Red Bird

Two Populations (Page 2)

pop A goes up so it's probably increasing; pop B goes down so it's probably decreasing
They could be fighting each other? One kills large chunks of their people [etc.]
Two species in ecosystem?
Maybe ecosystem is changing and one can adapt better than the other.
There's an ice age...maybe one could change more quickly and the other didn't have that so they would die more.

Introducing Competition (Page 3)

As there are more otters, there are less fish. The otters eat the fish.
They'll probably go down...the otters and the fish. Because otters would have to compete with cormorants for fish and wouldn't do as well. The fish would be eaten more so they would go down as well.
Student draws jumbled curves. (Don't forget the cormorants too.)
Student gives convoluted incorrect answer about otters and fish.
Student chooses incorrectly (3).
because the fish go down, then the others go down. #1 doesn't make sense. I think the fish go down a little too much in the middle one.

Introducing Camouflage (Page 4)

Anxious to start drawing right away.
Snakes eat the frogs.
Student draws relatively flat curves. Must be reminded to draw grass.
Grass doesn't have anything eating it, right?
Frogs start dying less because they have the grass to hide so it gets more constant. Then the snakes go down a little bit because they can't get as many frogs. Maybe they'll go up and down a little bit.
Student ranks curve sets 1-2-3.
2: maybe grass gets trampled?
3: big gap between frogs and snakes. They seem really different. I don't think it would be that different if the frogs were hard to find. And then the snakes start going back up. I don't know why the frogs would go down.

Activity Reflection

I don't really care. Drawing is more fun.
Choosing is easier. Because with drawing you don't know what the answer could be, and with choosing you can guess.
Ranking is easier because you're more likely to get something right. If you're not really sure between two choices....
I don't know. Drawing wasn't that much harder...

Interaction Types (Page 5)

Part 1

Population B is decreasing, Pop A is increasing.

Maybe one has the plague and dying. Maybe civil war.

Species in ecosystem...

Maybe they're not adapting and getting colder. Maybe hunted by humans.

Part 2

So that one's first? (student thinks each population can have different relationship.

Antagonism.

Because that one's going up and that one's going down.

Part 3

Mutualism.

They're both going up.

[Student was very quick on this activity (all parts) and quite disinterested.]

Checking Plots (Page 6)

When this one's rising, this one's decreasing, when this one's rising, this one is decreasing.

They're not the same.

You can draw new dots that are more accurate.

Student does poorly fixing incorrect plots.

Is it represented differently on this side? (varied scales)

Which side does population B start on (left or right?).

Time is always the same, left to right. Does that make sense? Yes.

Adding a Population (Page 7)

It's very big.

Student plots data without considering new scale.

Student draws third scale after short discussion.

Any interactions between populations?

Maybe. That one could be unrelated and doing well (C) and these could be eating each other.

Did the difference in scale size affect your thinking?

Probably. Because it looks a little more like the other [graphs] where they're eating each other.

[this answer doesn't make sense]

Food Web and Graph (Page 8)

Student makes poor ABC choice first time around (black).

Does seeing food web give more insight to graph?

A little. *[Student gives tangential answer]*

Prompted again. Yeah when I chose them I didn't see that.

Better ABC choice second time - more specifically based on scale (blue)

Eventually modifies first choice as well.

Indirect effects?

Less acorns, less squirrels...don't really get the question.

Indirect effects further explained...
[mumbled response]

Cognitive Approaches to Interaction (Page 9)

Useful in science class?
Depends on what you're doing...what kind of data you're getting, the results.
Team project, responsible for creating graph...highlight parts?
specific interesting parts
Homework different?
Don't think so.
[bell rings...end of period]

Orange Bird

Two Populations (Page 2)

Pop A has risen, Pop B has decreased. Seems that because Pop A decreased, they made up for lost time or whatever, and Pob B was the opposite.
It kind of looks like the line was just flipped.
Species in ecosystem?
One was probably used to it in the beginning (Pob B) where one was still acclimating to it (Pop A). Maybe in period 2 the other one got used to it (Pop A) which made the other go down.
{Basically Pop A becomes the dominant species}

