

## Appendices for:

ELEMENTARY SCIENCE STUDENTS' CONCEPTIONS IN BIOLOGY: THEIR LANGUAGE, MEANINGS,  
CLASSIFICATIONS, AND INTERPRETATIONS OF SCIENCE CONCEPTS: AN ETHNOGRAPHIC STUDY

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**APPENDICES A-1 TO A-9**

**PLANT SPECIES USED FOR INTERVIEWS;**

**ANALYSES OF INTERVIEWS**

## Appendix A-1: Slide Sets: Plant Species Lists

### Slide set I - 34 species

1. *Quercus fusiformis*, plateau live oak - full, green tree, no close-up
2. a white mushroom
3. *Opuntia lindheimeri*, prickly pear cactus - large plant with many pads, much red fruit
4. *Tillandsia usneoides*, Spanish moss - hanging from trees
5. *Quercus buckleyi*, Spanish oak - full tree with red leaves, no close-up
6. Maidenhair fern (*Adiantum*) and moss hanging on a travertine overhang
7. *Echinocereus caespitosus*, lace cactus - with pink flowers
8. *Ratibida columnaris*, Mexican hat - field of yellow and red wildflowers
9. *Amaranthus*, pigweed - single plant
10. *Tillandsia recurvata*, ball moss - close-up, not showing tree on which it grows
11. *Yucca treculeana*, tree yucca - in bloom
12. *Cercis canadensis*, redbud tree - full tree, in bloom
13. *Cucurbita foetidissima*, stinking gourd - vine, distance shot of leaves covering ground
14. *Engelmannia pinnatifida*, cutleaf daisy - cluster of yellow wildflowers
15. ferns clinging to side of tree trunk
16. *Typha*, cattails in marsh (Dark photo - hard to see)
17. *Ibervillea lindheimeri*, balsam gourd - vine on fence, with red fruit
18. *Solidago*, goldenrod - large field of yellow wildflowers
19. *Ilex vomitoria*, yaupon - trimmed, rounded bush from a distance
20. *Taxodium disticum*, bald cypress - full, green, pyramidal tree

21. *Lantana camara* - scraggly bush covered with red and orange flowers
22. *Gaillardia pulchella*, Indian blanket - field of red and yellow wildflowers
23. orange lichen on rock
24. *Viola*, violet - close-up of purple flower and leaves
25. *Ligustrum*, privet - full tree with berries, distance shot
26. *Sabal texana*, palmetto - full tree
27. *Salix babylonica*, weeping willow - full tree
28. green lichen on tree limb, close-up not showing tree
29. grass in seed
30. *Ambrosia*, small ragweed - single plant
31. *Pinus taeda*, loblolly pine - full tree, cones present but not obvious
32. *Parthenocissus quinquefolia*, Virginia creeper - vines covering house, distance shot
33. *Juniperus ashei*, cedar or juniper - full bush or tree
34. *Sophora secundiflora*, Texas mountain laurel - full tree without blooms

Slide set II - 30 species

1. *Rosa*, rose - domestic, close-up
2. *Trifolium repens*, white clover - cluster of wildflowers
3. *Cocculus carolinus*, snailseed vine - on fence, with berries
4. *Wisteria* - large, free-standing vines covered with purple flowers (tree-like appearance)
5. & 6. *Prosopis glandulosa*, mesquite - full tree; close-up of pods
7. *Yucca rupicola*, small yucca - in bloom
8. *Taraxacum officinale*, dandelion - flower and seed head

9. *Toxicodendron radicans*, poison ivy - vine on tree trunk
10. *Nelumbo lutea*, lotus - white flower and leaves, in water
11. *Agave americana*, century plant - with tall flowering stalk, tree-like appearance
12. *Rubus trivialis*, dewberry - vine with red and black berries
13. & 14. *Ilex vomitoria*, yaupon - trimmed ornamental bush; close-up of red berries
15. & 16. *Eichhornia crassipes*, water hyacinth - distance shot of large pond full of plants; close-up of purple flower and leaves
17. *Castilleja indivisa*, Indian paintbrush - red wildflowers
18. *Cnidoscopus texanus*, bull nettle - white flowers, stinging hairs visible on leaves and stems
19. *Nymphaea*, pink water lily - flowers and leaves, in water
20. *Oxalis dillenii*, yellow wood sorrel - flowers and leaves
21. *Vitis mustangensis*, mustang grape - vines with grapes (dark photo - hard to see)
22. & 23. *Juniperus ashei*, cedar or juniper - full tree; close-up of leaves and blue berry-like cones
24. *Oenothera speciosa*, pink evening primrose – close-up of flowers
25. *Sabal minor*, dwarf palmetto – palm fronds without a trunk
26. & 27. *Quercus buckleyi*, Spanish oak – full tree with red leaves; close-up of leaves turning red (no acorns present)
28. & 29. *Helianthus annuus*, sunflower- close-up of flower; field of flowers with man for size reference
30. & 31. *Lupinus texensis*, bluebonnets – field of wildflowers with women; close-up of flowers
32. & 33. *Quercus fusiformis*, plateau live oak – close-up of leaves and acorns; full tree
34. & 35. *Pinus taeda*, loblolly pine – close-up of needles and cone; full tree
36. *Agave americana*, century plant – single plant, no flower stalk

37. & 38. *Acer grandidentatum*, bigtooth maple – full tree with red leaves; close-up of leaves

39. & 40. *Taxodium disticum*, bald cypress – full pyramidal tree with reddish-gold leaves in fall; close-up of green leaves with cone

41. & 42. *Quercus shumardii*, shumard oak – close-up with acorns; full green tree

## Appendix A-2: Sorting Task – Color Photographs: Plant Species List

1. Understory shrubs in a forest, weedy looking
2. Trees around a building - single trunks
3. Scrubby trees in a forest, with people under them - single trunks
4. Small scrubby trees in a forest - no leaves, single trunks
5. Tree with large, single trunk, numerous leaves
6. African tree with thorns (possibly an *Acacia*) - large, many branched, with single, large trunk
7. *Prosopis glandulosa*, mesquite tree - large trees with single and double trunks
8. African tree silhouette - single trunk, flat top
9. *Quercus virginiana*, live oak - large tree with multiple trunks
10. *Taxodium disticum*, bald cypress - large green trees in forest, single trunks, by and in water
11. Small trees in a grove, with single trunks, by ocean
12. Large tree without leaves, multiple trunks
13. Pine trees - single trunks; at a distance, around a lake
14. *Juniperus*, Juniper or cedar - tree or shrub with multiple trunks, taller than child
15. *Sabal texana*, palmetto - grove of large trees by water, single trunks, trunks hidden by dead leaves
16. Tropical palms - silhouette, single trunks
17. Dense cluster of bushy trees - perhaps live oak; multiple trunks hidden by leaves
18. Large oaks in water, single trunks
19. *Cercis canadensis*, redbud - large tree by a house, single trunk
20. Bald cypress - with red leaves, in water, a forest; single trunks
21. Large trees, without leaves, by water; single trunks

22. Large pines in forest - single trunks
23. Large birch trees in forest - single trunks
24. *Leucophyllum*, cenizo - shrub in bloom, trunks hidden by leaves
25. *Sapium sebiferum*, Chinese tallow tree - close-up of red leaves in dense canopy (no trunks showing but branches visible)
26. *Sophora secundiflora*, mesquite or Texas mountain laurel - tree or shrub in bloom, trunks hidden by flowers
27. *Fouquieria splendens*, ocotillo - small, no blooms; desert scene with other small shrubs
28. Juniper - bushy shrub, trunks hidden by leaves and branches
29. Trimmed hedges, trunks hidden by branches
30. Mesquite grove, trees with single and multiple trunks; with small junipers
31. Wild azalea - shrub in bloom; sparse branches
32. Hawaiian yucca-type tree without blooms; single trunk, hidden by drooping leaves
33. *Yucca* - non-tree type without blooms, surrounded by field of wildflowers
34. Tree-like yucca - in bloom
35. *Agave* - large plant in bloom, flowering stalk tree-like
36. *Sabal minor*, dwarf palmetto - no trunks
37. *Opuntia*, prickly pear - in bloom
38. *Opuntia*, cholla - large, branching cactus, tree-like
39. Saguaro cactus - single trunks, tree-like; desert scene with many cacti and other shrubs
40. *Echinocactus*, Horse creeper cactus - in bloom
41. *Yucca*, Joshua tree - branching, tree-like, with multiple trunks, trunks covered with drooping, dead leaves

42. *Echinocereus triglochidiatus*, claret cup cactus - in bloom
43. Fern, large, elaborate fronds
44. *Adiantum*, maidenhair fern (some moss in background)
45. Tropical fern - large, bushy fronds
46. Railroad vine - in bloom
47. Railroad vine - no blooms, on sanddunes with grasses
48. Sea oats on dunes
49. Field of wheat
50. Prairie grasses
51. Grasses and herbaceous wildflowers - dry, weedy, dead looking
52. Grasses and inconspicuous cattails in water - dead looking
53. Marsh grass in water - green
54. Blue and purple wildflowers - blue-eyed grass (*Sisyrinchium*) and *Verbena*
55. *Liatris*, gayfeather - field of showy wildflowers
56. Pink evening-primrose (*Oenothera speciosa*) and Indian paintbrush (*Castilleja indivisa*) - close-up of wildflowers
57. *Helianthus annuus*, sunflowers
58. Field of wildflowers - bluebonnets (*Lupinus texensis*), Indian blankets (*Gaillardia pulchella*), and a yellow composite
59. Bushy, scrubby looking wildflowers, tall yellow composites on dunes by ocean
60. *Eichhornia crassipes*, water hyacinths in bloom (dense population, hiding water)
61. *Nymphaea*, water lily - pad with white flowers
62. Tulips in bloom

- 63. White Baptisia - weedy looking, branching herb, grass also
- 64. *Oxalis*, wood-sorrel - leaves only
- 65. Weedy looking yellow wildflowers, composite family
- 66. Herbaceous plant, leaves only - similar to wild geranium
- 67. Herbaceous plant (*Lupinus* species) - leaves only
- 68. *Castilleja*, Indian paintbrush - a species with green flowers
- 69. *Trifolium repens*, white clover - in bloom
- 70. Herbaceous plant, leaves only
- 71. *Cirsium*, purple thistles in bloom
- 72. Large tree covered with Spanish moss (*Tillandsia usneoides*)
- 73. *Opuntia*, prickly pear - with fruit
- 74. *Yucca* - not blooming, some trunkless, some on short trunks but not tree-like (trunks hidden by green leaves); wildflowers in background

#### The Groups of Plants Used in the Sorting Task

Broadleaf, woody, single-trunked trees - 2,3,4,5,6,8,11,17,18,19,21,23,72

Broadleaf, woody, multiple trunked trees - 7,9,12,30

Tallow tree, red leaves only - 25

Coniferous trees, single trunks - 10,13,20,22

Broadleaf shrubs, multiple trunks or trunks not obvious - 1,24,26,29,31

Coniferous shrubs (junipers), multiple trunks - 14,28

Palm trees - 15,16

Dwarf palmetto - 36

Yuccas - 32,33,34,41,74

Agave - 35

Cacti - 37,38,39,40,42,73

Ocotillo - 27

Ferns - 43,44,45

Vines - 46,47

Grasses - 48,49,50,51 (also herbs),52,53

Herbaceous, with attractive, showy flowers - 54,55,56,57,58,62

Herbaceous, with showy flowers, in water - 60,61

Herbaceous, with showy flowers, thistles - 71

Herbaceous, with weedy or non-showy flowers - 59,63,65,69

Herbaceous, without flowers (or flowers not obvious) - 64,66,67,68,70

Spanish moss, on large trees - 72

## Appendix A-3: Informant 1: Domain Analysis - Strict Inclusion: Categories of Plants

(Note: The informant's names and spellings are outside of parentheses or in quotes. If the name is inaccurate, the correct names and comments follow in parentheses.)

### Trees

#### Slides:

- Named: fruit tree (redbud), palm tree (*Sabal texana*), acorn (2 oaks with acorns), fir tree (pine, cones not obvious), spruce (bald cypress, cones showing), cedar (juniper with cones), spruce or cedar (juniper - full tree), cherry tree (yaupon with fruit), maple (maple, Spanish oak - both with red leaves), pine tree (pine with cones)

- No generic names: (live oak without acorns, Spanish oak - full tree, bald cypress - full tree, *Ligustrum*, willow, mesquite, wisteria, grape vine)

#### Field (neighborhood):

- Named: pine tree, super tree (sycamore), cedar

- No generic names: (cedar elm sapling, live oak, hackberry)

#### Field (river walk):

- Named: acorn tree (unseen oak), maybe oak (mesquite)

- No generic names: (magnolia, bald cypress, chinaberry, box elder, sycamore, hackberry, anacua, pecan, *Ligustrum*)

#### Listing tasks:

- Named: Mapel, elm, spruce, fir, cedar, pine, super (sycamore)

#### Concept map:

- Named: oak, cedar, elm

#### Sorting tasks: No generic names

- Most like a tree: (2, 3, 4 leafless, 5, 6 leafless Acacia; 7, 30 mesquite; 8; 9 live oak; 10, 20 bald cypress; 11, 12 leafless, 14, 15, 16, 17, 18, 19, 21, 22, 23, 25, 34, 72; trees with single or multiple trunks, conifers, large juniper with multiple trunks, palms, one treelike yucca in bloom, tallow leaves, redbud)

(While doing this task, informant moves out any questionable material - to weed, bush, or cactus. This leaves nothing for a "least like a tree" category. Species moved: 1 understory shrubs, 24 cenizo, 26 mesquite, 28 bushy juniper, 31 azalea, 35 agave, 63 branching herbaceous *Baptisia*)

- Sort of like a tree: all the bushes; 35 (*Agave americana* - had included this as a tree, then moved to cactus)

### Bushes

Slides:

- No generic names: (yaupon - trimmed, rounded crown tree)

Field (neighborhood):

- No generic names: (snakewood, agarita, croton, cedar elm branch low on side of trunk)

Field (river walk): - No generic names: (boxwood)

Listing tasks: No names

Sorting tasks:

- No generic names: 29 (trimmed hedges); 1, 24, 26, 28 (these four shrubs moved from trees; trunks hidden).

### Flowers

Slides:

- Named: violets, rose

- No generic names: (*Lantana*, wisteria)

Listing tasks:

- Named: tulips, roses, marigolds, violets, bluebonnets, gladiola

Concept map: - Named: Garden flowers = roses, tulips

## Wildflowers

### Slides:

- Named: dandelions (dandelions, Mexican hats, cutleaf daisy), bluebonnets, Indian paintbrushes, sunflowers, buttercups (pink *Oenothera*)

### Field (neighborhood):

- Named: bluebonnets, dandelions (unknown composite)
- Combined name: weed flower (wild mint with flower)
- No generic names: (phlox, blue-eyed grass, anemone, *Verbena*)

### Field (river walk):

- Named: wild violets (spiderwort), primrose (pink *Oenothera*), dandelions (yes)

Listing tasks: - Named: bluebonnets, Indian paintbrushes

Concept map: - Named: bluebonnets, paintbrushes

### Sorting tasks:

- No generic names: (37 prickly pear in bloom, 46 railroad vine in bloom, 48 sea oats; 50, 51, and 52 - grasses; 54, 55, 56, 57, and 58 - all attractive colorful wildflowers; 59 - bushy, weedy yellow composites; 62 tulips, 65 weedy yellow wildflowers, 69 white clover)

## Plants

Categories of plants: Listing tasks: cactus, flowers, trees, grasses, weeds, crops

Real plants: Listing tasks: flowers, crops, vegetables

### Small Plants and Water Plants:

Slides: - Named: lily pads (lotus, water hyacinth, water lily, maidenhair fern); (Assumed category:) Texas wild rice (cattails), water flowers (bull nettle)

Field (neighborhood): - No generic names: little plant (a low-growing herb)

Field (river walk): - Named: water plants: elephant ears, wild rice (a grasslike water plant), seaweed (a grasslike water plant), water lily (elephant ears at a distance)

Listing tasks: - Named: lily pads, elephant ears and others (are types of lily pads)

Sorting tasks:

- No generic names: (13 pine trees by lake, 47 railroad vine without flowers, 53 grass in water, 60 water hyacinth, 61 water lily, 64 Oxalis without flowers; 66, 67, 68, 70 herbs without flowers or flowers green.)

### Grass

Field (neighborhood):

- Named: Johnson grass (a tall grass - also a weed)
- No generic names: (two true grasses in yard, rain lily without flower)

Field (river walk):

- Named: clover (yes)

Listing task: No names

### Ivy

Slides: - Named: poison ivy

Field (river walk):

- Named: honeydew (honeysuckle), poison ivy
- No generic names: (mistletoe, Virginia creeper, leaves on trunk of Chinaberry tree)

Listing tasks:

- Named: poison ivy
- Unnamed: the kind like that up there (a house plant ivy); the kind that grow on the wall

### Vines

Field (neighborhood): - Named: forget-me-not (vetch)

Field (river walk):

- Named: poison ivy
- No generic names: (grape vine)

### Cactus

#### Slides:

- Named: prickly pear cactus
- No generic names: (lace cactus, 2 yuccas - treelike and not, stinking gourd, 2 agaves - with and without flower stalk, dwarf palmetto)

#### Field (neighborhood):

- Named: prickly pear
- No generic names: (*Yucca rupicola*)

#### Listing tasks:

- Named: prickly pear
- No generic names: little ones on the ground; big ones you see in deserts (saguaro)

#### Sorting tasks:

- Most typical - (38 cholla, 39 saguaro, 40 horse creeper, 42 claret cup, 71 purple thistle, 73 prickly pear with fruit)
- Least typical - (27 ocotillo; 33 and 74 non-tree yuccas, 32 Hawaiian tree-like yucca; 35 agave, moved from trees; 36 dwarf palmetto, 41 Joshua tree)

### Weeds

#### Slides:

- Named: berry weed (balsam gourd), clover (*Oxalis* - assumed from field)
- No generic names (ball moss, goldenrod, grass in seed, small ragweed)

#### Field (neighborhood):

- Named: three-leaved clover (yellow clover without flower), clover (*Oxalis* without flower), Johnson grass (a tall grass), onion weeds (wild onion), forget-me-not (vetch - also a vine)
- Combined name: weed flower (wild mint with flower)
- No generic names: (thistle rosette, henbit without flowers, *Draba* seeding stalk, sedum, *Torilis*, bladderpod in bloom, rain lily without flowers, two grasses in seed)

Field (river walk):

- Named: wild onions
- No generic names: (assorted low herbs, plantain, wild geranium without flowers, grass in seed)

Listing tasks: - Named: Johnson grass, wildflowers

Sorting tasks: - No generic names (31 azalea, 63 *Baptisia*) (both moved from trees when evaluating. Both branching and bushy)

**Crops**

Listing tasks: - Named: vegetables, cotton

Sorting tasks: - No generic names: 49 (wheat field)

**Mushroom**

Slides: - No generic names: (white mushroom)

Listing tasks: No names

**Mold**

Slides: - No generic names: (orange lichen on rock)

Listing tasks:

- Named: mushroom
- No generic names: stuff that grows in your food

### **Moss**

Slides: - No generic names: (Spanish moss, true moss, Virginia creeper)

Field (neighborhood): - No generic names: (orange and gray tree lichens)

Listing tasks: ("Are there different kinds?") No, I don't think so.

### **Mold or Moss**

Slides: - No generic names: (green tree lichen)

### **Ferns**

Sorting tasks:

- No generic names: sort of like ferns (43, 44, 45 all ferns)

### **Vegetables**

Listing tasks: corn, squash, broccoli, tomatoes, peas, beans, lettuce, carrots, celery, onions, mushrooms, peppers, potatoes, cucumbers.

### **Fruits**

(Data lost when updating this document to new version of Word)

### Appendix A-3: Informant 2: Domain Analysis - Strict Inclusion: Categories of Plants

(Informant's name and spelling outside of parentheses or in quotes. If name is inaccurate, researcher's names and comments follow in parentheses.)

#### Trees

##### Slides:

- Named: oak tree (live oak - full tree), acorn tree (two oaks with acorns), blueberry tree (grape vine), pine cone tree (pine - close-up), pine tree (palmetto, *Sabal texana*). (No response for several, including 3 full shot trees.)

- No generic names: (bald cypress - full green tree, *Ligustrum*, mesquite, juniper, Spanish oak - close-up, maple)

##### Field (neighborhood):

- Named: pecan tree, bean tree (mimosa), not a pine tree (mesquite), pine tree - like a coconut tree (*Sabal* palm tree), pine tree or fir tree - a Christmas tree thing (large Deodar cedar), cedar - no, not cedar (juniper), rose tree (rose bush)

- No generic names: (hackberry, 2 live oaks, 3 *Ligustrum*, sycamore, tree-like yucca, cedar elm)

##### Field (river walk):

- No generic names: (bald cypress, mesquite - thought they were same; box elder, paper mulberry - thought they were same)

##### Listing tasks: (Child's spelling)

- Named: pecan tree, cedar, birch, maple tree, peach tree, fir tree, apple tree, orange, pear.

##### Concept map:

- Named: pecan, apple

Sorting task: (No generic names. My instructions may have caused her to think she was to sort all the trees into these two groups)

- Most like a tree: (taller than a person, single trunks - 2, 3; 4 - leafless, 5, 8, 11, 18; 12 large, no leaves, multiple trunks; 13, 22 pines; 10, 20 bald cypress; 14 large juniper, multiple trunks visible; 16 tropical palm, 19 redbud, 21 large, single trunk, leafless; 9, 17 live oaks with multiple trunks; 25 red tallow leaves, 6 thorny leafless, *Acacia*; 7, 30 mesquite)

- Least like a tree: 15 (palm), 23 (paper birch), 32 (Hawaiian yucca), 34 (tree-like yucca), 35 (tree-like agave), 36 (palmetto trees), 41 (Joshua tree)

### **Bushes**

#### Slides:

- No generic names: (yaupon - full, trimmed shrub; juniper, wisteria)

#### Field (neighborhood):

- Named: rose bush, pine bush (juniper)

- No generic names: (4 trimmed hedge shrubs, *Ligustrum*, *Pittosporum*, boxwood, arbor vitae, *Nandina*, 2 yellow jasmine)

#### Field (river walk):

- Named: honeysuckle (also a vine)

- No generic names: (boxwood, small mesquite)

Listing tasks: (Are there different kinds?) Yes

Sorting task: (No generic names)

- Normal bushes: (28 juniper, trunks hidden, 29 trimmed hedge, 31 azalea; 43, 45 ferns; 48 sea oats)

- Least like a bush: 38 (cholla), 39 (saguaro), 73 (prickly pear). (Although she didn't tell me which were cactus, she said: "I picture cactus as a type of bush".)

### **Categories of Flowers**

Listing tasks: flowers on bushes, flowers on trees, flowers out in a field

Concept map: Flowers grow on bushes, trees, ground, and in water

### **Names of Flowers**

#### Slides:

- Named: red flower (Indian paintbrush), not daisies (Mexican hat, Indian blanket). (Assumed to

be in this category:) morning glory (violets), buttercup (pink *Oenothera*), dandelion, rose, bluebonnet

- No generic names: (*Lantana*, orange lichen)

Field (neighborhood):

- Named: marigolds, little bitty red flowers (potted Kalancho)

- No generic names: (2 anemones in bloom, ornamental flowers in garden, henbit)

Field (river walk):

- Named: buttercups (pink *Oenothera*), clovers (bur clover in bloom - also a weed), mustard flowers (bur clover)

- No generic names: (spiderwort, wild onion in bloom, undocumented herb in bloom)

Listing tasks:

- Named: daisy, buttercup, bluebonnet, lily, waterlily, dandelions, marigolds, roses, Indian paintbrush, honeycycle = flowers on a bush.

