Science T Level

Essential Skills Guide

Skills Builder PARTNERSHIP

Technical Education Networks

About this Guide

This guide has been produced by Skills Builder Partnership to support teachers with identifying and utilising opportunities within the T Level curriculum to develop and progress their students' essential skills. It can be used in a variety of ways including in curriculum planning, schemes of learning and/or lesson plans.

What are essential skills?

At Skills Builder, we define a skill as a repeatable action whereby the more you do it, the better you become. It's something that can be taught.

Essential skills are those highly transferable skills that everyone needs to do almost any job, which make specific knowledge and technical skills fully productive. They are therefore distinct from basic skills (literacy, numeracy and digital skills) and technical skills (specific to a particular sector or role, sometimes drawing off a particular body of knowledge).

Essential skills can unlock learning in the classroom, boosting academic outcomes, perseverance and self belief. They halve the likelihood of being out of work, and increase earnings across a lifetime. They even boost wellbeing and life satisfaction. You can read more on the research around essential skills on the Skills Builder website.

The Universal Framework

The Universal Framework: The Skills Builder Universal Framework is a tool for measuring and building essential skills. It breaks the 8 essential skills down into a sequence of steps, starting from absolute beginner through to mastery. It is supported by research and was developed with leading businesses, academics and educators. It consolidates an array of different skills frameworks into something comprehensive and practical.

The Universal Framework was Developed by the Essential Skills Taskforce: for more information see [Towards a Universal Framework for Essential Skills]

Building your students' essential skills:

Students can complete an online self-assessment using the Skills Builder Benchmark tool to discover their initial skill score. Alternatively, you can use the Universal Framework as a useful tool to explore what progress in a particular skill might look like for your students.

- You may find that your students have different starting points and will develop their essential skills at different rates and through different experiences, such as industry placements and classroom activities. Students' progress through the skill steps may not be linear.
- You may wish to use some of the suggested activities in this guide to support your students in their learning journey and to build their essential skills as they progress through the T Level course.
- The activities suggested in this guide are not an exhaustive list and there will be other ways to develop these core skills.

In the T Level specification for **Science**, there are seven core skills identified, with the main essential skills supporting development of these core skills below:

Core Skill 1: Project management

Core Skill 2: Researching

Core Skill 3: Working with others

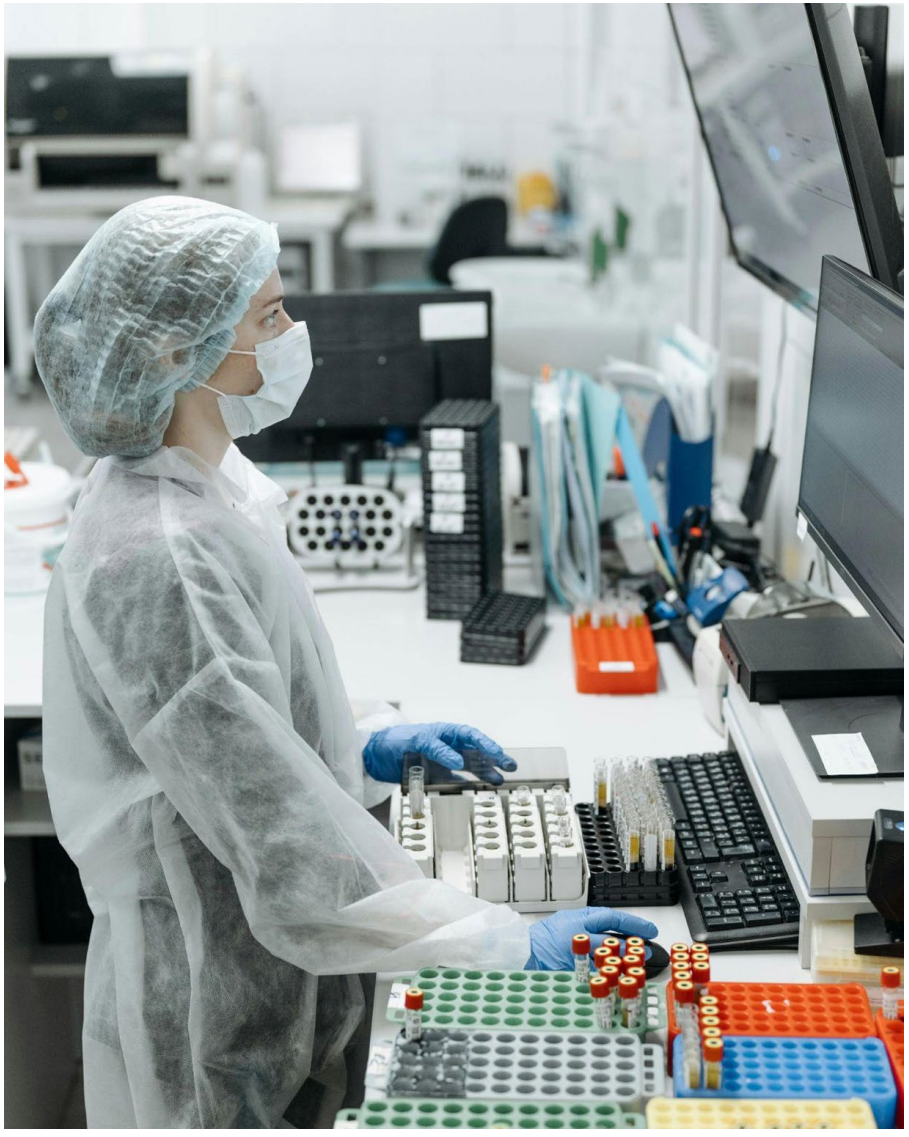
Core Skill 4: Creativity and innovation

Core Skill 5: Problem solving

Core Skill 6: Communication

Core Skill 7: Reflective evaluation

Core Skill 1: Project management



Why developing project management skills is important for students to progress in their future career:

- **Time management:** Careers in the science sector may involve working on multiple projects simultaneously. Working to prioritise and keep track of different tasks and timelines to ensure you meet deadlines.
- **Conducting experiments:** If taking part in experiments as part of your science career, being able to organise and plan your experiments will lead you to more reliable results and effective analysis.
- **Data and resource management:** Organising, tracking, and reporting experimental data and resource use effectively supports efficient project management.

Core Skill 1: Project management

To develop project management, building essential skills in problem solving and creativity are important.

Examples this may be evidenced through:

- independently producing high-level project plans, considering project deliverables, project inputs, timing of activities, resources and financial considerations, adherence to health and safety and the maintenance of quality outcomes.

Build students' Problem Solving skills

Can students complete tasks by finding the information they need themselves?

STEP 3

Example activities to develop this:

- Students **compile** a list of resources that could be used to learn more about a set topic.
- Students **create** a set of questions that other groups must answer using only the sources of information on the list.
- Students **reflect** on the different ways they can find information.

Can students explore problems by creating different possible solutions?

STEP 4

Example activities to develop this:

- **Present** students with a potential problem they might encounter while undertaking an experiment, e.g., not enough equipment for a large class.
- Students **produce** three different solutions to the problem.
- As a class **discuss** the different options and select the best potential solution.

Build students' Creativity skills

Can students generate ideas when they have been given a clear brief?

STEP 3

Example activities to develop this:

- **Present** students with a basic procedure for a specific science experiment.
- Students **compare** the procedure in groups looking for improvements.
- As a class **agree upon** a more detailed procedure that is easier to follow and likely to produce more accurate results.

Can students generate ideas to improve something?

STEP 4

Example activities to develop this:

- Students take an existing science experiment, process or product and **produce** multiple ways to improve it.
- Students **evaluate** the suggested improvements against a set of success criteria.

For more ideas and resources to build your students' essential skills, check out the Universal Framework and the Problem Solving and Creativity workshops.

Core Skill 2: Researching

Why developing research skills is important for students to progress in their future career:

- **Critical thinking:** Research skills will enhance students' ability to analyse information, form hypotheses, and draw evidence-based conclusions.
- **Information literacy:** Research skills enable students to find, evaluate, and use reliable scientific information effectively.
- **Technical proficiency:** Students gain hands-on experience with lab equipment, techniques, and data analysis tools used in scientific research.
- **Keeping up-to-date:** Developing research skills helps students stay current with new discoveries, procedures, and equipment in their field, ensuring their knowledge remains relevant in the rapidly evolving science industry.

Core Skill 2: Researching

To develop research skills, building essential skills in problem solving and staying positive are important.

Examples this may be evidenced through:

- conducting a review of independently selected scientific literature and other appropriate primary/secondary sources and reference these sources appropriately.

Build students' Problem Solving skills

Can students explore complex problems by identifying when there are no simple technical solutions?