Introducing Competition (Page 3)

Otters eat the fish in period 1.   *Period 2?* I don't know...maybe it was breeding season?
Cormorants will probably go up (from nutrients from fish). Fish will go down, and otters will go up and down.
Student draws accurate representation of explanation.
They can't keep going up and down because that would be unnatural. It needs to be curvy, but it's not a straight line. [???]
Student chooses incorrectly (1). QUICKLY
Because cormorants are eating the fish, and the fish go down. And the otters don't have as much fish to eat, they go down.
Period 4? I have no idea.
Why pick 1? Looks a lot like the one I drew.

Introducing Camouflage (Page 4)

Snakes probably eat the frogs at one point in period 1. But then the frogs make a comeback.
Because frogs can use grass as camouflage it will be harder for the snakes to catch them.
Student draws curves fairly well, with moderate accuracy.

Grass helps the frogs to hide, so snakes can't eat them, so their population might go up and the snakes will decrease because they don't have frogs to eat. Unless the snakes and frogs eat the grass the grass will just stay [keep going up]
Student ranks choices 1-3-2
#1 looks like the graph I drew.
Between 2-3? 2 also seems like my reasoning earlier. 3 seemed quite extreme...grass swoops down and up. All of it didn't look very likely.
Why doesn't it look likely? I don't know. Now that I go back on it, it does seem somewhat likely. Because...[cut student off, oops.]

Activity Reflection

Kind of the same, liked drawing curves. Drawing curves my way seemed better. There are many ways to draw it while choosing you get stuck with three ways.
Choosing is easier. Not as many choices, limited to three.
Ranking? Could be easier, unless you're given choices that are almost the same, then you have to...because as humans we have instinct to get right answer. Conflicted with two possible right answers so close to each other you just feel this need to get it right.
... Because they're so close you might forget that there ARE still differences that you have to look for.
Situations where hardest (drawing) is better?
If you're really trying to learn a subject, and you have to do something that's harder, you'll probably learn it better, because you remember that this is hard and you have to keep going over it, many times. Whereas if something is easy you can just... [check it off]. Like if you're given a worksheet that is almost like busywork you're not going to learn too much because you can just breeze through it right away. But if you're doing a worksheet that's harder for you, you'll have to go over the material more to answer the questions.

Interaction Types (Page 5)

Part 1
One starts out well and then something happens, plague, maybe. One just stays average but slowly rises.
Species in ecosystem actually interacting?
One could be quite used to it (B), but then introduction of new species using their resources could allow them to [decline]. B starts out higher, they're used to their environment. A comes in and begins to live there, might be territorial fights.
Part 2
Thinking about what the first one means. Student receives list of definitions.
Antagonism. (took a while to decide)
Just by the +/- thing: A had a positive effect and B has negative effect.
Part 3
It's definitely not antagonism, because it's not too large a difference. Can't be amensalism. I'm thinking commensalism or neutralism.
What would make you lean one way or the other?

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They don't really interact too much in just this graph. Population B is increasing, but not really affecting A.
Commensalism. (again took a while)

Checking Plots (Page 6)

Population A is definitely bigger than Population B at all times. For A, 25-35 are their lowest time, and for B 15-30 are their high point.
Student changes too many plots. (see comment below)
Does B start here? It doesn't look right. That says 800, but this says 37. *[Student prompted on second scale.]*
Student corrects a few mistakes in fixing process.
I flipped it around. I just kept doing this for population B [using wrong scale].

Adding a Population (Page 7)

This one is enormous (C).
You can't. This only reaches 2000, that's way over.
Can you add another scale? How would you do it?
You could put it on the top, but that's conflicting with time.
Add another to the side?
Student creates third scale.
Plotting skipped.

