a quantity that can be quantified and calculated.
The law of conservation of energy is explained.

Physical processes and mechanisms, rather than energy, is used to explain the intermediate steps that bring about such changes.

Examples of light transferring energy from source to absorber leading to chemical and electrical effects *are given using solar panels*.

The Periodic Table

Various physical and chemical properties of selected elements are shown, for example copper and silicon.

The properties of metals and non-metals are explained.

Earth and Atmosphere

The importance of the Earth as a source of limited resources, is central to the app.

The connection between consumption and the carbon cycle and the *composition* of the atmosphere is referred to and explained frequently.

Human activity and the release of carbon dioxide and the impact on climate change is a central strand to the app.

Recycling when compared to the extraction of minerals and ores from the Earth's surface is much more efficient.

Measurement

Accurate SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature is used throughout the app.

Users are encouraged to use and derive simple equations and calculations. Relevant, up-to-date data will be provided for them to analyse.

Other Subjects

Geography

Locational knowledge and spatial awareness of the UK and the world's countries, using maps where appropriate.

The Middle East is highlighted for their oil reserves, instability as well as focusing on their environmental issues.

Human geography relating to population, urbanisation, international development and economic activity in the primary, secondary, tertiary and quaternary sectors is featured in different strands with the app.

The use and *distribution* of natural resources is considered.

English

An unusual extension of this app is its ability to promote discussion and enquiry.

Once students have worked through the knowledge, the S4S app aims to empower them to write clearly, accurately and coherently, with purpose. The tasks can be adapted for different audiences, such as their own peers, teachers or the school governors.

The discussions with the S4S app could elucidate any number of questions.

For example

How long will renewable energy last?

What can we do to reduce energy consumption?

Why have we not already switched to renewable energy in the UK, are we moving quick enough?

How are my actions effecting the Earth?

Is it financially viable to install solar panels?

What can we do as a society?

Is solar panel installation suitable for our school?

Could we raise funds to support this and make them more financially efficient?

Whether the pupils are writing to persuade the school to install solar panels, or to convince their peers to recycle more plastic, the S4S app should help them to elaborate and explain clearly their understanding and ideas. When students construct the presentation they must know the purpose and the audience for which they are writing. They will be encouraged to check their understanding to make sure that what they have read makes sense.

The hope is to provide the stimulus material for more spoken English, including classroom discussion. Encouraging the participation in debates and questioning will empower children before they present their findings to adults or assembly halls of peers.

Promoting the arts of oracy and listening with purpose, making formal presentations, demonstrating to others their new findings or understanding of economics and science, we hope will empower them to be change makers. By equipping pupils with the scientific background knowledge and facts, it is hoped they will have the confidence to give short speeches and presentations, expressing their own ideas and keeping to the point. This should effectively arm them to participate in formal debates and structured discussions, summarising and/or building on what has been said.

History

Where possible historical context of inventions and scientific advancements are used to inspire pupils' curiosity about the past.

Britain's influence and how it has been influenced by the wider world in the energy and economic markets and developments.

Historical perspective are encouraged by constructing knowledge into the energy contexts understanding the connections between local, regional, national and international history; between cultural, economic, military, political, religious and social history; and between short- and long-term timescales.

Britain as the first industrial nation and the impact on society, now. Considerations of the fourth industrial revolution.

Maths

Test fluency in the fundamentals of mathematics, in an unexpected situation.

Allow pupils to develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

Encourage pupils to reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language.

This will be explicit for any students who manage to present to the school governors.

Mathematical reasoning will be needed to make financial connections.

Ratio, proportion and rates of change are contextualised in the context of energy resource management and domestic costs.

Various scientific equations are used where users will need to rearrange the formulae to change the subject.

RE

Using the major idea of energy insecurity and the challenges that face individuals and society across the world can provide a focus for work within and between subjects and across the curriculum as a whole. More resources can be found on the website at:

<https://www.solarforschools.co.uk/students>

Cross-curricular dimensions such as identity, cultural diversity and community cohesion provide important unifying themes that help young people make sense of the world and give sustainable education relevance.

Citizenship / PSHE

The S4S app aims to encourage pupils to develop an interest in, and commitment to, participation in activism or volunteering of time outside of compulsory education hours. Motivating young people to undertake responsible activity, that they will take with them into adulthood.

