PLTW Engineering Standards Connection Engineering Essentials



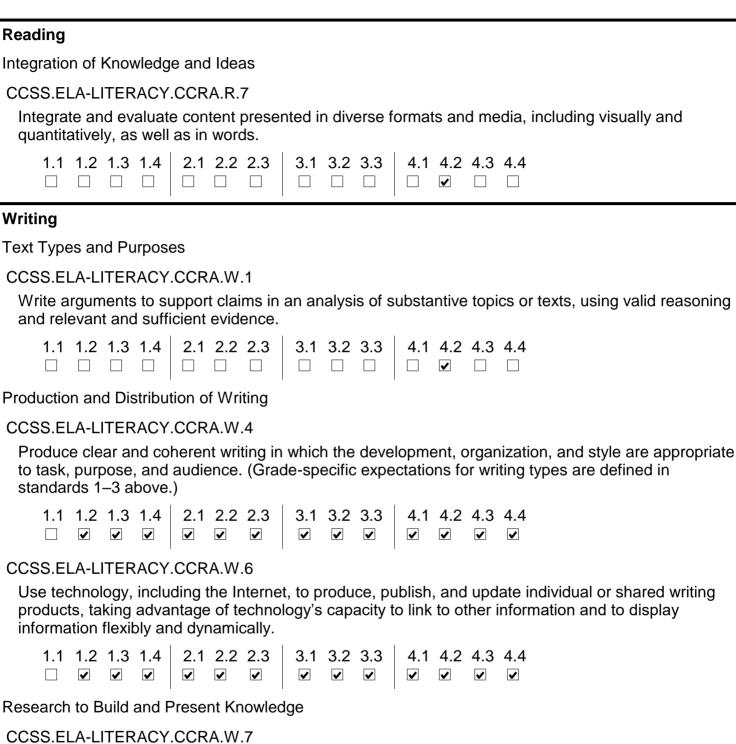
Connections to Standards in Engineering

PLTW curriculum is designed to empower students to thrive in an evolving world. As a part of the design process when developing and updating our curriculum, we focus on connections to a variety of standards. PLTW Engineering Essentials connects to standards in the following:

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Common Core State Standards for Mathematics	Page 4
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Next Generation Science Standards	Page 15
Standards for Technological and Engineering Literacy	Page 26

Common Core State Standards for English Language Arts Anchor **Standards**



Conduct short as well as more sustained research projects to answer a question (including a selfgenerated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4
✓		✓					✓					✓	

Common Core State Standards for English Language Arts Anchor Standards



Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CCSS.ELA-LITERACY.CCRA.W.9

Draw evidence from literary or informational texts to support analysis, reflection, and research.