STEP 6

Example activities to develop this:

- Students **evaluate** a list of science problems and **classify** them as simple or complex problems.
- Students **discuss** how their approach to problem solving might differ depending on if the problem is simple or complex.
- Students **create** a series of questions to help determine if a problem is simple or complex.

Can students explore complex problems by building their understanding through research?

STEP 7

Example activities to develop this:

- Set students a complex problem, e.g., planning the logistics of a particular experiment.
- Students identify a set of smaller questions that will help them address the larger problem.
- Students research the smaller questions individually and discuss how these collectively supports solving the overall problem.

Build students' Staying Positive skills

Can students keep trying when something goes wrong and think about what happened?

STEP 4

Example activities to develop this:

- Students **reflect** on an experience when something went wrong (or could share an example one).
- Students **analyse** what happened, **consider** if anything could have prevented it and **consolidate** what learnings they can take from it for the future.

Can students look for opportunities in difficult situations?

STEP 7

Example activities to develop this:

- **Present** students with a scenario e.g., there has been a chemical spillage in the laboratory or storeroom.
- Students **identify** opportunities that could be explored when dealing with the situation, including any lessons learnt.
- Students **create** their own scenarios and exchange in pairs to suggest potential opportunities.

For more ideas and resources to build your students' essential skills, check out the Universal Framework and the Problem Solving and Staying Positive workshops.

Core Skill 3: Working with others

Why developing the ability to work with others is important for students to progress in their future career:

- **Collaboration:** Most projects require teamwork, with stakeholders from various disciplines working together to solve complex problems and achieve common goals.
- **Communication:** When working with diverse teams, being able to effectively share specific findings and ideas in a way that can be understood by non-experts is very useful.
- **Interdisciplinary research**: Modern scientific challenges often require expertise from multiple fields, necessitating cooperation across disciplines to drive innovation and discovery.

Core Skill 3: Working with others

To develop the skill of working with others building essential skills in speaking, listening and teamwork are important.

Examples this may be evidenced through:

- identifying their own role in relation to the wider team;
- meeting their responsibilities when working in a wider team by ensuring that the project is compliant with relevant regulations.

Build students' Speaking skills

Can students speak clearly to groups of people they know?

STEP 1

Example activities to develop this:

- Students **discuss** and **create** a list of principles for speaking clearly to groups.
- Students **present** on a topic of their choice to the class.
- Students **peer assess** based on the decided principles agreed.

Can students speak effectively by making points in a logical order?

STEP 3

Example activities to develop this:

- Students **create** a presentation to explain a standard operating procedure (SOP) - this could be to a technical or non-technical audience.
- Students **focus** on the order in which they present information and how this might impact their audiences' understanding.

Build students' Listening skills

Can students listen to others and record important information?

STEP 5

Example activities to develop this:

- Students **listen** to information on a topic area and record the key pieces of information.
- Students **compare** the information they recorded and discuss the different methods they can use to take notes.

Can students show they are listening by summarising or rephrasing what they have heard?

STEP 8

Example activities to develop this:

- Students **listen** to a set of instructions to carry out a science experiment and then **summarise** what they heard.
- In pairs students **role play** laboratory assistants, one student has a set of instructions they must **share** and the other must **rephrase** what they heard. Student then swap roles.

Build students' Teamwork skills

Can students work well with others by taking responsibility for their tasks?

STEP 3

Example activities to develop this:

- Students are each given different aspects of a topic to **plan**.
- As a group they must **combine** all the different aspects to produce an overall presentation for the topic.

Can students contribute to group decision making?