Help them to be equipped with the skills to think critically and debate political questions. Enable them to manage their money on a day-to-day basis, and plan for future financial needs.

Help to deliver a frequently overlooked aspect of citizenship, the roles played by public institutions and voluntary groups in society, and the ways in which citizens work together to improve their communities, including opportunities to participate in school-based activities the different ways in which a citizen can contribute to the improvement of his or her community, to include the opportunity to participate actively in community volunteering, as well as other forms of responsible activity.

Alongside introducing the functions and uses of money, the importance and practice of budgeting, and managing risk.

In the context of school financial planning, income and expenditure, loans, and savings and how public money is raised and spent is considered when deciding if the installation of solar panels would be cost effective and therefore save the school and public money.

Design and Technology

Drawing on the inspirations pupils gain in design and technology lessons, the S4S reinforces the pupils natural creativity and enterprising nature as they are able to design an actual solar panel array for their own school. As the world's independence on oil is reduced, the alternatives, problems and issues are considered.

With the ability to actually make this a reality through Solar 4 Schools pupils can work towards solving the very real and relevant problem of supplying cheaper, greener electricity for the school. The Paneliser's powerful in built ability to help pupils critique, evaluate and test their design by generating real facts and figures at the touch of a button.

The S4S app explores solar energy's contribution to the UK's electricity generation by considering pupils own and others' needs, wants and values. The Environmental learning journey contextualises the global environmental and economic issues of electricity generation.

Pupils are encouraged to be resourceful and innovative. Through the evaluation of past and present technology, they develop a critical understanding of its impact on daily life and the wider world. Supporting teachers to help make an essential contribution to the creativity, culture, wealth and well-being of the UK.

Design

The App follows the discovery and exploration behind our present day electricity generation, considering different cultures and user needs. Development and communication skills are encouraged using 2-D modelling on the S4S App.

Make

The Paneliser has a powerful built-in ability to help pupils critique, evaluate and test their designs by generating real facts and figures at the touch of a button.

Challenge your pupils

Form teams to design the best solar panels for the school.

Ideas can be presented within class, the best design to present to the school's head teacher and governors.

Use our app to set a series of homework tasks.

There are four learning journey's closely matched to the national curriculum, energy, electricity, efficiency and environment. The solar journey supplements the national curriculum and allows more mastery of one renewable energy source.

The pupils scores, from the tests are collated in an easy format to record engagement in the work, completion and final score. The children are able to retake the test and this will be recorded as well.

Supplement your class material with new material from the app.

Whilst linked to the national curriculum the app is designed to contextualize the science, in action. The mobile phone is a central theme to explore various scientific processes.

Half termly homework.

A great homework to set over half term, to consolidate learning, one the pupils should find fun to engage with.

Synchronise with class learning.

Check learning the same evening. The pupils may even have it completed before the end of their bus journey home!

This can also be used in a flipped learning style, set the app before you teach the content.

Pupils need to complete either one topic, or complete all the topics before you teach it, within the classroom. You can check improvements by asking them to complete the test again and checking if they improve their marks.

Set as consolidation work or challenge for your younger students

Use it to prompt a scientific debate around climate change, energy security or the use of renewables with schools.

Project work

This could be the impetus for renewable energy investigative work.

Cross-curricular engagement (Compliments geography and communication elements of KS3)

Extracurricular activities

Do you run an Eco team, or an environmental group? Are you working towards your Eco Schools Green Flag award, or are you renewing soon? Whatever stage you are at on this environmental journey with your students and school, the S4S app can support and extend your path. Use the S4S app to promote discussion and perhaps start a group of young people or staff within school.

Bridging units from primary to secondary. Set common goals. Provide primary teachers with the rubric and allow them to work through certain topics.

Set one topic at primary school for over the school holidays and pick the remaining topics up on return to secondary, including planning solar panels on the school roof. Was the school roof as they visualized? A new school, people and buildings are always fascinating. Stimulate their natural curiosity.

Home learning

Offer an alternative piece of work, with a unique style. A plethora of uses without the need for direct teacher guidance.

Enrichment and extension activities from science, to English, maths to history, the energy crisis affects us all.

Confident in the knowledge that the pupils are safe, they are not exposed to advertising, as on other free apps. The school does not need to subscribe.

