

Summary of BIOZONE's 3D Approach By Chapter

Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs), Disciplinary Core ideas (DCIs), and Performance Expectations (PEs) for Instructional Segments 1-6 of the CA NGSS (Three Course Model) are summarized below. A concluding basic skills chapter, which covers some of the background for Science and Engineering Practices, is also included. Performance Expectations (PEs) are met within activities and/or the summing up activities concluding each Instructional Segment.

Page		Activity	Hub	SEP	DCI	CCC	PE
1		IS1: Ecosystem Interactions and Energy					
2	1	An Endless Swarm	✓				
3	2	The Earth's Systems	✓	2	LS2.A	4	
5	3	Abiotic Factors Influence Distribution	✓	4, 5	LS2.A	2	
10	4	The Ecological Niche	✓	4, 6	LS2.A	2	
13	5	Populations Have Varied Distributions	✓	2	LS2.A		
15	6	Population Growth	✓	3, 4, 5, 6	LS2.A	4, 7	HS-LS2-1, HS-LS2-2
21	7	Modeling Population Growth	✓	2,3	LS2.A	2, 7	HS-LS2-2
23	8	The Carrying Capacity of an Ecosystem	✓	2, 4, 5	LS2.A	2, 3, 5, 7	HS-LS2-1
27	9	Species Interactions Can Regulate Populations	✓	4	LS2.A	2	HS-LS2-2
29	10	Predation Can Control Some Populations	✓	4	LS2.A	2, 3, 5	HS-LS2-2, HS-LS2-4
32	11	Organisms Compete for Limited Resources	✓	2, 3, 4	LS2.A	2, 3, 5	HS-LS2-2
37	12	Human Activity Alters Populations	✓	6	LS2.C	2, 5	
40	13	Producers, Consumers, and Food Webs	✓	2	LS2.B	5	
46	14	Energy in Ecosystems	✓	2, 3, 4, 5	LS2.B	5	HS-LS2-4
53	15	Nutrient Cycles	✓	5	LS2.B	5	HS-LS2-4
52	16	Humans Intervene in Nutrient Cycles	✓	3, 5, 8	LS2.C	3, 5	HS-LS2-2
63	17	Group Behavior Improves Survival	✓	7	LS2.D	4, 5	HS-LS2-8
66	18	Individuals in Groups Often Cooperate	✓	7	LS2.D	4, 5	HS-LS2-8
73	19	An Endless Swarm Revisited					
74	20	Summing Up	✓	5, 7	LS2.A, LS2.B, LS2.D	2, 3, 5	HS-LS2-2, HS-LS2-4, HS-LS2-8

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79		IS2: History of the Earth's Atmosphere: Photosynthesis and Respiration					
81	21	One of These Worlds is Not Like the Others	✓			3, 4	
79	22	Energy in the Cell	✓	2	LS1.C	5	
85	23	Photosynthesis	✓	2, 3, 6	LS1.C	5	HS-LS1-5, HS-LS1-6
93	24	Cellular Respiration	✓	3, 6	LS1.C LS2.B	5	HS-LS1-7, HS-LS2-3
101	25	Modeling Photosynthesis and Cellular Respiration	✓	2	LS1.C, LS2.B	5	HS-LS1-5, HS-LS1-6, HS-LS1-7
105	26	Putting Biological Processes To Work	✓	2, 3, 6, 8	LS2.B ETS1.B	5	HS-LS2-3
109	27	How Old is the Earth?	✓	2, 3, 6	ESS1.C	5, 7	HS-ESS1-6
113	28	The Coevolution of Earth's Systems	✓	7	ESS2.E	4, 7	HS-ESS2-7
120	29	Carbon Cycling	✓	2, 6	LS2.B, ESS2.D	2, 4, 5	HS-ESS2-6
123	30	Modeling the Carbon Cycle	✓	2, 3, 6	LS2.B ESS2.D	2, 4, 5	HS-ESS2-6
126	31	How Carbon Dioxide Affects the Oceans	✓	3, 6	LS2.A, LS2.B	2	Assessed in IS6
129	32	Fossil Fuels and the Environment	✓	2, 6	LS1.C	5, 7	HS-LS1-6
133	33	Revisiting Model Worlds	✓	2	LS2.B	3, 4	
134	34	Summing Up		2, 6, 7	LS1.C, LS2.B, ESS1.C, ESS2.D, ESS2.E	4, 5, 7	HS-LS1-5, HS-LS1-6, HS-LS1-7, HS-LS2-3, HS-ESS1-6, HS-ESS2-6, HS-ESS2-7