Sorting task:

- No generic names: (24 cenizo, 26 mescalbean; 37, 40, 42 flowering cacti; 46 railroad vine in bloom; 54, 55, 56, 57, 58, 59, 62, 63, 65, 69 all flowering herbs, some weedy looking; 71 purple thistle, 74 yucca in field of flowers)

### **Categories of Plants**

Listing tasks: flowers - flowers on bushes, flowers on trees, flowers out in a field (also called "wildflowers"); trees, bushes, weeds, potted plants, grass, plants in or by rivers (also called "water plants" or "river plants"). Ivy.

Concept map: tree, flowers, plants in or by river

### **Names of Plants**

Slides:

- No generic names: (pigweed)

Field (neighborhood):

- No generic names: (green tree lichen)

Field (river): - Named: elephant ears (assumed category)

Listing tasks:

- Named: Plants in and by rivers = elephant ears, those cat things - are those dandelions?, water lilies (lotus, water lily), lily pads, weeds. Potted plants (Are there different kinds? "Yes.")

Concept map:

- Named: Plants in or by river = elephant ears, lily pads, cattails (she used listing task to do concept map); tomatoes, carrots

Sorting task:

- Names: water plants: 60 (water hyacinth), 61 (water lily), 52, 53 (grasses in pond)

- No generic names (regular plants, plants I don't know the names of): 1 (weedy understory shrubs), 27 (ocotillo), 33 (low yuccas without flowers); 66, 70 (leafy herbs, no blooms)

### **Grass**

Field (neighborhood):

- Named: Johnson grass (2 weedy grasses)

- No generic names: (3 turf grasses)

Listing tasks: (Are there different kinds?) No

### **Categories of Vines**

Vines on the ground, vines in trees, ivy is kind of like a vine

### **Names of Vines, Ivy**

Slides:

- No generic names: vines (stinking gourd, balsam gourd), ivy (Virginia creeper), ivy or a vine (poison ivy)

Field (neighborhood):

- Named: vines - milkweed (Galium), little clovers on vines (henbit)
- No generic names: vines (2 Wisteria, honeysuckle, purslane in a pot, sedum in a pot, henbit); ivy (2 English ivy, ivy in hanging basket)

Field (river walk):

- Named: vine - honeysuckle (4 - also a bush)
- No generic names: vine (poison ivy)

Listing tasks:

- Named: ivy - poison ivy
- No generic names: ivy (a house plant)

**Cactus**

Slides:

- Named: prickly pear
- No generic names: (lace cactus)

Field (neighborhood):

- No generic names: little cactus (potted succulent)

Listing tasks:

- Named: (Are there different kinds? "Yes, prickly pear. I don't know if it's a different kind of cactus.")

**Weeds**

Slides:

- No generic names: (pigweed, cattails, grass in seed, ragweed)

Field (river walk):

- Named: buttercups (pink *Oenothera* - "without the flowers, it's a weed"), clovers (bur clover - also a flower)
- No generic names: (ragweed, wild onion - also a flower, the fruit on ball moss)

Listing tasks: (Are there different kinds?) Yes

Sorting task:

- No generic names: 44 (maidenhair fern), 47 (railroad vine without flowers), 49 (wheat), 50 (grass), 51 (dry grasses and herbs), 64 (*Oxalis* without flowers), 67 (*Lupinus* without flowers), 68 (green Indian paintbrush)

### **Mushroom or Toadstool**

Slides:

- No generic names: mushroom or toadstool (white mushroom)

Listing tasks:

- Named: (Are there different kinds? "Yes. I don't know if a toadstool is related to a mushroom. There's poisonous mushrooms and mushrooms you can eat.")

### **Mold or Moss**

Slides:

- No generic names: moss (Spanish moss); moss and mold (true moss and maidenhair fern); mold (green lichen)

Field (neighborhood):

- No generic names: moss (ball moss, fibers on *Sabal* palm tree)

Field (river walk):

- No generic names: moss (ball moss)

Listing tasks: (Are there different kinds of moss? "Yes." mold? "I don't know.")

Sorting tasks: - No generic names: moss (Spanish moss)

## Berries

### Slides:

- Named: red berries (snailseed vine), dewberries
- No generic names: berries or a vine (balsam gourd)

## Leaves

### Slides:

- No generic names: (ferns on side of tree)

### Field (neighborhood):

- No generic names: (anemone in bloom - also a flower; unknown ground hugging herb; mistletoe)

## Vegetables (no list)

## Fruits (no list)

## Unknown Domains

Slides: morning glory (violets), beans (mesquite), cherries (yaupon with fruit), clover (*Oxalis*)

Field (neighborhood): baby breath (chickweed, *Galium*), aloe vera (2 potted Sansevieria, 1 potted aloe vera), mint things or parsley things (*Calyptocarpus* in bloom), mint things (ragweed seedlings), buttercups (*Vinca*), dandelions (*Sonchus*), clovers (*Oxalis*), morning glories (no referent), hot peppers (chile pequin)

## Thinks a plant is not a plant

- Named: bird's nest (ball moss)

### Appendix A-3: Informant 3: Domain Analysis - Strict Inclusion: Categories of Plants

(Informant's name and spelling outside of parentheses or in quotes. If name is inaccurate, researcher's names and comments follow in parentheses.)

#### Trees

##### Slides:

- Named: pecan (Spanish oak - full tree), palm tree (*Sabal texana*), south tree (willow), baby tree (small ragweed), pine cone tree (2 pines), evergreen (cedar), upulicktus tree (mescalbean), grape tree (wisteria), cedar tree (mesquite), mesquite tree (cedar), blue and red berry tree (dewberry), berry tree red (yaupon with fruit), blueberry tree (grape vine), red leaved tree (maple), Christmas tree (bald cypress - close-up and fall color), nut tree (2 oaks with acorns). (Several non-responses.)

- No generic names: (live oak - full tree)

##### Field (own neighborhood):

- Named: Chinaberry tree (loquat)

- No generic names: (cedar elm, *Bumelia* sapling)

##### Field (cousin's neighborhood):

- Named: evergreen (juniper), tree cedar (juniper)

- No generic names: (Chinaberry, small *Bumelia*, *Ligustrum*, several other trees)

##### Field (river walk):

- Named: Chinaberry trees (*Magnolia*)

- No generic names: (bald cypress, elderberry)

##### Listing tasks: (Child's spelling)

- Named: pine tree, oak tree, south tree, muskeet (mesquite), red wood, pecan tree, apple tree, orange tree, limone (lemon) tree, naranha (orange), manzanita

Sorting task: (No generic names)

- Most like a tree: (1 understory shrubs in forest, 2, 3; 4 no leaves; 5, 6; 7 and 30 mesquite, 8, 9 large live oak, 10 and 20 bald cypress, 11; 12 large, multiple trunks, no leaves; 13, 22 pines; 14 large juniper, multiple trunks visible; 15, 16 palms; 17 dense grove of fairly large trees, some with multiple trunks partly hidden by leaves, 18, 19 redbud, 21 no leaves, 23, 25 red tallow leaves, 72, 73 prickly pear with fruit, 74 low yuccas. (All have single trunks, unless noted otherwise.)

- Least like a tree: 34 (tree-like yucca), 35 (tree-like agave), 38 - cactus (cholla)

- In between: 24 (Cenizo in bloom), 28 - "looks like the evergreen or the mesquite tree" (shrubby cedar), 32 - "looks like a palm tree" (Hawaiian yucca), 41 (Joshua tree)

- Sort of like a tree: 26 (mescalbean), 29 (trimmed hedge), 31 (azalea in bloom), 39 (saguaro), 71 (thistles)

**Bushes**

Slides:

- No generic names: (yaupon - full trimmed shrub)

Field (own neighborhood):

- Named: rose bush (3)

- No generic names: (*Pittosporum*)

Field (cousin's neighborhood):

- No generic names: (several shrubs, ornamental cabbage, elbow bush)

Listing tasks:

- Named: thornbushes, berry bush. I don't know others.

Sorting task:

- No generic names: 26 (mescalbean in bloom), 29 (trimmed hedge)

## Flowers (Child's spelling)

### Slides:

- Named: sun flower (sunflower, dandelion), colyflower (pink evening primrose), lily flower (lotus, water lily), fan flower (palmetto, *Sabal minor*); (assumed category based on later performance:) rose, daisy (bull nettle), Mexican hats, butterfly (violets), three-leaved clover (*Oxalis* in bloom), Texas bluebonnet

### Field (own neighborhood):

- Named: buttercups (pink *Oenothera*), three-leaf clovers (*Oxalis* in bloom - also a plant)

- No generic names: (*Euphorbia* with tiny flowers, bur clover with and without flowers, potted plant without flowers that he says is not a "plant" because it will flower)

### Field (cousin's neighborhood):

- Named: yellow flowers (dandelion)

- No generic names: (Iris)

### Field (river walk):

- Named: buttercups (pink *Oenothera*)

- No generic names: (*Brassica* in bloom)

### Listing tasks:

- Named (flowers and plants): fern, rose, lily, daisy, doggy's, ivy, beritos

### Sorting task: (No generic names)

- Most typical flowers: (31 azalea, 37 prickly pear in bloom, 40 devil's head cactus, 42 claret cup cactus, 46 railroad vine in bloom; 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 65 - all flowering herbs)

- Least typical flowers: 69 (true clover in bloom)

## Plants

### Field (own neighborhood):

- Named: three-leaf clovers (*Oxalis* in bloom - also a flower)

- No generic names: (*Sonchus* in seed, dock, wild onion in bloom, rain lily - no blooms, goldenrod, agave - in cousin's neighborhood gave no response, potted tradescantia)

Field (cousin's neighborhood): - Named: three-leaf clover (assumed category, clover, no flowers)

Listing tasks:

- Named: Flowers and plants = fern, rose, lily, daisy, doggy, ivy, beritos

Sorting task: (No generic names)

- Most typical plants: 27 (ocotillo), 33 (low yucca, no flowers), 36 (*Sabal minor*); 43, 44, 45 (ferns - two of these he called "ferns"); 47 (railroad vine, no flowers), 64 (*Oxalis*, no flowers), 66, 67, 68, 70 (green, leafy herbs, no blooms)

- Least typical plants: 39 (saguaro); 48, 49, 50, 51, 52, 53 (6 grasses; some "look like grass".)

### Grass

Slides:

- Named: Johnson grass

Field (own neighborhood):

- Named: speargrass (grass in seed)

Field (cousin's neighborhood):

- No generic names: (turf)

Listing tasks:

- Named: (Are there different kinds?) "Yes, Johnson grass."

Sorting task:

- No generic names: (3 true grasses, which are categorized as "plants")

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## Vines

### Slides:

- Named: berry vine (snailseed vine)
- No generic names: (balsam gourd, Virginia creeper, poison ivy)

### Field (own neighborhood):

- No generic names: (snailseed vine)

### Field (river walk):

- No generic names: (honeysuckle, Virginia creeper)

Listing tasks: (Are there different kinds? "Yes." He didn't know any names.)

### Sorting task:

- No generic names: 46, 47 (railroad vines, with and without flowers - also classified in "flowers" and "plants")

## Cactus

### Slides:

- No generic names: (prickly pear)

### Field (cousin's neighborhood):

- No generic names: (prickly pear with fruit)

Listing tasks: (Are there different kinds? "Yes." He didn't know any names.)

### Sorting task: (Secondary sort)

- No generic names: 38 (cholla), 39 (saguaro), 40 (devil's head cactus, in bloom), 41 (Joshua tree - yucca), 42 (claret cup cactus, in bloom). (These also were first classified as plants or flowers or trees.)

## Weeds

### Slides:

- Named: sea weeds = river weeds (water hyacinth)
- No generic names: (pigweed)

Field (own neighborhood): - No generic names: (vetch in bloom)

Listing tasks: (Are there different kinds? "I don't know.")

Sorting tasks: (Are there any weeds? "Not that I found.")

## Mushrooms

### Slides:

- No generic names: (white mushroom)

Listing tasks: (Are there different kinds? "Yes." He didn't know any names.)

## Fungus

### Slides:

- No generic names: (orange lichen)

Field (cousin's neighborhood):

- No generic names: (yellow tree lichen)

Listing tasks: (Are there different kinds? "No.")

## Ferns

### Slides:

- No generic names: (fern on tree)

Listing tasks: (Are there different kinds? "No.")

Sorting tasks: (one fern, also classified as "plants")

### **Leaves**

Slides: - No generic names: (maidenhair fern)

### **Vegetables**

Listing tasks: lettuce, spinach, celery, onion, peas, carrot.

### **Fruits**

Listing tasks: apples, oranges, lemons, tomatoes, potatoes, pineapple, grapefruit, grapes, watermelon

### **Unknown Domains**

Field (river walk): elephant ears, fly-traps (bur clover fruit)

### **Appendix A-3: Informant 4: Domain Analysis - Strict Inclusion: Categories of Plants**

(Informant's name and spelling outside of parentheses or in quotes. If name is inaccurate, researcher's names and comments follow in parentheses.)

#### **Trees**

##### **Slides:**

- Named: pecan tree (Ligustrum), weeping willow, pine tree (2 pines), cedar (full shot - when saw cones, said, "No"), acorn tree (live oak with acorns)

- No generic names: (live oak - full shot, 2 Spanish oaks - no acorns, Shumard oak - with acorns, redbud, 2 bald cypress, small ragweed, juniper - full shot, mescalbean, wisteria, mesquite, agave with flower stalk, yaupon with fruit, grape vine, maple)

##### **Field (neighborhood):**

- Named: ash tree (3), peach tree (2), pear tree (2), mimosa tree, pecan tree (peach with no leaves), cedar tree (3 juniper, 1 arbor vitae), plum tree (small redbud)

- No generic names: (hackberry, ash, Chinaberry, 3 unidentified trees)

##### **Field (river walk):**

- Named: honeysuckle bush (could be a bush or tree or vine)

- No generic names: (bald cypress)

##### **Listing tasks:**

- Named: oak, pine, peach, cedar, pecan, apple, banana, orange, mimosa, weeping willow, rubber, pear, cherry, mahogany

##### **Concept map:**

- Named: mahogany, plums (plums), pear, peach, ash

##### **Sorting task:**

- No generic names (trees): 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 16, 17, 18, 19, 20, 22, 23, 25, 28 (juniper - trunks hidden, later moved to bushes), 30, 72, 35.

- No generic names (trees with flowers - a separate category): (24 cenizo, 26 mesquite)

(When asked to add to the trees all the trees he initially put in other groups, added) 6, 15, 21, 24, 26, 38

- Most like a tree: (2, 3, 5, 11 - taller than people, single trunks, 7 & 30 - mesquite, 10, 20 bald cypress, 14 juniper - tall, trunks visible; 17 dense cluster of fairly large trees, multiple trunks partially hidden by leaves; 18 large oaks, single trunks, 25 - red leaves of tallow tree)

- Least like a tree: 9 (live oak), 6 (acacia, thorny, no leaves), 15 (*Sabal minor*), 35 (agave with stalk), 38 (cholla)

- Not selected for either category: (4 leafless trees, 8 African tree, flat-topped, 12 large tree with multiple trunks, no leaves; 16 palm, 19 redbud, 21, 22, 23, 72 - all large, single trunks, 24 cenizo, 26 mesquite in bloom, 38 cholla)

- Sort of like a tree: 13 "without the water, it's trees" (pines), 28 "looks like a cedar tree" (juniper, shrubby), 34 (tree-like yucca), 41 (Joshua tree), 45 (bushy fern), 67 (Lupinus without flower). (In discussion, he removed 45, 67 from this group)

### **Bushes**

Slides:

- No generic names: (yaupon - full trimmed shrub)

Field (neighborhood):

- No generic names: (2 trimmed shrubs)

Field (river walk):

- Named: honeysuckle bush (2 - could be a tree or a vine)

Sorting task: - No generic names: (28 juniper, trunks hidden, 29 trimmed hedge)

### **Flowers**

Slides:

- Named: dandelion, rose, sunflowers, bluebonnets, Indian paintbrushes (Indian paintbrush, Lantana), lily pads (lotus), wildflowers (pink evening primrose)

- No generic names: (Engelmann's daisy, goldenrod, Indian blanket, violets, water lily, water hyacinth, bull nettle, dandelion).

Field (neighborhood):

- Named: roses, wildflower or powder puffs (yellow *Oenothera*), wildflowers (2 *Verbena bipinnatifida* in bloom; henbit - he says these wildflowers are flowers, not grass, but earlier he called henbit without flowers "grass"), pink powder puffs (pink *Oenothera*)

- No generic names: (*Corydalis* in bloom, *Brassica* in bloom)

Field (river walk):

- Named: buttercups (pink *Oenothera*)

Listing tasks:

- Named: bluebonnets, Indian paintbrushes, daisies, tulips, roses, dandelions, lily, powder-puffs (pink evening primrose)

Concept map:

- Named: bluebonnets, marigold, petunias, dandelion, wildflowers, isalias (azaleas?), Indian paintbrushes

Sorting task:

- No generic names: 31 (azalea in bloom), 37 (prickly pear in bloom), 40 (horse creeper cactus in bloom), 42 (claret cup cactus in bloom), 46 (railroad vine in bloom), 54, 55, 56, 57, 58, 60, 62 (herbs with showy flowers), 63, 65, 69 (herbs with weedy or non-showy flowers)

## Plants

### Categories of Plants

Listing tasks: poisonous, vegetables, fruits, wild, miscellaneous (miscellaneous), trees, flowers, ivy, vines, water, land. ("What were you thinking of when you said 'miscellaneous'?" "Animals.")

### Names of Plants

Slides:

- No generic names: (pigweed)

Field (neighborhood):

- Named: clover (clover with no blooms - "I don't know if it's grass or weeds or what.")

Field (river walk):

- Named: small plants (clover)
- No generic names: (poison ivy)

Sorting task:

- No generic names (plants): (1 understory shrubs; 43, 44, 45 ferns; 47 railroad vine, no blooms; 50 grasses, 64 *Oxalis*, no blooms; 66, 67, 68, 70 herbs, no blooms)
- No generic names (plants and trees by the water): (13 pines, 15 *Sabal* palm, 21 trees, 48 sea oats, 52, 53 marsh grasses and cattails, 59 weedy composites, 61 water lily. All these are by water. When asked to pull all trees out, he extracted 15 and 21.)

**Grass**

Field (neighborhood):

- Named: speargrass (grass in seed)
- No generic names: (5 samples of turf grass or weedy grass, plantain, wild geranium, henbit, *Draba* in seed, dock rosette, *Sonchus* rosette, composite rosette, *Oxalis* - all without flowers)

Field (river walk):

- Named: grass burs (bur clover fruits)

Sorting task:

- Named: farm grass (49, wheat)

**Vines**

Slides:

- No generic names: (Virginia creeper, poison ivy)

Field (river walk):

- Named: honeysuckle bush (tree, bush, or vine)
- No generic names: (Virginia creeper)

### **Cactus**

#### **Slides:**

- Named: prickly pear cactuses
- No generic names: (lace cactus)

### **Things with Prickly Stuff On It**

#### **Sorting task:**

- Named: cactus (38 cholla, 39 saguaro, 41 Joshua tree, 73 prickly pear with fruit); yucca (34 tree-like yucca)
- No generic names: 6 - tree (thorny acacia tree), 32 (Hawaiian yucca), 33 (low yucca, no flowers), 36 (Sabal minor), 71 (thistle), 74 (yucca, no blooms)

### **Weeds**

#### **Slides:**

- No generic names: (grass in seed)

#### **Field (neighborhood):**

- No generic names: (*Galium*, dead grass, *Capsella* in bloom)

### **Mushrooms**

#### **Slides:**

- No generic names: (white mushroom)

### **Fungus**

#### **Slides:**

- No generic names: (orange lichen, green lichen)

Field (neighborhood):

- No generic names: (shelf fungus on dead tree)

### **Algae**

Slides:

- No generic names: (true moss)

### **Moss**

Slides:

- No generic names: (Spanish moss, ball moss)

### **Vegetables**

Listing tasks: tomatoes, potatoes, green beans, peas, corn, spinach, squash, pumpkins, carrots, lettuce. (In kitchen) celery, broccoli, onions. Eggs. (Does not include peanut butter, though looks at it.)

### **Fruits**

Listing tasks: apples, oranges, bananas, grapes, lemons, tangerines, grapefruit, pickles, cucumbers - almost the same thing, strawberries, limes, cherries. (In kitchen) pineapple, apricots, peaches, raspberries.

### **Berries**

Slides: - Named: strawberries (balsam gourd), raspberries (dewberry)

### **Things I Don't Have Names For**

Sorting task: 27 (ocotillo), 51 (dead wildflowers and grasses)

### **Miscellaneous**

Sorting task: - Named: yucca (tree-like yucca, with flowers), flowering tree (26 mesquite in bloom). (Both were later moved to other categories)

### Unknown Domains

Slides: cattails (Mexican hats), poison oak (fern on tree), poison ivy (white clover), clover (maidenhair fern, *Oxalis* with flower)

Field (neighborhood): clover, bluebonnet, dandelions (2 *Sonchus* with seed heads), holly (agarita)

Field (river): elephant ears or banana plants (elephant ears)

## Appendix A-3: Informant 5: Domain Analysis - Strict Inclusion: Categories of Plants

(Informant's name and spelling outside of parentheses or in quotes. If name is inaccurate, researcher's names and comments follow in parentheses.)

### Categories of Trees

Slides and Field: trees, coniferous trees, not coniferous

Concept map: trees; pine trees

Sorting tasks: trees; pine trees and coniferous

### Names of Trees

Slides:

- Named: maple tree (Spanish oak - full tree; true maple, bald cypress - fall color, changed when saw cones), maple tree or oak (Spanish oak, close up), oak tree (2 oaks with acorns), acorn tree (mescalbean - distant full tree), mesquite tree, weeping willow tree, palm tree, spruce tree (juniper with blue cones), maybe spruce tree - not coniferous (bald cypress - green leaves), not coniferous (bald cypress - red leaves, with cones)

- No generic names: (live oak - full tree, redbud)

Field (neighborhood):

- Named: palm tree (2), pear tree, cedar tree (ornamental juniper), maple tree (2 Spanish oaks), mesquite tree, non-fruit producing peach tree, peach tree (3), acorn tree – “I think is oak tree” (live oak), oak tree (2 live oaks), mulberry tree (ornamental plum), pine tree. Coniferous tree (ornamental juniper), coniferous = like pine or Christmas tree (no referent); not coniferous (blue Italian cypress)

- No generic names: (maple - 2, ash, cottonwood, *Wisteria*, ornamental shrub)

Field (river walk):

- Named: oak tree or maple tree (Spanish oak), maple or oak tree (bur oak), mesquite tree

- No generic names: (hackberry, Chinaberry)

### Listing tasks:

- Named: oak tree, maple tree, mesquite tree, orange tree, apple tree, lemon tree, mulberry tree, palm tree, pecan tree, walnut tree, peach tree, apricot tree, rosewood, redwood, pine tree, some other trees with cones.

