Making Learning Tangible with Glowforge

Education

glowforge

The World of Work is Rapidly Changing

Employers are adapting to technology advancements and automation by shifting priorities and rethinking expectations for the next generation of employees. Much of this shift is away from specific technical skills and more towards "soft skills" that are attributes, capabilities, and dispositions.

This research summary illustrates how Glowforge leads in supporting skills-based learning, pedagogies, and key disciplines—Career and Technical Education, STEM/STEAM, Experiential Learning, Design Thinking, and Maker Education—that make providing opportunities for students to develop and apply crucial skills both simple and fun!

What's in a Glowforge Lesson?

The Glowforge Education Lesson Library features dynamic learning experiences that offer educators support to facilitate students in planning, creating, customizing, printing, and using their designs.

✓

Lesson overview
to set context and build excitement around the learning experience

✓

Grade and standards alignment
with scaffolding for adapting up or down

✓

Thematic questions
to balance between content knowledge, technical skills, and soft skills

✓

Getting ready guidance
to help educators prepare for the learning experience

✓

Resources and handouts
to help frame and support the learning experience

✓

Reflection questions
to provide opportunities for metacognition and formative assessment

✓

Assessment support
with single-point rubrics for both educator and peer assessment

✓

Pro tips
to provide best practices for teaching, learning, and creating

✓

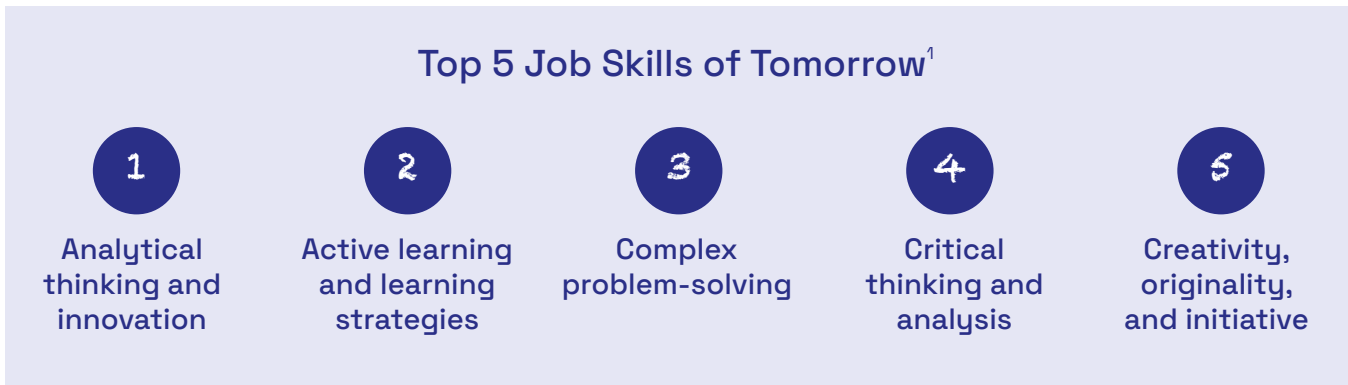**Enhancements and extensions**
for ways to remix and reimagine the experience

See a lesson →

Skills of Today For the Jobs of Tomorrow

According to the World Economic Forum, **critical thinking** and **problem-solving** top the list of the types of skills employers believe will grow in prominence in the next five years. Trends also identify skills in **self-management**—such as **active learning**, **resilience**, **stress tolerance**, and **flexibility**—as being highly important to employers. An unprecedented 97 million jobs may emerge that are more adapted to the new division of labor between humans, machines, and algorithms.

Top 5 Job Skills of Tomorrow[1]

1	2	3	4	5
Analytical thinking and innovation	Active learning and learning strategies	Complex problem-solving	Critical thinking and analysis	Creativity, originality, and initiative

In a recent survey of executives from the nation's leading companies representing industries such as healthcare and information technology, EdWeek reports that employers urge schools to help develop students within capability areas such as:

- Agility and flexibility
- Growth mindset
- Teamwork and collaboration
- Critical thinking and creativity
- Strategic thinking[2]

In their Job Outlook 2020 survey of employers, The National Association of Colleges and Employers (NACE) found that 91.2% of respondents recognize problem-solving skills as the most sought-after attribute employers seek from candidates, with the ability to work on a team coming in second with 86.3%.[3]

With state-of-the-art 3D laser printing technology and a built-in design app, students have endless opportunities to cultivate and apply crucial employability skills while making learning tangible.

1 Whiting, K. (2020, October 21). *These Are The Top 10 Job Skills Of Tomorrow—And How Long It Takes To Learn Them.* World Economic Forum.
2 Top U.S. Companies: These Are the Skills Students Need in a Post-Pandemic World. (2021, March 2). *Education Week*.
3 *Key Attributes Employers Want To See On Students' Resumes.* (n.d.). Www.naceweb.org.

Taking Research from Theory to Application

The limitless potential and promise of Glowforge in the classroom is grounded in research and practical real-world applications. Glowforge's comprehensive learning solution helps educators to easily connect key pedagogies and disciplines with skills application, making real-world learning not just possible, but daily practice.

Experiencing the Future Today

The adaptable lessons provided in the Lesson Library allow students to step into roles of the future by solving real-world problems through the relevant application of both soft and technical skills such as critical thinking and problem-solving. With the Tiny Home Challenge lesson for example, students put their architectural and engineering skills to the test by designing an energy-efficient Tiny Home.

