Making design and technology accessible to all

Making design and technology (D&T) lessons accessible to all students is not always an easy task, but with some forward thinking and careful planning, every learner can experience its benefits. Ed Charlwood, a D&T teacher of almost 20 years, shares five tried-and-tested methods that could help you.

1 Use universal design for learning (UDL) principles

To ensure all students can access and engage with the lesson content, apply Universal Design for Learning (UDL) principles by offering multiple means of engagement, representation and action/expression. Each of these principles targets a specific aspect of learning, ensuring that students can interact with the material in a way that works best for them.

- **Representation**
  Present information in multiple formats to help students absorb and process content. 3D-printed manipulatives help students engage with abstract concepts like angles or geometric shapes through tactile learning. For instance, try using a 3D angle teaching aid to allow students to physically manipulate models and better understand geometric relationships. Additionally, visual tools like Picture Communication Symbols (PCS), Open Symbols or The Noun Project can aid language processing for students with different levels of literacy or language proficiency.

- **Action/Expression**
  Offer students varied ways to demonstrate their understanding. You can encourage audio recording devices (such as Canva Uploads > Record yourself or Flip) for verbal note-taking or allow students to record their reflections. This gives students a chance to express their learning through speech or multimedia rather than written forms alone.

- **Engagement**
  Use a mix of activities to keep students motivated and engaged, catering to different interests and preferences.
  If budget allows, explore LEGO Education kits like Spike Robotics. They offer hands-on problem-solving challenges with adjustable difficulty to engage both tactile learners and those who enjoy robotics and coding.

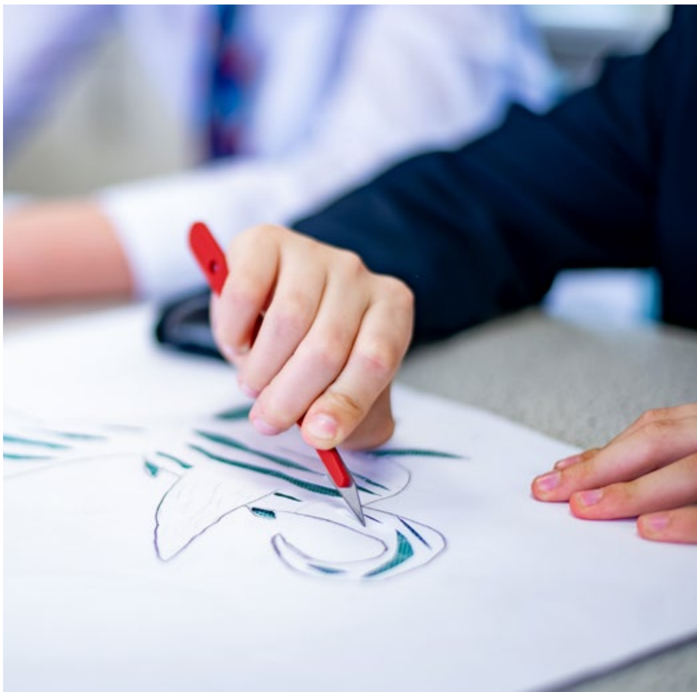
2 Scaffold complex concepts

Breaking down complex D&T concepts into manageable chunks helps students build a strong foundational understanding. This approach ensures that they develop critical thinking and problem-solving skills step by step, moving from concrete to abstract thinking.

- **Chunking information**
  Start with concrete examples, such as a basic product analysis or an initial exploration of a making process. Gradually increase complexity by connecting these examples to real-world contexts.

- **Use construction kits for physical representation**
  For example, Micro:bits are widely available and can be used across the D&T curriculum - kitchen timers, virtual egg drops, wearable activity monitors etc. Strawbees kits also allow students to build structures that explore basic engineering concepts. This enables students to physically manipulate elements and experiment with engineering challenges without requiring advanced fine motor skills.

- **Categorisation tools:**
  Use tools like concept card sorts with visual cues. These cards help categorise and organise information, making abstract concepts more tangible and manageable. For example, which of these is a cutting tool: a zester, a 3D printer or a wooden mallet?



3 Connect with real-world applications

Making STEM content relevant to students' lives increases engagement and motivation. Show how classroom concepts can solve real-world problems and offer practical applications that students can relate to.

- **Makedo Cardboard Construction Kits**
  Let students prototype low-cost solutions, encouraging resourcefulness and creative thinking.
- **Adaptive Workshop Tools**
  Consider incorporating tools like large-grip knives and talking scales, which can make it easier for students with physical disabilities to participate in hands-on projects. Explore the Make:able challenge.
- **LEGO SPIKE Prime Robots**
  Provide an opportunity for students to tackle real-world engineering and coding challenges, such as creating an automated system for recycling or designing a smart home device. By building tangible models, students see how STEM principles come alive in real-world scenarios.

4 Provide accessible digital tools and materials

Choosing the right digital tools is essential for creating an inclusive learning environment. Select technology that supports diverse learning needs and integrates accessibility features like text-to-speech, speech-to-text, and screen reader compatibility.

- **Canva for Education**
  Provides accessible design tools that students can use to create presentations, posters, or infographics with high contrast and clear fonts, making the content more accessible for students with visual impairments.
- **Translation Tools**
  Platforms like Google NoteBook LM can translate resources into various languages to support English as an Additional Language (EAL) learners.
- **3D Models**
  Complex structures and features can be better understood by providing digital and physical models, which students can manipulate. This can also apply to historical or scientific structures - there is a huge gallery in Tinkercad. They can also be 3D printed, for example, a simulate-able Newtons Cradle.

5 Use multiple assessment methods

To provide a more holistic view of student progress, consider moving beyond traditional tests. Offering multiple ways for students to demonstrate their knowledge fosters creativity and accommodates different learning styles

- **E-Portfolios**
  Use digital portfolios where students can draw, write, or add pictures to showcase their learning journey. This format encourages reflection and allows students to track their progress over time. Here is an example.
- **Physical project showcase boards**
  Allow students to present their projects in a way that suits their abilities - some may choose to present through visuals, while others might give verbal explanations.
- **Manipulative assessments**
  Use manipulatives (e.g. construction kits or physical models) for students to demonstrate their understanding of D&T concepts through creation and design.
- **Oral assessments**
  Incorporate oral assessments or verbal check-ins using question banks and rubrics to gauge understanding of concepts, especially for students who might struggle with written tests.

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