



Advanced STEM Master

Competency

Student understands the principles of advanced STEM topics and their effects on our lives and societies.

Key Method

Student uses a range of advanced STEM tools and topics to create projects.

Method Components



What is “advanced STEM”?

While knowledge about topics like coding has become more common, technology has continued to advance at a rapid pace. For success in the 21st century, it is important to recognize that coding is only the beginning, not the end, of the world of STEM.

However, the thought of getting started with more advanced topics like artificial intelligence, blockchain, and big data can feel overwhelming. To put it simply, we define advanced STEM as the emerging technologies that are shaping our present and future. From artificial intelligence to data science, blockchain to machine learning, these technologies are wide-ranging but connected by their immense impact on our lives and societies.

Why should you learn about these topics and technologies?

One of the reasons most often shared for why young people should learn to code is “to prepare them for the jobs of the future.” This is a worthwhile goal; jobs in STEM fields are growing at a rate of close to 8%, compared to just 3.7% for non-STEM jobs. Over 70% of jobs in STEM are actually computing jobs or use computer science in a major way (US Bureau of Labor Statistics, 2021). As a result, learning the fundamentals of a range of advanced STEM topics can be a valuable skill in the workforce.

However, you may not end up in a STEM field. Nevertheless, you should still learn about these advanced STEM topics!

Although learning about these topics can be inherently enjoyable for many, young people need to better understand technology. One of the goals of 21st-century education should be to move students from being digital consumers to digital creators. Learning about advanced STEM topics means that, rather than being a passive user of technology, you better understand how technology is shaping our lives and societies and how you can use technology to make a positive impact in the world.

To truly understand how technology works, you must begin to understand how these emerging and advanced technologies are evolving our experiences of and interactions with the technology of our everyday lives and experiences.

Three Skills of Advanced STEM Learners

Learning about advanced STEM technologies is about much more than just learning how to code. The three skills embraced by great advanced STEM learners are:



1. **Critical Thinking and Problem Solving**

Great learners know that mistakes = learning! They recognize that *something* is likely to go wrong or present a challenge every time they work on a project or learn about a new topic and that this process is actually how they learn and build our skills. They are able to analyze problems, break them down into smaller steps, and work through them while still keeping their cool. They use their previous knowledge and experience to find appropriate solutions and approaches to achieve their goals.

2. **Communication and Collaboration**

Great learners communicate effectively with others about their learning and work in a variety of contexts. They are able to work independently and with others to create unique projects, share experiences, and build new skills.

3. **Knowledge Constructor**

No single person, course, or video can teach you everything you need to know about advanced STEM technologies. Great learners know that they need to combine their knowledge and skills in new settings to find solutions to new problems and continue their learning. They are also able to use a variety of resources and tools to build new knowledge independently.

Supporting Rationale and Research

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Resources

Key Terms & Concepts:

Emerging Technologies: Technologies whose development and/or practical applications are not yet fully realized and are likely to significantly change the status quo. These technologies are often entirely new but also include evolutions of older technologies.

Artificial Intelligence: Creating the capacity for computers to do tasks that would normally require human intelligence.

Machine Learning: Describes the methods used to get machines to learn—that is, to find patterns and make predictions—from data without being explicitly programmed to do so. Machine learning is a subset of artificial intelligence that focuses on learning from data.

Big Data: Extremely large data sets that can be analyzed to reveal patterns, trends, and associations, especially relating to human behavior and interactions. Big data can be the combination of several large data sources to help understand more about the information contained within the data.



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Blockchain: A system in which a record of transactions (often made in Bitcoin or another cryptocurrency) is maintained across several computers that are linked in a peer-to-peer network.

Cryptography: The practice and study of techniques for secure communication, especially to protect against interception from adversaries.

Internet of Things: The large and growing network of devices that are connected to the Internet and to each other.



Submission Guidelines & Evaluation Criteria

To earn the micro-credential, you must receive a passing evaluation for Parts 1 and 3 and a “Yes” for Part 2.

Part 1. Overview Questions

1. How old are you?
2. How would you rate your confidence when it comes to STEM (out of 5 stars)?
3. How would you rate your ability when it comes to STEM?
 - a. I’m a total beginner; I’ve never done this before.
 - b. I’m pretty new to this; I have only a little bit of experience.
 - c. I’ve got some experience and am looking to take my learning to the next level.
 - d. I’ve got lots of experience, and I’m ready for more advanced stuff!
4. How would you rate your interest in exploring a STEM career when you get older (out of 5 stars)?
5. What are you most hoping to get out of your STEAM Hub course? Why?

Passing: The participant has responded to the survey answering all of the question prompts.

Part 2. Work Examples/Artifacts/Evidence

To earn this micro-credential, submit the following artifacts:

Artifact 1: Badges

Upload THREE of the following badges from the STEAM Hub courses:

- Intro to Cryptography
- Intro to Blockchain
- Intro to Machine Learning
- Intro to Big Data
- Intro to Internet of Things (IoT)
- Intro to Artificial Intelligence
- Intro to Databases
- Intro to Networks

Artifact 2: STEAM Hub Course Final Project

For the STEAM Hub course you selected above, please submit a copy of your final project. It must include:

1. the full project file (please do not submit screenshots)
2. any relevant share settings appropriately set to allow anyone to view the project



Artifact	“Yes”	“Almost”	“Not Yet”
Artifact 1	All three badges from STEAM Hub courses were provided.	One or two badges from STEAM Hub courses were provided.	No STEAM Hub course badges were provided.
Artifact 2	The project provided meets the expectations as outlined in the project rubric within the STEAM Hub course at a level of 80% or higher.	The project provided meets the expectations as outlined in the project rubric within the STEAM Hub course at a level of less than 80%.	The project was not provided.

Part 3. Reflection

Please write your responses below (500 words maximum).

1. What was the most challenging part of creating your project? How did you deal with these challenges?
2. What part of your project are you most proud of? Why?
3. Discuss what you have learned about [insert topic here]. Could you see yourself pursuing a career in this industry? Why or why not?

Passing: Response provides reasonable and accurate information that outlines their experience with learning about advanced STEM technologies. Student demonstrates a genuine attempt to reflect on their learning process and how their learning will influence their future.