Food Web and Graph (Page 8)

Initially had C as snakes.
Thinking about the chipmunk...maybe A, since there always seems to be an enormous amount of them.
What if you think about the different scales?
I forget about scales all the time...probably B (hawk). That was a mistake (C snake).
A: snakes, B: hawks, C: frogs.
Lots and lots of frogs, so C seemed a much better answer. B has very small scale, and hawks are endangered. Snakes, there's a fair amount of snakes.

Cognitive Approaches to Interaction (Page 9)

[ran out of time]

Yellow Bird

Two Populations (Page 2)

Probably by minority or disease. Red's going down, blue's going up, obviously.
Could be different races, different species or something. One could be lizards and one could be snakes.
Species in Ecosystem?

Red peaks in P1, P2 it has a huge downfall almost to extinction, P3 goes back up, falls again in P4 maybe due to lack of protection, but comes back up at the end, up to blue.

Introducing Competition (Page 3)

Maybe a population boom in P1 that's why the fish stock kinda died down, but then maybe the otters started getting hunted for their furs, and the fish regained, but otters did not capitalize.
Anything between otters and fish?
Yeah, due to greater population, the fish population is lower, because the otters need a bigger diet. *[eating the fish]*
I think the otter population will take tiny drop because not as much fish. Fish will suffer due to cormorants and otters but probably survive since they lay a bunch of eggs, so I think they'll be fine.
Student draws curves fairly accurately based on explanation.
Student chooses curve set incorrectly (3).
Because it really demonstrates what I said before. Cormorants have a shaky start, then hit peak, tiny bit of descent (which I didn't put in, but...). Fish does exactly what I anticipated, down gradually but starts to even out and then rise again. Definitely otters will make a peak but I kinda disagree that they'll go down that fast.
Why's that?
Because unless hunters or something come in P4 I doubt they'll go down that far. Naturally, they'll be set for a while *[unless external pressure comes along]*.

Introducing Camouflage (Page 4)

I guess maybe you could say the frogs die down because they were just introduced, like the king toads in australia. Then they really start to adapt to that ecosystem. Snakes are kinda benefitting from them. [student explains poisonous king toads] Snakes die down because they can't eat them or learn not to eat them, then they go back up slightly towards the end.
[Grass: Let's assume snakes eat the frogs.]
Frogs will probably go up because grass will provide more camouflage, but it will also help the snakes, since they can hide too, and since the way they hunt is using heat. But it won't have that much of an effect on them, so I imagine they'll stay kinda even. Both populations will probably go up a tiny bit but they'll probably stay even.
Student draws curves accurately representing explanation.
Grass will stay the same unless it's overly eaten or mowed down or something.
The way the snakes hunt, it's not going to have a big effect. But the frogs will be covered from other animals, so they'll probably go back up, but the snakes will keep them in check.
Student ranks 1-2-3.
That one I would say is bull, because of the grass [still ranks it 2]
Quick to rank 1...
Yeah because they're pretty close, the frogs take tiny drop (don't think would happen). Snakes, yeah does exactly what I said. Grass, it barely changes...that's the big one.

Activity Reflection

Liked drawing better, because you can actually give an answer. You have a bit more choice. When you have to rank it like that, you don't get as much choice so you have to go with the one that's closest. If it's on a multiple choice test, you have to kinda do it that way...you can't just draw lines on a test, even if it's not multiple choice, because each teacher is going to have a different say about what is [correct].

Drawing is easier. Because you don't have to narrow down from choices [demonstrates with previous task].

Ranking is easier than choosing, because you can [think about probability of each one].

So it's an easier decision to rank than to choose one from three? Yeah.

When you have to choose [its more of a commitment *(???)*]

Hardest (choosing) better?

Maybe if you're trying to give a harder test, like a final exam, it might throw you off for a second, but you'll still get the right answer if you've practiced.

Interaction Types (Page 5)

Part 1

Pop A is gradually growing, nothing stopping them, nothing needs them...like birds, maybe. Pop B could be an animal in high demand, like when settlers killed the buffalo.