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139		IS3: Evidence of Common Ancestry and Diversity					
141	35	The Rise of the Tyrants	✓				
142	36	What are Fossils and How Do They Form?	✓	4	LS4.A	2, 6, 7	
144	37	Erosion Shapes the Landscape	✓	1, 2, 3, 4, 6	ESS2.C ETS1.B	2,3,7	HS-ESS2-5, HS-ETS1-3
158	38	Evidence for Evolution	✓	7, 8	LS4.A	1, 2, 6	HS-LS4-1
166	39	All Life is Related	✓	7, 8	LS4.A	1, 6	
168	40	Natural Selection	✓	2, 3, 4, 6	LS4.B, LS4.C	1, 2, 7	HS-LS4-2, HS-LS4-3, HS-LS4-4
178	41	Speciation	✓	6, 7	LS4.C	1, 2, 7	HS-LS4-5
185	42	The Extinction of Species	✓	7	LS4.C	2	HS-LS4-5
188	43	SNAPSHOT: Antibiotic Resistance	✓	2, 6, 7	LS4.C	1, 7	HS-LS4-5
192	44	SNAPSHOT: Human Evolution	✓	1, 2	LS4.C	2	
		EXPLORE: Climate change	✓	1, 4, 7, 8	ESS2.E, ESS3.D	7	
		EXPLORE: Physical changes in human evolution	✓	1, 4, 7, 8	LS1.A, LS4.A, ESS1.C	6	
		EXPLORE: Molecular evidence of human evolution	✓	1, 4, 7, 8	LS4.A	1	
		EXPLORE: Human cultural evolution	✓	1, 4, 7, 8	LS2.D	2	
		EXPLAIN: Where did we come from?					HS-LS4-5
202	45	Continental Drift	✓	2, 7	ESS2.B	2	
209	46	The Rise of the Tyrants Revisited					
203	47	Summing Up	✓	6, 7, 8	LS4.A, LS4.C, ESS1.C, ESS3.A, ESS3.B	1, 2	HS-LS4-1, HS-LS4-4, HS-LS4-5, HS-ESS3-1,

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217		IS4: Inheritance of Traits					
218	48	Pale and Interesting	✓				
219	49	Experiments Showed DNA Carries the Code	✓	1, 8	LS1.A, LS3.A	2	HS-LS3-1
222	50	Modeling the Structure of DNA	✓	2, 3	LS1.A, LS3.A	2	
227	51	Genome Studies	✓	1, 7	LS3.A, LS3.B	2	
230	52	Modern Genetics	✓	1, 8	LS3.A, ETS1.B	2	HS-LS3-1
235	53	Variation	✓	6, 7	LS3.B	2	
238	54	Sexual Reproduction Produces Genetic Variation	✓	2, 3, 6, 7	LS3.B	2	
245	55	Mutation Produces Variation	✓	7	LS3.B	2	
250	56	Mendelian Genetics	✓	2, 3, 4, 5	LS3.B	3	HS-LS3-3
265	57	Pedigree Analysis	✓	2, 7	LS3.B	1	HS-LS3-1
259	58	Environment Influences Phenotype	✓	5, 7	LS3.B	2	
270	59	Natural Selection Acts on Phenotype	✓	4, 6	LS4.B, LS4.C	1, 2	HS-LS4-2, HS-LS4-3
272	60	Pale and Interesting Revisited	✓				
268	61	Summing Up	✓	4, 7	LS3.B, LS4.B, LS4.C	1, 2	HS-LS3-2, HS-LS4-3,

