Table 1: The Knowledge Area, Algorithmic Foundations mapped against sections covered in selected OERs

			Khan Academy Computer Science Theory	**MIT OCW Introduction to algorithms**	**MIT OCW Theory of Computation**	**MIT OCW Introduction To Algorithms (SMA 5503)**	**Harvard Introduction to Computer Science (edX)**	**HackerEarth data structures/ Algorithms/ Basic Programming**	**Standford Algorithms Specialisation (via Coursera)**	**OpenDSA Data structures and algorithms module collection**
AL-Foundational	CS Core	Abstract Data Type and operations	X	X			X	X		X
		Arrays		X		X	X	X		X
		Records/Structs/ Tuples and Objects					X			X
		Linked lists		X		X	X	X		X
		Stacks					X	X		X
		Queues and deques		X			X	X		X
		Hash tables/maps	X	X		X	X	X	X	X
		Graphs (e.g., [un]directed, [a]cyclic, [un]connected, and [un]weighted)	X	X				X	X	X
		Trees	X	X		X	X	X	X	X
		Sets	X	X			X			X
		Search algorithms	X	X		X	X	X	X	X
		Sorting algorithms (e.g., stable, unstable)	X	X		X	X	X	X	X
		Graph algorithms	X	X		X	X	X	X	X
	KA Core	Sorting algorithms	X	X		X	X	X	X	X
		Graph algorithms	X	X		X	X	X	X	X
		Matching	X	X						

	None	Cryptography algorithms (e.g., SHA-256)	X				X			
		Parallel algorithms				X				
		Consensus algorithms (e.g., Blockchain)								
		Quantum computing algorithms								
		Fast-Fourier Transform (FFT) algorithm								X
		Differential evolution algorithm								X
AL-Strategies	CS Core	Paradigms	X	X		X	X		X	X
		Handling exponential growth (e.g., heuristic A*, branch-and-bound, backtracking)		X		X		X	X	X
		Iteration vs recursion (e.g., factorial, tree search)		X		X	X	X	X	
	KA Core	Paradigms							X	
	None	Quantum computing								
AL-Complexity	CS Core	Complexity Analysis Framework		X		X		X	X	X
		Asymptotic complexity analysis (average and worst-case bounds)		X		X			X	X
	KA Core	Little-o, Little-Omega, and Little Theta notations	X			X				
		Formal recursive analysis		X		X		X		X

		Amortized analysis				X				X
		Turing Machine-based models of complexity								
AL-Models	CS Core	Formal automata			X					
		Formal languages, grammars and Chomsky Hierarchy			X					
		Relations among formal automata, languages, and grammars			X					
		Decidability, (un)computability, and halting			X					
		The Church-Turing thesis			X					
		Algorithmic correctness								
	KA Core	Deterministic and nondeterministic automata			X					
		Pumping Lemma proofs			X					
		Decidability			X					X
		Reducibility and reductions			X					X
		Time complexity based on Turing Machine			X					X
		Space complexity (e.g., Pspace, Savitch's Theorem)			X		X			X
		Equivalent models of algorithmic computation								
	None	Quantum computation								

		Column vector representations of qubits								
		Matrix representations of quantum operations								
		Simple quantum gates (e.g., XNOT, CNOT)	X							
AL-SEP	CS Core	Social, ethical, and secure algorithms								
		Algorithmic fairness								
		Anonymity (e.g., Differential Privacy)								
		Accountability/Transparency								
		Responsible algorithms								
		Economic and other impacts of inefficient algorithms								
		Sustainability								
	KA Core	Context aware computing								
Matches		**58**	**15**	**20**	**11**	**18**	**18**	**17**	**14**	**27**

Table 2: Evaluating OERs using criteria from modified rubric from The University of Texas at Austin