1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4
✓		✓					✓					✓	

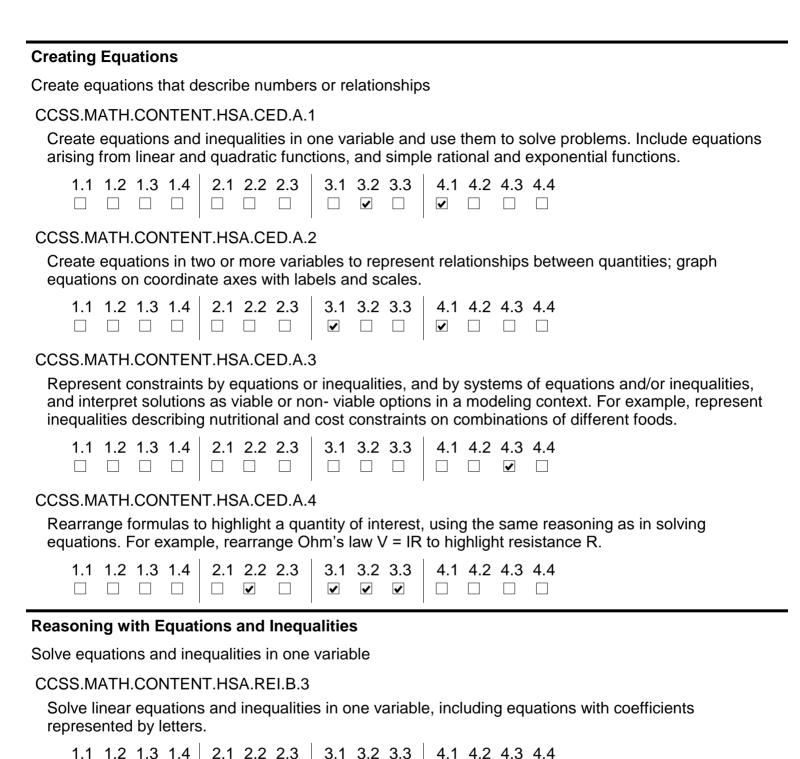
Range of Writing

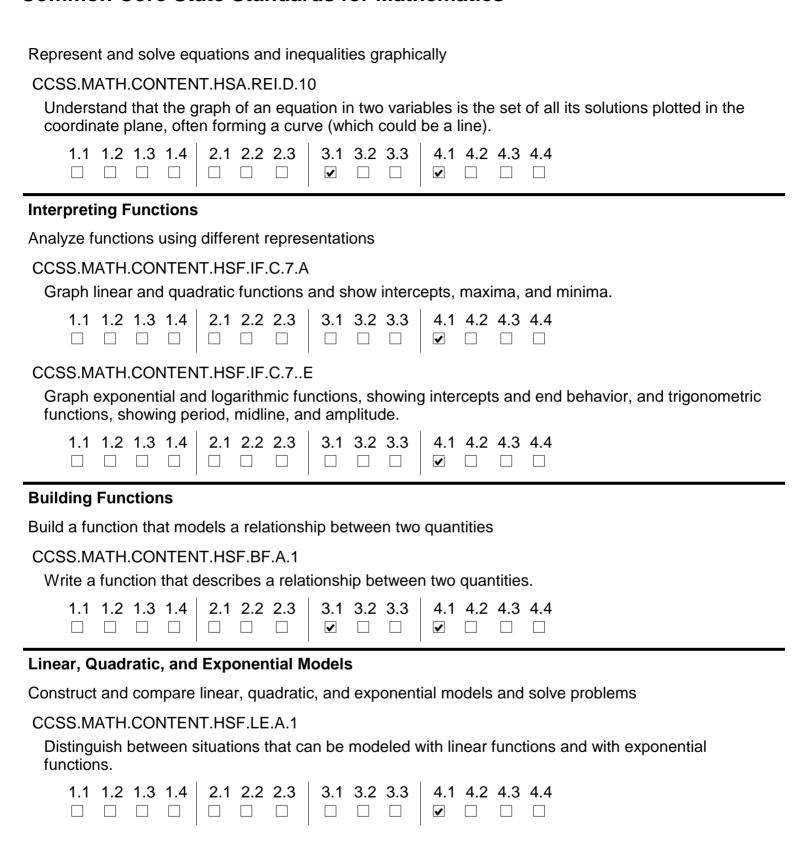
CCSS.ELA-LITERACY.CCRA.W.10

Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4
	✓												

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graph,	uct lii a de:	near scrip	and e	of a re	entia Iatio	al func	or tw	o inp	ut-ou	tput p		(inclu	geometric sequences, given a ude reading these from a table).
										✓			
Interpret	expre	essio	ns fo	r func	tions	in ter	ms of	f the	situat	ion th	ey m	odel	
CCSS.M	ATH	.COI	NTEN	IT.HS	F.LE	.B.5							
Interpre	et the	par	amet					nent	ial fur	ction	in te	rms	of a context.
1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1 ✓	3.2 ✓	3.3	4.1 ✓	4.2	4.3 ✓	4.4 □
Geometr	ic M	easu	reme	ent ar	nd Di	mens	ion						
Explain v	olum	e for	mula	s and	use	them	to sol	ve p	robler	ns			
CCSS.M	ATH	.CO1	NTEN	IT.HS	G.GI	MD.A.	3						
Use vo	lume	forn	nulas	for cy	ylinde	ers, py	/ramid	ds, co	ones,	and s	pher	es to	solve problems.
1.1	1.2	1.3	1.4	2.1		2.3	3.1	3.2	3.3	4.1 □	4.2	4.3	4.4 ✓
Modeling	y wit	h Ge	ome	try									
Apply ged	omet	ric co	oncep	ts in	mode	eling s	situatio	ons					
0000 14	۸ты	CO	JTEN	IT.HS	G.M	G.A.1							
CCSS.M	АІП	.COi	N I CIV										
	ome	tric s	hape	s, the				d the	ir pro	pertie	s to d	desc	ribe objects (e.g., modeling a tree
Use ge trunk o	ome r a h	tric s umar	hape n tors	s, the	a cyli				ir pro 3.3 ✓		s to 6 4.2 □		
Use ge trunk o	ome r a h 1.2 □	tric s umar 1.3 □	hape n tors 1.4	s, the o as a 2.1	a cyli 2.2 ☑	nder). 2.3 □	3.1		3.3				
Use ge trunk o 1.1 CCSS.M	ome r a h 1.2 ATH	tric s umar 1.3 CON	hape n tors 1.4 UNTEN	s, the o as a 2.1 • IT.HS	a cyli 2.2 ☑ G.M	nder). 2.3 G.A.2	3.1	3.2	3.3 ✓	4.1	4.2	4.3	
Use ge trunk o 1.1 CCSS.M Apply o mile, B	ome r a h 1.2 — ATH conce TUs	tric s umar 1.3 □ .CON epts o	hape 1.4 1.4 NTEN of der	s, the o as a 2.1 IT.HS nsity to foot).	a cyli 2.2 ✓ G.Mo pased	nder). 2.3 G.A.2	3.1 □ area a 3.1	3.2	3.3	4.1	4.2	4.3 □ ng si	4.4 Utuations (e.g., persons per square
Use ge trunk o 1.1 CCSS.M Apply o mile, B	ome r a h 1.2 — ATH conce TUs	tric s umar 1.3 □ .CON epts o	hape 1.4 1.4 NTEN of der	s, the o as a 2.1 IT.HS nsity to foot).	2.2 G.M. case 2.2	nder). 2.3 G.A.2 d on a	3.1 □ area a 3.1	3.2	3.3	4.1	4.2	4.3 □ ng si	4.4 Utuations (e.g., persons per square
Use ge trunk o 1.1 CCSS.M Apply o mile, B	ome r a h 1.2 ATH conce TUs 1.2	tric s umar 1.3 .CON epts o per o	hape 1.4 UNTEN of der cubic 1.4	s, the o as a 2.1 IT.HS nsity to foot).	a cyli 2.2 GG.Mo	2.3 G.A.2 d on a 2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4 □ tuations (e.g., persons per square
Use getrunk of trunk	omer a hir 1.2 ATH concertus 1.2 ATH Grant Gr	tric sumar 1.3 CON epts of per of contents. CON etric	hapen tors 1.4 NTEN 1.4 NTEN MTEN meth	s, the o as a 2.1 IT.HS nsity to foot). 2.1 IT.HS nods t	a cyli 2.2 G.M. case 2.2 G.M. cosol	2.3 G.A.2 d on a G.A.3 ve de:	3.1 area a	3.2 nd vo	3.3 v	4.1	4.2 odelii 4.2	4.3 ng si 4.3 v	4.4 □ tuations (e.g., persons per square