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278		IS5: Structure, Function, and Growth					
280	62	A Cancerous Creep	✓				
281	63	Cells and Life	✓	2, 6	LS1.A,	6	
287	64	Cells, Tissues, and Organs	✓	2, 6	LS1.A, LS2.B	6	HS-LS1-2, HS-LS1-4
294	65	Interacting Systems	✓	2, 3	LS1.A	6	
299	66	How Cells Make Proteins	✓	2, 3, 6	LS1.A	6	
305	67	The Functions of Proteins	✓	2, 6	LS1.A	6	
310	68	Proteins Do Work in Cells	✓	2, 3, 6	LS1.A, ETS1.B	5, 6	
315	69	How Do We Know What Proteins Do?	✓	4, 6	LS1.A	2, 6	
321	70	DNA Replication	✓	2, 4	LS1.B	6	
326	71	Growth and Repair of Cells	✓	2, 4	LS1.B	6, 7	HS-LS1-4
328	72	The Cell Cycle	✓	2, 4	LS1.B	7	
334	73	Keeping in Balance	✓	1, 2, 3, 6	LS1.A	4, 7	HS-LS1-3
347	74	Disease Affects Interactions	✓	2, 8	LS1.A	2, 7	
350	75	A Cancerous Creep Revisited	✓				
351	76	Summing Up	✓	2, 6	LS1.A, LS1.B	4, 6	HS-LS1-1, HS-LS1-2, HS-LS1-4

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355		IS6: Ecosystem Stability and Response to Climate Change					
356	77	Weather Whiplash	✓				
357	78	Ecosystem Dynamics	✓	2, 7	LS2.C, LS4.C	7	HS-ESS4-5
363	79	Climate Change	✓	2, 3, 4, 5	ESS3.C, ESS3.D	3, 7	
370	80	Feedback Systems	✓	2, 3	ESS3.D	2, 4, 7	
374	81	Models of Climate Change	✓	4, 7	LS4.C, ESS3.D, ETS1.B	2, 4, 7	
382	82	Solutions for Climate Change	✓	6	LS2.C, LS4.D, ESS3.C, ETS1.B	4, 7	HS-LS2-7, HS-ESS3-4
385	83	Human Impact on Ecosystems	✓	3, 5, 6	LS2.C, LS4.D, ESS3.D, ETS1.B	2, 4, 7	HS-ESS3-6, HS-ETS1-3
381	84	Weather Whiplash Revisited					
382	85	Summing Up	✓	4, 7	ESS3.D	7	HS-LS2-6, HS-ESS3-5

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399		SEPs: Basic Skills for Students in Life Science					
400	86	How Do We Do Science?	✓	1, 6, 7, 8		4	NA
401	87	Systems and System Models	✓	2		4	NA
402	88	Observations, Hypotheses, and Assumptions	✓	1			NA
403	89	Accuracy and Precision			3		NA
404	90	Working With Numbers			5		NA
405	91	Tallies, Percentages, and Rates			5		NA
406	92	Fractions and Ratios			5		NA
407	93	Dealing with Large Numbers	✓	5			NA
408	94	Apparatus and Measurement			3		NA
409	95	Describing Data	✓				NA
411	96	Variables and Controls			3		NA
412	97	Drawing Graphs	✓	4, 5			NA
414	98	Interpreting Line Graphs			4, 5		NA
415	99	Mean, Median, and Mode	✓	4, 5			NA
416	100	Can You Trust Your Data?	✓	4, 5			NA
418	101	Detecting Bias in Samples	✓	4, 5			NA