	Khan Academy Computer Science Theory	**MIT OCW Introduction to Algorithms**	**MIT OCW Theory of Computation**	**MIT OCW Introduction To Algorithms (SMA 5503)**	**Harvard Introduction to Computer Science (edX)**	**HackerEarth data structures/ Algorithms/ Basic Programming**	**Standford Algorithms Specialisation (via Coursera)**	**OpenDSA Data structures and algorithms module collection**
Criteria								
Created	2014	2020	2020	2005	2018	2012	2020	2011
Usage requirements	Need to make an account/sign up	Accessible without signing up	Accessible without signing up	Accessible without signing up	Need to create an edX account and enrol for this course	Need to sign up for the full experience, but can access tutorials without doing so	Need to create a Cousera account and enrol for this course	Accessible
Breadth, perspectives and accuracy								
The information in the OER is correct	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
There is appropriate coverage of material in a clear, logical manner	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
There is accurate and recent expertise in the relevant subject matter	Accurate: Yes Recent; No updates in the last two years	Yes, accompanying textbook last updated in 2022	Yes	Accurate: Yes Recent: No, lectured in 2005	Yes	Accurate: Yes Recent: no clear updates except for leaderboard updates	Yes	Yes
There is thorough exploration of course content	Yes, for 14/58 topics	Yes, for 18/58 topics	Yes, for 11/58 topics	Yes, for 18/58 topics	Yes, for 14/58 topics	Yes, for 18/58 topics	Yes, for 14/58 topics	Yes, for 27/58 topics

The OER provides theoretical perspectives for the topic(s)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
There are no spelling errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
The OER aligns with course student learning outcomes and objectives	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
There is an authoritative author involved with the OER	Yes, Dartmouth College professors, Tom Cormen and Devin Balkcom	Yes, MIT educators Prof Erik Demaine, Dr Jason Ku and Prof Justin Solomon	Yes, MIT lecturer Prof Michael Sipser	Yes, MIT professors Prof Charles Leiserson and Prof Erik Demaine	Yes, Harvard professor Prof David Malan	Yes, the founders are Sachin Gupta (credentials at Microsoft and Google) and Vivek Prakash	Yes, the lecturer is Columbia University professor, Prof Tim Roughgarden	Virginia Tech lecturer, Cliff Shaffer is the project director
Recommended by other users	--	Yes	--	Yes	Yes	--	Yes	--
Production Quality								
The content in the OER is clear and understandable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
The interface and design are easy to navigate	Yes	Somewhat	Yes	Somewhat: the lecture notes are below the lecture videos and not clearly sectioned	Yes	Yes	Yes	Yes
The OER is designed to promote learning	Yes; discussion forums, activities and lessons included	Yes, practice problems and problem-solving video sessions	Yes, practice problems and exam questions	Yes, practice problems and tests	Yes, practice problems, tests, interactive learning	Somewhat: interactive practice problems and visualisers but no audio and video resources	Yes; there is interactive learning	Yes, interactive learning, visualisers, audio resources
The sound quality is high for audio resources	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Yes
The video and audio quality are high	Yes	Yes	Yes	Average: the videos are a little dated	Yes	n/a	Yes	n/a
Accessibility								
Transcript provided for audio resources	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Yes
Closed captions/subtitles provided for video resources	Yes	Yes	Yes	Yes	Yes	n/a	Yes	n/a