Interacting species?

Oh, yeah. You could say like wolves for blue are eating the deer (red). That's causing the deer population to slowly go down even though they're pretty self-sustaining.

Part 2

Student concerned with ordering of symbols in pairings.

Amensalism.

What swayed you to amensalism over commensalism?

Because for amensalism, Pop A has an effect on Pop B, but B can't really affect A except as like food or something.

[Student was fairly indecisive on this issue.]

Part 3

Neutralism.

This is definitely neutralism. They don't really have an effect on each other, they're each growing. You could say that one is helping the other out by eating the tougher grass, and you could possibly say that's mutualism, but most likely it's neutralism.

Checking Plots (Page 6)

There's a definite decrease for a certain species. And then maybe it's banned and you couldn't hunt them so they come back.

Student was really concerned with precision in plotting.

Student makes correct fixes, but then additional incorrect fixes (Pop A). Student re-plots Pop B on Pop A scale (fairly accurately, though).

That's pretty low, though. It never goes above 500 or even a 100.

[Student showed physical fatigue in drawing hand]

Adding a Population (Page 7)

Their numbers skyrocket. There's a bit of a die off toward the end, but nothing really stopping them. Maybe [these are] humans?
Student plots Pop C data as if they were thousands, not ten thousands.
I think there could be a symbiotic relationship between B [and C], if the B one is supposed to be right.
Towards the end, competing for food, or something?
Difference in scale affect thinking?
A bit. That one is pretty low.
There are two different scales (A/B). OH.
[Student laments graphing Pop C on wrong scale]
Because [C] is a smaller species, this one is definitely surviving, but this one [B] holds its own for a while, then peak.
{ENDED HERE}

Food Web and Graph (Page 8)

n/a

Cognitive Approaches to Interaction (Page 9)

n/a

Green Bird

Two Populations (Page 2)

Pop A has increased, probably safer, people got married. Pop B decreased a lot, maybe depression, war, yeah.
Species in ecosystem?
Predator and prey. When Pop B (predator) increases, they eat more of Pop A, but since not very much of Pop A, Pop B doesn't have enough food, so they die off. When there is no one hunting them, Pop A increases.

Introducing Competition (Page 3)

Are periods 3 and 4 supposed to be blank?
Otters are the predators, more otters, eat more fish. Less fish, otters die off.
[Student starts in with cormorants unprompted...halted by me to receive prompt]
Both will go down (otters and fish). It will probably be the same cycle but lower down.
Nothing eats the cormorants, right?
Student draws curves accurately based on explanation.
Otters and fish should be a little lower [to better account for cormorants].
I'm thinking that the otters are starting to go on an upper curve which is true with all of these.
The fish are going to decrease a lot more, so I'm thinking it's this one [2], because cormorants and otters are at about the same level.
Student chooses correctly (2).

Introducing Camouflage (Page 4)

I think the snakes are the predators and frogs are the prey.

So the grass isn't eaten by them, just provides protection?

I think the grass will stay around the same, the frogs will continue downward curve a little but then go up a little more, and snakes since they can't catch as easily, it will be the same switching, but the frogs will be higher than the snakes.

Student draws curves accurately based on explanation.

Student ranks 1-3-2.

I think this is one because grass will mostly stay same, and frogs will be higher than snakes because they have more protection. I think 2 because grass is somewhat high and frogs are higher than snakes, and this is 3...I think that's how it is [unsure].

What makes you think that is 3?

Because grass population is going down a lot, and there's no reason for that. And the frogs and snakes are going on the same curve, both frogs and snakes are increasing.

Wait, I think that this [bottom] might actually be the first one now.

Student re-ranks: 2-3-1.

Activity Reflection

I felt that drawing got me thinking more. Choosing let me think of more possibilities of what could happen. I liked choosing better because it got me thinking why it would or wouldn't instead of having one view and sticking with the one view. Drawing made me think about it more, but choosing made me have a more open mind.