### Sorting task:

- No generic names: (1 understory shrubs in forest, 2, 3, 4 leafless, 5, 6 leafless Acacia, 8; 9 live oak, multiple trunks; 11, 12 large, leafless, multiple trunks; 14 large juniper, multiple trunks; 16 tropical palm, 17 multiple trunks, 18, 19 redbud also classified with "flowers", 20 bald cypress, 21 leafless, 23, 26 mescalbean in bloom, 30 multiple trunks, 35; all single trunks except where noted)

- Most like a tree: 5 (single trunk, leafy), 9 (live oak), 30 (mesquite)

- Least like a tree: 35 (agave with stalk)

- Sort of like a tree: 15 (*Sabal texana*)

## **Pine Trees and Coniferous**

Slides: coniferous tree (pine - full tree), pine tree (with cones). Not coniferous trees (bald cypress - 2 - one with cones),

Field: coniferous tree (juniper - also bush); pine tree; coniferous tree = pine tree (no referent). Not coniferous – “like a Christmas tree or pine tree but no cones” (blue Italian cypress).

Listing tasks: Coniferous trees - pine trees ("That's all I know. There's different kinds of coniferous and different kinds of pines.")

Sorting task: Pine trees and coniferous = 7 (mesquite), 10 (bald cypress), 13 (pine), 22 (pine)

## **Bushes**

### Slides:

- No generic names: (yaupon - full, trimmed shrub, juniper - full shrub, wisteria, *Sabal minor*)

### Field (neighborhood):

- No generic names: (various trimmed ornamental shrubs, pittosporum, cenizo, boxwood, several hedges - all evergreen; 1 small, leafless, branching tree; *Nandina*, *Vinca* - "a bush staying on the ground," azaleas, dwarf yaupon, mescalbean, Ligustrum, ornamental juniper - also a

tree, cycad, loquat.)

Field (river walk):

- Named: honeysuckle bushes
- No generic names: (poison ivy on ground)

Listing tasks:

- Named: mulberry bush, blueberry bush ("I don't know others. There are four different bushes in our yard.")

Sorting task: - No generic names: 28 (juniper), 48 (sea oats) (both unlabeled at first)

## Flowers

Slides:

- Named: flowers - rose; wildflowers - bluebonnets, clover (*Oxalis* in bloom), sunflower, dandelion, buttercup or perryrose (pink evening primrose), Indian paintbrush
- No generic names: flowers (Mexican hats, water hyacinth); wildflowers (violets)

Field (neighborhood):

- Named: (assumed category) African violets (violets)

Field (river):

- Named: primrose
- No generic names: real flowers (herbs - no referent)

Listing tasks: "Flowers and flowering weeds" (Child's spelling)

- Named: flowers: carnations, lily, roses, baby's breath, waterlily
- Named: wildflowers: dandelion - weeds, bluebonnets, yellow primrose, pink primrose, sunflowers, clover flowers - good weed, cactus with purple flowers - weed.

Sorting task:

- Named and unnamed: "wildflowers and regular flowers that you would buy," (as she

examined the group, she said, "some are grasses," and changed the name of the group to "Grasses and Flowers": 19 – "a flowering tree" (redbud), 24 (cenizo in bloom), 25 (red leaves of tallow tree), 31 - wildflower (azalea in bloom), 40 (horse crippler cactus), 46, 47 (2 railroad vines, with and without blooms), 51 - wild growth (grasses and weedy wildflowers), 54 (flowering herbs), 55 - wildflower, bluebonnets (gayfeather); 56 (pink evening primrose), 57 - sunflower, flower; 58 (flowering herbs), 59 (composites), 62 (tulips), 64 - clover, weed (*Oxalis*, no flowers); 65 (flowering herbs), 69 (white clover); grasses (44 - maidenhair fern, 50 - grass, 63 - *Baptisia* and grass, 52 - grass and cattails, 49 "wheat")

### Categories of Plants

Listing tasks: trees, fruits, vegetables, bushes, indoor plants, houseplants, weed, grass, flowers, wildflowers; plants that grow in the river - like reeds and elephant ears; cactuses, ivy, ferns and airplane plants - are those house plants?

Concept map: flower, tree, pine trees, bush, cactus

### Names of Plants

Slides:

- No generic names: (yucca, leafy portion only, stinking gourd)

Sorting task:

- Named: 44, 45 - ferns; 28, 29 - bushes (juniper and trimmed hedges), 61 - lily pad (water lily), 60 - ivy (water hyacinths), 66, 67, 68, 70 (green, leafy herbs)

### Grass

Field (neighborhood):

- Named: rabbit grass (weedy grass in lawn), monkey grass; regular grass (turf)

Listing tasks:

- Named: monkey grass, sod, rabbit grass

Sorting task:

- Named: 49 - wheat, 52 - regular grass (grasses and cattails in pond)

- No generic names: 44 (maidenhair fern - distant), 50 (grasses), 52 (grass and cattails), 63 (white *Baptisia* with grass in background)

## Vines

### Slides:

- Named: ivy (Virginia creeper, white clover); poison ivy
- No generic names: vines (balsam gourd)

### Field (neighborhood):

- Named: ivy (2 English ivy)

### Field (river walk):

- Named: ivy - poison ivy (Virginia creeper)

### Listing tasks:

- Named: ("Are there different kinds of vines?") grape vine, ivy, some beans grow on vines

## Cactus

### Slides:

- Named: cactus plant with prickly pears
- No generic names: (lace cactus, agave with stalk)

### Field (neighborhood):

- No generic names: (*Lactuca* - no blooms, *Sonchus* rosette - also weeds, 2 tree-like yuccas, red yucca)

### Field (river walk):

- Named: thistle (prickly poppy); has dandelion things (*Sonchus*)

### Listing tasks: ("I don't know the different kinds.")

### Sorting task:

- No generic names: 15 (*Sabal texana* - palm tree), 27 (ocotillo), 32 (Hawaiian yucca), 33, 34 (yuccas, with and without blooms), 36 (*Sabal minor*), 37 (prickly pear in bloom), 38 (cholla), 39

(saguaro), 41 (Joshua tree), 42 (claret cup cactus in bloom), 53 (marsh grass), 71 (thistle), 73 (prickly pear with fruit), 74 (yucca)

### Weeds

#### Slides:

- No generic names: (pigweed, Engelmann's daisy, goldenrod, Indian blanket, grass in seed, small ragweed)

#### Field (neighborhood):

- Named: cactus (*Sonchus* rosette)

#### Field (river walk):

- Named: flowering weeds (clover)

- No generic names: (various weedy herbs, ragweed, *Torilis* in bloom)

#### Listing tasks: (Child's spelling)

- Named: cactus with purple flowers, clover flowers, dandelions

#### Sorting task:

- Named: clover (64, *Oxalis* - no blooms but she knows it will have flowers)

### Mushrooms

#### Slides:

- No generic names: (white mushroom)

Listing tasks: (Are there different kinds? "I only know there's poisonous and non-poisonous.")

### Fungus

#### Slides:

- No generic names: (orange lichen, either maidenhair fern or true moss)

Listing tasks: (Are there different kinds? "No, I don't know of any.")

## Moss

### Slides:

- Named: peat moss (Spanish moss)
- No generic names: (ball moss, green lichen)

### Field (neighborhood):

- No generic names: (ball moss - 2)

### Listing tasks:

- Named: peat moss, ball moss

Sorting tasks: - No generic names: 72 (Spanish moss)

## Ferns

### Slides:

- Named: wild fern (fern on tree)

### Listing tasks:

- Named: red fern, wild fern, house fern in a basket

Vegetables (no list)

Fruits (no list)

## Berries

### Slides:

- Named: poisonous berries (snailseed vine), wild blackberries (dewberries), poison berries (yaupon with fruit), blueberries (grape vine)

Unlabeled Category (later moved to bushes)

Sorting tasks: 28 (juniper - trunks hidden), 48 (sea oats)

## Unknown Domains

Slides: Johnny-jump-ups or periwinkle (*Lantana*), lily pads (lotus, water lily)

Field (neighborhood): mistletoe; growths (2 tree lichens; galls on Spanish oak); clover (*Medicago* clover - no bloom)

Field (river): elephant ears

## Appendix A-3: Informant 6: Domain Analysis of Strict Inclusion: Categories of Plants

### Trees

Categories of Trees: Deciduous, evergreen/conifers

Slides:

- Named: oak tree (live oak, full tree; Spanish oak, close-up, Shumard oak with acorns), oak or maple tree (Spanish oak, red leaves, full shot), acorn tree or oak tree (live oak with acorns), maple tree, redbud or apple tree (redbud), grape tree (Ligustrum with fruit), palm tree (Sabal texana), related to palm tree (agave with stalk), weeping willow, mesquite tree, spruce or cedar (juniper with cones), cedar (juniper), fir tree or spruce or some kind of Christmas tree (pine, full shot), pine tree (pine with cones, bald cypress with cones and fall color), fern tree (bald cypress - full shot, green)

- No generic names: (mescalbean)

Field (neighborhood):

- Named: cedar tree (3 junipers), peach tree or apricot tree (peach), redwood tree - no - redbud tree (3 crepe myrtles, 1 Ligustrum), banana tree (made-up name for ash with samaras), pear tree, mesquite tree, palm tree, pearies - not persimmons (loquat)

- No generic names: (ornamental cherry, chaste-tree, bald cypress, cenizo, 1 ornamental shrub = "a bushy tree", ash, cottonwood)

Field (river walk):

- Named: redbud tree (crepe myrtle), peach tree, maple tree or oak tree (sycamore), mimosa or fern tree (small mesquite)

- No generic names: (Magnolia, paper mulberry)

Concept map:

- Named: evergreen/conifer = pine, fir, spruce; deciduous = maple, silver maple, oak

Sorting task: (No generic names)

- Best examples of a tree: 7, 30 (mesquite); 17, 18 (oaks)

- Worst examples of a tree: 15, 16 (palms), 32 (Hawaiian yucca), 35 (agave)

- In between: (2, 3, 4, 5, 6 leafless Acacia, 8, 9 live oak; 10, 20 bald cypress; 11; 12 large, leafless, multiple trunks; 13 pine; 14 large juniper, multiple trunks; 19 redbud, 21, 22, 23, 25 red leaves of tallow, 34 tree-like yucca, 72; all with single trunks except where noted; several leafless)

- Sort of like a tree: 26 (mescalbean in bloom), 28 (juniper), 36 (Sabal minor), 38 (cholla), 39 (saguaro), 74 (low yuccas)

## Bushes

### Slides:

- No generic names: (trimmed yaupon - full shot)

### Field (neighborhood):

- Named: red leaf (ornamental shrub), rose bush, honeysuckle

- No generic names: (5 ornamental shrubs - one over our heads, Ligustrum - hedged, dwarf yaupon, another dwarf shrub, honeysuckle, pyracantha)

### Field (river walk):

- Named: honeysuckle bush (2)

### Sorting task:

- Named: bush and weed stuff: fern - 43, fern - 45, bluebonnets - 67 (Lupinus, no blooms)

- No generic names: bush and weed stuff: 1, 24, 26, 28, 29 (all shrubs, some in bloom), 44 (fern), 47 (vine, no blooms), 48 (sea oats), 49 (wheat), 50, 51, 52, 53 (all grasses, some with weedy herbs), 59 (weedy composites), 60 (water hyacinth), 61 (water lily), 64 (Oxalis - no blooms), 66 (herb, no bloom), 68 (green paintbrush), 69 (white clover in bloom), 70 (herb, no blooms)

- Bush: 26 - flowers or bush (mescalbean in bloom), 28 (juniper), water lilies or lily pads - flowers or bush (60 water hyacinth, 61 water lily)

- Weeds: 50 (grass), grain - 49 (wheat), flower or weeds (59, yellow composite), best example 69 (white clover in bloom)

## Flowers

### Slides:

- Named: lily pad flower (lotus, water lily), on a lily pad (water hyacinth, white clover), sunflower, bluebonnets, rose. (Assumed to be in this category or in wildflowers:) dandelion, not wildflowers - related to phlox (Lantana), goldenrod.

- Named (flowers): wildflowers - daisy (Engelmann's daisy), little bitty wildflower (Oxalis with flower), buttercup (pink evening primrose), Indian paintbrush.

- No generic names (wildflowers): (Mexican hats, violets)

### Field (neighborhood):

- Named: buttercups (pink *Oenothera*), sunflowers

- No generic names: (2 Oxalis in bloom, 2 garden flowers; *Calyptocarpus*, galium and henbit - also weeds)

### Field (river walk):

- Named: buttercups or primrose (pink *Oenothera*)

### Concept map:

- Named: bluebonnet, roses, sweet William/baby breath, daisy, not wild = tulips, carnations, violet

- Named: wildflowers = buttercup, yellow and pink; Indian paintbrush

Sorting task: - No generic names: flowers by themselves: 31 (azalea in bloom), 46 (railroad vine in bloom), 54 and 56 (flowering herbs), 55 (gayfeather), 57 (sunflowers), 58 (bluebonnets, and other flowering herbs), 62 (tulips), 63 (Baptisia), 65 (yellow weedy looking flowering herbs)

## Plants

### Categories of Plants

- Listing tasks: trees - deciduous and conifer, cactus, flowers, water plants, fruit bearing plants, weeds/brush, vines, bush, thorny things
- Concept map: trees - evergreen/conifers and deciduous; flowers

## Names for Plants

### Slides:

- Named: related to cactus (yucca)

### Field (neighborhood):

- Named: tomato plants, blackberries, rose bush (2), bush, honeysuckle plant - not a bush
- No generic names: (potted airplane plant, ornamental herb, pot plant); just plants (wandering Tradescantia)

## Grass

### Field (neighborhood):

- Named: monkey grass
- No generic names: (turf - 2 kinds)

## Ivy

### Slides:

- Named: English ivy (Virginia creeper), poison ivy
- No generic names: (stinking gourd)

### Field (neighborhood):

- Named: English ivy
- No generic names: (potted ivy)

### Field (river walk):

- Named: poison ivy (2)

## Vines

Field (neighborhood): - No generic names: (snailseed vine - also a weed)

## Cactus

### Slides:

- Named: prickly pear cactus (lace cactus). Related to cactus, looks like Venus flytrap (bull nettle).
- No generic names: (prickly pear). Related to cactus (2 yuccas, agave without stalk).

### Field (neighborhood):

- No generic names: (2 yuccas; large tree-like cactus; agave)

### Sorting task:

- No generic names: 27 (ocotillo), 33 (low yucca, no blooms), 36 (Sabal minor), 37 (prickly pear), 38 (cholla), 39 (saguaro), 40 (horse creeper cactus in bloom), 41 (Joshua tree - yucca), 42 (claret cup cactus in bloom), 71 (thistle), 73 (prickly pear), 74 (low yucca)
- Most like a cactus: 37, 39, 73 (all true cactus in diverse forms)
- Least like a cactus: 41, 71, 74 (no true cactus)
- Sort of a cactus: 35 (agave with stalk)

## Weeds

### Slides:

- No generic names: (pigweed, small ragweed, grass in seed)

### Field (neighborhood):

- Named: some types of grass (yellow grass in lawn); like dandelion flowers (*Sonchus*)
- No generic names: classic example = (grass in seed); (hackberry sapling; snailseed - also a vine; *Calyptocarpus* and henbit and galium - also flowers)

### Field (river walk):

- Named: baby's breath or sweet William (*Torilis*); like dandelions (*Sonchus*)

Sorting task: (See **Bushes**)

- Named: grain (49 - wheat)

- No generic names: 50 (grass), flower or weeds (59 - yellow composite), best example - 69 (white clover in bloom)

### Leaves

Field (neighborhood):

- Named: clover (*Oxalis* - no blooms; wild geranium - no blooms)

- No generic names: (wild geranium - with flower)

### Mushrooms

Slides: - No generic names: (white mushroom)

### Algae or Moss

Slides: - No generic names: (true moss, orange lichen, green lichen)

### Moss

Slides: - No generic names: (Spanish moss)

### Ferns

Slides: - No generic names: (fern on tree, maidenhair fern)

### Vegetables (not listed)

### Fruits (not listed)

### Berries

Slides:

- Named: blueberries (grape vine), wild red berry (snailseed vine), wild berry – not strawberries or tomatoes (balsam gourd), blackberries or raspberries (dewberries)

Field (river walk):

-Named: grapes (grape vine with buds), blackberries (dewberries)

### **Unknown Domains**

Slides: -Named: wasp nest (ball moss), pussy willows (cattails), violet (wisteria), palmetto – related to a palm tree (*Sabal minor*), goldenrod.

Field (neighborhood): -Named: onion (daffodil with no blooms), clover (*Medicago*, clover)

Field (river walk): - Named: elephant ears, broomweed (*Brassica*)

## Appendix A-3: Informant 7: Domain Analysis - Strict Inclusion: Categories of Plants

(Note: The informant's names and spellings are outside of parentheses or in quotes. If the name is inaccurate, the correct names and comments follow in parentheses.)

### Trees

Slides: (Informant's spelling used)

- Named: pine tree (bald cypress - full green tree; *Sabal texana*; two true pines), bean tree (mesquite), acorn (two oaks with acorns).

- Combined category: wild plant tree (agave with stalk)

- No generic names: (live oak, full tree; 2 Spanish oak; redbud; *Ligustrum*; 2 juniper; mescalbean; wisteria; yaupon - close-up; maple; bald cypress - close-up)

Field (neighborhood only):

- Named: pine (ornamental spruce), Christmas tree (juniper), Christmas tree or pine tree (*Arbor vitae*), acorn tree (live oak), Chinese peaches (loquat), maple tree (no referent), cherry tree (no referent).

- Combined category: weed tree (hackberry)

- No generic names: (*Garrya*, hackberry, *Magnolia*, *Catalpa*, Chinaberry, dead stalk of giant ragweed, yucca flower stalk, *Ligustrum*, various large, single trunked trees, one small shrub without leaves).

Listing tasks:

- Named: Pacon tree (pecan), apple tree, orange tree, "Some kind of tree that animals get salt from," peach tree, walnut tree, pear tree, pine tree, pineapple tree, cocanut tree, plum tree, grapefruit tree.

- Combined category: weed tree (hackberry)

Concept map: - Named: peach tree, apple tree

Sorting tasks: No generic names

- Most like a tree: 2, 3, 5, 7, 8, 9, 10, 11, 12, 13 - "Christmas trees", 15, 16 (two palms), 17, 18, 19, 20, 21, 22, 23, 72. (Woody; tall; all with single trunks except the very large live oak; with or

without leaves; leaves small and numerous, except on palm; only redbud has flowers).

- Least like a tree: 24, 25, 26, 31, 32. (Three woody shrubs with flowers; Hawaiian yucca "has weird leaves"; red leaves of tallow tree "has no branches".)

- In between: (4 - leafless trees, 6 - thorny African acacia, 14 - juniper, multiple trunks visible, 30 - mesquite).

### **Bushes**

Slides: No generic names: (yaupon - trimmed shrub)

Field:

- Named: rose bush, ivery bush (agave without stalk).

- Combined category: weed bushes (Turk's cap without flowers).

- No names: (trimmed hedges)

Listing tasks: "I don't know names."

Sorting tasks: No generic names (1, 28, 29, 41)

- Most like a bush: (29 - trimmed hedge)

- Least like a bush: (1, 41 - forest understory shrubs and Joshua tree)

- In between (juniper)

### **Flowers versus Plants versus Grass**

Field: flower or plant (dandelion with seed head, no flower present); flower on a plant (*Verbena* with flowers, henbit with flowers)

Sorting tasks: (54 - Verbenas and blue-eyed grass) "look like plants... but have a flower at the end." (They are like plants because) "the stem is dark green and it's pretty thick."

### **Flowers**

Slides:

- Named: sunflower, daisies flower (Mexican hat), daisies (cutleaf daisy), rose, bluebonnet

- No generic names: (Lantana, Gaillardia, violets, *Oenothera speciosa*)

Field:

- Named: bluebonnets, rose plant.

- Combined category: flower vine (yellow jasmine).

- No generic names: (yellow *Oenothera*, pink *Oenothera*, clover with yellow flowers, *Verbena bipinnatifida*)

Listing tasks: Named: Daisies, roses, tulip, ivory, avocado plant (then scratched it out and said, "No, that's a plant, avocado plant"), poinsettia, corsage.

Concept Map: - Named: daisies, tulips, roses (all changed from "plant.")

Sorting tasks: No generic names: 42 (claret cup cactus - also called "cactus bush"), 46 (railroad vine with flowers), (various herbaceous plants with colorful blooms, including tulips - 54, 55, 56, 57, 58, 62, 65)

- Most typical: ("bluebonnets" and all the herbs but 54 - Verbenas and blue-eyed grass - which "look like plants... but have a flower at the end". They are like plants because "the stem is dark green and it's pretty thick.")

**Categories of Plants:**

Listing: wild, fresh.

**Types of Plants**

(Hypothesis): grass - flower - vine - cactus - plants in or by a house (low growing plants with green stems) - wild plants - plants that float in the river

Slides:

- Named: ivory (tree yucca, agave without stalk), lilies (water lily - category inferred from sorting task), green clover (*Oxalis* - inferred from sorting task), wild plant (pigweed, small ragweed).

- Combined category: wild plant tree (agave with stalk), vines of a plant (Virginia creeper), cactus plant (*Sabal minor*).

- No generic names: (maidenhair fern, ball moss, small yucca, fern, white clover, dandelion, lotus, water hyacinth, red Indian paintbrush)

Field:

- Named: wheat plant (Johnson grass), wild plant or grass (henbit without flowers)
- No generic names: (*Sedum*, *Sonchus* without flowers, clover, *Torilis arvensis*, *Corydalis* with flowers, young ragweed, dock, *Tradescantia* - plant or grass.)

Listing tasks: - Named: avocado plant

Concept Map: Named: daisies, tulups, rosies (all changed to "flower.")

Sorting tasks:

- TYPES OF PLANTS (hypothesis): Grass (see below), cactus (see below), plants that float in the river (water hyacinth, water lily), wild plants (thistle, weedy composite - 59), plants at or in a house (2 ferns, two herbs without obvious flowers - 67, 70)
- No generic names: (two non-tree yuccas; railroad vine without flowers; *Sabal minor*; maidenhair fern; 9 herbaceous plants with and without flowers - no logical difference from "flowers.")

Concept map: "I don't think I know any names for plants."

**Grass**

TYPES OF GRASS: plants (low growing herbs only), weeds, (true grass)

Slides: - Named: long grass (cattails), grain (grass in seed).

Field:

- Named: sticky grass (bedstraw).
- No generic names (true grass, various low growing herbs without flowers, including chickweed, clover, *Torilis*)

Listing tasks: - Named: Wheat; hay - but that's wheat.

Sorting tasks:

- Named: wheat, clovers (*Oxalis*).
- No generic names: (true grass - 50, 51, 52, 53; sea oats - 48).

## **Vines**

### Slides:

- Named: grape vine (yes); watermelon vine (stinking gourd).
- No generic names: (Virginia creeper, snailseed vine.)

### Field:

- Named: grape vine (informant asks if snailseed vine is "grape vine").
- No generic names: (Boston ivy, *Clematis drummondii*, Greenbriar, Japanese honeysuckle, coral honeysuckle.)
- Combined categories: flower vine (yellow jasmine).

### Listing tasks:

- Named: Grape vines; watermelon vine.
- Combined category: plants sometimes leave a vine.