1.1 1.2 1.3 1.4 | 2.1 2.2 2.3

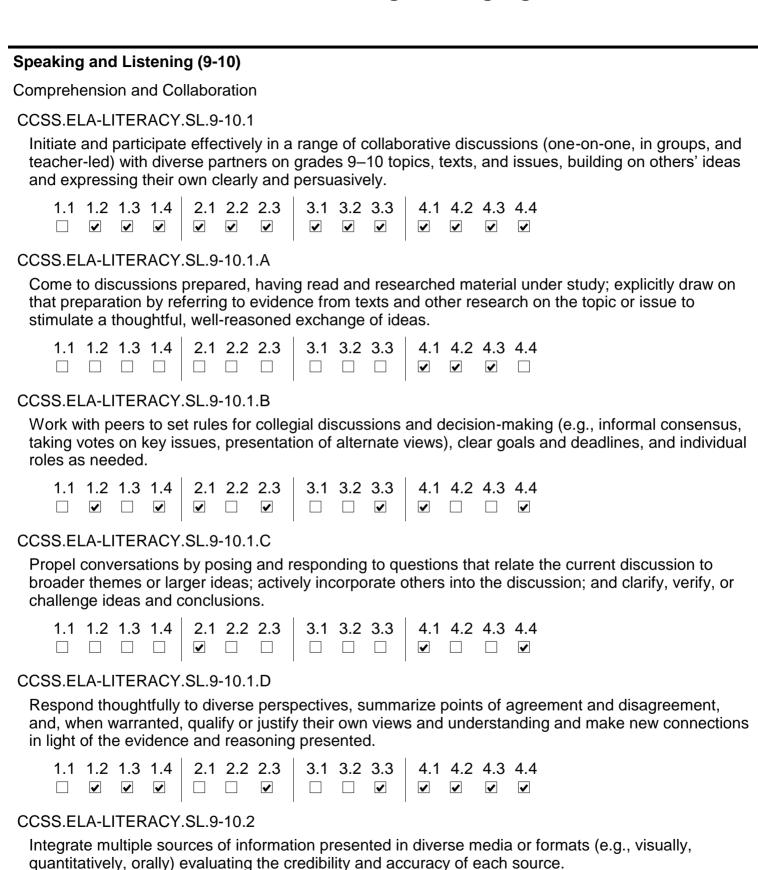
Interpreting Categorical and Quantitative Data Summarize, represent, and interpret data on a single count or measurement variable CCSS.MATH.CONTENT.HSS.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). 1.1 1.2 1.3 1.4 | 2.1 2.2 2.3 3.1 3.2 3.3 | 4.1 4.2 4.3 4.4 CCSS.MATH.CONTENT.HSS.ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interguartile range, standard deviation) of two or more different data sets. 1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 CCSS.MATH.CONTENT.HSS.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). 1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 CCSS.MATH.CONTENT.HSS.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. 1.1 1.2 1.3 1.4 | 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 CCSS.MATH.CONTENT.HSS.ID.B.6.A Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. 1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 **V V** CCSS.MATH.CONTENT.HSS.ID.B.6.C Fit a linear function for a scatter plot that suggests a linear association.

3.1 3.2 3.3

4.1 4.2 4.3 4.4

Standards for Mathematical Practice CCSS.MATH.PRACTICE.MP1 Make sense of problems and perservere in solving them. 1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 **✓** CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively. 1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning of others. 1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 CCSS.MATH.PRACTICE.MP4 Model with mathematics. 1.1 1.2 1.3 1.4 | 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically. 1.1 1.2 1.3 1.4 | 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 ✓ CCSS.MATH.PRACTICE.MP6 Attend to precision. 1.1 1.2 1.3 1.4 | 2.1 2.2 2.3 3.1 3.2 3.3 | 4.1 4.2 4.3 4.4

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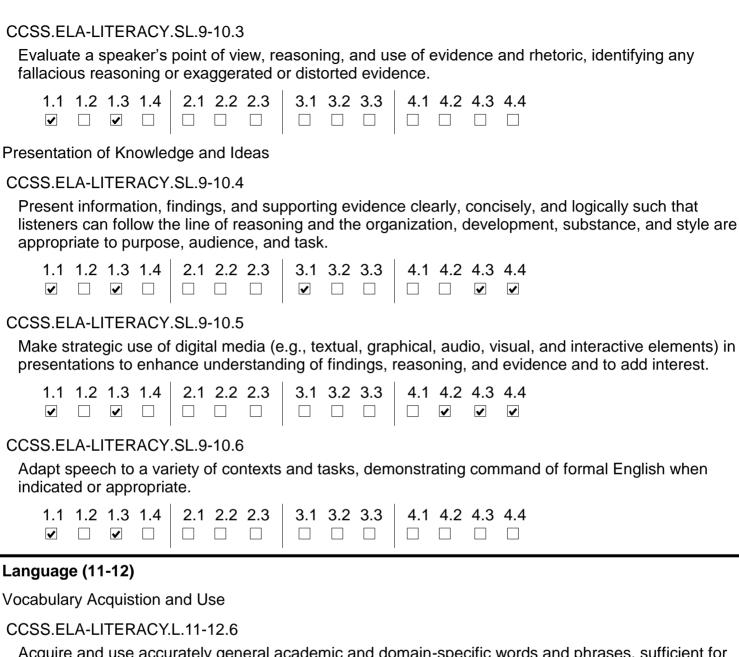