Alt tags/long descriptions are provided for graphics	No	No	No	No	No	No	No	No
The OER is accessible in multiple modes	Yes	Yes: reading online and downloading	Yes, reading online and downloading	Yes	Yes, available in several different modes and platforms and media types	No, only available for viewing online	Yes	No, only available for online viewing
Student Engagement								
The OER promotes active learning/class participation/ collaboration	Yes, with discussion forums	No	No	No	Yes, on several different platforms	No; there are leaderboards but there are no discussion forums	Yes, there are discussion groups	Yes, interactive learning is encouraged
There is opportunity for students to test their learning	Yes, in the form of ’Challenges’	Yes: quizzes, practice problems etc	Yes, practice problems and exam quizzes	Yes, practice problems and quizzes	Yes, practice questions and interactive learning	Yes, it is interactive, and the code gets checked immediately	Yes, with practice and exam questions	Yes, with interactive code compilers
The OER includes a mix of instructional approaches	Yes: no audio resources, needs more video resources	Yes, but no audio resources and no interactive learning	Yes, but no audio resources	Yes, but no audio resources	Yes, but no audio resources	Yes, but there are no audio and video resources	Yes, but no audio resources	Yes, but no video resources
The OER includes multiple modalities to support student learning	Yes: graphs, images, videos	Yes: graphs, images, videos	Yes	Yes: graphs, images, videos	Yes, graphs, images, videos	Somewhat: interactive code compilers and visualisers	Yes	Yes
The OER includes additional faculty resources	Yes, after every unit	Yes, after every unit	Yes, with an accompanying textbook	Yes, in some sections	Yes	No	Yes, there is accompanying reading	Yes, there is accompanying reading
The OER includes effective and engaging student assessments	Yes	Somewhat: present but not engaging	No	Somewhat but it isn’t engaging	Yes	Yes	Yes	Yes
Cultural Responsiveness								
The OER provides for self-reflection and self-assessment	No	No	No	No	No	No	Yes	Yes
Licensing and adaptation								
Does the license allow for modification or adaptation?	No	Yes, under the Creative Common License	Yes, under the Creative Commons License	Yes, under the Creative Commons License	Yes, under the Creative Commons license	Unspecified	Yes, for non-commercial purposes	Yes
Is the OER easily modifiable?	No	No	No	No	No	No	Yes, there is support available for this	Yes, nut no support available for this

Table 3: Summary of evaluating OERs according to the questions posed in 'Approaches to curating OER'

	Easily find-able	Clearly described	Clearly licensed (permissive license)	Trustworthy and valuable source	Easily modifiable	Self-contained	Free of copyrighted material	Recommended by other users	Imperfect but applicable to your use case
Resource									
Khan's Academy	Yes	Yes	Yes	Yes	No	Yes	No	--	Yes, 67% applicable
MIT Introduction to Algorithms	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes, approximately 50% applicable
MIT introduction to algorithms 2005	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes, about 65% applicable
MIT Theory of Computation	Yes	Yes	Yes	Yes	No	Yes	No	--	Yes, about 50% applicable
Harvard Introduction to	Somewhat	Yes	Yes	Yes	No	Yes	No	Yes	Yes, 60%

computer science									
HackerEarth	Yes	Yes	No	Yes	No	Yes	Yes	--	Yes
Stanford Algorithms Specialisation	Somewhat	Yes	Yes	Yes	No	Yes	No	Yes	Yes
OpenDSA Data Structures and Algorithms	yes	Yes	No	Somewhat	No	Yes	Yes	--	Yes

Table 4: Comparison of the advantages and disadvantages of content curation vs content creation

	Curation	Creation	Generation (AI)
Advantages	• Time efficiency compared to creating original content • Diverse perspectives • Cost Effectiveness • Up-to-date information • Flexible learning paths • Access to varied resources and instructional formats/media	• Time efficiency with creating very specific content as needed, knowing the needs of students • Quality controlled sources • Increased educator-learner engagement	• Time efficiency compared to creating original content without assistance

Disadvantages	• Limited personalisation for educator-learner engagement • Potential loss of originality and engagement, • Quality control challenges • Overwhelming resource volume • Dependence on external content • Possible reduction of opportunities for innovation	• Limited perspectives • Possibly tedious and outdated content • Creating superfluous content • Time taken to create original content • Possible reduction of opportunities for innovation • Rigid learning paths • Limited resources	• Quality control challenges • Possible ethical concerns • Time taken to ensure the accuracy and cohesiveness of generated content • Rigid learning paths • Lack of diversity in resources • Limited resources