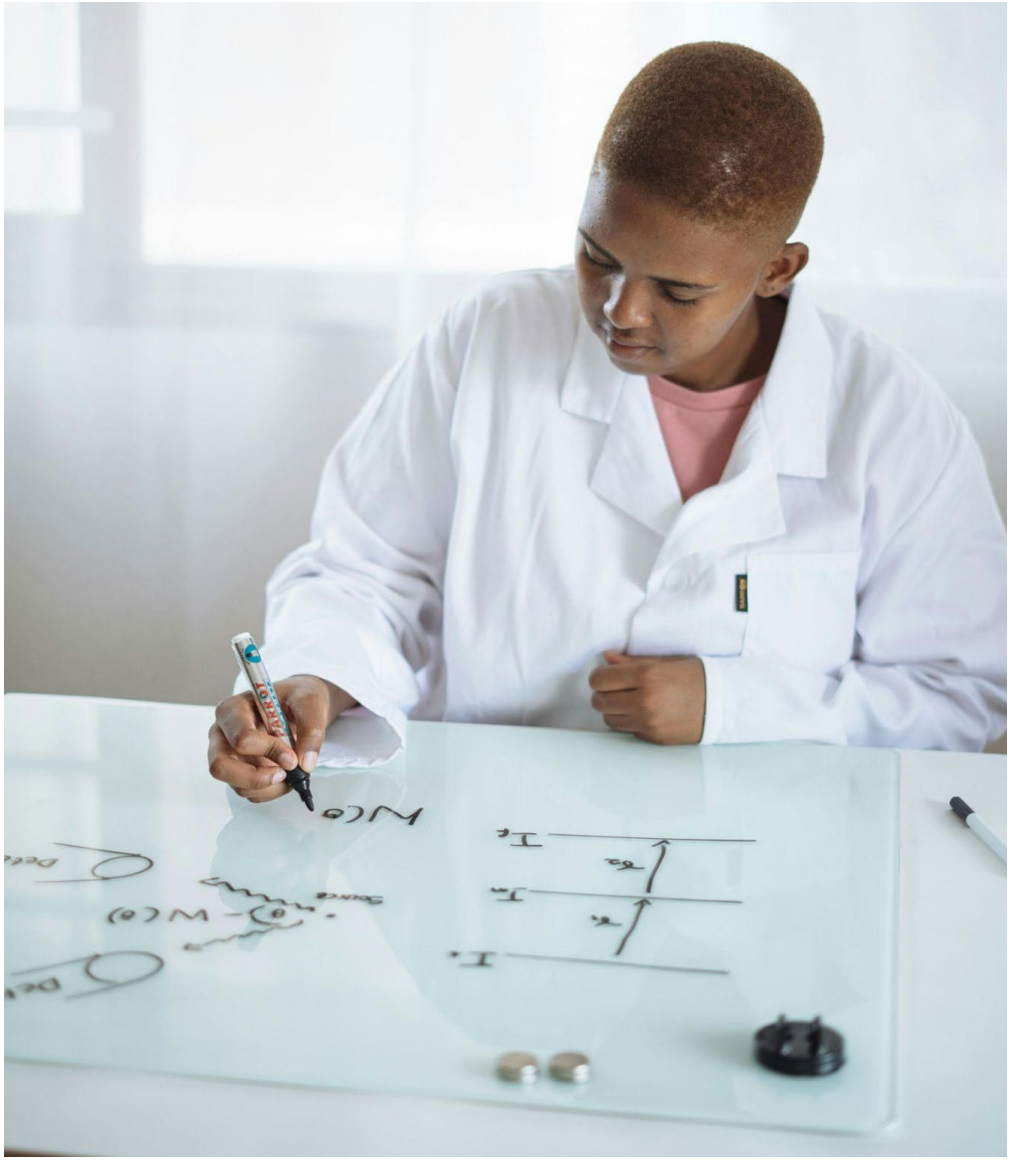
STEP 6

Example activities to develop this:

- Students **research** different ways to collect data.
- Students **share**, in groups, what they have learnt.
- Groups must **reach a unanimous consensus** on which ways to collect data in different given scenarios.

For more ideas and resources to build your students' essential skills, check out the Universal Framework and the Speaking, Listening and Teamwork workshops.

Core Skill 4: Creativity and innovation



Why developing creativity and innovation skills are important for students to progress in their future career:

- **Problem-solving:** Creative thinking enables scientists to approach complex issues from novel angles, leading to innovative solutions and breakthroughs in research.
- **Experimental design**: Creativity helps in designing unique experiments and methodologies to test hypotheses and explore new scientific frontiers.
- **Technological advancement**: Innovation skills drive the development of new tools, techniques, and technologies that can revolutionise scientific research and applications.

Core Skill 4: Creativity and innovation

To develop creativity and innovation skills, building essential skills in problem solving and creativity is important.

Examples this may be evidenced through:
- making creative, innovative improvements to scientific practice, processes and outcomes by following an evaluation cycle.

Build students' Problem Solving skills

Can students explore problems by creating different possible solutions?

STEP 5

Example activities to develop this:
- **Set** students a problem such as "how to keep track of chemicals in a lab".
- In groups or pairs students **produce** multiple solutions / plans on how to answer the question.
- Students **share** these ideas a class and **discuss** the differences.

