

## APPENDICES

**Table 8** Conceptual Framework by (Long and Magerko 2020): Five themes and 17 competencies of AIL

Themes	Competencies	Short Definition
<b>1. What is AI?</b>	1: Recognizing AI	Distinguish between technological artifacts that use and do not use AI.
<b>2. knowledge questions</b>	2: Understanding AI	Critically analyze and discuss features that make an entity "intelligent," including discussing differences between human, animal, and machine intelligence.
	3: Interdisciplinarity	Recognize that there are many ways to think about and develop "intelligent" machines. Identify various technologies that use AI, including technology spanning cognitive systems, robotics, and ML.
	4: General vs. Narrow	Distinguish between general and narrow AI.
<b>What can AI do?</b>	5: AI's Strength and Weakness	Identify problem types that AI excels at and problems that are more challenging for AI. Use this information to determine when it is appropriate to use AI and when to leverage human skills.
	6: Imagine Future AI	Imagine possible future applications of AI and consider the effects of such applications on the world.
<b>How does AI work?</b>	7: Representation	Understand what a knowledge representation is and describe some examples of knowledge representations.
	8: Decision Making	Recognize and describe examples of how computers reason and make decisions.
	9: ML Steps	Understand the steps involved in machine learning and the practices and challenges that each step entails.
	10: Human Role in AI	Recognize that humans play an important role in programming, choosing models, and fine-tuning AI systems.
	11: Data Literacy	Understand basic data literacy concepts such as those outlined in Padro & Marzal (2013)
	12: Learning from Data	Recognize that computers often learn from data (including one's own data).
	13: Critically Interpreting Data	Understand that data cannot be taken at face-value and requires interpretation. Describe how the training examples provided in an initial dataset can affect the results of an algorithm.
	14: Action and Reaction	Understand that some AI systems have the ability to physically act on the world. This action can be directed by higher-level reasoning (e.g. walking along a planned path) or it can be reactive (e.g. jumping backwards to avoid a sensed obstacle).
	15: Sensors	Understand what sensors are, recognize that computers perceive the world using sensors, and identify sensors on a variety of devices. Recognize that different sensors support different types of representation and reasoning about the world.
<b>How should AI be used?</b>	16: Ethics	Identify and describe different perspectives on the key ethical issues surrounding AI (i.e. privacy, employment, misinformation, the singularity, ethical decision making, diversity, bias, transparency, accountability).
<b>How do people perceive AI?</b>	17: Programmability	Understand that agents are programmable.