4.1 4.2 4.3 4.4

3.1 3.2 3.3

1.1 1.2 1.3 1.4

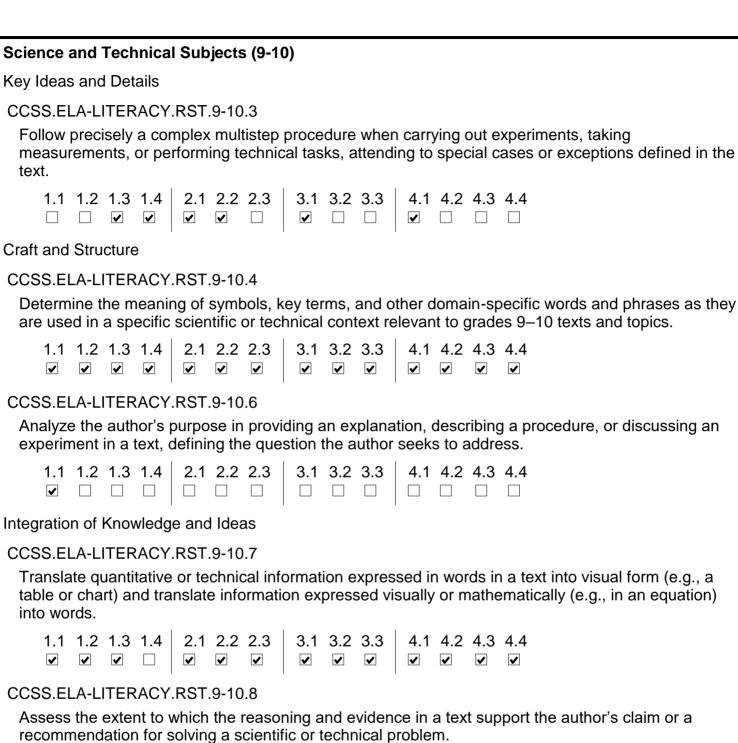
2.1 2.2 2.3



Vocabulary Acquistion and Use

Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

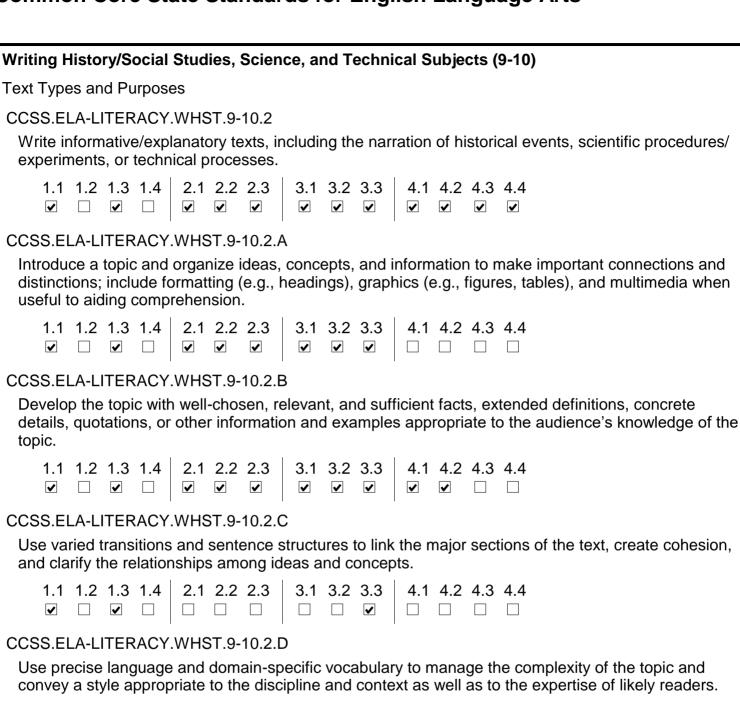




3.1 3.2 3.3

1.1 1.2 1.3 1.4 | 2.1 2.2 2.3

4.1 4.2 4.3 4.4

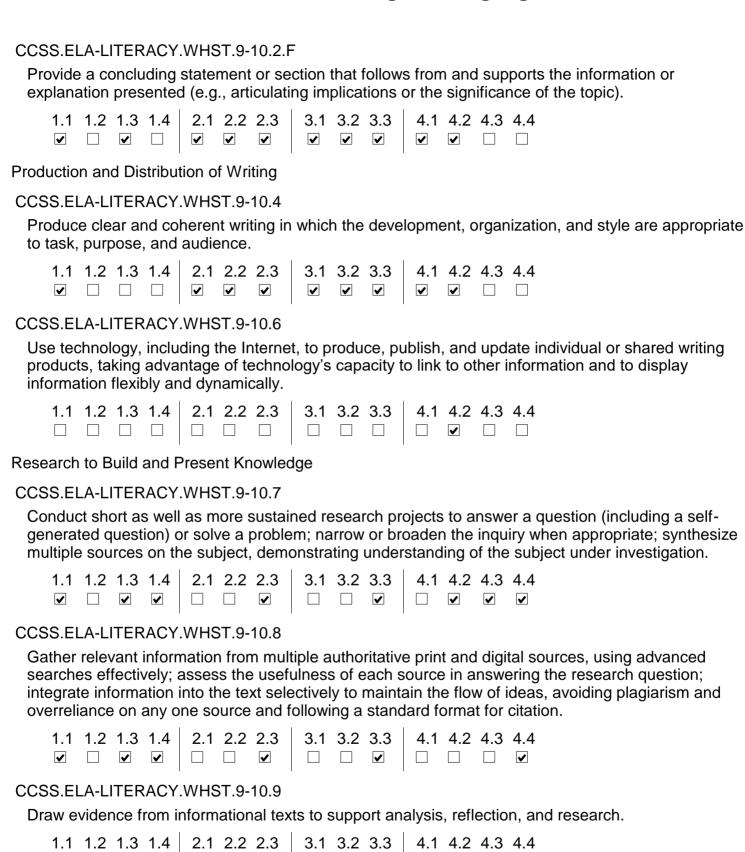


1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4
✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

CCSS.ELA-LITERACY.WHST.9-10.2.E

Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.



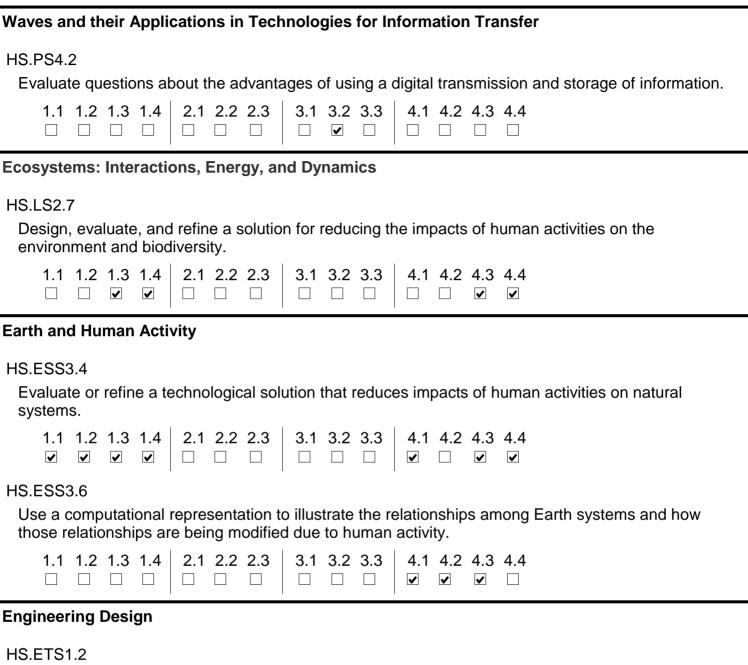


Range of Writing

CCSS.ELA-LITERACY.WHST.9-10.10

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

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Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.