Can students explore complex problems by analysing cause and effects?

STEP 8

Example activities to develop this:
- Students **examine** the procedure for a particular experiment or scientific process and **discuss** how a set of proposed changes may affect the procedure/process.
- Students **discuss** if they think the changes would produce positive or negative effects and the idea of intentional and unintentional cause and effect relationships.

Build students' Creativity skills

Can students generate ideas when they have been given a clear brief?

STEP 3

Example activities to develop this:
- Students **produce** ideas on the impact of innovation in the science sector.
- **Compare** the ideas generated across the class.

Can students generate ideas by combining different concepts?

STEP 5

Example activities to develop this:
- Students **produce** individual ideas on the impact of not following COSHH regulations.
- In pairs, students **combine** the different ideas into one new idea that will have the most impact.

Can students develop ideas by considering different perspectives?

STEP 10

Example activities to develop this:
- **Share** a scientific process with students.
- Students **consider** the priorities of different stakeholders and discuss how these priorities might affect the process.

For more ideas and resources to build your students' essential skills, check out the Universal Framework and the Problem Solving and Creativity workshops.

Core Skill 5: Problem solving

Why developing problem solving skills is important for students to progress in their future career:

- **Carrying out experiments:** Problem-solving skills are fundamental to applying the scientific method effectively, allowing researchers to formulate hypotheses, design experiments, and interpret results.
- **Troubleshooting:** In laboratory and research settings, the ability to identify and resolve issues quickly is essential for maintaining experimental integrity and progress.
- **Innovation**: Strong problem-solving skills enable scientists to develop novel approaches to challenges, potentially leading to groundbreaking discoveries or technological advancements.
- **Adaptability:** Science is constantly evolving, and problem-solving skills help professionals adapt to new technologies, methodologies, and unexpected research outcomes.

Core Skill 5: Problem solving

To develop problem solving, building essential skills in problem solving, creativity and aiming high are important.

Examples this may be evidenced through:

- solving a problem within a science context, by identifying and clearly defining a problem and deciding on a change to be made;
- implementing the changes, using new technologies as appropriate, evaluating the impact and continuing to monitor any changes.

Build students' Problem Solving skills

Can students explore complex problems by analysing the causes and effects?

STEP 8

Example activities to develop this:

- Students **evaluate** a scenario; for example, there is a chemical spillage in the laboratory.
- Students **determine** what the potential effects this scenario may have for different stakeholders and the normal operating of the laboratory.

Can students create solutions for complex problems by generating a range of options?

STEP 9

Example activities to develop this:

- Students **identify** a problem they may be faced with in the workplace.
- Students **produce** at least 3 different possible solutions for the problem.
- Students **discuss** the potential outcomes the different solutions could produce and choose their preferred option.

Build students' Creativity skills

Can students use creativity in the context if their work?

STEP 6

Example activities to develop this:

- Students **create** a list of different ways they can use creativity in the workplace.
- Students **evaluate** situations in the workplace and **suggest** ways that they could use creativity to improve a situation or make it more efficient.

Can students use mind maps to develop ideas?

STEP 8

Example activities to develop this:

- Students **create** a mind map for a problem statement.
- Students **compare** their mind maps in pairs or groups.
- As a class, students **create** a collective mind map template to use in the future.

Build students' Aiming High skills

Can students work with a positive approach to new challenges?

STEP 4

Example activities to develop this:

- Students **reflect** on a time they have succeeded at something new.
- Students **discuss** what factors may have contributed to their success or what they learnt.
- Students **create** a toolbox of strategies they can use when facing new challenges.

Can students set goals, ordering and prioritising tasks to achieve them?

STEP 7

Example activities to develop this:

- Students are **tasked** with a problem, such as how to ensure all laboratory equipment is serviced and maintained without disrupting services.
- Students **produce** a project timeline with SMART targets. The targets must be Specific, Measurable, Achievable: Realistic and Timed and have considered the needs of all potential stakeholders.

For more ideas and resources to build your students' essential skills, check out the Universal Framework and the Problem Solving, Creativity and Aiming High workshops.

Core Skill 6: Communication

Why developing communication skills is important for students to progress in their future career:

- **Communicating research:** Scientists must effectively communicate their findings through publications, presentations, and reports to share knowledge and advance their field.
- **Collaboration**: Clear communication is essential for successful teamwork in research projects, enabling efficient exchange of ideas and coordination of efforts.
- **Public engagement:** Scientists often need to explain complex concepts to non-experts, including policymakers, funding bodies, and the general public, to gain support and promote scientific literacy.