## **Cactus**

### Slides:

- No generic names: (prickly pear cactus, lace cactus)
- Combined category: cactus plant (*Sabal minor*)

Field: - No names: (prickly pear)

Listing tasks: (Informant draws pictures of several) "That's all I know."

Sorting tasks: No generic names: (2 prickly pears, devil's head cactus, cholla, saguaro, agave with stalk, tree-like yucca); "some sort of cactus" (ocotillo); (claret cup cactus placed with flowers, but) "It kind of looked like a cactus bush and a flower." (Informant asked me) "Is it a flower or a bush or a tree?"

## **Weeds**

Slides: No generic names: (small ragweed)

Field:

- Named: vine (*Clematis drummondii*), wheat plant (Johnson grass).
- No generic names: (hackberry sapling, young ragweed; various herbs, both vines in trees and small herbs along ground.)
- Combined category: weed bushes (Turk's cap).

Listing tasks: Combined category: weed tree (hackberry tree).

### **Mushrooms**

Slides: wild mushroom

Field: No generic names: (shelf fungus)

Listing tasks: White, most are poison, black, spotted. There are others.

### **Moss**

Slides: No generic names: (true moss.)

Listing tasks: - Named: seaweed; algae. That's all I know.

### **Fungus and Algae**

Slides: No generic names: (orange lichen)

### **Vegetables**

Listing tasks:

- Named: Asparagus, broccoli, spinach? (informant is unsure if this is a vegetable), potato, squash, avocado, peas, green beans, beets, carrot, onion - no, it's not, okra.

### **Fruits**

Listing tasks:

- Named: Apple, orange, grapes, peaches, pineapple, tangerine, plums, coconut, grapefruit, pears, bananas, nectarines, watermelons, strawberries, cherries.

## Leaves

Slides: "dried leaves" (Spanish moss); "leaves" (weeping willow - full tree); "dead or dried leaves" (green lichen).

## Unknown Domains

Slides:

berries (dewberry)

tomatoes (balsam gourd)

poisin iveri (poison ivy)

flytrap (bull nettle)

something that grows on old trees (ball moss - field)

## Appendix A-3: Informant 8: Domain Analysis - Strict Inclusion: Categories of Plants

(Informant's name and spelling outside of parentheses or in quotes. If name is inaccurate, researcher's names and comments follow in parentheses.)

### Trees

#### Slides:

- Named: oak (2 Spanish oaks - no acorns), acorn tree (2 oaks with acorns), lilac tree (wisteria), lilac (redbud), fir or conifer (pine - full shot, bald cypress - cones and fall color), cedar (2 junipers), pine tree (with cones), palm tree
- No generic names: (live oak - full shot, maple, bald cypress - green, full shot, *Ligustrum*, willow, yaupon with fruit, mesquite, agave with stalk)

#### Field (neighborhood):

- Named: cedar (juniper), oak - no it's acorn (2 live oaks), acorn (several live oaks), rosebud - redbud (redbud), peach tree, weed tree (ragweed).
- No generic names: (Chinaberry, elbow bush, rose bush, no flowers)

#### Field (river walk):

- Named: acorn (live oak), redbud, conifer (juniper), deciduous (a leafless tree)
- No generic names: (elderberry, bur oak, various trees)

#### Listing tasks: (Child's spelling)

- Named: ceder (cedar), mappal (maple), oak, fur (fir), pine, peach, red bud, apple, bannana, palm, persemon, acorn, fig, red wood, orang (orange). Conifers = fur, pine.

#### Concept map:

- Named: ceder (cedar)

#### Sorting task: (No generic names)

- Most like a tree: 4 (small, scrubby trees, no leaves), 5, 7 and 30 (mesquite), 9 (live oak), 10 (bald cypress), 11, 16 (tropical palm), 18 (large oaks), 22 (pines), 23 (birch), 72 (all but mesquites and live oak have single trunks)

- Least like a tree: 8 (flat-topped African tree), 12 (large, no leaves, multiple trunks), 19 (redbud), 21 (large, no leaves, single trunk), 34 (tree-like yucca), 35 (agave with stalk)

- In neither group: 1, 2, 3, 6, 13, 14, 17, 20

- Sort of like a tree: The bushes. (From the flowers,) 24 (cenizo), 31 (azalea), 55 (gayfeather), 59 (yellow composite on tall stalks), 63 (*Baptisia*)

## Bushes

### Slides:

- Named: bush with flowers (*Lantana*)

- No generic names: (trimmed yaupon - full shot)

### Field (river walk):

- No generic names: (boxwood)

### Listing tasks:

- Named: rosebush, honeysuckle bushes.

### Sorting task:

- No generic names: (15 *Sabal texana*, 25 tallow tree leaves, 26 mesquite in bloom, 27 ocotillo, 28 juniper, 29 trimmed hedge, 32 Hawaiian tree-like yucca, 33, 74 low yuccas, 38 cholla, 39 saguaro, 41 Joshua tree - yucca, 43, 45 large ferns, 48 sea oats, 49 wheat, 51 weedy grasses and wildflowers, 53 marsh grass, 73 prickly pear with fruit)

## Flowers

### Slides:

- Named: rose, bluebonnet, buttercup (pink evening primrose), sunflower

- No generic names: wildflowers (Mexican hats), flowers (Engelmann's daisy, goldenrod, Indian blanket, violets, dandelion, Indian paintbrush)

### Field (neighborhood):

- No generic names: wildflowers (*Corydalis* in bloom, henbit, without flowers - she knows it has

flowers; crow poison in bloom)

Field (river walk):

- No generic names: (dewberry in bloom); wildflowers (spiderwort)

Listing tasks:

- Named (flowers): bluebonnet, rose, tulip, daisy, buttercup, wildflower, sunflower seed - no - sunflower, peach bud, apple bud, orange bud, redbud bud, banana bud, coconut bud, fig bud - there's not fig bud, persimmon bud, gardenia, honeysuckles.

- Named (wildflowers): sunflower, bluebonnet.

Concept map:

- Named: roses

Sorting task:

- No generic names: 24 (cenizo), 31 (azalea), 37 (prickly pear in bloom), 40 (horse creeper cactus in bloom), 42 (claret cup cactus in bloom), 46 (railroad vine in bloom), 54, 55, 56, 57, 58 (flowering herbaceous wildflowers), 59 (yellow composite on tall stalks), 60 (water hyacinths), 62 (tulips), 63 (*Baptisia*), 65 (weedy flowering herbs)

### **Categories of Plants**

Listing tasks: grass - weeds, flowers, and herbs are a type of grass; not trees

Field: trees, short plants near the ground.

Concept map: trees are plants. Flowers are plants.

### **Names of Plants**

Slides:

- Named: little plants (stinking gourd), water plant (water hyacinth)

- No generic names: (maidenhair fern, pigweed, 2 yuccas, small ragweed, white clover, *Sabal minor*, agave without stalk)

Field (neighborhood):

- Named: small tree (elbow bush), short plants (dead, weedy looking vegetation).
- No generic names: (red buckeye in bloom)

Field (river walk):

- No generic names: (grass and herbs, poison ivy)

Sorting task:

- No generic names: small plants (36 *Sabal minor*, 44 maidenhair fern, 47 railroad vine - no blooms, 50 prairie grasses, 52 grasses and cattails, 61 water lily, 64 Oxalis - no blooms, 66, 67, 68, 70 green, leafy herbs, 69 white clover in bloom, 71 thistle)

**Categories of Grass**

Listing tasks: weeds, flowers, and herbs are a type of grass

**Grass**

Field (neighborhood):

- No generic names: (various low herbs, no flowers; *Torilis*, clover, vetch, galium)

**Ivy or Vines**

Slides:

- No generic names: ivy (poison ivy)

Field (neighborhood):

- Named: vines - thorn-vine (greenbriar)

Field (river walk):

- No generic names: vines (Virginia creeper)

Listing tasks:

- Named: honeysuckles grow on vines

## Cactus

### Slides:

- No generic names: (prickly pear, lace cactus, bull nettle)

### Field (neighborhood):

- No generic names: (prickly pear)

Listing tasks: "I don't know the names."

## Weeds

### Slides:

- No generic names: (grass in seed, Virginia creeper)

### Field (neighborhood):

- Named: short plants (dead, weedy looking vegetation)
- No generic names: (knee high dry herbs - twice; dry vegetation to shoulder high)

### Field (river walk):

- No generic names: (honeysuckle, small ziziphus - no leaves)

### Listing tasks:

- Named: garden weeds and others. I don't know their names.

## Mushrooms

### Slides:

- No generic names: (white mushroom)

## Moss

### Slides:

- No generic names: (true moss, Spanish moss, ball moss, orange lichen, green lichen)

Field (neighborhood):

- No generic names: (yellow tree lichens, Spanish moss)

Listing tasks:

- Named: (Are there different kinds?) "I call them tree moss, rock moss - I don't know the names."

### Mold

Field (neighborhood): - No generic names: (cochineal on prickly pear)

### Ferns

Slides:

- No generic names: (fern on tree)

### Leaves

Field (neighborhood):

- Named: bluebonnet leaf (no flowers)

- No generic names: leaves or berries (mistletoe)

### Vegetables

Listing tasks: carrots, potatoes, green beans, black-eyed peas, green peas, snow peas, string beans, ranch style beans, re-fried beans - that's the way beans are cooked, celery, broccoli, cauliflower, sweet potato, cabbage, lettuce, tomato (later, changed to fruit), herbs, mushrooms. (In kitchen) corn, wheat, rice. Are noodles a vegetable - no. Pickles, peppers - green and red, onions, jalapenos, asparagus, olives, sweet peas, bean sprouts, hominy, mint - it's a plant but not sure if it's a vegetable, wild rice, mustard greens, oats, radish, avocados.

### Fruits

Listing tasks: apples, oranges, coconut, starfruit, apricot, lemon, mango, papaya, pineapple, cherries, strawberries, grapes - green and purple or red, figs, peaches, bananas, blueberries, raspberries, blackberries, dewberries, persimmons, tangerine, grapefruit, prickly pear, pears. (In kitchen) sugar beets, sugar cane, pumpkin, watermelon, cantalope, raisins, mandarin oranges, mustang grape, cranberry, fruit. Is honey fruit - yes. Nuts - put under fruit and vegetable both.

## Berries

### Slides:

- Named: blackberries (dewberries)
- No generic names: (snailseed vine)

### Field (neighborhood):

- No generic names: (mistletoe)

## Unknown Domains

Slides: cattails, tomato (balsam gourd), clover (*Oxalis* in bloom), lily pad (lotus, water lily)

Field (neighborhood): - Named: marigolds (blue Iris)

Field (river): - Named: elephant ears, seaweeds (aquatic plants)

## Appendix A-3: Informant 9: Domain Analysis - Strict Inclusion: Categories of Plants

(Informant's name and spelling outside of parentheses or in quotes. If name is inaccurate, researcher's names and comments follow in parentheses.)

### Trees

#### Slides:

- Named: oak (willow), pine tree (pine with cones, bald cypress - green, full tree, juniper with cones), cedar tree (pine - full shot), palm tree, pod tree (mesquite), maple tree, fern tree (bald cypress - cones and fall color), acorn tree (Shumard oak with acorns). (Several non-responses.)

- No generic names: (live oak - full shot, mesquite)

#### Field (neighborhood):

- Named: pine tree or evergreen (juniper), poison berry tree (Chinaberry), fat leaf tree (live oak), little thorn tree (small *Bumelia*, no leaves), pear tree

- No generic names: (juniper, plum, *Ligustrum*, oleander, various trees)

#### Listing tasks:

- Named: fir tree, evergreen tree, cedar tree, oak tree, pine tree, palm tree, apple tree, orange tree, pear tree, banana tree, cherry tree, hairy tree

Concept map: - Named: pear, coconut

Sorting task: No generic names

- Most like a tree: (4 leafless, 5, 6 thorny leafless acacia; 7, 30 mesquite; 8; 9, 17 live oaks; 10, 20 bald cypress; 11; 12 large, leafless, multiple trunks; 13 pine, 14 large juniper, multiple trunks, 16 tropical palm, 18, 19 redbud in bloom, 21, 22, 23. Except where noted, all have single trunks)

- Least like a tree: (15 large *Sabal* palms - trunks hidden by dead leaves, 34 tree-like yucca, 35 agave with stalk)

- Sort of like a tree: none

## Bushes

### Slides:

- No generic names: bush (trimmed yaupon - full shot), shrub (juniper - full shot)

### Field (neighborhood):

- No generic names: shrub (2 rosebushes, evergreen hedge), "a shrub is sort of like a bush, a miniature bush."

Listing tasks: (Are there different kinds? "I don't know any.")

Concept map: - Named: apple tree

### Sorting task:

- No generic names: (1 understory forest shrubs, 24 cenizo in bloom, 26 mesquite in bloom, 28 juniper - trunk hidden, 29 trimmed hedge, 32 - Hawaiian tree-like yucca, 33, 74 low yuccas, 38 cholla, 41 Joshua tree - yucca, 45 large fern, 48 sea oats, 72 large trees with Spanish moss)

## Flowers

### Slides:

- Named: five white-petalled flowers (bull nettle), red rose, daffodil (dandelion), sunflower, bluebonnet, buttercups (pink evening primrose)

- No generic names: (Engelmann's daisy, Indian blanket)

### Field (neighborhood):

- Named: yellow flower (dandelion), yellowish flower (Iris in bloom), little bitty flower (henbit)

### Field (river walk):

- Named: like bluebonnets (spiderwort)

- No generic names: (crow poison)

### Listing tasks:

- Named: buttercup, bluebonnets, rose, pink rose, carnations, daffodil, daisy, sunflower, poinsettias, blossom, Indian paintbrushes

Concept map:

- Named: bluebonnets, roses

Sorting task:

- Named: bluebonnets (67 *Lupinus*, no blooms - he recognized it as a bluebonnet, otherwise would have been "leaves" - presence of flowers not essential as long as he knows it will have flowers.)

- No generic names: (25 - red tallow leaves, 31 azalea, 40 horse creeper cactus in bloom, 46 railroad vine in bloom, 54, 55, 56, 57, 58, 59, 60, 62, 65, 69 flowering herbs, 71 thistle)

**Categories of Plants**

Listing tasks: (What categories are there for things like trees?) trees, flowers, grass, wildflowers or wild stuff, bushes, plants under water. Is algae a plant?

Concept map: grass, trees, vegetables, fruit. Wood - the same as trees.

**Names of Plants**

Slides:

- Named: claw plant (white clover), thorn-tipped plant (*Sabal minor*, agave without stalk), yucca plant (2 yuccas)

Field (neighborhood):

- Named: big thorn plant (agave)

Listing tasks:

- Named: ornamental cabbage, fruit on cactus. (Only listed two. In dialog, other things also called "plants" are) wheat, oats, corn, bluebonnets, roses.

**Grass**

Slides: - Named: saw grass (cattails)

Field (neighborhood): - No generic names: (turf)

Field (river walk): - Named: speargrass (grass), fake speargrass (grass)

Listing tasks:

- Named: seaweed - but I don't think it's really grass; sawgrass. I don't know others.

Sorting task:

- No generic names: (49, 50, 51, 52, 53 all grasses, one with dead herbs, 63 *Baptisia* with grass)

**Vines and Ivy**

Slides:

- Named: strawberry vine (balsam gourd), wild berry vine (snailseed vine), poison ivy (stinking gourd)

Field (river walk):

- Named: vines - honeysuckle

Listing tasks:

- Named: vines in the jungles; vines with strawberries

**Cactus**

Slides:

- Named: prickly pear cactus, Teddy bear cactus (lace cactus)

Field (neighborhood):

- Named: prickly pears

Listing tasks:

- Named: Teddy bear, some kind in the desert with big like fingers on it (saguaro), nopales - prickly pear

Sorting task:

- Named: may be Teddy bear cactus (42 claret cup cactus in bloom)

- No generic names: (37 prickly pear in bloom, 39 saguaro)

## Weeds

Field (neighborhood):

- No generic names: (henbit in bloom, composite rosette)

Field (river walk):

- No generic names: (bur clover)

## Mushrooms

Slides:

- No generic names: (white mushroom)

Listing tasks:

- Named: poisonous and non-poisonous, black, toadstools

## Moss

Slides:

- No generic names: (ball moss, orange lichen)

Field (neighborhood):

- No generic names: (yellow lichen on tree, ball moss)

Listing tasks:

- Named: green moldy kind on rocks, some kind of yellowish-green

## Ferns

Slides:

- No generic names: (maidenhair fern, fern on tree)

Listing tasks: "I don't know any kinds."

## Leaves

### Slides:

- Named: three-pointed leaves (poison ivy), maple leaves (grape vine), red maple leaves (Spanish oak, with close-up)
- No generic names: (Virginia creeper)

### Field (neighborhood):

- Named: thorn leaves (live oak seedlings)
- No generic names: (English ivy)

### Sorting tasks:

- Named: three-leaf clover (64 - *Oxalis*, no blooms)
- No generic names: (36 *Sabal minor*, 44 maidenhair fern, 47 railroad vine, no blooms, 61 water lily in bloom, 68 green Indian paintbrush, 66, 70, 73 herbs without flowers)

## Vegetables

Listing tasks: corn, broccoli, lettuce, radishes, potatoes, cucumber, mushroom, okra, pinon, bell pepper, tomato - is it a fruit or a vegetable?, beets, turnips, squash, zucchini, carrot, celery, red cabbage, yellow squash, cauliflower, sweet potatoes, pumpkin, beans, rice - no it's a grain.

## Fruits

Listing tasks: strawberry, cherry, apple, orange, pineapple, grape, green grapes, watermelon, cantalope, honeydew melon, coconut, red grapes, banana, lemon, grapefruit - now I'm thinking of citrus fruits, kiwi, one that's yellow (pomegranite), peach, apricot, plum, prune - is it the same as a plum? (Added in concept map) pear

## Berries

Slides: - Named: red and black raspberries (dewberries)

Field (neighborhood): - Named: red berries (*Nandina*)

## Things I Didn't Know About

Sorting tasks: (27 ocotillo, 43 large fern)

## Unknown Domains

Slides: - Named: mesquite (small ragweed), cherrie tomato (yaupon with fruit), three-leaved clovers (*Oxalis* in bloom), lily pads (water lily, lotus)

Field (neighborhood):

- Named: five-leaved clover (bluebonnet rosette), big giant thorn things (thistle rosette), spearmint stuff (*Torilis*), cabbage (ornamental cabbage), yucca, chile pequins (no referent)

Field (river walk):

- Named: like lily pads (elephant ears)

## Appendix A-4: Informant 1: Domain Analysis of Attribution

### **TREE VERSUS BUSH**

Informant's verbal statements:

A tree is not exactly a plant. On top, it's a plant. It's not an animal so it must be a plant. The leaves are the part that's a plant.

A bush kind of has to be a plant. It seems half plant, half tree. Because of its branches.

D: How do you tell a tree from a bush?

I: A bush is shorter, usually. Leaves aren't as far apart. Don't have as many branches.

A bush usually is not as tall as a tree.

D: How is a bush similar to a tree?

I: They have roots, but not the same as real plants. They're made out of wood.

(Bushes and trees) They've got wood roots.

A weed you can pull up easily. Trees or bushes you really can't.

### **PLANT**

Plants are things with leaves that are close to the ground.

The roots aren't as sturdy as a tree. They have soft vein roots, not wood roots. No wood, no hard wood.

### **WEEDS**

D: So weeds don't have wood roots?

I: Not really.

A weed you can pull up easily.

(See comparison with grass, below.)

## **GRASS**

Grass is usually small and doesn't grow that big (compared to weeds). Cause usually you mow it. And it doesn't grow as tall as weeds, sometimes.

D: So the size is a big difference between a weed and a grass?

I: I'd imagine so.

Grass leaves are straight up and down, and the weed leaves... are kind of curly and sort of like tree leaves.

### **TAXONOMIC ANALYSIS - INFORMANT 1**

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

The informant's taxonomy is inconsistent, depending on her usage of "plants" as an herb or an all-encompassing concept. Even when used other than as a unique beginner, however, the concept "plant" tends to include within it a variety of designations, "flowers, crops, and vegetables," for example. "Plants" appears at different levels in the taxonomy at different times, serving as a unique beginner, life-form or intermediate, and possibly as a generic ("water plants").

Several life-forms have intermediate designations. "Flowers" include "wildflowers" and "garden flowers." "Plants" (below the unique beginner level) can be broken down into a number of life-form groups. Lily pads and dandelions are over-generalized to include a variety of similar looking species, but probably should be viewed as true generics.

The categories "trees, flowers, weeds, and small plants" are used frequently. "Trees" and "flowers" are given generic names the most often. "Wildflowers, grasses, and weeds," are described the most often. "Small plants" and "weeds" have named members fairly often. For all of these categories, the generic level may be the preferred level of abstraction.

"Cactus" is used frequently but only one member is named. The categories "bush, ivy or vines, grass, and cactus" rarely have named generic members and are rarely described. For these categories, life-form designations are acceptable to the informant.

The informant fairly often calls something, "just a weed," or "just a grass," indicating that the category may be a residual.

## COMPONENTIAL ANALYSIS - INFORMANT 1

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

### TREES

The prototype tree is tall, with one or more fairly large trunks topped by numerous leafy branches spreading out to form an elevated crown. A tree is woody. It differs from weeds and other non-woody things in that it is difficult to pull up by the roots.

Though the typical leaf is fairly small, of the type common to a broadleaf tree, size and shape vary considerably on specimens selected. Several specimens lacked leaves. Other criteria, possibly unimportant for selection include presence or absence of showy flowers (most trees seen did not have them) and fruit.

In her selection of trees, most specimens share several characteristics of the prototype. Most choices are consistent and predictable. No criterion fit all of the designated trees, however. Palms are not particularly branching, and a number of specimens are short, with leafy multiple trunks emerging from the base.

Specimens which differ dramatically from the prototype, such as junipers, agaves and yuccas, are likely to be classified as trees on one occasion but as bushes, weeds, or cacti on other occasions. This category overlap lends support to prototype theory.

The informant's selection indicates a wide degree of tolerance for forms that differ from the prototype. A few specimens designated as "most like a tree" differ markedly from the prototype (yucca, juniper). When asked to pick out those most and least like a tree, however, all specimens that did not fit her idea of "most like a tree" were removed from the category altogether. While her selections may reflect a gradation of form from most to least like the prototype, she was not comfortable with acknowledging that gradation. She was able, however, to acknowledge that the bushes are "sort of like a tree."

Most specimens chosen are consistent with the choices a botanist would make.

### BUSHES

The prototypical bush is woody and small, shorter than a tree. The leaves are fairly close together. An overall bushy form, fairly rounded, with the branching crown surrounding and hiding the slender multiple trunks, may be the most important criterion. The trimmed hedge, such as is common in much landscaping, may exemplify the prototypical bush. Like trees, bushes cannot be easily pulled up by the roots. The typical leaf is small, of the broadleaf type. Criteria possibly not important for selection include the presence or absence of showy flowers

and fruit.

Almost all choices are consistent and predictable and would be acceptable to a botanist. Despite the close fit of most specimens with the prototype, the only criteria that fit all specimens is the presence of branches and leaves.

## **FLOWERS**

Though the informant did not give any definition of the category, the selections made indicate a prototype that is herbaceous and has colorful flowers. Most specimens share these characters, but there are enough exceptions to indicate that the category is not consistent or predictable. Several shrubs, vines, and one cactus are included, on the basis of bearing showy flowers. The same species without flowers are classified in different categories. The presence of four grasses in the category is unexplained, as other grasses appear in the "grass" and "weeds" categories.