HS.ETS1.3
Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 □
HS.ETS1.4
Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 □
Disciplinary Core Ideas
PS3.A Definitions of Energy
• "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. (secondary to HS-PS2-5)
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 □ □ □ □ □ □ □ □ □ □ □
• At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HSPS3-2), (HS-PS3-3)
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 □ □ □ □ □ □ □ □ □ □ □
PS3.B Conservation of Energy and Energy Transfer
• Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PS3-1), (HS-PS3-4)
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 □ □ □ □ □ □ □ □ □ □ □
ETS1.A Defining and Delimiting Engineering Problems
• Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 \[\begin{array}{c c c c c c c c c c c c c c c c c c c

 Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 Image: Continuous continu
ETS1.B Developing Possible Solutions
• When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ETS1-3)
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 .
ETS1.C Optimizing the Design Solution
 Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (tradeoffs) may be needed. (secondary to HS-PS1-6)
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4
ESS3.C Human Impacts on Earth Systems
 Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4)
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4
Science and Engineering Practices
Practice 1 Asking Questions and Defining Problems Asking questions and defining problems in 9-12 builds on K-8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.
 Ask questions that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. that arise from examining models or a theory, to clarify and/or seek additional information and relationships.
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 Image: Control of the control of th
Evaluate a question to determine if it is testable and relevant.
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4

	nvironment) with av		ne school laboratory, research facilities, nd, when appropriate, frame a
1.1 1.2 1.3 1.4	2.1 2.2 2.3 3.1	3.2 3.3 4.1 4.	2 4.3 4.4
 Ask and/or evaluate of data set, or the suitability 	•	enge the premise(s	of an argument, the interpretation of a
=	2.1 2.2 2.3 3.1 2.1 2.2 2.3 3.1	I 3.2 3.3 4.1 4. □ ✓ □ □	
			process or system with interacting ial, technical, and/or environmental
1.1 1.2 1.3 1.4		1 3.2 3.3 4.1 4. ✓ ✓	2 4.3 4.4
	n K-8 experiences ow relationships an		using, synthesizing, and developing een systems and their components in
 Evaluate merits and li 	mitations of two dif	fferent models of the	e same proposed tool, process,
		r revise a model tha	t best fits the evidence or design criteria.
mechanism or system i 1.1 1.2 1.3 1.4	n order to select or	1	t best fits the evidence or design criteria. 2 4.3 4.4
mechanism or system i 1.1 1.2 1.3 1.4	n order to select or 2.1 2.2 2.3 3.1 V	I 3.2 3.3 4.1 4. ✓ □	_
mechanism or system i 1.1 1.2 1.3 1.4	n order to select or 2.1 2.2 2.3 3.1	I 3.2 3.3 4.1 4. ✓ □ □ ✓ □ reliability. I 3.2 3.3 4.1 4.	2 4.3 4.4
mechanism or system i 1.1 1.2 1.3 1.4 □ □ □ □ □ • Design a test of a model 1.1 1.2 1.3 1.4 □ □ □ □ □	n order to select or 2.1 2.2 2.3 3.1	I 3.2 3.3	2 4.3 4.4
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• [evel)	op a	com	plex	mode	l tha	t allow	s for	mani	ipulat	ion ar	nd tes	sting	of a proposed process or system.
	1.1						2.3 •							
		•				•		_					•	ational) to generate data to support oblems.
	1.1						2.3 •							
Plani	ning tigat	and (carry	ing o	ut inv	estig		in 9-	12 bı	uilds (nces and progresses to include tical, physical, and empirical
ba	sis fo	or evi	idend	ce as		of bu								ely to produce data to serve as the ag explanations for phenomena, or
							2.3 •					4.2		
ba: pro	sis fo	or evi e reli	idend able	ce, ar meas	nd in t surem	he d nents	esign:	decid consid	le on Ier Iir	type mitatio	s, hov	v mu	ch, a	o produce data to serve as the and accuracy of data needed to sision of the data (e.g., number of
							2.3 •					4.2		4.4 □
			•							•				ata. Make directional hypotheses ndent variable is manipulated.
	1.1	1.2	1.3 ✓	1.4	2.1 ✓	2.2 ✓	2.3 •	3.1 ✓	3.2	3.3	4.1 •	4.2	4.3	4.4 □
Analy	/zing ⁄sis,	data	a in 9)-12 b	uilds	on K		erien						troducing more detailed statistical models to generate and analyze
	-			_			_				•	_		utational, mathematical) in order design solution.
	1.1	1.2	1.3 ✓	1.4 •	2.1 ✓	2.2	2.3 •	3.1 ✓	3.2 ✓	3.3 ✓	4.1 •	4.2	4.3 □	4.4 □

	ot, ar	nd co	rrelat	ion co	oeffic	cient fo	or line	ar fit					function fits to data, slope, ngineering questions and
						2.3				4.1 ✓			
 Consi and inte 				of da	ta ar	alysis	(e.g.	, me	asure	ment	error	, sar	nple selection) when analyzing
1.1	1.2	1.3 ✓	1.4	2.1 □	2.2 □	2.3	3.1 ✓	3.2	3.3	4.1 ✓	4.2	4.3 ✓	4.4 □
• Comp										e.g., se	elf-ge	enera	ited, archival) to examine
						2.3							
 Analy or syste 											of th	ne co	emponents of a proposed process
						2.3 ✓							4.4 □
algebraic functions,	tical think expo	and of the state o	comp and a itials a del da	utatio nalysi and lo ata. S	nal t is, a ogarit imple	hinking range thms, a	g in 9 of lin and c outati	- 12 ear a omp	builds and no utatio	s on konline	ar fu ols fo	nctio or sta	ences and progresses to using ns including trigonometric atistical analysis to analyze, ted and used based on
Creat process				a co	mput	tationa	al mod	del o	r simı	ulatior	of a	phe	nomenon, designed device,
1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1 ✓	3.2 ▼	3.3 ✓	4.1 ✓	4.2	4.3 ✓	4.4 □
Use n solution								_					ons of phenomena or design
1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1 ✓	3.2 ▼	3.3 ✓	4.1 ✓	4.2	4.3 ✓	4.4 □
Apply problen		niqu	es of	algeb	ora ai	nd fun	ctions	s to r	epres	sent a	nd so	olves	scientific and engineering
1.1	1.2	1.3	1.4	2.1	2.2 ✓	2.3	3.1 ✓	3.2	3.3	4.1 ✓	4.2 □	4.3 ✓	4.4 \Box