Pupils can generate unique log ins for the teacher to see interaction time, scores from quizzes and progress through the various learning journeys.

The Solar for Schools App follows the style of Project Based Learning, to make learning come alive for students.

Our app aims to engage pupils in solving real-world Energy problems, using knowledge gained from the S4S app to create a real solar panel system for the school as well as develop a presentation for a real audience.

As a result, students develop deep scientific content knowledge on energy, as well as critical thinking, collaboration, creativity, and communication skills. Project Based Learning unleashes a contagious, creative energy among students and teachers.



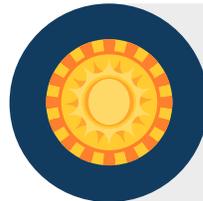
Our app is aligned to the national curriculum



Learning reinforced throughout varying styles of activities



Work is scaffolded to help the learners



Learning is assessed and recorded for the teachers



By encouraging sharing of info pupils can coach each other



Real life planning & design examples are given

Project Based Learning (PBL) is a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging, and complex question, problem, or challenge. The question the S4S app aims to solve is;

Can solar panels be effectively installed on our school roof?

Ideal for home learning.

Project Based Learning can be transformative for students – especially those furthest from educational opportunity and those less engaged in lessons, be it face to face or online.

Outline

Most of the KS3 Science energy content for the national curriculum is covered. Ideal to enhance your learning, revisit past work or motivate students by using their knowledge to put real knowledge into practice. Elements of English, maths, geography and history are also covered and ethical issues covered in PSHE or the RE curriculum are considered.

Empowering children to make real life decisions which could not only reduce the energy costs of their own school, but improve the environment for everyone, by reducing the carbon dioxide emissions is just one reason why children should engage with this app.



Safe Log in/Authentication

Users opening the S4S app for the first time will generate a random code to identify their account and will be prompted to set a nickname and set a security question to authenticate. Users will be required to register an account to unlock all features within the app, no sensitive information will be collected to register or authenticate.

Automatic marking and class analysis

Students' answers are marked instantly with on-screen feedback and an allowance for minor spelling mistakes, saving hours. Instant rewards in the form of badges are generated for students. Compare progress in class through medals gained and levels completed. (More on this on page 17).

Leaderboard

Compare classes / teams within your school and compare their progress to other schools. When a user is logged in, and has set their school (and class, optionally) the total number of points they have goes towards their school's position in the regional and national leaderboards, and towards the class's position within the school leaderboard.

The Unique Design Journey

The design journey centers around the Solar for Schools design tool (also called the Paneliser). This allows them to create a solar panel system for their own school, and generate statistics and reports based on their work. Access is from three different points within the S4S app; from the top of the home screen, directly from the Paneliser icon within the tab bar, and as an extension of the solar power learning module. This tool enhances the place-based¹ solar learning available in the app.

Image Upload

Users will be soon be able to upload pictures of their school roof within the design journey for sharing with Solar for Schools.

¹Place-based learning, is learning focused on local themes, systems, and content which is personally relevant to the learner. See more [here](#)

Glossary

The briefcase tab will also give users access to the glossary, a searchable database of terms used within the app, listed alphabetically, which users can click on to open a subpage which contains a definition of the selected word.

Quizzes

Each module contains an end of unit quiz, comprised of set question type templates and shuffled predefined questions. Medals, and therefore points, are won based on percentage score achieved in the quiz. Previously completed quizzes can be accessed within the briefcase tab, and selecting the individual module, and may be re-attempted at any time, along with any of the content previously accessed.