The informant appears to view flowers as falling into two groups, wildflowers and garden flowers. She occasionally used "wildflowers," however, in reference to horticultural specimens, such as tulips.

Because it is based on a feature (showy flowers) that can be found in all the various forms of plants, the category inevitably must become inconsistent. The category would not be acceptable to a botanist, though the term "herb" might be a reasonable substitute that would include most specimens.

## **PLANTS**

The informant has a double usage of the term "plants." Though she knows that bushes and trees must be plants because they are not animals, she is not reconciled to the concept, and insists that bushes and trees are not "real plants." The prototype "real plant" is not woody, has leaves close to the ground, and does not have colorful flowers.

While most specimens chosen fit the prototype, the informant appears caught between the two usages and somewhat confused by the discrepancy. While preferring to use the term in reference to herbs, she occasionally unconsciously makes a comment such as, "moss grows on plants," while looking at a tree.

The informant uses several different designations when referring to herbaceous plants. The labels "real plants" and "small plants" are apparently inter-changeable. She also uses "water plants" to refer to herbs, but her usage is inconsistent. In one case, trees by a lake are included with "water plants." The presence of flowers would usually place a specimen in the "flower" category. Flowers are allowable, however, on the "water plants". The use of water as a means of classification is inconsistent and not used exhaustively, as several grasses and trees in or by water are not placed in this category.

## **GRASS**

The prototype grass is lawn turf, mowed and short. The leaves are linear ("straight up and down").

The informant does not use the label often. In all but one case, the specimen fit the prototype in appearance. Most selections were true grasses. As noted above, however, some true grasses are classified as "wildflowers" or "weeds". The non-prototype specimen, clover, indicates a tendency to over-generalize non-flowering low-growing herbs as "grass."

The category appears poorly defined. Though she in fact does designate some grasses as weeds, she tends to deny that there is an overlap between categories, and she attempts to differentiate "grasses" from "weeds" in her verbal definition.

## **VINES**

The informant gave no verbal defining characters for vines or ivy. The two labels appear to be inter-changeable. Most specimens chosen have long, slender, flexible stems.

The specimens selected come in a variety of forms, growing along the ground, climbing in trees, bushy plants, and potted plants. The category is somewhat inconsistent. Two specimens (mistletoe and leaves on the side of a Chinaberry trunk) do not have the expected stem type.

Most specimens do not have flowers. Several vines with showy flowers were placed in other categories. The category appears to be rather poorly defined and inconsistent.

## **CACTUS**

The informant gave no verbal defining characters for "cactus". She includes a large number of specimens in the category. The presence of spines is the most consistent criterion, though several non-spiny plants appear in the group. No single form can be seen as dominant in the specimens chosen.

The informant includes a wide variety of true cacti in the group, demonstrating quite a bit of familiarity with the diverse forms cacti can take. She includes a large number of spiny non-cacti in the group also. Most of these specimens would be acceptable as cacti to the adult layman (yuccas, agaves, ocotillo), though not to the botanist. Several others, some herbaceous spiny plants and the dwarf palmetto, for example, would not be acceptable even to the adult layman.

Her designations indicate quite a bit of overlap between this category and several others, as a number of spiny plants also appear in other groups (one flowering cactus in the "flowers", yucca and agave in the "trees").

## **WEEDS**

The prototype "weed" is herbaceous. The leaves differ from grass leaves, in that they are not linear but are broader. Weeds are taller than lawn grass. Though not stated in her verbal definition, the prototypical weed is either non-flowering or lacking a showy flower.

The informant designates a surprisingly large number of specimens as weeds. All but one (azalea) of her choices are herbaceous. Though quite a few have flowers, the flowers are small, not very showy (except azalea) or attractive.

Though most specimens match the prototype closely, they also match the prototype for "real plants." No clear differentiation between these two groups is made. Though the informant has a different prototype for "weeds" and "grasses," the same specimens might be placed in either category. These inconsistencies indicate that "weeds" may be a poorly defined category, a catch-all for specimens that the informant doesn't think are suited to other herbaceous categories. The designation of azalea in this group is an anomaly. As she moved it from the tree category, it probably was placed here simply because it didn't fit elsewhere.

## **FRUITS AND VEGETABLES**

Informant did not display any misconceptions about these categories. Her lists were rather short and no defining attributes were mentioned.

## Appendix A-4: Informant 2: Domain Analysis of Attribution

(Note: The informant's verbatim statements are outside of parentheses. The researcher's comments are in parentheses.)

### **TREE**

A tree has leaves, branches, a trunk. The leaves make the tree pretty. The trunk has bark.

(Live oak) just has your basic tree trunk. It's just a regular tree trunk.

(Palm) tree trunk is really weird.

### **TREE VERSUS BUSH**

A tree has a trunk, and it's real big, a lot taller than a bush.

A bush doesn't have a long stem. It's usually on the ground, real little squatty thing that sits on the ground.

They both have leaves. Some have flowers in them. They're green. I don't know if bushes have limbs, but trees do.

A bush is a little squatty thing that sits on the ground with a bunch of leaves and everything and it's usually green. A tree is a big tall thing with a trunk with branches sticking out. And it's real tall, and a bush is real short. Trees lose their leaves in the fall, and a bush's leaves stay green. And the tree leaves usually turn brown.

(So the bush stays green?) Well, some bushes do. But they don't have brown and red and all those colors (that trees have).

### **BUSH**

(Arbor vitae) just looks like a bush. But with really interesting leaves.

I picture cactus as a type of bush.

### **TREES VERSUS FLOWERS**

Flowers grow on trees, on bushes, and on the ground, and in the water. But mostly they grow on other plants.

Trees are a lot bigger than flowers in a field. Usually a lot of them (flowers) bunched together.

There wouldn't be a whole bunch of trees together or they wouldn't fit.

Flowers are real colorful. And trees are just green and brown.

### **FLOWERS**

Flowers are pretty, and smell good.

Flowers have a center, leaves (= petals), and a stem.

It doesn't look like a flower (if) it doesn't have the flower on it.

### **PLANTS**

Plants in the river: some grow on vines. Some have flowers. Some are just big leaves. And some of them are really weird.

### **GRASS**

(No verbal statements)

### **VINES**

Vines can grown in trees, on the ground.

Ivy is kind of like a vine because it grows up your house.

A vine is really long, and it just lays on the ground, and it crawls up the wall. But it will grow almost anywhere, like a weed. And it's just real long and stretchy. And they're real hard to break.

### **CACTUS**

I picture it as a type of bush.

### **WEED**

Something that grows where you don't want it to grow.

Will grow almost anywhere.

(Flowers are beautiful, weeds are ugly.)

## TAXONOMIC ANALYSIS - INFORMANT 2

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

When using plants in an all-encompassing manner, her taxonomy is quite extensive and consistent with an adult layman. It is not a scientific classification scheme.

Polysemous use of "plants". "Regular plants" (residual) are unnamed. "River plants" are usually named.

Several intermediate categories under flowers, plants, vines, bushes; may indicate elevation of level from generic to slightly more abstract, but still allowing avoidance of life-form.

All categories, including the intermediates, have named generics: tree, bush, flowers, plants, vines, cactus, weeds, grass.

Categories named the most, trees and flowers, also are among those named the most and described the most. For these categories, the informant clearly prefers the generic level.

Bushes is used a lot but rarely named. However, it is frequently described, so the informant probably is uncomfortable with using the life-form. Occasional use of "just a bush," however, indicates that the prototypical bush does not require a name.

For weeds, cactus, grass, and vines, the informant may be quite comfortable with the life-form designation. These are rarely named or described.

## COMPONENTIAL ANALYSIS - INFORMANT 2

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

### TREE

The prototype tree has a tall trunk, with branches sticking out (not at ground level), and deciduous leaves that turn colors in the fall. Trees are taller than bushes. Leaves tends to be small, such as those typical of a deciduous tree.

No criterion matched all specimens. Most specimens chosen share several or all characters of the prototype. Thus, the choices generally appear consistent and predictable. Every specimen shared at least one character with the prototype.

In general, those chosen as "least like a tree" have only one or two characters of the prototype and tend to have atypical trunks and atypical leaves (agave, yucca, Sabal palm). A few unexplained inconsistencies appear - paper birch is designated as "least like a tree." One juniper and one palm are designated as "most like a tree," although other palms and junipers are either considered "least like" or not trees at all. When asked to select those most and least like a tree, however, the informant used up all the specimens - there were no in between. The instructions either were not clear or she simply was not thinking that there could be trees that fit in between the two extremes.

The selections appear to indicate a gradation away from the prototype tree, towards the bushes. The informant classified several species (seen at different times) in both categories (rose, mesquite, Ligustrum). On a very few occasions, she mentions that some specimens (such as juniper) can be either a tree or a bush. A botanist would not disagree with her in most cases, as most of these species vary in form and size from shrub to tree. Yuccas appear in tree, bush, and plant categories.

In general, the informant's designations are in line with those expected by an adult, layman or botanist.

## **BUSH**

The prototype bush is the evergreen, trimmed shrub typical of home landscapes. It is short, with small leaves closely packed together, the crown close to the ground.

In addition to bushy form, size is the most important criterion. Though a number of "trees" were short, only one "bush" (saguaro) is taller than the prototypical tree. No criterion fit all the specimens. Most specimens shared most or all of the characters of the prototype. Every specimen shared at least one character of the prototype.

In general, the informant's designations were consistent and predictable. The informant noted that honeysuckle and yellow jasmine resemble both a bush and a vine. A botanist would not disagree.

The specimens designated as "least like a bush" were three cacti. Cacti vary considerably in form and do not really fit into any folk category very well, as they are neither woody nor herbaceous. Thus, the placement of them on the periphery of the category is predictable.

The informant does not know what to do with ferns and grasses. Some are placed here, some in other categories. She may not recognize all grasses as grasses and all ferns as ferns. Though a botanist would disagree with the designation, the ferns and grasses placed in "bushes" all match the prototype characters very closely. Their selection is internally consistent.

Some bushes with colorful flowers are placed here, and some are placed with "flowers." This results in an inconsistency.

## **FLOWERS**

The prototype flower has a colorful flower. The informant indicated that "prettiness" is an important factor as well. Though the informant states that flowers grow on trees, bushes, on the ground, and in the water, most of her selections were herbaceous (growing on the ground). Thus, the prototype is assumed to be herbaceous.

Most selections share all the characters of the prototype. No single criterion, however, applies to all specimens.

Though it would appear at first that the category was consistent and predictable, the specimens that do not fit the prototype very closely are not predictable members of the group. The fact that woody plants and cacti also can produce colorful, attractive flowers creates a problem for the informant. She includes three woody shrubs and three cacti in the group, all of them inconsistent with the prototype. These selections make it apparent that she sometimes treats the category as monothetic, relying on presence of flowers alone. In most cases, however, she treats the category as polythetic, relying on several characters.

If viewed as a monothetic category, "flowers" is consistent, but it is not exhaustive, as a number of non-herbs with flowers are not included in the category. If viewed as a polythetic category, most members are consistent but a significant number are not predictable.

"Prettiness" is a subjective designation, of course. The informant stated that, with flowers, several herbs are "flowers" (that part being pretty), and without flowers, they become "weeds" (the leafy part being ugly). The result is an unpredictable overlap between the various herbaceous categories (flowers, plants, weeds).

Difficulty with recognition of true flowers is revealed in her selection of an orange lichen and an herb with colorful leaves in the group.

A botanist would disagree with the use of the term "flower" to refer to a category. The multitude of problems produced by such a designation are apparent.

## **PLANTS**

The informant recognizes that "plants" can be used as an all-encompassing term for woody and herbaceous plants, including food plants (tomatoes, carrots). In actual usage, however, she restricts the term to two different groups of specimens, plants in or by the river, and a residual group.

The prototype plant is not clearly defined. In preference to a prototype for all plants, she seems to have a prototype based on the subset "plants in or by the river." The subset probably grew out of a unit in science on the plants that grow in the local spring-fed river. Throughout the

interviews, she tends to refer to water plants, more than to any other group, when asked questions about "plants."

The prototype river plant grows in or along the edge of the water and is herbaceous. It may or may not have flowers, but tends to consist mainly of large leaves. Water lilies ("lily pads") and elephant ears are examples of the prototype.

Outside of the river plant subset, other specimens, which she designates as "regular plants; plants I don't know the names of," tend to be a hodge-podge of plants that don't fit other categories very well. It appears that, for these specimens, the designation "plants" is a residual category, a catch-all category for left over specimens. Several non-herbaceous members that are difficult to classify (ocotillo, some yuccas) are thrown into this group.

### **GRASS**

The informant only names five specimens "grass." All are true grasses. Her prototype probably is mowed turf. She probably lacks additional criteria to assist her in classifying tall grasses and grass that has gone to seed. Though she includes two weedy grasses in the group, she places other tall grasses in "weeds, bushes, and plants." She is, thus, quite inconsistent in how she classifies true grasses other than turf. This may be a monothetic category, in which case it is also unstable - take away the lawn-mower, and what do you have?

### **VINES OR IVY**

The most important criterion of the prototype vine is the long, flexible stems. The terms "ivy" and "vine" are inter-changeable. The informant is aware of the diverse forms that vines can take, including ground hugging, climbing, potted, and even free standing plants with vine-like stems.

Though most specimens chosen have typical vine stems, a few do not fit the criteria at all. Two potted succulent herbs appear as unpredicted members.

Even the botanist tends to classify plants as vines, based on stem form alone, a monothetic category. Though one would think that stem form would be an unstable character, it tends to be fairly stable in nature. Some species do cause confusion, however, as is indicated by this informant's classification of honeysuckle and *Wisteria* as both "vines" and "bushes."

### **CACTUS**

The informant calls only three plants "cactus." The two true cacti have spines, one has flowers and one has fruit. The non-cactus is a potted succulent, a specimen that might be called cactus by the adult layman though not by a botanist.

The researcher did not determine whether the informant recognizes other cacti. She placed

some with the bushes, and some with the flowers. As she also indicated that she thinks of a cactus as being a type of bush, she did recognize some cacti in the sorting task, but the researcher did not discover whether the informant had accurate designations.

### **WEEDS**

The informant uses the definition for weeds that is common among adults, both layman and botanists. A weeds grows where it's not wanted and is ugly. The category is subjective, not based on anatomical structures, and thus, is inevitably a problematic category.

This informant designates a surprising number of specimens as "weeds." Though not stated, her prototype is obviously herbaceous, as virtually all members are herbaceous. The prototype probably does not have showy flowers.

Most members fit the herbaceous prototype closely. Some of the members, by the informant's own admission, can fit into more than one category. The subjective nature of the concept "ugly" makes it difficult to judge some members, and some inconsistencies may occur there. Would others agree that without the flower, a buttercup is a "weed"? A couple of flowering herbs arbitrarily appear in both categories. Does that indicate that the informant is inconsistent in judging a plant ugly or pretty?

### **LEAVES**

The informant referred to several specimens as "leaves." She may have chosen to refer to the leafy part of a plant in preference to an abstract designation when she did not have a suitable generic name for the specimen. The references are too few to justify calling this a true category.

## **SUMMARY OF COMPONENTIAL ANALYSIS**

The informant has a varied usage of the term "plants," as an all-encompassing concept, in reference to herbaceous river plants, and as a residual category.

The informant's categories are not scientific categories. All would be recognized by the adult layman, however, and most would be used by the botanist. The two categories that are used in scientific taxonomies, cactus and grass, are not used in the same manner by the informant.

Two of the informant's categories had consistent and predictable members and would fit a botanist's usage: trees and bushes (botanists call "shrubs").

Her selections indicate the use of a prototype, with a gradation of members away from the prototype and towards a predictably similar category (trees can be bushes, bushes can be vines). Not enough data was collected to ascertain the prototype for the cactus.

Several categories (such as vines) yield unpredictable members. The monothetic categories are particularly troublesome as the criterion tends to be unstable (flowers, grass). Though weeds is not a monothetic category, it's most important criteria are based on subjective opinion, rather than structural features.

The informant frequently classifies the same species or closely related species in different categories. Occasionally, she acknowledges the possibility of multiple classifications. In most cases, the multiple designations are reasonable (cacti vary greatly in form), but a few result in unexplained inconsistencies (some flowering shrubs classified as "flowers" rather than "bushes," grasses appearing in four different categories).

## Appendix A-4: Informant 3: Domain Analysis of Attribution

(Note: The informant's verbatim statements are outside of parentheses. The researcher's comments are in parentheses.)

### **TREE**

(Typical trees are) green, they're tall, they spread, they have bark on them.

Most have bark. They're big.

Tree is bigger (than a bush).

It spreads.

Has branches, limbs, leaves, the stump, and the roots, and the bark.

It has green on it.

(The trunk) is brown.

(Joshua tree is a tree because) it looks like it has bark, and it has spreading.

(Cenizo) cause it's coming out everywhere (branching), and they have leaves and some flowers.

(Cholla is least like a tree) because inside, they would be green (the stems) and because they have thorns everywhere.

(Yucca is least like a tree) because they look shorter and they're growing these up here (flower stalk).

### **BUSH**

Bush is smaller (than a tree), more in a round shape with more leaves.

(Forestiera) It has lots of branches together.

### **FLOWERS AND PLANTS**

(The informant usually lumped these together.)

(Are flowers different from plants?) No, they're the same.

## **FLOWERS**

(Is that a plant - a potted succulent?) No, it's a flower. Because after this, soon there will be some purple flowers coming up.

## **PLANTS**

(Typical plants) are mostly all green. They're all green most of the time. They're real short. Some of them are short.

(How can you tell a plant?) Most of the stems, they break easier (than a tree) if you bend them. Most have pretty colors.

(Rain lily) They spread out more (than grass), and they fall to the side.

(*Oxalis* in bloom) they're all mixed together (flower and plant). (The leaves) come out by itself (making it a plant), and then (the flowers) come out, too (making it a flower).

(Grass is least typical of plants) because it looks like grass.

## **GRASS**

No statements

## **VINES**

No statements

## **CACTUS**

(Prickly pear cactus is) green, lots of little thorns on them.

(How can you tell a cactus?) Got thorns. They're green. They grow little reddish things. They grow in groups. You can eat them. (Would that fit all cactus?) No... All got thorns on them. They're green inside.

## **WEEDS**

I think weeds look different (from plants and flowers).

(In sorting task, was there anything that you would call weeds?) Not that I found.

### TAXONOMIC ANALYSIS – Informant 3

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

There is no obvious evidence that the informant uses generic names to indicate intermediate levels between life-forms and generics. Though the term "evergreen" is used, it appears to be used exclusively for junipers. When asked if there are different kinds of evergreen, he says no. The name "pine cone tree" is used only with true pines, while bald cypress is called "Christmas tree."

Evidence of differential salience: The categories "trees," "flowers," and "flowers and plants" are used and named frequently. All are salient at the generic level of abstraction. All other categories are seldom used and rarely named, thus appear to be less salient. For those, the life-form level may be acceptable for naming plants.

### COMPONENTIAL ANALYSIS – Informant 3

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

**Plants:** This is the only informant who did not appear to ever use "plants" in reference to trees. He does, nonetheless, have a somewhat polysemous use of the term: 1. His verbal statements consistently reveal a prototype that is a small green, non-flowering herb. The prototype is not grasslike, but the boundaries of the category are broad enough to include grasses. Greenness may be one of the most important criteria, as saguaro is admitted to the group, despite its size. Despite the strong evidence for an herbaceous prototype, so many inconsistencies occur that it seems the informant tends to use the category as a residual. Any plant that doesn't fit well into the more salient "trees" or "flowers" is thrown into the "plants."

**Flowers and plants:** Of all the informants, this is the only one to use a category that includes nearly all the herbaceous plants, with and without flowers. Though a number of non-herbs are included, few herbs are omitted from this joint category. While tending towards a monothetic definition for "flowers" (relying solely on the presence of flowers for classification), the informant realizes that when the flower is gone, the plant has not changed its identity. The joint category allows him to include the two forms of the plant under one heading; ie., when it has a flower, it is a "flower," when the flower is gone, it's "flowers and plants." The joint category is fairly stable, as it relies on herbaceous habit rather than presence of flowers alone, and appears to be a polythetic category, relying on a family of resemblances rather than one or two critical criteria, and having a gradation of similarity to the prototype.

**Flowers:** Polysemous use: 1. Polythetic herbaceous prototype when used as "flowers and

plants," described above. 2. Monothetic - tending to rely on presence of flowers alone. Though the prototype is herbaceous, a wide range of plants, including shrubs and cacti, are included if they have attractive, showy flowers. The fact that a clover was the only plant designated "least like a flower" indicates that prettiness may be a more important factor than herbaceous habit in classifying "flowers."

**Tree:** The prototype is tall, has bark, spreading branches, leaves, and a brown stump (trunk). Though most members share a number of criteria with the prototype, the boundaries of the category are much broader than those of any other informant. He includes plants such as prickly pear cactus and non-tree yuccas as "most like a tree." Perhaps these assumed errors reflect the informant's Mexican background. In Mexico, these types of plants would be prevalent in the landscape (if not more so) than the woody trees typical of the temperate north. He also includes several vines, mostly woody, in the group. He seems to have separated his categories into two very broad groups, woody plants (called "trees") and herbaceous ("flowers and plants.") All other categories have relatively little salience.

**Bush:** Prototype - probably an ornamental, trimmed shrub. While overall low, rounded form is the stated criteria, it appears that the category is polythetic, relying on family resemblance, and admitting variation within the category. Woodiness is probably an important criteria. While some informants tend to rely too heavily on overall form, using this as a monothetic category, this informant obviously relies on other criteria as well, as he only includes one non-woody plant in the group. Most plants on the boundary between trees and bushes are placed with the trees. This indicates that the "bush" category has more restricted boundaries and is not as salient as trees.

**Grass:** Grass is a subset of "plants". Only true grasses are included and few are omitted. Whether or not the category is monothetic (relying on low herbaceous form and leaf shape alone) is difficult to determine, as all members are similar in form and leaf type. Would the informant include bamboo as a type of grass? This is one of the few informants to use the category without over-generalizing. He appears to have a scientifically accurate concept of the category.

**Vines:** The prototype is probably a climbing herbaceous vine, with long flexible stems, no flowers. The informant recognizes railroad vines with flowers as "vines," but prefers to classify them as "flowers." The woody vines are placed with "trees," indicating that the boundaries of the category are fairly restricted, though some deviation from the prototype is allowed. Perhaps this is a monothetic category, but not enough data is available to be certain. Does he know that the woody vines are vines?

**Cactus:** Presence of spines and greenness seem to be the critical criteria. Prototype - true cactus. In the listing task, it appears that prickly pear cactus is the prototype. In the sorting task, however, prickly pears are not included in the cactus category. In the sorting task, a number of treelike cacti are omitted initially. In a second sort, however, the informant was asked to pull any missing cacti into the group, and he was able to do so.

## Appendix A-4: Informant 4: Domain Analysis of Attribution

(Note: The informant's verbatim statements are outside of parentheses. The researcher's comments are in parentheses.)

### **TREE**

Trees have leaves, stems, and branches (stated several times).

They have roots.

Trees would have trunks on them.

(Concept map) Leaves, trunk, branches ("trunk" singular, several times).

(Sorting task) There's tall. Most of them you could see the trunks. They had leaves sticking all out of them. Tall.

(Agave is) tree without many branches or leaves.