	ions	of a	proce	ss or	syst	em to							r programs, algorithms, or by comparing the outcomes with
1.1	1.2	1.3	1.4	2.1 □	2.2	2.3	3.1	3.2	3.3 ✓	4.1 ✓	4.2	4.3	4.4 □
probler	ns in	volvii	ng qu	antiti	es wi	th der	ived o	or co	mpou	nd un	its (s	uch	xt of complicated measurement as mg/mL, kg/m3, acre-feet, etc.)
1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3 ✓	4.4 □
	ting e	expla and d	natior lesign	ns an Is tha	d des t are	signino suppo	g solu orted	itions by m	s in 9- iultiple	12 bu e and	ilds o inde		-8 experiences and progresses to lent student-generated sources of
Make indepe					or qua	alitativ	e clai	m re	gardiı	ng the	rela	tions	hip between dependent and
1.1	1.2	1.3 ✓	1.4	2.1 ✓	2.2 ✓	2.3	3.1 ✓	3.2	3.3 ✓	4.1 •	4.2 □	4.3	4.4 □
source	s (incotion	ludir that	ng stu theor	dents ies ai	i owi nd la	n inve ws tha	stigat at des	ions, cribe	mode	els, th	eorie	es, si	vidence obtained from a variety of mulations, peer review) and the perate today as they did in the
						2.3 •			3.3				
Apply design					•					•			planation of phenomena and solve
1.1						2.3 ✓		3.2 •		4.1 •	4.2	4.3 ✓	4.4 ✓
Apply to whice				_									o the claims to assess the extent on.
1.1	1.2	1.3 ✓	1.4	2.1 ✓	2.2 ✓	2.3 ✓		3.2	3.3 ✓	4.1 •	4.2 □	4.3	4.4 □
													oroblem, based on scientific ia, and tradeoff considerations.
1.1 □	1.2 •	1.3	1.4 •	2.1 •	2.2 ✓	2.3 •		3.2 ✓	3.3 ✓	4.1 •	4.2 □	4.3 ✓	4.4 ✓

Practice 7 Engaging in Argument from Evidence Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.												
• Compare and evaluate competing arguments or design solutions in light of currently accepted explanations, new evidence, limitations (e.g., trade-offs), constraints, and ethical issues.												
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 □												
• Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merits of arguments.												
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 Image: Angle of the content of the												
 Respectfully provide and/or receive critiques on scientific arguments by probing reasoning and evidence, challenging ideas and conclusions, responding thoughtfully to diverse perspectives, and determining additional information required to resolve contradictions. 												
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 □												
 Construct, use, and/or present an oral and written argument or counter-arguments based on data and evidence. 												
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 Image: Angle of the content of the												
 Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student-generated evidence. 												
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4												
• Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and/or logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations).												
1.1 1.2 1.3 1.4 2.1 2.2 2.3 3.1 3.2 3.3 4.1 4.2 4.3 4.4 \[\begin{array}{c c c c c c c c c c c c c c c c c c c												

to evalua	•		_	nd co		ınicat	ing inf		ation		2 bui	lds o	on K-8 experiences and progress signs.	ses
conclu	sions ots, p	and roce	or to	obtai	n sci	entific	and/	or te	chnic	al info	rmat	ion to	ermine the central ideas or o summarize complex evidence, asing them in simpler but still	
1.1	1.2	1.3 ✓	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4 □	
(e.g., v probler	isual n.	ly, qi	uantit	atively	y) as	well a	as in v	vords	s in or	der to	add	ress	d in different media or formats a scientific question or solve a	
1.1 •	1.2	1.3	1.4 •	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2 •	4.3 •	4.4 □	
• Gathe											rmat	tion f	rom multiple authoritative source	es,
1.1 ✓		1.3	1.4 •	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3 ✓	4.4 □	
		_						,		_			alara and a large Marchaelara	
			•			•							aims, methods, and/or designs ng the data when possible.	
that ap	pear 1.2	in so	cientif 1.4	ic and 2.1	d tecl 2.2	hnical 2.3		or m	nedia 3.3	report 4.1	s, ve 4.2	rifyir	ng the data when possible. 4.4	
that ap	pear 1.2	in so	1.4	ic and 2.1	d tecl 2.2	hnical 2.3	texts 3.1	or m	nedia 3.3	report 4.1	s, ve 4.2	rifyir 4.3	ng the data when possible. 4.4	
that ap 1.1 Crosscu	1.2 tting	1.3 Cor	1.4 Comparison of the compari	ic and 2.1	d tecl	nnical	3.1	or m 3.2 □	nedia 3.3	report	4.2	erifyir 4.3	ng the data when possible. 4.4	
that ap 1.1 Crosscu Patte improv	1.2 tting rns of e the	1.3 Cor essystem	1.4 Comparison of the compari	ic and 2.1 S	d tecl 2.2 of de	nnical	texts 3.1 d syst	or m	3.3	report	4.2	erifyir 4.3 □ d an	ng the data when possible. 4.4 d interpreted to reengineer and	
that ap 1.1 Crosscu Patte improv	tting rns of e the	1.3 Cor of perespective system	1.4 crept rformatem. 1.4	ic and	of de	signe	d syst	3.2 dems	can I	report 4.1 De ana 4.1	4.2 alyze 4.2	d and	d interpreted to reengineer and 4.4 —	
that ap 1.1 Crosscu Patte improv 1.1 Math	tting rns of e the	Cor of per syst 1.3	1.4 crept rformatem. 1.4	ic and 2.1 s ance (2.1	of de	signe	d syst	or m 3.2 tems 3.2 d to id	can I	report 4.1 De ana 4.1 y som	4.2 alyze 4.2	d and	d interpreted to reengineer and 4.4	
that ap 1.1 Crosscu Patte improv 1.1 Math	tting rns ce the 1.2 mathematical distribution of the control o	Cor of per expectations in so	formatem. 1.4	2.1	of de	signe 2.3 Signe 2.3 2.3	3.1	3.2 at to id 3.2 at 5.2	can I	report 4.1 De ana 4.1 y som	4.2 alyze 4.2 be pa	d and ttern 4.3	d interpreted to reengineer and 4.4	