Core Skill 6: Communication

To develop communication, building essential skills in speaking, and listening are important.

Examples this may be evidenced through:

- providing results and recommendations (written and verbal) to customers/clients, for example: communicating in a clear and unambiguous way, tailoring language and technical information to the audience;
- actively listening to the client's contributions and asking questions to test understanding.

Build students' Speaking skills

Can students speak engagingly by using facts, visual aids and examples to support their points?

STEP 7
STEP 8

Example activities to develop this:

- Students **prepare** a presentation about their industry placement.
- Students **suggest** improvements they could make to get even more from their industry placement in the future, using visuals aids and facts to **support** their suggestions.

Can students speak adaptively by changing their language, tone and expression depending on the response of listeners?

STEP 10

Example activities to develop this:

- Students **take part in** a role play, for example new staff starting at a laboratory.
- Students **take on** the roles of different stakeholders.
- **Set questions** for the 'audience' to ask that will **challenge** the students to adapt their answers.

Build students' Listening skills

Can students listen to others and tell someone else what it was about?

STEP 3

Example activities to develop this:

- Split students into two groups, each group listens to an extended talk on a relevant topic.
- Give students time to reflect on what they heard.
- Pair students up, one from each group, they share what they remember about the talk they heard.
- Students return to their groups and compare the information they have and feedback to the whole class.

Can students use open questions to deepen their understanding of what they heard?

STEP 7

Example activities to develop this:

- Students **categorise** a list of questions as open or closed.
- Students **listen** to a student presentation on a specific topic and **create** a list of open questions to improve their understanding.

For more ideas and resources to build your students' essential skills, check out the Universal Framework and the Speaking and Listening workshops.

Core Skill 7: Reflective evaluation

Why developing reflective evaluation skills is important for students to progress in their future career:

- **Continuous improvement**: Reflective evaluation allows scientists to critically assess their methods, results, and overall approach, leading to ongoing refinement of their research practices.
- **Error identification**: The ability to reflect on one's work helps in identifying potential mistakes or biases in experiments, enhancing the reliability of scientific findings.
- **Career growth:** Self-reflection enables scientists to recognize their strengths and areas for improvement, guiding their professional development and career choices.
- **Ethical considerations**: Reflective skills are crucial for evaluating the ethical implications of scientific work, ensuring responsible conduct in research.

Core Skill 7: Reflective evaluation

To develop reflective evaluation, building essential skills in problem solving and aiming high are important.

Examples this may be evidenced through:

- making improvements to own practice, for example having completed a task, reviewing and suggesting improvements and considerations of lessons learnt for own professional development.

Build students' Problem Solving skills

Can students complete tasks by following instructions?

STEP 0

Example activities to develop this:

- Students **create** a set of instructions for a standard operating procedure (SOP).
- Students **swap** their instructions with another group and **reflect** on what makes good instructions and how to follow them.

Can students create solutions for complex problems by evaluating the positive and negative effects of a range of solutions?

STEP 10

Example activities to develop this:

- Students **identify** a complex problem they have worked on.
- Students **reflect** on the approach they used to address the problem.
- Students **identify** the positive and negative effects their approach produced.
- Students **consider** the implications of their approach and **suggest** alternative approaches they could have taken that may have addressed them.

Build students' Aiming High skills

Can students work with pride when being successful?

STEP 3

Example activities to develop this:

- Students **reflect** on a time they have been successful; how did they know they were successful?
- Students **reflect** on what motivates them to be successful and **share** strategies they can use to motivate themselves in their education and in the workplace.

Can students set goals for themselves?

STEP 5

Example activities to develop this:

- Students **reflect** on a personal achievement.
- Students **reflect** on the factors that helped them with the achievement.
- Students **consider** a potential achievement in the short term and in the long term.
- Students **produce** a plan to help them work towards their achievements. They could **explore** the idea of SMART targets.

For more ideas and resources to build your students' essential skills, check out the Universal Framework and the Problem Solving and Aiming High workshops.

For more information on building your student essential skills please visit the Skills Builder website at https://www.skillsbuilder.org/

For more resources and support for this T Level please visit https://www.technicaleducationnetworks.org.uk/health-science/