Choosing is easier, because one of the options is obviously not right and you can tell. With drawing you have to make your own thinking and come up with your own scenarios.

I liked ranking more than choosing, because it's pretty obvious which one is the most likely, but it was a little harder to distinguish...made me think more about which is more likely than the third one. I liked ranking better than drawing because it got me thinking about most likely scenarios.

Scenarios where hardest (drawing) is best?

Well, I like to have a challenge a lot of times.

If I'm studying for a test, when I have to use the harder...kinda creating it...it's kind of like teaching where you have to develop more of an understanding of it. [That's why it's better]

Interaction Types (Page 5)

Part 1

Are they both different species?

Oh, maybe they're both predators, and Pop B their prey is decreasing, and Pop A perhaps they hunt multiple species.

Pop B is going down somewhat of a steep curve but starts to level out so I think that its prey had some crisis but are still there. Pop A are continually growing because they're not running out and eating multiple species.

Part 2

From what I was saying it's probably neutralism, but it might be mutualism. Because neutralism they're not really affecting each other, which is the scenario I described, but mutualism, they're kind of on the same side, and there are probably scenarios where they are on the same side.
If you focused on the data in front of you, and had to make a scientiftific decision...
Neutralism.
Probably neutralism. Neutralism seems more likely, even though I have a feeling it's mutualism.
Why?
There's gotta be some sort of relationship between why this one's going down and this one's going up.
Part 3
These are in the same ecosystem? *Same for them but different from previous one.*
Mutualism.
Probably mutualism, because they're both increasing, and they're kind of helping each other.

Checking Plots (Page 6)

This has a huge population (A), and they're slowing going down, as Pop B which has a small population is slowly going up until year 40, when suddenly Pop A has gigantic population and Pop B has tiny population, even smaller than they started with. And A increases and B decreases until 50, when B increases. I don't understand why this population increases at year 50, because it goes against all the other data. I'm guessing that they are probably hunter and prey, because the huge population has other prey that it feeds on, but they start to die out a little, which means Pop B can recover. Maybe there's a huge crisis and Pop goes back down.
I did it wrong, didn't I?
[student was very concerned with making a perceived mistake]
Double check graph?
Well, Pop B is starting way higher than it should. It looks like Pop A is mostly right until year 40, and there should be a...wait, no I think it's right.
I'm not doing it right, am I? This is not right at all...it's too big, I can't draw it on here [student starts to notice scale issue]
Student prompted with second scale.
Can I use these numbers then? Oh, Pop B is correct for this side.

Adding a Population (Page 7)

I'm guessing that Pop C is predator to Pop A and B.
Student plots Pop C data on graph (using scale for Pop A).
[Student prompted for adding third scale] Student adds scale on left.
C is predator for A and B, as they increase, Pop A decreases. Wait it's (C) probably just predator for Pop A (when C decreases A increases).
Anything about scales that affects thinking?
Well Pop C is way bigger than A, which is way bigger than B, so I noticed that as A increases a lot, C doesn't decrease as much because they are a much bigger population and they have other prey.
[ENDED HERE]

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Blue Bird

Two Populations (Page 2)

Blue didn't have as much, and as time went further on population got more. Close to the end it...people started to go down. For the Red it started off, there was more and then went down and back up...something had probably happened to the people in that time.
Species in an ecosystem?
The blue: probably a better ecosystem for that species. First kind of starting off as a species, later on more and more populous...started to go down again maybe because of a disease or something. For the Red, where the species had moved to maybe it was not a very good ecosystem for them, so it would have gone down.

Introducing Competition (Page 3)

Fish have more e of a chance of surviving than the otters do, because the fish goes up a lot higher, while the otters don't go as high. I was going to say the otters were eating the fish, but... [student was very unsure, but gave a reasonable explanation for why otters might be eating fish] I think the fish population will go down, but also the otter population might go down, because if the otters eat the fish, then when there are less fish there might be less otters. But based on this it looks like the more fish there are the less otters there were, so there might be more...
Student draws curves inaccurately based on first explanation, but accurately based on synchronous explanation.
Student chooses incorrectly (1) very quickly.
Because like I said the fish starts to go down because cormorants are eating it but then the otters have less food, so they start to go down, since they're probably living in the same area and there's less room or space for the otters.