(Yucca is sort of like a tree because) it is tall.

(Joshua tree is sort of like a tree because) it has the trunk of a tree, but it's all curved.

(Juniper is sort of like a tree) but it's kind of short.

(See comparison with "plants.")

### **BUSH**

They have a bunch of trunks.

(Sorting task) Like clods of grass all put together. They're round. And not too tall.

### **FLOWERS**

(Concept map) Flowers have petals, branches, stems, some have leaves, some have seeds.

(Sorting task: How would you contrast "flowers" with "trees with flowers"?) Trees are trees with flowers on them, and flowers are just... (So you wouldn't put anything that was a tree in the flower stack?) I don't think I did. And I put a few things with pricklies on them in the flowers because they had mostly flowers on them.

Have petals, and they're pretty, and all different colors.

### **PLANTS**

Plants are green.

(Sorting task) They were short. They weren't too long. They had little leaves on them.

(Compared to trees) They were shorter. you couldn't see any trunks or anything. and sometimes the leaves are bigger than the branches. Which isn't usual for a tree.

### **GRASS**

(Definition of grass) Short. Skinny. Green.

(How is grass different from a small plant?) They don't have petals, they don't have seeds. They don't have leaves. They don't have branches.

### **VINES**

No statements

### **CACTUS**

No statements

### **WEEDS**

I'd call it something like a weed (Galium). It gets so big.

## **TAXONOMIC ANALYSIS - INFORMANT 4**

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

The relationship between categories was very unclear - many inconsistencies occur. There is too much overlap to make his categories very useful for him. When asked to name the categories of plants, he included "miscellaneous." When I asked what he was thinking of when he said that, he said, "Animals."

The informant's liberal over-discrimination of the "trees" and "flowers" categories may be an attempt to differentiate below the life-form level. If so, the categories "trees with flowers," and "things with prickly stuff on it," can be viewed as intermediate categories. He does not have any

named generics in any of these intermediate groups, though he does have life-forms groups and described groups included under "prickly stuff."

"Plants and trees by the water" is a poor intermediate, if it is one at all. It overlaps with several life-form categories and cannot be placed into a linear taxonomic relationship.

Evidence for differential salience of life-form categories: Only the categories "flowers" and "trees" are used and named frequently. For both, the generic level of abstraction appears salient. "Flowers" is obviously an important category, as the informant designates "trees with flowers," and places "prickly things" in the flowers group when they have flowers. For all other categories, the life-form appears to be an acceptable level of abstraction for naming things.

#### COMPONENTIAL ANALYSIS - INFORMANT 4

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

More so than any other informant, he uses a large number of monothetic categories, relying on the presence or absence of a single criterion (or small group of criteria), rather than a family resemblance. These categories overlap widely with other groups. For example, "flowers with trees" overlaps with both "trees" and "flowers," though he states that flowers with trees are different from other flowers. In the sorting task, he allowed backgrounds to influence his selections ("trees and plants by the water." Also he classified one tree as colorful because of the sunset in the background, and classified one yucca based on the presence of flowers in the background.) He has a poor understanding of the importance of using stable criteria in classification. None of his categories were sorted exhaustively. He has a lot of inconsistencies in his classifications. Every category was over-discriminated, which could be seen as an attempt to differentiate between types of trees, et cetera. His selection criteria, however, is generally unstable (flowers, water). He moves some things from one category to another, in an attempt to get it right (tree-like yucca, mesquite with flowers, at first are in a miscellaneous category; several things designated "sort of like a tree," were removed.) He occasionally mentions that something could fit into more than one category, but is not sure if that is right.

**Plants:** Polysemous use: 1. Knows that trees are plants. 2. But his prototype appears to be a small, non-flowering herb. A number of his selections are inconsistent with the prototype, indicating that the category serves as a residual, a catch-all for plants that don't fit neatly into his other categories.

**Plants and trees by the water:** Monothetic - presence of water is the only criterion. Includes a wide range of dissimilar plants. Sorting is not exhaustive.

**Trees:** Tall trunk is an important criterion. The trunks are usually visible. Trees have leaves and branches. The category is over-generalized, including numerous plants that don't fit the criteria

well. He also over-discriminates the category, based on the presence of water, flowers, or prickles. In most cases of over-discrimination, however, he does recognize the plant as a tree.

**Bush:** Not a very meaningful category, the prototype is an ornamental trimmed shrub. He differentiates bushes from trees by size and number of trunks. Numerous shrubs, however, are included with the trees. Those designated as "bushes" all have a low, rounded form and no flowers. Flowering shrubs are placed either with "trees", "flowers", or "trees with flowers". Though the category is monothetic, relying on overall form almost exclusively, all members are also woody. He does not include any oddball members, as do some other informants. He may not recognize a gradation in form from the prototype, though he does acknowledge overlapping boundaries for honeysuckle.

**Flowers:** Prototype - Herbs with showy, pretty flowers. Several inconsistencies (woody shrubs, cacti, railroad vine), though all have flowers. Some flowering herbs included here are not particularly attractive. Species found in this category are omitted if they lack flowers. He is aware that he has overlapped "prickly things" into this category; presence of flowers seems to be a more important criterion for classification than presence of spines.

**Flowers with trees:** Monothetic category - presence of pretty flowers, woody plants. Two flowering shrubs included in this group. Though he verbally differentiates "flowers with trees" from "flowers," he is inconsistent in his selections. Several flowering trees and shrubs are not included here.

**Grass:** Though the prototype is turf grass, several true grasses are omitted, and most members are not grasses. The category appears to be a residual, including just about any low, non-flowering herb found in the lawn. The liberal use of the comment, "It's just a grass," supports the hypothesis that this is a residual category. The informant does not make any clear distinction between this category and "weeds" or "plants."

**Vines:** Monothetic - Long slender stems, non-flowering. The category is not used often and several vines are excluded, such as those that have flowers or are woody. The prototype probably is a climbing vine. Honeysuckle does not fit the prototype and is found in three possible categories.

Things with prickly stuff on it: Monothetic - prickles. The category includes a wide range of dissimilar plants. Informant states that prickly things with flowers on them overlap into the flower category.

**Cactus:** Monothetic category. Includes things with pricklies, but category is not exhaustive.

## Appendix A-4: Informant 5: Domain Analysis of Attribution

(Note: The informant's verbatim statements are outside of parentheses. The researcher's comments are in parentheses.)

### **TREE**

(Sorting task) Trees are like bushes on top of real large trunks. Like a bush on a trunk.

(Concept map) Trees have leaves, trunk. Pine trees have clumps of pine needles, cones.

A tree usually has leaves and a trunk.

Has bark.

(Compared to bush) A tree has a trunk, and has leaves or needles. A tree you can tell there's branches.

(Life cycle) And then it starts to make a trunk, with the leaves on top of it. And then it gets big.

### **BUSH**

(Concept map:) A bush is close to the ground, has individual leaves.

I don't really care what kinds of bushes (there are). It's just a bush.

A bush comes straight from the ground. It doesn't have very much of a trunk. And there's leaves going all over. There's not distinct little branches on a bush.

(Loquat is) usually little round things coming out of the ground.

(Ragweed) is a weed but it's in the form of a bush.

Even a bush has a little bit of a trunk, so the leaves don't drag on the ground.

### **FLOWERS**

(Sorting task:) Wildflowers and regular flowers you would buy at a store and put in your back yard. Wildflowers grow in the wild, they aren't planted.

(Concept map) has stems, buds = bloom.

(Evening primrose) Has pollen, and the flower, and leaves, and the stem.

A flower grows up out of the ground, straight out of the ground and forms into a bud, I mean a bloom. (Do flowers ever grow on trees?) Yes.

Real flowers (differ from) flowers off of a tree.

### **PLANTS**

Plants are green.

(Sorting task:) They're not weeds or flowers. They're plants. Some are things that people would have at their house.

### **GRASS**

No statements

### **IVY**

(Boston ivy) I know it cannot grow without having something to support it. It likes to grow up things.

### **CACTUS**

(Concept map) has sharp intrusions; some bloom; cactus are prickly.

(Red yucca) a cactus has long pointed looking things that look like they might hurt you if you ran into it.

(Cycad) sort of like a cactus but it's not sharp and pointy.

(Prickly poppy is a cactus) because it's prickly.

Cactuses are real ugly, and then all of a sudden they have flowers.

### **WEEDS**

Clover is also flowers. It's really like a weed because it grows by itself.

## **TAXONOMIC ANALYSIS – Informant 5**

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

Evidence for differential salience of categories: The categories trees and flowers are used and named the most frequently. For both, the generic level of abstraction is the most salient. All categories have named generics, but several are rarely named. Bushes and cactus are frequently used but rarely named categories. The life-form level of abstraction is apparently acceptable. "Plants" is seldom used, indicating that more specific levels of abstraction are almost always preferred. Only one generic name is included under "plants." Plants with names usually can be fitted into a different category. For weeds, grass and vines/ivy, few generic names are used, thus, the life-form appears to be acceptable.

### COMPONENTIAL ANALYSIS – Informant 5

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

**Plant:** Polysemous use: 1. Informant is aware that "plants" is an all-encompassing term. 2. But her prototype is a green, non-flowering herb, probably a houseplant. There are several members inconsistent with this prototype, however. She seldom uses the category, and may use it reluctantly as a residual, a catch-all for plants that don't fit well in other categories.

**Tree:** Trees are big, have a trunk with a branches and leaves at the top. Trees have bark. Live oak and mesquite may be the prototypes for "trees." The leaves differ for "trees" and "pine trees and coniferous." "Pine trees and coniferous" are included in a category separate from regular trees. Pine is the prototype for conifers. This is a well-defined, generally consistent category, with some overlap with bushes and cactus.

**Bush:** Overall low, rounded form is the most important criteria.

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## Appendix A-4: Informant 6: Domain Analysis of Attribution

(Note: The informant's verbatim statements are outside of parentheses. The researcher's comments are in parentheses.)

### **Tree**

Has a trunk (Concept map).

They probably all have flowers, but I can never see them.

A main tree from a bush, trees have bark. There's a trunk. You can tell that's a tree (large mesquite) even though there's no distinctive trunk (it has a rather large multiple trunk) because you can tell there's bark on it, and the leaves are up higher, they're not all around it. The leaves are only at the top.

They're pretty tall, at least as tall as me. They can go from real tall to real short.

Most of them have some kind of leaves, even if they don't have them right this very moment.

(Hawaiian yucca) The way it's not like a tree, it doesn't really have any leaves, and it doesn't really have bark. It's just not the same.

### **Bush**

(Honeysuckle is a bush, not a vine.) They might not get into a bush form like that, but they're not a vine... and they're too big to be called a weed. (She states that the fact that it's not self-supporting makes it less a bush).

A bush is supposed to stand on the ground by itself, doesn't need anything. And it's kind of round. And it can be big and tall. But most of the time, it's something that's solid. It's solid, like you could shape it. And all the leaves are mostly on the outside.

(Pyracantha) I would call it a bush, but it's not in the shape of a bush right now. If you just cut it off, there, eventually, it would grow in to a bush.

(Compared to tree:) There's not distinctively a trunk or anything. It just kind of all goes out everywhere.

That's what kind of makes a bush, when there's leaves all around it.

(Trimmed shrub) is a tree. If it was a tree, you could definitely see the trunk. And the leaves are all the way around on the ground.

## **Flowers**

(Flowers) have stems, roots, leaves, buds.

Flowers usually just grow on a plant (as distinguished from a tree.)

Flowers by themselves.

It has a flower.

I decided these were lily pads instead of flowers because they couldn't be without the bush (water hyacinth).

## **Plants**

Most plants are green.

(Wandering Tradescantia) They're just plants. They're not weeds, because I know you have to plant them. But they're not a bush or a tree or anything. They're just a plant.

**Grass** - No statements

## **Vines**

(Snailseed) is a vine cause they twirl around up in the fence.

A vine has to have support.

## **Cactus**

There are many kinds of cactus. There are your pokey cactus (yucca) that don't really hurt you, they're just pokey. If you run into them, you won't die. It'll just make you go away. (True tree-like cactus) this will make you go away very quickly because it's sharp. (Agave) these are like the pokey ones, only they're on the ground more, and they have spikes. (So these are all different kinds of cactus?) I think they are. They're all related to cactus and they're all sharp and everything.

They have prickly stuff on them.

## **Weeds**

(Grass in seed) It's just a classic example of weeds.

(Tall grass in seed is most typical of the category "bush and weed stuff.")

(Honeysuckle is a bush because) they're too big to be called a weed. Because weeds are little things that you can step on. Weeds, they can get big, they can get real big. But they're too flimsy. They're kind of flimsy.

(Wandering Tradescantia) They're not weeds, because I know you have to plant them.

It could have been a flower, but I decided it was with the weeds because it didn't look like you would plant that (yellow composite).

## Appendix A-4: Informant 7: Domain Analysis of Attribution

(Note: The informant's verbatim statements are outside of parentheses. The researcher's comments are in parentheses.)

### **TREE VERSUS BUSH**

Both have a trunk and branches. A tree is straight up, then it branches out; a bush start spreading out before it gets tall.

(In reference to one small woody plant with slender, multiple trunks branching from the base:) It's a tree. (How can you tell?) It's brown and has branches. It may be a bush, but it's shaped like a tree. It's hard to tell.

Trees have a little thick, I mean, a pretty big stem. Usually they're pretty straight up and then they start going in different directions (branching out). Most of them have leaves on them, depending on what time of year.

A tree usually grows straight up, then it branches out; has a trunk.

(Why did you classify these pictures as bushes?) The bushes had a stem. I just know 'cause I know. Cause they're pretty. They don't look like a tree or a flower or a plant. The leaves are pretty close together. They're all green.

A bush, when it's growing, it starts spreading out, branching before it gets tall. It's bushy. It has a trunk and branches.

A bush usually has leaves covering mostly all of it. A bush has a little stem down below the leaves.

A bush has leaves close together.

D (researcher): A tree is a type of?

I (informant): Bush. (Informant repeats this in listing task and in concept map dialog.)

D: A bush is a type of?

I: Tree.

### **FLOWERS VERSUS PLANTS**

I think a plant and a flower is just about the same thing. Oh, what am I thinking. They're not the

same. Plant usually has more than one stem. I'm not sure. They all have stems that look similar.

D: A flower is a type of?

I (informant): Plant.

D: A plant is a type of?

I: Grass.

D: A grass is a type of?

I: Grass.

D: A vine is a type of?

I: Plant. Oh, it's like in between a plant and a tree.

...

D: A flower is a type of?

I: Plant.

D: A plant is a type of?

I: Grass. No... A grass is a type of a plant. I was thinking that a plant grows like grass, but it doesn't. A plant is a type of a flower.

## **FLOWER**

They all got a stem with a flower at the end of it.

(Concept map:) flower has stem, flower, leaves.

## **PLANT**

[CATEGORIES OF PLANTS]: Listing task: wild, fresh.

[TYPES OF PLANTS]: grass - flower - vine - cactus - plants in or at a house (low growing plants with green stems) - wild plants - plants that float in the river

Mostly all of them, they're green. They have like something weird just sticking out, like it's going to grab you or something. These looks like plants that someone would have outside their

house, in their house or something.

The way I classify most plants is because, like when their stem is a greenish color. You know how trees are like a brownish color. Plants most time it's like a greenish color. So if I see a green stem, with some kind of weird shape on it, like a green leaf, that look smooth or something, and a green stem, I mostly classify it as a plant.

All these, in common, their leaves like, they have like a green stem. Most of them go in all different directions on the ground and stuff.

Plant doesn't have a trunk, the wooden part that a tree has.

And this is another plant that somebody would have at their house, cause it has a green stem with green leaves.

Cactus, I consider plants.

I said that this is a plant, because I call it cactus (tree-type yucca). I think they're trees and plants, too. This is pretty much the same (Agave). I think this is different from all the rest because it has a bush right there and the plant just shoots up through the middle.

These just look like grass, and grass is pretty much like a plant.

And I knew this was a plant because I saw somebody, they had one in a plant pot.

Because it didn't go with flower or tree. It fits best for a plant.

(Water hyacinth) You can tell from the stem that they're like plants, and they have flowers in them. (I ask if they're more like a plant than a flower.) Cause there aren't too many flowers that float in the water.

(Concept map:) plant has stem, leaves.

### **GRASS**

Grass grows straight up. It's green or brown, sometimes red.

Grass doesn't have limbs (Galium is a "grass").

Grass doesn't have a stem. A plant has a stem; a plant grows outward, not straight up.

(In reference to a Tradescantia without flowers) Maybe a plant because the leaves are all in one spot. Grass would grow all over.

## **VINE**

In between a plant and a tree.

It has long stems you can bend. The stems are straight.

(It can) spread out on the ground.

## **CACTUS**

This is a plant because I call it cactus (yucca). I think they're trees and plants, too.

This looked like a cactus bush and a flower, so I put it with the flowers (claret cup.)

## **WEED**

I think a weed is just some kind of tree that grows in your yard (points to hackberry tree).

## **FRUIT VERSUS VEGETABLE** (no verbal statements.)

### **TAXONOMIC ANALYSIS - INFORMANT 7**

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

The informant's implicit plant taxonomy was reasonably well-developed. The informant, however, probably lacked information that would have enabled him to make those hierarchies explicit. Nothing in the textbook would help him understand the interrelationship between the various hierarchies. For example, the economically useful plants, "fruits" and "vegetables," and the non-useful "weeds" did not fit into the same taxonomic framework as the categories "tree, bush, plant, flower," based on anatomical structure.

The informant did not use the scientific classification scheme presented in the textbook. His folk scheme relied on anatomical structure and overall form of the plant (such as woody, non-woody; bushy, straight) rather than reproductive characters (such as flowers and seeds).

The informant did not have a named category at the unique beginner level, other than "living things." "Plants" is not used in an all-encompassing manner. All the evidence points to the placement of "plants" on the same level as "bushes, trees, flowers, grass." These could all be life-forms. "Flowers" and "grass", however, also become subsets of "plants" in certain cases.

"Vines, cactus, wild plants, plants in or at a house, and plants by the river" also appear as subsets of "plants". The complex development of "plants" into so many subsets, all of which

could be life-forms, indicates that "plants" may be in transition, from an early definition of plants as herbs only, to one that now accepts a wide array of forms. It should not be too difficult to convince this informant that trees and bushes are also "plants."

"Vines, flowers, and grass" all have named members and qualify as true life-forms. Berlin prefers to treat "cactus" as a generic label, since it often lacks named members. The accuracy of the informant's choices of cacti in the group (including several vastly different forms), however, causes the researcher to theorize that it is at least an incipient life-form, if not a full life-form. It is a life-form, however, with quite a bit of boundary overlap with other life-forms. "Cactus" represents a crossover between a classification scheme that relies on overall form (tree, bush, vine, flower - a folk scheme), and a scheme that relies on reproductive characters (the scientific scheme).

Because the other three subsets, "wild plants, plants in or at a house, plants that float in the river," are monothetic, one is led to question whether they can qualify as life-forms and whether they have much salience for the informant. Berlin (Brown, 1984) would probably not consider these as life-forms because they are not primary lexemes (usually simple unitary words) and because they do not have named members. Are they residuals, mere dumping grounds for plants that don't fit elsewhere? More data is needed.

Though occasionally using the same generic name for different species (pine, daisies), there is no strong evidence that these labels should be viewed as intermediates between life-forms and true generics. In common adult lay usage, generics such as "daisy" and "pine" are often used to refer to more than one species.

If encouraged to examine his own classification scheme, comparing it with the folk schemes of other students and with a scientific scheme, this informant might easily be convinced to alter his framework to accommodate the scientific scheme. He already exhibits abilities to recognize similarities between related species on the family level.

Evidence for differential salience: The categories, tree and flower, are used frequently and named fairly often. For each, the generic level of abstraction appears preferable. The category, plants, is used often and named fairly often. The attempts to break the category into life-form groups and to name some members of those groups indicates a preference for a less abstract level of abstraction. The categories cactus, bush, weeds, vines, and grass are used infrequently and named only a few times. For each of these, the life-form level may be acceptable.

#### **COMPONENTIAL ANALYSIS - INFORMANT 7**

(Analysis of informant's attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are not those of the informant.)

## **TREE**

This informant appears to use a multi-dimensional prototypical concept of "tree." For this informant, tree is a well-defined, consistent category. Overall form is an important criterion for recognition of a tree. The prototypical tree grows straight up some distance before branching out. Trees are woody and preferably have single trunks that are thick and tall. Tree trunks are brown. Most trees have leaves at some time during the year. Leaves are variable in size and shape, but typically occur in a crown, raised off the ground.

Three specimens with slender, multiple trunks, branching from the base, characters that fit the concept of "bush", were designated as "least like a tree." Plants which share few of the prototype characteristics are on the fringes of the category. Agaves with tree-like flower stalk and tree-like yuccas were designated as being both trees and plants, but also classified as cactus. While the flowers stalks resemble tree trunks, giving the plant a tree-like form, these specimens do not have woody, brown trunks or typical leaves.

## **BUSH**

As with trees, overall form seems is an important criterion for designation of bushes. The prototypical bush is the trimmed, rounded hedge, such as that seen in many home landscapes. The small, closely packed leaves tend to hide the trunks. Bushes have multiple trunks, branching from the base. The brown, woody trunks are very slender and typically short.

Bushes usually have small leaves, and can have either broad leaves or needle-like leaves. They can have flowers and fruit, but most of the specimens chosen had neither. Informant states at one point that bushes are "all green." The presence of flowers has the tendency to throw a woody shrub into the "flower" or "tree" categories. Two flowering woody shrubs, rose and Lantana have been placed in the flower category. Three others were placed with the trees.

As with the trees, the specimens that share few of the prototypical characters tend to be placed on the fringe of the category. Agave and yucca do not have brown, woody trunks or typical leaves. The non-flowering agave is "all green", however, and has an overall rounded shape. This shape, while not much resembling a typical bush, is quite different from the tree-like appearance when flowering. Informant designates the Joshua tree, a yucca, as "least like a bush." This oddball specimen has few characters that qualify it for the bush category. However, it does branch from the base and the non-typical leaves do cover the entire trunk, though they do not obscure it.

At first, informant's comments that, "They don't look like a tree or a flower or a plant," made me suspect that the bush category was poorly defined, possibly serving as a residual category, for placement of plants that don't fit elsewhere. However, the analysis typically showed consistent selection of specimens. Though used much less frequently than "tree," the "bush" category is a consistent, well-defined category.

## **FLOWER**

Poyleseous use: 1. The prototype is herbaceous, and most members are herbaceous. 2. One character, however, the presence of colorful flowers, appears to be the single most important criterion for the category. Because flowers can grow on a wide variety of plants, a number of non-herbs are included in an inconsistent manner.

Though a few woody shrubs with showy flowers were chosen for the category, two of these, rose and yellow jasmine, are designated by informant as belonging to more than one category.

A few flowering herbs were included in the "plants" category rather than here. Possibly, the herbs chosen for the "flower" group appear more attractive to the informant. Thus, "prettiness" may be another important criterion of "flowers."

## **PLANT**

The informant does not use "plants" in the all-encompassing manner that would be acceptable to a botanist. Though the prototype is a non-flowering, green herb, the term is not exclusively used for herbs. It is a broad complex category that may be on the verge of including woody plants as well. Some of the subsets (vine, flowers) already include a few woody plants, and informant recognizes that some of the things he calls cactus are like trees.