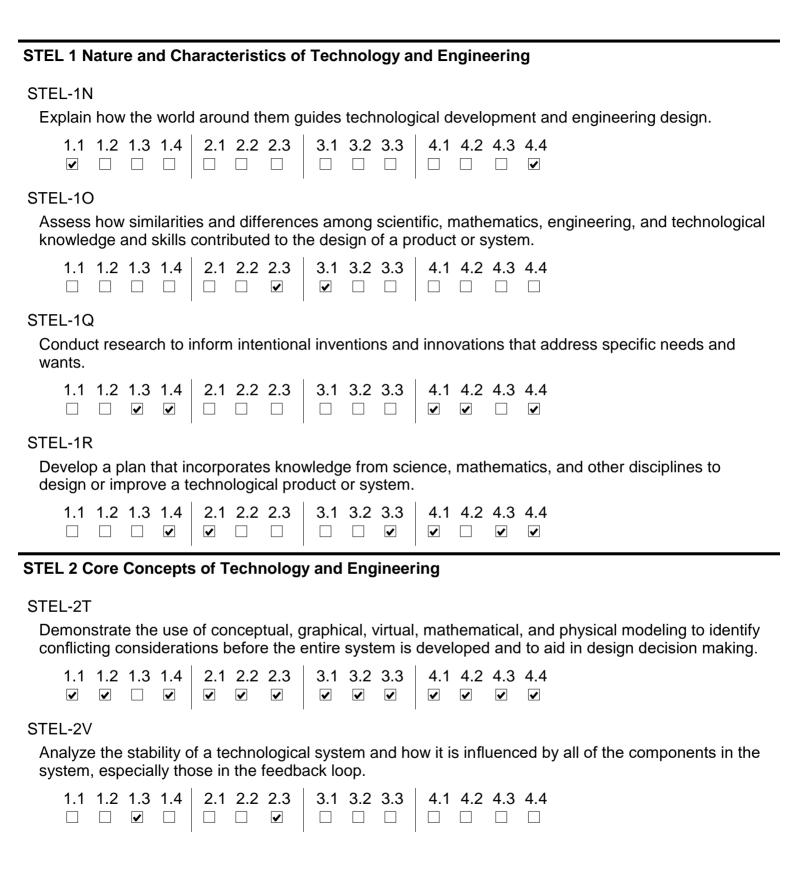
 Patte 	rns o	bser	vable	at or	ne sc	ale m	ay no	t be o	obser	vable	or ex	kist a	t other scales.
1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4
 Algeby variable 													e effect of a change in one
1.1	1.2	1.3	1.4	2.1	2.2 ✓	2.3	3.1 •	3.2	3.3	4.1 •	4.2	4.3	4.4 □
	A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.												
1.1	1.2 •	1.3	1.4	2.1 •	2.2 •	2.3 ✓	3.1 •	3.2 •	3.3 ✓	4.1 •	4.2 ✓	4.3 ✓	4.4 ✓
Syste	ms c	an b	e des	igned	d to c	do spe	cific t	asks					
1.1	1.2	1.3 ✓	1.4 •	2.1	2.2 ✓	2.3 ✓	3.1	3.2 •	3.3 ✓	4.1 □	4.2	4.3 ✓	4.4 ✓
													tial conditions of the system need using models.
1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1 ✓	3.2	3.3	4.1	4.2 □	4.3	4.4 □
	tions	—inc											sed to simulate systems and n and between systems at
1.1	1.2 •	1.3	1.4	2.1 •	2.2 ✓	2.3 ✓	3.1 ✓	3.2 ▼	3.3 ✓	4.1	4.2 ✓	4.3	4.4 □
													predictions have limited precision n models.
1.1			1.4	2.1 •	2.2 ✓	2.3 ✓	3.1 ✓	3.2 ✓	3.3	4.1 ✓	4.2 ✓		
• The v	vay a	n ob	ject is	shap	oed o	or stru	cture	d det	ermin	es ma	any o	of its	properties and functions.
1.1	1.2	1.3	1.4	2.1 •	2.2 •	2.3	3.1	3.2 ✓	3.3 ✓	4.1	4.2	4.3 ✓	4.4 ✓
			I							I			

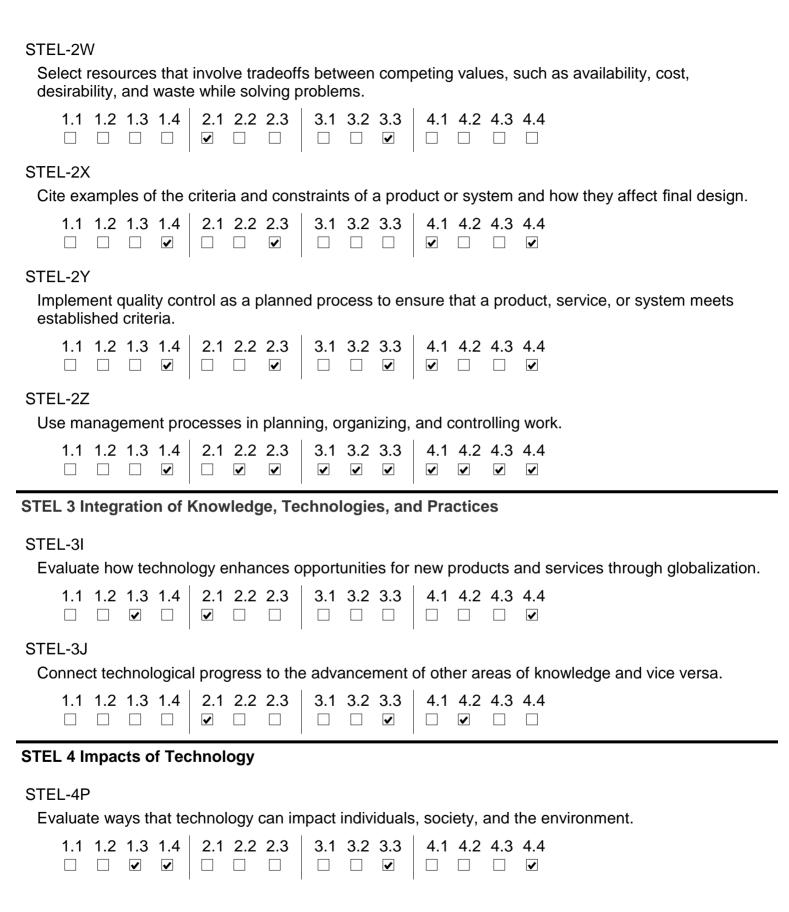
• Investigating or designing new systems or structures requires a detailed examination of the
properties of different materials, the structures of different components, and connections of
components to reveal its function and/or solve a problem.