Introducing Camouflage (Page 4)

At the time the snakes went up, the frogs went down because I'm pretty sure the snakes eat the frogs, and the time period when the snakes started to leave or migrate or whatever they do, the frogs population started to get higher because they had more of a space to live and they weren't getting eaten.
Student draws relatively accurately as explanation is verbalized.
I think that the grass will go up because it's kinda like a weed it just grows. The frogs won't get more but they will go down and up and down. And the snakes will kind of stay going up and down, because if they both have camouflage, they probably both have an even way of staying the way they were since they can hide.

What if it was just the frogs?
Then the frogs would probably go up because they would be hiding from any predators.
Would you draw it differently?
Student redraws frog curve.
Student ranks 1-2-3 (fairly quickly).
I don't think the grass would go down just because the animals were living in it. But then I don't think the snake population would go down because they would be able to hide in the grass just like the frogs do. The grass stays the same over time except maybe a dry period where it dies. The frogs and snakes have an equal living space but the snakes might at one point kinda die off a bit because they can't find the frogs and they don't have anything to eat.

Activity Reflection

Student liked both, but drawing better. When you're drawing, it kinda sticks to your memory better. If you're just ranking them, I guess, if you have a better memory you're going to remember which ones are first second and third, but if your memory isn't as good, you're probably not going to remember which ones are better by writing 1 2 and 3. But I also like ranking because you can see what it would actually be. If you pick one, you can go back and look at it, and think that it's not right.
Choosing is easier. Because if you can see it as ways it could be, and think which one would make the most sense, you can just pick one. But when you're drawing, you can't do it perfectly or how you think it should look exactly.
Better to do harder (draw)?
I guess if you were trying to be taught how to do something the harder version would be better. Like with the memory, it's probably easier to learn something when you're doing it, and doing it the harder way could probably help other than just circling.

Interaction Types (Page 5)

Part 1
With Pop B over time, something is harming the people...
Species in ecosystems...
The species could be...umm. If they're living in the same ecosystem, how could they be...I don't see how they could be quite different. Maybe a disease happened to one group and with another one it could have been not as bad.
Part 2
{Student gets list of definitions}
It might be the first one, because [B] is going down, and [A] doesn't change as much. Maybe [A] has something to do with why [B] is going down.
Amensalism.
Part 3
Neither one of them is going down, both are going up, one more drastic than the other.
Antagonism.
It could be that they... They're helping each other in a way.
Student marks out Antagonism.
Commensalism.

Checking Plots (Page 6)

There is a lot more of [A] than there is B throughout the whole thing. [B] has less and [A] has more, so it's overpopulating, I guess? At certain points it's going down but coming back up again.
Student corrects several mistakes on A, but not all, and adds a few extra (incorrectly). 25-35 on A was problematic, student struggled with placement between 500-1000.
The red one is up higher than it should be because all these numbers are below 100. And these are all in thousands.
So what about this scale over here?
Oh, just kidding. (student realizes mistake in using scales). Student catches one error in plots on B once using correct scale.

Adding a Population (Page 7)

The new population is a lot more than all the others.
No (can't plot). It doesn't go up high enough.
I don't know.
Well you could put it up here (top x-axis), but that just wouldn't be right.
[student is coaxed through addition of third scale...eventually defines min and max]
Since these two have a really big population, it kind of affects how this population can be because since these are so big, these are smaller.
Populations with a lot bigger numbers need more food and supply and clothing and everything. And they're taking all the stuff that the smaller population has and using it for themselves, which is also causing the smaller population to get smaller.
{ENDED HERE}

Food Web and Graph (Page 8)

n/a

Cognitive Approaches to Interaction (Page 9)

n/a