Social Media Sharing

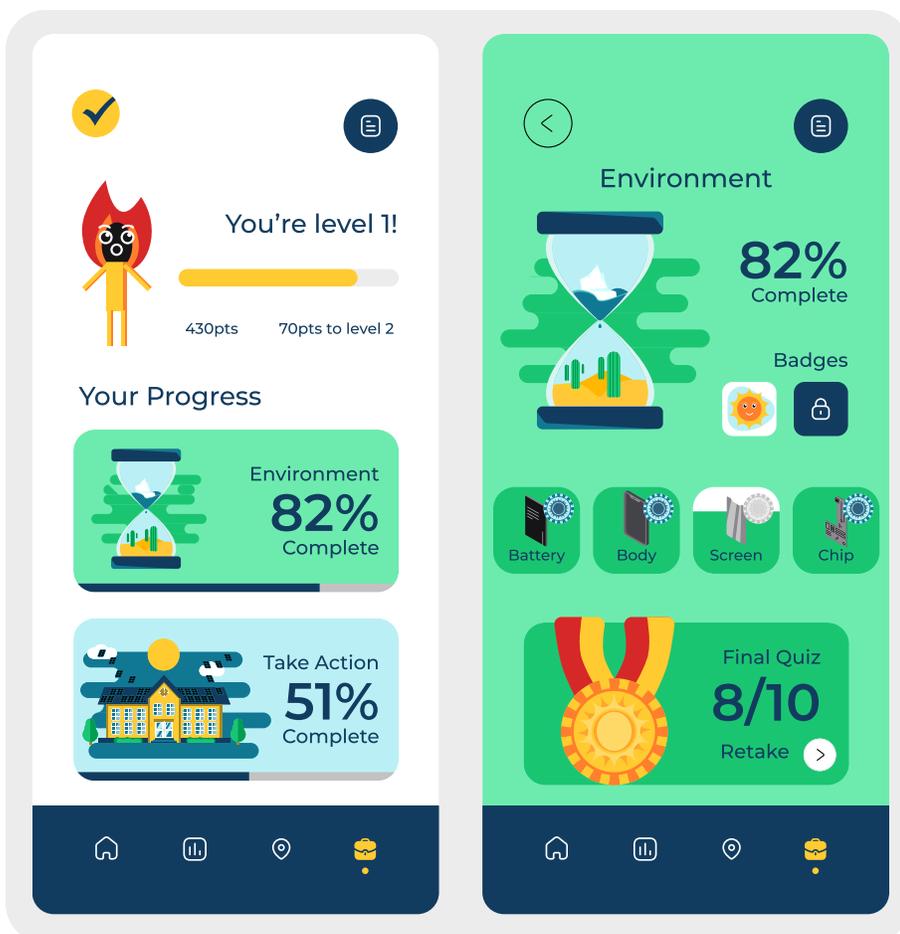
Upon completing the design journey, users will be able to share their work on social media platforms, Instagram, Twitter, and Facebook, of their choosing, in the form of a screenshot of their design, the medal they achieved for it, a few key stats, and the Solar for Schools logo and a unique hashtag. Users will also further into the share journey and be able to generate a pdf report with information specific for their school, about the logistics of a real solar panel system, intended for teacher or administrator reference.



Monitor your pupils progress through the Solar for Schools app. Each question is carefully written by teachers to assess and improve students' knowledge and understanding.

Easily track your students' progress as the S4S app functionality can track where a user is within one of the journeys. A screen will only be marked as complete once it has been interacted with, and incomplete if the user has navigated past it with the next arrow.

How long your pupils have spent on different units, their test scores? Were they resilient and tried again? We've got it all stored for you.



The briefcase tab (progress tab) will give users access to their progress displaying their current level and character, points total, and percentage completion of each module they have attempted. Modules are split as follows: Take Action, Energy, Electricity, Environment, and Efficiency.

Clicking each module will expand into a separate page, showing progress in each unit, including medals won, final quiz score if taken, and any badges unlocked.



Resilience and perseverance are rewarded. If students have struggled on certain questions and concepts, specific encouragement and badges can be obtained, for repeating summative assessments*

By participating within the app, users will win medals and unlock badges, which have varying numbers of points attached, these points move users up levels and unlock new characters. All content within the app is broken down into units, every unit is worth a medal, from coal to bronze, silver, gold, and finally platinum. End of module quizzes count as a unit as well. Modules, which consist of groups of units, do NOT win a medal, but are tracked percentage completion in the same way units are. The medal awarded directly corresponds to the percentage of content interacted with, for content units, or the percentage score achieved on the quiz.

The score percentage is calculated based on the number of correct answers out of the total number of answers. Within a learning content unit, the score is based on the total number of screens that are interacted with out of the total screens in the unit. For example, if a screen has a video, and the user does not play the video instead clicking to the next screen, that screen is incomplete, and decreases the total score. Similarly, if a user does not answer a question or label a diagram, or clicks next on a text screen within a few seconds, these screens are marked as incomplete.