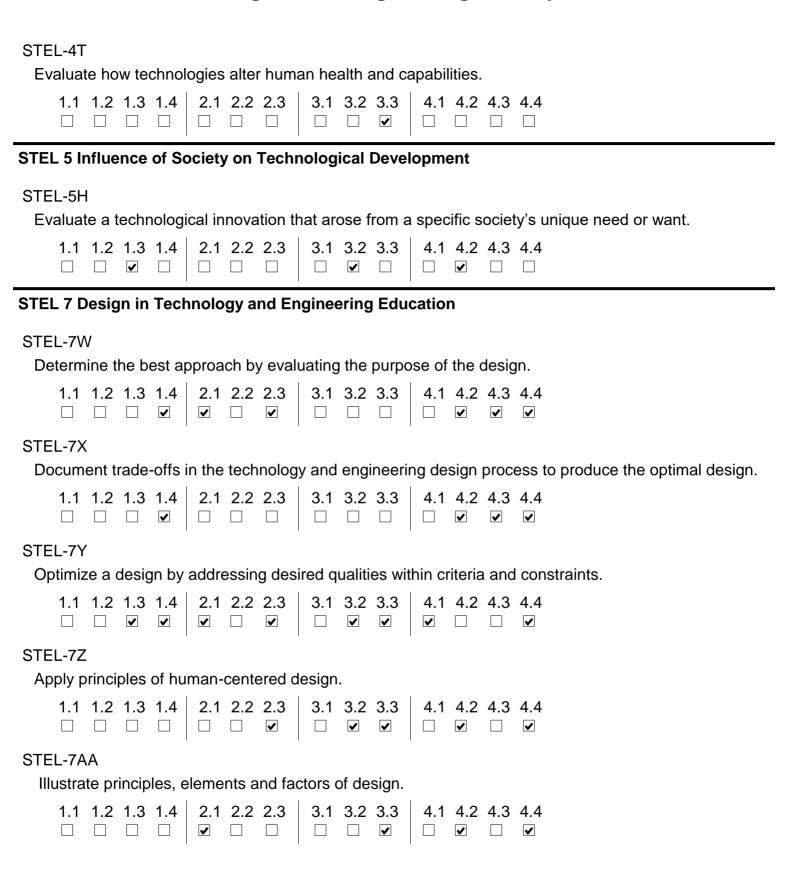
1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4
			✓		✓	✓		✓	✓	✓	✓	✓	✓

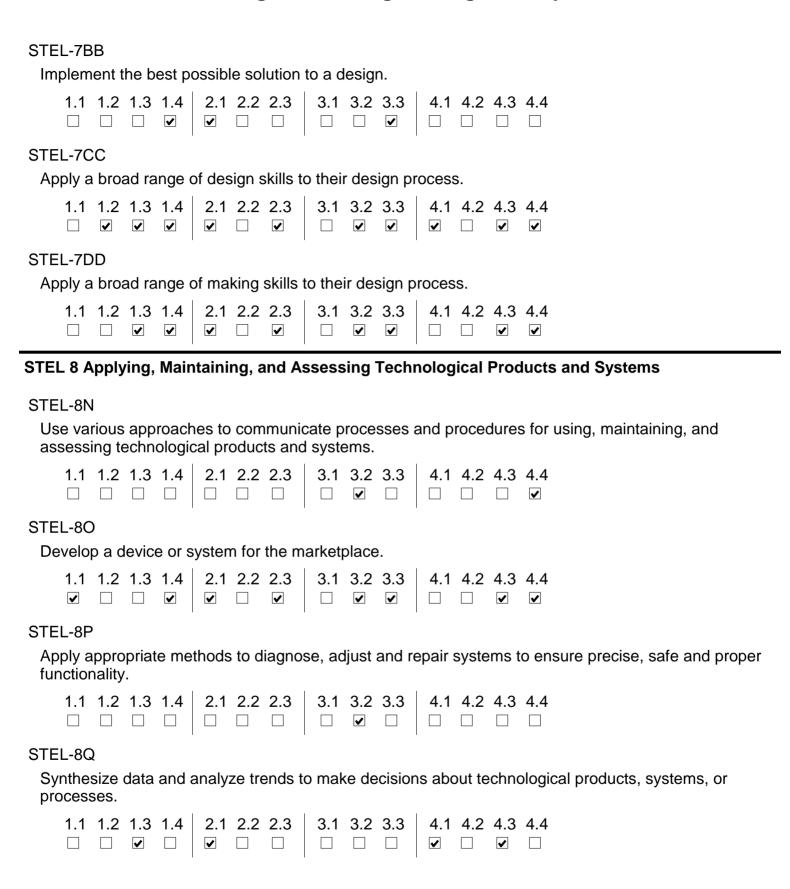
• The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.

1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	4.4
			✓		✓	✓		✓	✓	✓			









References

International Technology and Engineering Educators Association. (2020). Standards for technological and engineering literacy: The role of technology and engineering in STEM education. Retrieved from https://www.iteea.org/STEL.aspx

National Governors Association Center for Best Practices, & Council of Chief State School Officers. (2010). *Common Core State Standards*. Washington, DC: National Governors Association Center for Best Practices, Council of Chief State School Officers. Retrieved from http://www.corestandards.org/read-the-standards/

Next Generation Science Standards: For States, By States. (2019). *Read the Standards*. Retrieved from https://www.nextgenscience.org/search-standards