Career and Technical Education (CTE) students are significantly more likely than their peers to report developing problem-solving, project completion, research, communication, time management, and critical-thinking skills during high school.[4] Seventy-seven percent of employers report hiring an employee in part because of their CTE experience in school.[5]

Paving Pathways for Future Doers

Dynamic technology, such as Glowforge, provides access and entry points to excite and encourage students to explore STEM- and STEAM-based careers. With Glowforge, students step into roles that provide hands-on opportunities to apply interdisciplinary knowledge in science, technology, engineering, art, and math. In the Animated Servo Robot lesson, students combine the app's amazing design functions with the simplicity of micro:bit coding to create and program their very own motorized robots.

STEM/STEAM based learning empowers students to explore creative ways of problem-solving, displaying data, and innovating, providing an interdisciplinary link between subjects. Elementary and secondary education in mathematics and science is the foundation for student entry into postsecondary STEM majors as well as a wide variety of STEM-related occupations. High school STEM achievement and coursetaking frequently facilitate STEM-related postsecondary education and employment.[6]

> "Desktop creating offers the same power that desktop computing did when I was a kid. It takes technology out of industry and makes it accessible to a new generation of children, who can use it to build our future."
>
> —Dan Shapiro, CEO & Co-Founder, Glowforge Inc.

4 *CTE: Readiness for All Careers*. (n.d.). ACTE. Retrieved May 3, 2022, from www.acteonline.org/cte-readiness-for-all-careers

5 *Shifting the Skills Conversation: Employer Attitudes and Outcomes of Career Technical Education | Advance CTE*. (n.d.). Careertech.org. Retrieved May 3, 2022, from https://careertech.org/resource/employer-attitudes-CTE

6 *Elementary and Secondary STEM Education | NSF—National Science Foundation* (n.d.). Ncses.nsf.gov.

Connecting Knowledge with Experiences

Glowforge's state-of-the-art printing technology and easy-to-use design application encourage students to foster innovation and hone their creativity and problem-solving skills hands-on with real-world fabrication tools. Lessons such as Operation Organization and R3Design Studio (Repair, Repurpose, Recycle) challenge students to identify a customer's need, problem solve to design a solution, build and test a prototype, and print and deliver a customized design.

> **Experiential Learning** produces student-centered, technology-integrated learning environments that help students think critically, solve problems, collaborate, and engage deeply in the learning process.[7] Laser machining in particular engages students in experimentation to develop methods to achieve a manufacturing outcome.[8]

Learning by Doing

Glowforge fuels the design thinking process by empowering students to engage in critical thinking with hands-on experimenting, prototyping, and creating to meet challenges and solve problems. In lessons such as Customized Pegboard, students have the opportunity to engage in design thinking protocols to identify needs and creatively craft solutions that serve others in their schools.

> **Design Thinking** is a non-linear, iterative process that teams use to understand users, challenge assumptions, redefine problems, and create innovative ways to prototype and test strategies and solutions.[9] It helps students approach problems in a way that promotes inquiry and creates meaningful learning while developing abilities such as navigating ambiguity, synthesizing information, and moving between concrete and abstract ideas.[10]

Applied Skills in Action

Glowforge Education lessons such as Imagination in 3D and Customized Games provide opportunities for students to apply critical thinking skills, explore their own creativity, and use cool features like the Trace and Print tool, all while leaning into the excitement of creation. Through iteration, designing, printing, and assembling students see these ideas come to life before their eyes!

> **Maker Education** is built on the foundation that learning is best done through doing, allowing students to tackle abstract concepts through physical interaction and experimentation to further their understanding. Students are better prepared to pursue their passions and challenge themselves after graduating when they've engaged in making.[11]

7 Kwon, H. (2017). Effects of 3D Printing and Design Software on Students' Outcomes. *Journal of STEM Education: Innovations and Research, 18*(4), 37–42.

8 Flowers, J., Wierzbicki, A., & Weldy, A. (2020). Laser Machining 3D Challenge. *Technology and Engineering Teacher, 80*(1), 8–15.

9 Yu Siang, T. (2009). *What is Design Thinking?* The Interaction Design Foundation.

10 Stanford. (2014). *Stanford d.school.* Stanford D.school.

11 Brancazio, D., & Wendell, D. (n.d.). *The Growth of Making in K-12 and the Expectations for Maker Resources at Universities.* Retrieved May 3, 2022, from http://k12maker.mit.edu/uploads/9/7/5/8/97583140/final-isam_2016_brancazio_wendell.pdf

Help Students Create Their World

Combining state-of-the-art technology with simple-yet-powerful software, Glowforge provides the next generation of creative tools to educators and students of all grade levels.

As a comprehensive learning solution built for every class, Glowforge allows educators to empower their students to think creatively, use technology effectively, and to hone real-world skills. Students develop self-confidence while they explore subject and career pathways in new and exciting ways. With Glowforge, administrators are able to provide new technologies to support student outcomes and success in their schools and districts.

Glowforge and its rich collection of lessons provide hands-on opportunities for students to realize career goals.

Scientists
See Through Gardening Lesson

Engineers
Making Moves Lesson

Mathematicians
Noticing Patterns Lesson

Artists
Community Shadowbox Dioramas Lesson

Fabricators
Step-by-step Tracker Lesson

Historians
Be Here: Now and Then Lesson

"Glowforge has transformed how we approach making and innovation with even our youngest students. It's been quite magical having this machine. We keep our Glowforge on a low table, so that even the youngest students can walk up to it and open the lid. It's become a regular part of the school day."

—Patrick Benfield
Innovation Director
The Magellan School

Hear more →

⬡ Education

glowforge®

Glowforge is invested in preparing the next generation for the future by giving them the opportunity to experience the joy of creation.

Learn more →