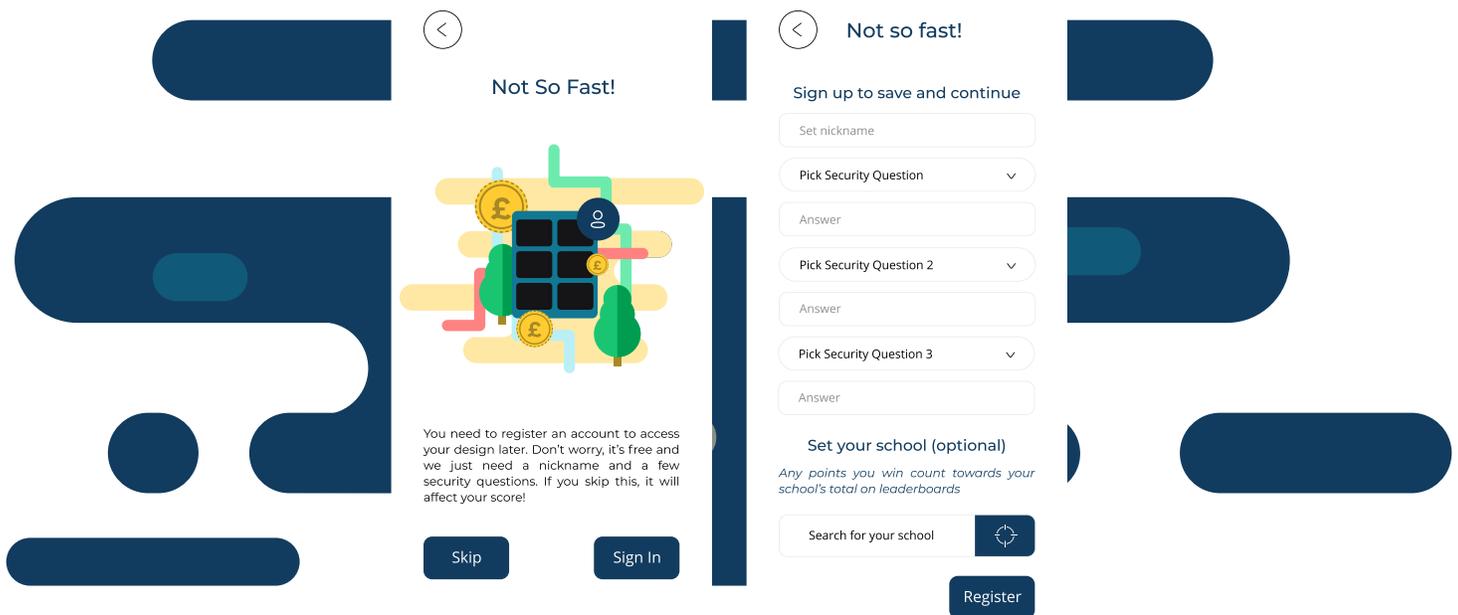
Points from medals is the main method - out of two ways - to win points, the other being unlocking badges. Points accumulate to progress users to higher levels, and if the user is registered to a school, all points pool together towards the school total.

Badges are won by users completing random and often specific tasks within the app, that they are unaware of, and as such can pop up at random points within units and elsewhere in the app. Badges are worth a different number of points based on their difficulty.

Medals and badges can also be awarded in the Take Action module relating to the percent complete the students design is, and how much they have interacted with the content.

*the questions in summative assessments change

All content within the app is broken down into modules, which break down into units. Completing each unit wins the user a medal, in the rewards structure. There are two distinct buckets of content accessible within the Solar for Schools app, and these are differentiated by whether the user is logged in or not.



The share journey is the first journey that is completely locked. If a user is not logged in and opts to continue through to this journey, they will be met with a popup requesting they register an account.

Getting Technical

The information architecture of the app is mixed, as separate sections serve differing purposes; the overarching architecture type most closely follows a matrix structure, with a tab bar used to direct users to distinct user journeys. Within these journeys, a mostly sequential structure is followed, with back and forward arrows used to guide users through the journeys in the S4S app. There are elements of hierarchal structure throughout, providing visual clues for users, and alphabetical ordering is used for a glossary within the app.