Table 2. Examples of students' written responses coded for how they expressed the construal logic.

Statement and Implication	Reject	Remove	Preserve	Unclear
Plants produce oxygen so that animals can breathe. *Implies that the need for animals to breathe causes plants to produce oxygen*	I think that the plants' production of oxygen is just something that plants do, it is not driven by animals' need to breathe.	I believe plants produce oxygen and then organisms use it to breathe.	*No student responses of this type*	Animals use oxygen in combination with glucose to produce energy and carbon dioxide.
Species adapt to the environment in order to survive. *Implies that the need to survive causes adaptation*	Species do not choose to adapt in order to survive. Instead, the simple mechanics of whether an individual lives or dies determines the genes passed down. The need to survive creates the adaptation, not the organism.	A species that can adapt better or faster to its environment is more likely to survive.	species all strive towards survival and ultimately reproduction. therefore, doing everything physically possible is in their nature and therefore they adapt to their environment to the best of their ability in order to survive.	Depending on the meaning of adaptation, species can learn how to cope with changing situations, by changing their behavior.
Many species develop protective "camouflage" to avoid predators. *Implies that the need to develop camouflage caused its development*	Species cannot decide to develop camouflage, camouflage is selected for because it helps them avoid predators.	'Camouflage' is a result of mutations that better mask the prey from their predators.	The primary reason species develop camoflage is to evade and hide from predators easier	Because evolutionary science.
Genes turn on so that a cell can develop properly. *Implies that the need to develop properly causes genes to turn on*	Cells don't have a 'need' to develop properly. If they happen to develop properly, they are not happier than if they were to develop improperly.	A cell can't develop correctly without the proper code and directions. These come from genes. When the gene is on the cell can develop the right way by following the directions for development the gene codes for.	A cell cannot develop properly or specify without specific genes turning on. Genes turn on with the end purpose of proper development of cells.	i don't understand this idea of genes turning on

Homeostasis keeps the body static and unchanging. *Implies that because of homeostasis the body does not change*	Homeostasis is the body's way of adjusting to any outside changes. The body needs to change to maintain equilibrium.	The body is at homeostasis at most times but can still grow and change	Homeostasis keeps the body temperature, blood pressure, etc. the same without regards to the environment it is surrounded by	Energy is still used in homeostasis.
Apart from difference due to age and sex, members of the same species are essentially identical; any variability is biologically unimportant. *Implies that species are essentially invariant*	Variation among individuals in a population is essential for eventual evolution of a species.	Members of the same species can differ in ways other than age and sex, like in coloring/patterning of skin or fur. I don't have enough information to say whether or not such differences would be biologically important or not.	Variations don't really matter in the big picture.	I honestly think it depends of the species, and the observers knowledge of the species. To me, all humans look different, all dogs look different. But all squirrels look the same to me. But I know a lot more about humans than I know about squirrels.
Different cells in an organism (e.g. skin, muscle, nerve) contain different DNA. *Implies that DNA must be different to determine different cellular functions*	All cells contain the same DNA, they just differ by which genes are expressed.	They just express them differently	Everything has a different function, and if shape determines function, then the shape/sequence of DNA must be different.	mutations could probably occur that give them the same sequence.
Without outside influences, ecological communities will remain stable indefinitely. *Implies that ecological communities are essentially static*	Outside factors influence an ecological community. They're rarely consistently stable because everything is interconnected and they rely on so many other organisms	Organisms die and are born. Species can migrate to other locations. These are examples of changes that could happen in ecological community.	Ecological communities stay stable through their own processes.	ex. predator-prey graphs
Humans have caused the majority of extinctions.	The earth has existed far longer than humans have inhabited it. Humans are	Other factors, such as predators and lack of resources, can cause	Directly or indirectly, we've definitely caused a large number of extinctions.	Some extinctions are natural occurrences

Implies that human agency is overly important	probably only a partial cause of a TINY portion of earth's extinctions.	extinction.	(record numbers, I read this in an article somewhere)	
Plants get their food from the soil. *Implies the plants, like humans, eat food*	Plants do not eat in the same way humans do. They absorb nutrients through the soil, but do not digest and consume soil	they get their energy from the sun, molecules to store energy from air and soil (water) and nutrients from soil	Plants use soil to obtain nutrients, i.e. soil is their food.	plants need to get their form of energy some how
The heart decides how much blood is needed throughout the body and adjusts the rate at which it beats accordingly. *Implies that the heart, like humans, is capable of deciding*	the heart cannot think of its own accord	Heartbeat is controlled by its myogenic muscle contraction, nerves (SA node & AV node), hormones such as adrenaline secreted by the brain.	*No student responses of this type*	Other parts of the body affect the heart
Competition between organisms involves direct, aggressive interactions. *Implies that all or most organisms are, like humans, aggressive*	Species often compete for resources, which is rarely direct	There are so many other types of competition. ex. food competition, living space competition, mating competition	Aggression is always in ecosystems because organisms must fight for limited resources	This is evident from the behavior of living things to survive