The presence of green stems appears to be the single most critical character defining the prototype. The stem is not readily visible on all specimens, however, so other characters must also play a part in classification. In addition to herbaceous habit, overall "greenness" of the plant is an important criterion. Ignoring the members of the cactus group that do not have leaves, all members have green leaves. Though not herbaceous, specimens designated as cacti generally are green all over.

There seems to be no clear differentiation between "plants" with flowers and "flowers." The two categories are somewhat interchangeable. However, the herbaceous flowering plants included in this category tend to be more scraggly, weedy looking, thus, possibly less attractive to informant than the "flowers."

In at least four cases (agave, yucca, and one herbaceous plant, sea oats), informant refers to the flowering stalk as the part that is the "plant." The rest of the plant is designated differently (tree, bush, grass). The flower stalk usually is green.

Form among "plants" varies widely, including ground hugging herbs, vines, house plants, and plants that float in the river. Several characteristics in the verbal definitions are inconsistent in the specimens: "leaves are all in one spot," and "goes in all different directions on the ground," and "has something weird sticking out." These phrases fit specific members of the category but are not useful criteria for identifying the category. When asked to name all the categories of plants, informant simply said, "wild and fresh." These do not appear to be useful subsets.

Cultural language problems may have caused some difficulties in communication.

At first, the researcher suspected "plants" was a residual category, where everything that didn't fit elsewhere was deposited. The explanation, "Because it didn't go with the flower or tree," provides some evidence for that hypothesis. And yet, there is quite a bit of depth to the category. The category may be in transition. Informant has probably long distinguished plants as herbs from woody trees and shrubs. However, with exposure to the wide variety of types of plants, he has been forced to broaden his definition of the category.

The informant has divided the category "plant" into several major subsets: grass, flowers, vines, cactus, plants in or at a house, plants that float in the river, and wild plants. "Plants" is the only major category that informant has subdivided with life-form labels (see glossary). Some of these subsets (vines, flowers, grass) include within them a variety of generic names. The other four subsets do not have any named members.

Flowers, grass, vines, and cactus are classified by structural attributes. The other three subsets appear to be monothetic, classified on the basis of a single attribute (in this case, wildness or location). While location may seem like a poor attribute for plant classification, houseplants and aquatic plants do tend to be herbaceous and often have non-showy flowers. The informant did not include any woody plants as members of these groups. He seems to have had "herbaceous" in mind when choosing the members. When viewed in this manner, "wild plants, plants in or at a house, and plants that float in the river" can be seen to fit more logically as subsets of "plants" when that term is used to designate herbs. Nonetheless, these are troublesome categories.

### **GRASS**

The prototypical grass is probably exemplified in the verbal description, and appears to be restricted to mowed turf grass, which tends to go "straight up," while lacking emergent stems. Despite the restricted prototype, however, informant shows remarkable ability to recognize a wide variety of true grasses as "grass." His awareness of the color variation in grasses is notable. The presence of seeds on several specimens of true grasses may be an important cue for the informant.

Though several specimens are not consistent with the prototype, most specimens are low-growing, ground hugging plants. All are herbaceous. The specimens chosen are either spreading or erect. Some have "limbs" (branch out) and some do not. Most have an obvious stem. While informant includes a number of non-grasses in the category, he probably would not include herbs with obvious flowers.

The boundaries of the category extend quite far from the prototype, and the boundaries between grass and plant are more ambiguous, if they can be said to exist at all, than the boundaries between tree and bush.

Informant has over-generalized grass to include a variety of low-growing herbs not found in the scientific category. Informant tends to use the terms "grass" and "plants" interchangeably. He also tends to vacillate between the idea that grasses are separate from plants and the idea that grasses are a subset of plants. This may be because he is in a transitional stage between thinking of "plants" as only herbs and developing an all-encompassing concept.

When asked to define grass, the informant realizes that he has misclassified some specimens and changes some of the non-grasses to "plants" because they "got a stem." The informant probably has never been given an accurate definition of "grass," either in books or in the field. Though showing an awareness of some of the differences between grasses and other herbs, he lacks the basic scientific information needed to differentiate consistently.

The informant may use "grass" somewhat as a residual category, to include low growing herbs that didn't fit elsewhere. The presence of herbs with generic names in the category may indicate that this is more than a residual. Though the verbal definition and actual usages are inconsistent with each other, there are enough internal consistencies in the observed characters to assume that the informant has at least some basis for segregating grasses from other "plants."

### **VINE**

The prototypical vine has long, slender, flexible stems. The stems are straight and spread out on the ground or climb a tree.

The specimens selected are consistent with the prototype except that few spread out on the ground. Most have climbing vines, clinging to fences and trees, and some are free standing woody shrubs with vining branches. Most specimens chosen have green stems and are herbaceous, though a couple of specimens have woody, brown stems. Some specimens have flowers or fruit. All specimens have leaves.

The statement that a vine is "in between a plant and a tree," is somewhat of a puzzle. Perhaps the informant thinks that since vines often climb up trees, they are like a tree. Or perhaps, the comment indicates his awareness that vines are not always herbaceous and green.

From the evidence at hand, it would appear that informant's usage is quite consistent with an expert's usage of the label. A botanist might prefer to call yellow jasmine a shrub because it is free standing. The branches are very much like vines, though they do not climb up or crawl along anything. Like so many other categories, vines tend to have fuzzy boundaries, sometimes forming bushy shrubs or low, ground hugging herbs.

### **CACTUS**

The prototypical cactus is not clear from the informant's statements. Unlike most other categories, no single form can provide a useful prototype for cactus. Some members have tree-

like forms, some resemble bushes, and some resemble "flowers" or "plants".

All of the specimens chosen bear spines, except dwarf palmetto. One other character, besides spines, may be important to the category, the presence of a green stem. This character may be the key to the inclusion of cactus as a type of plant, and it's separation from the trees and bushes. Other characters are too variable to be useful for classification: some plants have leaves and some do not; form is highly variable, from ground-hugging succulents, to tree-like forms, some with trunks and some not, some branching and some not.

Adult terminology probably plays a strong role in determining what goes into this category. It is likely that the informant has heard adults designate some of these plants as cactus. Like many adult layman, he over-generalizes, including a number of non-cacti that bear spines (agaves, yuccas, ocotillo).

This informant is one of the few who properly classified all of the true cacti viewed in the indoor sessions. He has a good concept of the wide variety of forms in which true cacti can be found.

One could be tempted to generalize that the informant refers to any plant with spines as "cactus." Unlike some other informants, however, he does not make the error of including any herbaceous spiny plants in the group. While some of his selections would be rejected by a botanist, they would be acceptable to the layman, who typically includes yuccas and agaves in his concept of a cactus garden.

The inclusion of dwarf palmetto is an oddity, as the plant does not have spines. In the photograph, however, the plant appears spiny. Some other informants also called this plant a "cactus." It would be interesting to see how they classify a live specimen.

The informant designates a number of specimens as belonging to more than one category, such as tree or cactus. He recognizes considerable overlap between cactus and other groups and this causes some confusion about classification. The confusion is inevitable, as he is combining a scientific category, based on flower characteristics, with a folk category, which usually is based on form.

### **WEED**

The informant has a specific prototype, the "weed tree", hackberry. Although informant selects a variety of types of plants as weeds, he clings to the notion that a weed is only a specific tree. This is verified by the questionnaire, in which he chooses only "tree" to complete the statement, "A weed is a type of." Other than in reference to this "weed tree," he uses the category only a few times, in reference to a vine, and a few grasses and herbs. The informant's selections are inconsistent with his prototype. The category overlaps into the boundaries of virtually all other major categories. "Weed" is not a particularly useful category for the informant and is possibly the source of some confusion.

## **FRUIT AND VEGETABLE**

Informant exhibited no obvious misconceptions other than some uncertainty about whether spinach and onions are vegetables. Not enough data available for analysis.

## **LEAVES**

Not enough data was available to ascertain why the informant used "leaves" as a label for several objects in the slide sets (lichens, Spanish moss, and weeping willow tree). Probably, the informant simply thought that the objects he was looking at were leaves. Early in the analysis, the researcher thought that the informant was using "leaves" as a category. This informant did not use the term as a category in any other interview, however, so that hypothesis does not seem to fit this informant.

## Appendix A-4: Informant 8: Domain Analysis of Attribution

(Note: The informant's verbatim statements are outside of parentheses. The researcher's comments are in parentheses.)

### **TREE**

Trees have bark, leaves; they are tall. Not all trees are tall.

They reproduce by seeding.

(Sorting task) They all have bark, leaves. Most of them are tall. What do they call the sprawly things... limbs.

Has wood.

(See comparison with weeds.)

Deciduous lose their leaves in the fall and during winter, and they don't get them back until about April, until fully bloomed. Conifers have leaves all year round.

### **BUSH**

(No statements.)

### **FLOWERS**

Flowers grow on bushes, on vines, on trees. Some grow on just one little flower. Some grow in bunches.

Flowers have stems, flowers, green leaves, petals.

(henbit) They have pretty little flowers.

### **PLANTS**

(No statements except in Domain Analysis, Strict Inclusion)

### **GRASS**

Little short stuff.

## **VINES**

(Greenbriar) has these swirly things (tendrils). I guess that's to attach to other stuff.

## **CACTUS**

(No statements.)

## **WEEDS**

All those little short plants that aren't super short near the ground. (Are the tall ragweed stalks weeds?) Weeds. Trees. It's a weed-tree. (How do you tell a weed from a tree?) Weeds are a lot shorter. And trees have blooms on them that have... You just tell. Weeds have a different color leaf than a tree. On a weed, (the leaves) are long and weedy. Or else they're short. You tell by their size, and the way the leaves... If there are no leaves then you know it's a weed. Unless it's really tall, like a tree, and fat.

## **FRUITS VERSUS VEGETABLES**

Fruit is sweet. Vegetable is not sweet. Well, some vegetables are. They really can't tell if a tomato is a fruit or a vegetable.

### **Taxonomic analysis – Informant 8**

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

Evidence for preferential salience: Trees, flowers are the only categories with numerous named generics. They also have intermediate levels with named generics. These are probably the only salient categories for which the generic level is preferred. Most other categories seem to be catch-alls, dumping grounds for things that don't fit elsewhere. Abstract labels seem perfectly acceptable for these categories.

### **Componential analysis – Informant 8**

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

Most categories are so inconsistent and so poorly defined that it is difficult to determine what her prototypes look like and whether or not they are monothetic. Polysemous use causes her and me a great deal of confusion.

**Tree**: Overall form, presence of bark, wood, and limbs. Size variable but generally tall.

**Bush**: Overall bushy form - may be monothetic. Prototype may be the trimmed ornamental shrub.

**Flowers**: May have polysemous use: recognizes that flowers grow on various types of plants, but tends to use the term mainly in reference to flowering herbs. Both uses are monothetic, depending on presence (or knowledge of the possibility of having) flowers. Prettiness may also be a factor.

**Plants**: Polysemous use: all-encompassing (polythetetic) versus herbs (monothetic). In early stages of project, denied that trees are plants, stating that only "grasses" (which includes the herbaceous categories "weeds, flowers, and herbs") are plants. Later stated that trees are plants. May be using "plants" largely as a catch-all for things that don't fit elsewhere.

**Grass**: Polysemous use: Only low-growing non-flowering herbs are actual included. At one point, states that "weeds, flowers, and herbs" are "grass", thus any herb could be included.

**Vines**: Long flexible stems, not self-supporting; probably monothetic.

**Cactus**: Spines - monothetic.

**Weeds**: Prototype - may be grass in seed; herbs that are short but not "super short." Some subjective criteria - possibly not pretty, growing where not wanted. Very inconsistent in reference to flowering herbs. Both uses are monothetic, depending on size and presence (or knowledge of) type of leaves.

#### Appendix A-4: Informant 9: Domain Analysis of Attribution

(Note: The informant's verbatim statements are outside of parentheses. The researcher's comments are in parentheses.)

##### **TREE**

(Concept map:) Bark is the outside part of the tree. Wood is the inside. Have leaves, branches. The trunk is the main part of the tree. The trunk is the biggest part of the tree. It's big and fat. The trunk gets bigger, ... and then a whole bunch of little bitty branches start growing out of it.

Have leaves.

(Sorting task:) Trees are different than bushes. They're like the same but they're not... Trees are real tall, have big fat leaves.

(How are trees like bushes?) They're made out of wood. Have green leaves. Adults are usually taller than bushes. Trees are usually taller than adults.

(Small *Bumelia* is a tree) A tree grows real tall, well, not that tall. It has little branches that go everywhere. A tree grows much bigger than a bush.

(Juniper) It's a tree. It's real short to the ground like a bush. Like a tree, all the branches extend way out.

##### **BUSH** (See comparison with trees.)

(Sorting task) Bushes are short and fat and have a whole bunch of little tiny leaves. Some leaves can be long.

(Small *Bumelia* is a tree, not a bush because) a bush is small, stays close to the ground, is fat. Has little branches that stay close together. Sometimes, there's a little tree and you think it might be a bush, but it might take ten years for it to grow.

Shrubs are like a bush, a miniature bush.

##### **FLOWERS**

(Sorting task) Flowers have petals. They're not usually green.

Have petals or bumpy stuff, some have nectar.

Flowers grow sometimes on trees, sometimes on the ground.

Leaves grow on flowers.

## **PLANTS**

(What makes something a plant?) Something that grows out of the ground, usually green or brown. It grows and has seeds that fall into the ground and make another one. (What else do plants have?) Sometimes trees have those little balls.

(What does algae have that makes it like a plant?) It grows on top of water. It feels like hair. There's brown kind and green.

## **GRASS**

(Sorting task: How do you tell grass) It's real long, stringy. It's just soft.

## **VINES**

(Honeysuckle is) some sort of vine. That's all it does is spread and spread and spread.

## **CACTUS**

(Sorting task) Cactus has little prickly things on it, hurts, like little thorns.

## **WEEDS**

Weeds can kill flowers... When there's a weed next to a flower, I guess it just keeps growing around it. Takes up the flower's space.

## **LEAVES**

(Sorting task) all different kinds, fat, skinny, furry. I know three-leaf clover is "leaves" because it's got the word "leaf" in it.

## **FRUIT VERSUS VEGETABLES**

Fruit is sweet, has natural sugar in it. Mostly has seeds in it... Like an orange has some kind of meat in it - I can't think of it... You can find it in juice. And it's the inside part of ... citrus fruits. (Other kinds of fruit) sort of have it, but it doesn't look the same. And some stuff tastes chewy.

Fruit grows on trees.

Vegetable is not really sweet, like fruit. Doesn't taste like it has sugar in it. They usually grow in

the ground. They have roots when you pick them.

### **TAXONOMIC ANALYSIS – Informant 9**

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

Evidence for differential salience for levels of abstraction: The categories trees and flowers are used and named frequently. For both, the generic level of abstraction appears salient. "Pine tree or evergreen" may qualify as an intermediate category that includes all conifers. As there are no named generics below this level, the intermediate level may be salient for conifers only.

All other categories, except weeds, have several named generics. The informant may prefer generic names for most of his categories. For bushes and weeds, the life-form level may be an acceptable level of abstraction.

### **COMPONENTIAL ANALYSIS – Informant 9**

(Analysis of attribute statements and characteristics of specimens seen in the field and in the indoor tasks. Terms and phrasing are the researcher's assumptions, not statements of the informant.)

Plants: Polysemous use: 1. Knows that trees, bushes, et cetera, are all categories of plants. When asked, "What makes something a plant?," gives a good scientific definition, relying on reproduction by seeds. 2. Seems to use the term as a catch-all, a residual taxon, including only those plants which do not fit his other categories. He never uses "plants" to refer to any obviously woody plants. No prototype apparent. No consistent selection criteria emerge.

Tree: Usually taller than adults; has a big trunk with branches at the top that extend way out; has wood, bark, leaves. Well-defined prototype, generally consistent members with some overlap with bushes.

Bush: Usually smaller than adults; overall low, rounded form; small leaves. Prototype clear but numerous inconsistent members.

Flowers: Polysemous use: 1. Informant knows that flowers can grow on various types of plants, including trees. This use is monothetic - relying on presence of showy flowers alone. 2. Tends to use the term most often in reference to flowering herbs, probably pretty. This is a polythetic prototype, but relying on flowers as a monothetic critical criteria. Almost all members have flowers (or else he knows it will have flowers - *Lupinus*), but several are not herbs. The choice of a photograph of red leaves reflects informant's tendency to call colorful leaves flowers.

Grass: Prototype - true grass (both turf and grass in seed); criteria - long, stringy leaves; herbs;

no flowers. Informant includes all but one of the grasses (sea oats) in the category. All members fit the criteria, except *Baptisia*, but the herb is surrounded by true grass in the photograph.

Vines: Criteria - long, flexible stems that spread out. All members fit the monothetic criteria.

Cactus: Not enough verbal data to determine criteria other than thorns. However, the fact that he includes only the true cacti in the group (and excludes several cacti) indicates that he is using a polythetic prototype.

Weeds: Not enough data (informant rarely uses the designation). Plants that grow where they are not wanted may be the critical criteria. He selects only low-growing herbs without flowers or with tiny flowers.

Leaves: Criteria uncertain; selection inconsistent. May rely heavily on the idea that if it has "leaves in the name," it belongs in the category. Prototype may be non-flowering, leafy herbs, low to the ground. Numerous members are inconsistent with that prototype, however.

Fruit and vegetables: Though sweetness is an important criteria for fruit, also knows that fruit has seeds. Thinks fruits differ from vegetables in that fruits grow on trees and vegetables grow in the ground. Members selected do not all fit the stated criteria, but are consistent with adult selections.

Appendix A-5: Trees and Flowers Paradigms

**Tree Paradigm**

Dimensions of Contrast				
Names of Trees <sup>a</sup>	Treelike Form <sup>b</sup>	Trunk brown	Trunk not hidden	Has leaves
Acorn Tree (Oak)	X	X	X	X
Bearn Tree (Mesquite)	X	X	X	X
(Juniper)		X	X	X
(Cenizo)		X		X
(Mescalbean)		X		X
(Yucca)	X			
(Azalea)		X	X	X
Pine tree (Pine or Spruce)	X	X	X	X
Weed tree (Hackberry)	X	X	X	X
Christmas tree (Juniper)		X		X
(Ragweed stalk)		X	X	
(Shrub)				X

Note:

- a = Children's names, with correct common names in parentheses.
- b = Trunk is "straight up" with branches spreading out at top.

## Flower Paradigm

Dimensions of Contrast			
Names of Flowers <sup>a</sup>	Showy flower	Herbaceous	Has leaves
Sunflower (Sunflower)	X	X	X
Daisies flower (Mexican Hat)	X	X	X
Bluebonnet (Bluebonnet)	X	X	X
Rose (Rose)	X		X
Tulip (Tulip)	X	X	X
(Poinsettia)	<sup>b</sup>	X	X
Flower vine (Jasmine)	X		X
Buttercup (Buttercup)	X	X	X
Violets (Violets)	X	X	X
(Gaillardia)	X	X	X
(Clover)	X	X	X

Note:

a = Children's names, with correct common names in parentheses.

b = Leaves are red, resembling flowers

## Appendix A-6: Names for Plants and Basic Levels of Abstraction

### **Error codes**

EA = common adult error

EN = mistakes a plant for a non-plant

ER = error, closely related species

ES = error, similar in form, not related

EU = error, cause undetermined

M = made-up names

-----

### **Informant 1**

#### **Slides Sets:**

Life-form or more abstract labels, simple: 29

Life-form or more abstract labels, described: 0

Correct responses = 15

Errors: EA = 5; EU = 5; ES = 4

-----

Generic labels, simple: 26

Generic labels, described: 1

Generic with life-form: 6

Specific labels: 1

Correct responses = 15

Errors: ER = 6; ES = 5; EA = 1; M = 3; EU = 4

-----

Other types of errors = 2

"I don't know" = 2

Ratios:

Correct life forms/ all responses =  $15/65 = 23\%$

Correct generics/all responses =  $15/65 = 23\%$

(Correct life-forms + generics)/all responses =  $30/65 = 46\%$

All life-forms/all responses =  $29/65 = 45\%$

(All generics + specifics)/all responses =  $34/65 = 52\%$

Simple life-forms/all responses =  $29/65 = 45\%$

(G + described LF responses)/all responses =  $34/65 = 52\%$

Slide set I - life-forms = 21, generics = 13

Slide set II - life-forms = 8, generics = 21

-----

**Field Interviews:**

Life-form or more abstract labels, simple: 15

Life-form or more abstract labels, described: 17

Correct responses = 27

Errors: EU = 2; ES = 2; EA = 1

-----

Generic labels, simple: 16

Generic labels, described: 10

Specific labels: 0

Correct responses = 14

Errors: EU = 5; ER = 2; EA = 1; ES = 1; M = 3

----

Other types of errors = 1

Description alone = 1

No response = 0

"I don't know" = 0 (with names, 1 time)

Ratios:

Correct life forms/all responses =  $27/59 = 39\%$

Correct generics/all responses =  $14/59 = 24\%$

(Correct life-forms + generics)/all responses =  $41/59 = 69\%$

All life-forms/all responses =  $32/59 = 54\%$

All generics/all responses =  $26/59 = 44\%$

Simple life-forms/all responses =  $15/59 = 25\%$

(G + described LF responses)/all responses =  $43/59 = 73\%$

-----

## **Informant 2**

### **Slides Sets:**

Life-form or more abstract labels, simple: 19

Life-form or more abstract labels, described: 7

Correct responses = 19

Errors: EA = 1; EU = 3; ES = 3

-----

Generic labels, simple: 15

Generic labels, described: 3

Generic labels, with life-form: 3

Specific labels: 0

Correct responses = 8

Errors: ER = 4; ES = 1; EA = 1; M = 5; EU = 2

-----

Other types of errors = 18

"I don't know" and "never saw it before" = 14

Description alone = 3

Not a plant = 1

-----

Ratios:

Correct life-forms/all responses =  $19/65 = 29\%$

Correct generics/all responses =  $8/65 = 12\%$

(Correct life-forms + generics)/all responses =  $27/65 = 42\%$

All life-forms/all responses =  $26/65 = 40\%$

All generics/all responses =  $21/65 = 32\%$

Simple life-forms/all responses =  $19/65 = 29\%$

(G + described LF responses)/all responses =  $28/65 = 43\%$

Slide set I - life-forms = 21, generics = 6

Slide set II - life-forms = 5, generics = 15

-----

**Field Interviews:**

Life-form or more abstract labels, simple: 11

Life-form or more abstract labels, described: 31

Correct responses = 37

Errors: EA = 3; EU = 2

-----

Generic labels, simple: 17

Generic labels, described: 9

Specific labels: 1

Correct responses = 15

Errors: ER = 3; ES = 2; EU = 6; EA = 1

-----

Other types of errors = 17

Description alone = 13

"I don't know" = 4

**Ratios:**

Correct life-forms/all responses =  $37/86 = 43\%$

Correct generics/all responses =  $15/86 = 17\%$

(Correct life-forms + generics)/all responses =  $52/86 = 60\%$

All life-forms/all responses =  $42/86 = 49\%$

All generics/all responses =  $27/86 = 31\%$

Simple life-forms/all responses =  $11/86 = 13\%$

(G + described LF responses)/all responses =  $58/86 = 67\%$

---

### **Informant 3**

#### **Slides Sets:**

Life-form or more abstract labels, simple: 10

Life-form or more abstract labels, described: 0

Correct responses = 10

Errors: 0

-----

Generic labels, simple: 32

Generic labels, described: 0

Specific labels: 1

Correct responses = 8

Errors: ER = 3; EA = 1; M = 17; EU = 4

-----

Other types of errors = 22

"I don't know" = 0

No response = 20

Description alone = 1

Photo too dark = 1

-----

Ratios:

Correct life-forms/all responses =  $10/65 = 15\%$

Correct generics/all responses =  $8/65 = 12\%$

(Correct life-forms + generics)/all responses =  $17/65 = 26\%$

All life-forms/all responses =  $10/65 = 15\%$

All generics/all responses =  $33/65 = 51\%$

Simple life-forms/all responses =  $10/65 = 15\%$

(G + described LF responses)/all responses =  $33/65 = 51\%$

Slide set I - life-forms = 9, generics = 10

Slide set II - life-forms = 1, generics = 22

-----

**Field Interviews:**

Life-form or more abstract labels, simple: 15

Life-form or more abstract labels, described: 2

Correct responses = 16

Errors: EU = 1

-----

Generic labels, simple: 11

Generic labels, described: 0

Specific labels: 2

Correct responses = 8

Errors: EU = 2; EA = 1; M = 2

----

Other types of errors = 18

Description alone = 8

No response = 5

"I don't know" = 5

Ratios:

Correct life-forms/all responses =  $16/48 = 33\%$

Correct generics/all responses =  $8/48 = 17\%$

(Correct life-forms + generics)/all responses =  $24/48 = 50\%$

All life-forms/all responses =  $17/48 = 35\%$

All generics/all responses =  $13/48 = 27\%$

Simple life-forms/all responses =  $15/48 = 31\%$

(G + described LF responses)/all responses =  $15/48 = 31\%$

-----

#### **Informant 4**

##### **Slides Sets:**

Life-form or more abstract labels, simple: 35

Life-form or more abstract labels, described: 1

Correct responses = 29

Errors: EA = 2; EU = 1; ES = 4

-----

Generic labels, simple: 18

Generic labels, described: 2

Generic, with life-form: 1

Specific labels: 0

Correct responses = 10

Errors: ER = 2; ES = 1; EA = 1; M = 1; EU = 6

-----

Other types of errors = 8

"I don't know" = 8

Ratios:

Correct life-forms/all responses =  $29/65 = 45\%$

Correct generics/all responses =  $10/65 = 15\%$

(Correct life-forms + generics)/all responses =  $39/65 = 60\%$

All life-forms/all responses =  $36/65 = 55\%$

All generics/all responses =  $21/65 = 32\%$

Simple life-forms/all responses =  $35/65 = 54\%$

(G + described LF responses)/all responses =  $22/65 = 34\%$

Slide set I - life-forms = 21, generics = 9

Slide set II - life-forms = 14, generics = 12

-----

**Field Interviews:**

Life-form or more abstract labels, simple: 16

Life-form or more abstract labels, described: 9

Correct responses = 21

Errors: EU = 4

-----

Generic labels, simple: 23

Generic labels, described: 2

Specific labels: 0

Correct responses = 20

Errors: ER = 1; EU = 2; ES = 1; M = 1

-----

Other types of errors = 22

Description alone = 8

"I don't know" = 14

**Ratios:**

Correct life-forms/all responses =  $21/72 = 32\%$

Correct generics/all responses =  $20/72 = 28\%$

(correct life-forms + generics)/all responses =  $41/72 = 57\%$

All life-forms/all responses =  $25/72 = 35\%$

All generics/all responses =  $25/72 = 35\%$

Simple life-forms/all responses =  $16/72 = 22\%$

(G + described LF responses)/all responses = 34/72 = 47%

-----

## **Informant 5**

### **Slides Sets:**

Life-form or more abstract labels, simple: 11

Life-form or more abstract labels, described: 13

Correct responses = 17

Errors: EA = 2; EU = 3; ES = 2

-----

Generic labels, simple: 18

Generic labels, described: 5

Generic, with life-form: 4

Specific labels: 0

Correct responses = 16

Errors: ER = 3; ES = 2; EA = 2; M = 1; EU = 2

Vacillating response (partially correct): 1

-----

Other types of errors = 14

"I don't know" = 10 (also used with a name 8 times)

Description alone = 4

### **Ratios:**

Correct life-forms/all responses = 17/65 = 26%

Correct generics/all responses =  $16/65 = 25\%$

(Correct life-forms + generics)/all responses =  $33/65 = 51\%$

All life-forms/all responses =  $24/65 = 37\%$

All generics/all responses =  $27/65 = 42\%$

Simple life-forms/all responses =  $11/65 = 17\%$

(G + described LF responses)/all responses =  $40/65 = 62\%$

Slide set I - life-forms = 20, generics = 7

Slide set II - life-forms = 4, generics = 20

-----

**Field Interviews:**

Life-form or more abstract labels, simple: 19

Life-form or more abstract labels, described: 7

Correct responses = 18

Errors: EA = 3; EU = 5

-----

Generic labels, simple: 22

Generic labels, described: 4

Specific labels: 1

Correct responses = 18

Errors: ER = 1; ES = 4; EU = 2; M = 2

-----

Other types of errors = 14

Description alone = 4

"I don't know" = 10

Ratios:

Correct life-forms/all responses =  $18/67 = 27\%$

Correct generics/all responses =  $18/67 = 27\%$

(Correct life-forms + generics)/all responses =  $36/67 = 54\%$

All life-forms/all responses =  $26/67 = 39\%$

All generics/all responses =  $27/67 = 40\%$

Simple life-forms/all responses =  $19/67 = 28\%$

(G + described LF responses)/all responses =  $34/67 = 51\%$

-----

**Informant 6**

**Slides Sets:**

Life-form or more abstract labels, simple: 13

Life-form or more abstract labels, described: 7

Correct responses = 13

Errors: EA = 3; ES = 2

Vacillating response (half correct) = 2

-----

Generic labels, simple: 31

Generic labels, described: 5

Generic, with life-form: 5

Specific labels: 0

Correct responses = 21

Errors: ER = 4; ES = 6; M = 2; EU = 4

Vacillating response (half correct): 4

----

Other types of errors = 4

"I don't know" = 1 (also used with a name 14 times)

Description alone = 3

Ratios:

Correct life-forms/all responses =  $13/65 = 20\%$

Correct generics/all responses =  $21/65 = 32\%$

(Correct life-forms + generics)/all responses =  $34/65 = 52\%$

All life-forms/all responses =  $20/65 = 31\%$

All generics/all responses =  $41/65 = 63\%$

Simple life-forms/all responses =  $13/65 = 20\%$

(G + described LF responses)/all responses =  $48/65 = 74\%$

Slide set I - life-forms = 17, generics = 16

Slide set II - life-forms = 3, generics = 25

-----

**Field Interviews:**

Life-form or more abstract labels, simple: 10

Life-form or more abstract labels, described: 23

Correct responses = 30

Errors: EA = 2; EU = 1

-----

Generic labels, simple: 7

Generic labels, described: 21

Specific labels: 0

Correct responses = 12

Errors: ER = 3; ES = 2; EU = 7; EA = 3; M = 1

----

Other types of errors = 12

Description alone = 10

"I don't know" = 2

Ratios:

Correct life-forms/all responses =  $30/73 = 41\%$

Correct generics/all responses =  $12/73 = 16\%$

(Correct life-forms + generics)/all responses =  $42/73 = 58\%$

All life-forms/all responses =  $33/73 = 45\%$

All generics/all responses =  $28/73 = 38\%$

Simple life-forms/all responses =  $10/73 = 14\%$

(G + described LF responses)/all responses =  $51/73 = 70\%$

-----

## Informant 7

### Slides Sets:

Life-form or more abstract labels, simple: 29

Life-form or more abstract labels, described: 8

Correct responses = 35

Errors: EU = 1; ES = 1

----

Generic labels, simple: 23

Generic labels, described: 1

Specific labels = 0

Correct responses = 9

Errors: ER = 3; ES = 1; EU = 3; EA = 1; M = 7

----

Other types of errors = 4

Description alone = 4

No response = 0

"I don't know" = 0

### Ratios:

Correct life-forms/all responses =  $35/65 = 54\%$

Correct generics/all responses =  $9/65 = 14\%$

(Correct life-forms + generics)/all responses =  $44/65 = 68\%$

All life-forms/all responses =  $37/65 = 57\%$

All generics/all responses =  $24/65 = 37\%$

Simple life-forms/all responses =  $29/65 = 45\%$

(G + described LF responses)/all responses =  $32/65 = 49\%$

Slide set I - life-forms = 22, generics = 9

Slide set II - life-forms = 15, generics = 15

-----

**Field Interviews:**

Life-form or more abstract labels, simple: 27

Life-form or more abstract labels, described: 5

Correct responses = 28

Errors: EU = 4

-----

Generic labels, simple: 14

Generic labels, described: 1

Specific labels = 0

Correct responses = 4

Errors: ER = 3; M = 8

---

Other types of errors = 2

Description alone = 2

No response = 0

"I don't know" = 0

Ratios:

Correct life-forms/all responses =  $28/49 = 57\%$

Correct generics/all responses =  $4/49 = 8\%$

(Correct life-forms + generics)/all responses =  $32/49 = 65\%$

All life-forms/all responses =  $32/49 = 65\%$

All generics/all responses =  $15/49 = 31\%$

Simple life-forms/all responses =  $27/49 = 55\%$

(G + described LF responses)/all responses =  $20/49 = 41\%$

-----

**Informant 8**

**Slides Sets:**

Life-form or more abstract labels, simple: 37

Life-form or more abstract labels, described: 2

Correct responses = 32

Errors: EA = 2; EU = 2; ES = 3

-----

Generic labels, simple: 20

Generic labels, described: 2

Generic, with life-form: 2

Specific labels: 0

Correct responses = 13

Errors: ER = 3; ES = 4; EA = 1; M = 3

----

Other types of errors = 2

"I don't know" = 0

Description alone = 1

Photo too dark = 1

Ratios:

Correct life-forms/all responses =  $32/65 = 49\%$

Correct generics/all responses =  $13/65 = 20\%$

(Correct life-forms + generics)/all responses =  $45/65 = 69\%$

All life-forms/all responses =  $39/65 = 60\%$

All generics/all responses =  $24/65 = 37\%$

Simple life-forms/all responses =  $37/65 = 57\%$

(G + described LF responses)/all responses =  $26/65 = 40\%$

Slide set I - life-forms = 28, generics = 7

Slide set II - life-forms = 11, generics = 17

-----

**Field Interviews:**

Life-form or more abstract labels, simple: 24

Life-form or more abstract labels, described: 4

Correct responses = 20

Errors: EA = 1; EU = 3; ES = 4

----

Generic labels, simple: 11

Generic labels, described: 1

Specific labels: 0

Correct responses = 8

Errors: EU = 1; M = 3

-----

Other types of errors = 8

Description alone = 3

"I don't know" = 5

Ratios:

Correct life-forms/all responses =  $20/48 = 42\%$

Correct generics/all responses =  $8/48 = 17\%$

(Correct life-forms + generics)/all responses =  $28/48 = 58\%$

All life-forms/all responses =  $28/48 = 58\%$

All generics/all responses =  $12/48 = 25\%$

Simple life-forms/all responses =  $24/38 = 50\%$

(G + described LF responses)/all responses =  $16/48 = 33\%$

-----

## **Informant 9**

Slides Sets:

Life-form or more abstract labels, simple: 11

Life-form or more abstract labels, described: 0

Correct responses = 9

Errors: EA = 1; ES = 1

-----

Generic labels, simple: 30

Generic labels, described: 4

Specific labels: 1

Correct responses = 11

Errors: ER = 5; ES = 2; EA = 1; M = 12; EU = 4

----

Other types of errors = 19

"I don't know" = 0

No response = 16

Description alone = 2

Photo too dark = 1

Ratios:

Correct life-forms/all responses =  $9/65 = 14\%$

Correct generics/all responses =  $11/65 = 17\%$

(Correct life-forms + generics)/all responses =  $20/65 = 31\%$

All life-forms/all responses =  $11/65 = 17\%$

All generics/all responses =  $35/65 = 54\%$

Simple life-forms/all responses =  $11/65 = 17\%$

(G + described LF responses)/all responses =  $35/65 = 54\%$

Slide set I - life-forms = 11, generics = 11

Slide set II - life-forms = 0, generics = 24

-----

**Field Interviews:**

Life-form or more abstract labels, simple: 9

Life-form or more abstract labels, described: 4

Correct responses = 11

Errors: ES = 1; EA = 1

-----

Generic labels, simple: 11

Generic labels, described: 5

Specific labels: 1

Correct responses = 5

Errors: ER = 2; EU = 1; ES = 1; M = 8

-----

Other types of errors = 12

Description alone = 9

"I don't know" = 3

**Ratios:**

Correct life-forms/all responses =  $11/42 = 26\%$

Correct generics/all responses =  $5/42 = 12\%$

(Correct life-forms + generics)/all responses =  $16/42 = 38\%$

All life-forms/all responses =  $13/42 = 31\%$

All generics/all responses =  $17/42 = 40\%$

Simple life-forms/all responses =  $9/42 = 21\%$

(G + described LF responses)/all responses =  $21/42 = 50\%$

## Appendix A-7: Overdiscrimination

Informant's names for plant species seen more than once. Evaluation of abilities to recognize same species in different settings; and tendencies for overdiscrimination (calling the same species by different names)

(Acceptable common names are in parentheses. Informant's names are outside of parentheses. S = slide sets; F = field interviews; \* = sorting tasks; OD = species or category overdiscriminated)

---

### Informant 1

- (*Agave*, century plant) - S (with stalk) cactus, S (without stalk) cactus; \* (with stalk) tree - no - cactus
- (bald cypress) - S (green leaves) tree, S (reddish leaves, cones) spruce, \*-2 tree, F tree
- (bluebonnet) - S bluebonnet, \* (in bloom with other wildflowers) flowers, (*Lupinus*, no blooms) small plants
- OD? - (cactus - various species) - S (lace cactus) cactus, (prickly pear) prickly pear cactus, \* (6 species) 1 wildflower, 5 cactus
- (clover, white) - S no response, \* wildflowers
- (clover, yellow) - F clover = grass; 3-leaved clover
- (dandelion) - S dandelion, F dandelion
- (evening primrose, pink) - S buttercup, \* wildflowers, F primrose
- OD? - (ferns - various species) - S-2 lily pads, touch-me-nots; \*-3 ferns
- OD - (grasses - various species) - S (in seed) weeds, F Johnson grass = weed (tall grass), F regular grass (2 weedy grasses, not seeding), F weed (3 grass in seed), \*-6 (tall, two in seed) 4 wildflowers, 1 water plants, 1 crops (wheat) (Note - does not seem to call grasses in seed "grass)
- (Indian paintbrush) - S (red flowers) Indian paintbrush, \* (green flowers) small plant
- (juniper) - S (with cones) cedar, S (no cones) cedar or spruce, \* tree, \* tree - no - bush, F cedar
- OD - (lichens) - S (orange lichen on rock) mold; S (green lichen on tree) mold or moss, F moss

(2 tree lichens)

- (*Ligustrum*) - S tree, F tree

- (mescalbean) - S (without flowers) tree, \* (with flowers) tree, no, bush

- (mesquite tree) - S (with pods) tree, 2-\* (without pods) tree, F maybe oak

- (moss) - S moss

- (*Tillandsia*) - S (ball moss) weed; S (Spanish moss) moss

- (oaks without acorns) - S (live oak) tree, S (Spanish oak - full shot, red leaves) tree, S (Spanish oak - close-up, red leaves) maple; \* (several) tree; F (live oak) tree

- (oaks with acorns) - S (live oak) acorn, S (Shumard oak) acorn

- (*Oxalis*) - S (with flowers) clover, \* (without flowers) small plant, F clover

- (palms - various species) - S (*Sabal texana*) palm tree; S (*Sabal minor*) cactus; \* (*Sabal minor*) cactus; \* (*Sabal texana*) tree, \* (tropical palms) tree

- OD - (pines) - S (with cones) pine tree; S (without cones) fir tree; \*-2 tree, water plants (by lake), F pine tree

- (poison ivy) - S poison ivy, F poison ivy

- OD? - (railroad vine) - \* (with flowers) wildflowers, \* (no blooms) small plant

- (rose) - S (flower only) rose

- (sunflowers) - S sunflowers, \* flowers

- (various yellow composites) - S (cutleaf daisy) dandelions, S (Mexican hat) dandelions; 3-\* wildflowers

- (water hyacinths) - S lily pads, \* water plant

- (water lily) - S lily pads, \* water plant

- (yaupon, in two forms) - S (distance - trimmed) bush; S (close up with berries) cherry tree

- (*Yucca* - various species and forms) - S (tree-like form) cactus, S (non-tree) cactus; \* (3 tree-like) 1 tree, 2 cactus, \* (2 non-tree) cactus

---

## Informant 2

- (*Agave*, century plant) - S (with stalk) no response, S (without stalk) no response;  
\* (with stalk) tree
- (bald cypress) - S (green leaves) tree, S (reddish leaves, cones) no response, \*-2 tree, F tree
- (bluebonnet) - S bluebonnet, \* (in bloom with other wildflowers) flowers, (Lupinus, no blooms) weed
- OD? - (cactus - various species) - S (lace cactus) cactus, (prickly pear) prickly pear, \* (6 species) 3 bush (some also "cactus"), 3 flowers
- (clover, white) - S no response, \* flowers
- OD - (clover, yellow) - F clovers; mustard flower
- (dandelion) - S dandelion
- (evening primrose, pink) - S buttercup, \* flower, F buttercup
- OD - (ferns - various species) - S-2 (maidenhair) moss or mold; (fern on tree) leaves; \* (3 species) 2 bush, 1 weed (maidenhair)
- OD - (grasses - various species) - S (in seed) weed, F Johnson grass (2 weedy grasses), grass (3 turf), \*-6 (tall, two in seed) 1 bush, 2 water plants, 3 weeds (wheat, tall weedy grasses, grass in seed) (Note: no tall grass in seed is named "grass")
- (Indian paintbrush) - S (red flowers) red flower, \* (green flowers) weed
- (juniper) - S (with cones) tree, S (no cones) bush, \* tree, \* bush, F cedar - no; pine bush
- OD - (lichens) - S (orange lichen on rock) flowers; S (green lichen on tree) mold, F plants (tree lichen)
- (*Ligustrum*) - S tree, F-3 tree, 1 bush
- (mescalbean) - S (without flowers) tree, \* (with flowers) flowers

- (mesquite tree) - S (with pods) beans, 2-\* (without pods) tree, F not a pine tree; tree; bush
- (moss) - S moss or mold
- OD - (*Tillandsia*) - S (ball moss) (not recognized as a plant), F (ball moss) 2 moss; S (Spanish moss) moss
- (oaks without acorns) - S (live oak) oak tree, S (Spanish oak - full shot, red leaves) no response, S (Spanish oak - close-up, red leaves) tree; \* (several) tree; F (live oak) tree
- (oaks with acorns) - S (live oak) acorn tree, S (Shumard oak) acorn tree
- (*Oxalis*) - S (with flowers) clover, \* (without flowers) weed
- (palms - various species) - S (*Sabal texana*) pine tree; S (*Sabal minor*) no response; \* (*Sabal minor*) tree; \* (*Sabal texana*) tree, \* (tropical palms) tree, F (*Sabal texana*) pine tree
- (pines) - S (with cones) pine cone tree; S (without cones) no response; \*-2 tree
- (poison ivy) - S ivy or vine, F vine
- (railroad vine) - \* (with flowers) flowers, \* (no blooms) weeds
- (rose) - S (flower only) rose; F rose bush; rose tree
- (sunflowers) - S dandelion, \* flowers
- (various yellow composites) - S (cutleaf daisy) no responses, S (Mexican hat) not daisies; 3-\* flowers
- (water hyacinths) - S no response, \* water plants
- (water lily) - S water lily, \* water plants
- (yaupon, in two forms) - S (distance - trimmed) bush; S (close up with berries) cherries
- OD - (*Yucca* - various species and forms) - S (tree-like form) no response, S (non-tree) no response; F (tree-like) tree; \* (3 tree-like) tree, \* (2 non-tree) regular plants, flowers (yucca in field of flowers)

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### Informant 3

- (*Agave*, century plant) - S (with stalk) no response, S (without stalk) no response; \* (with stalk) tree, F (without stalk) no response; plant
- (bald cypress) - S (green leaves) no response, S (reddish leaves, cones) Christmas tree, \*-2 tree, F tree
- (bluebonnet) - S Texas bluebonnet, \* (in bloom with other wildflowers) flowers, (*Lupinus*, no blooms) plants
- (cactus - various species) - S (lace cactus) no response, (prickly pear) cactus, \* (6 species) 4 cactus, 2 tree (1 also called "cactus"), 3 flowers (2 also called "cactus"), 1 plant; F (prickly pear) cactus
- (clover, white) - S no response, \* flowers
- (clover, yellow) - F flowers
- OD - (dandelion) - S sunflower, F yellow flowers
- OD - (evening primrose, pink) - S coly flower, \* flowers, F-2 buttercups
- (ferns - various species) - S-2 (maidenhair) leaves, fern; \* (3 species) 2 fern, all plants
- OD? - (grasses - various species) - S (in seed) Johnson grass, F Johnson grass (tall grass), speargrass (grass in seed), \*-6 (tall, two in seed) 3 grass, 6 plants
- (Indian paintbrush) - S (red flowers) no response, \* (green flowers) plants
- OD - (juniper) - S (with cones) mesquite tree, S (no cones) evergreen, \* evergreen or mesquite tree, \* tree, F evergreen; tree cedar
- (lichens) - S (orange lichen on rock) fungus; S (green lichen on tree) no response; F fungus (tree)
- (*Ligustrum*) - S no response, F tree
- (mescalbean) - S (without flowers) upulicktus tree, \* (with flowers) bush
- (mesquite tree) - S (with pods) cedar tree, 2-\* (without pods) tree
- (moss) - S no response

- (*Tillandsia*) - S (ball moss); S (Spanish moss) both no response
- (oaks without acorns) - S (live oak) tree, S (Spanish oak - full red tree) pecan, S (Spanish oak - close-up red leaves) no response; \* (several) tree
- (oaks with acorns) - S (live oak) nut tree, S (Shumard oak) nut tree
- (*Oxalis*) - S (with flowers) 3-leaf clovers, \* (without flowers) plant
- (palms - various species) - S (*Sabal texana*) palm; S (*Sabal minor*) fan flower; \* (*Sabal minor*) plant; \* (*Sabal texana*) tree, \* (tropical palms) tree
- (pines) - S (with cones) pine cone tree; S (without cones) pine cone tree; \*-2 tree
- (poison ivy) - S vine, F no response
- (railroad vine) - \* (with flowers) flowers, \* (no blooms) plant - but both vines
- (rose) - S (flower only) rose; F rose bush
- (sunflowers) - S sunflower, \* flowers
- (various yellow composites) - S (cutleaf daisy) no response, S (Mexican hat) Mexican hat; 3-\* flowers
- OD? - (water hyacinths) - S sea weeds, river weeds, \* flower
- (water lily) - S lily flower, \* flower
- (yaupon, in two forms) - S (distance - trimmed) bush; S (close-up with berries) berry tree red
- OD - (*Yucca* - various species and forms) - S (tree-like form) no response, S (non-tree) no response; \* (3 tree-like) 2 tree (Joshua tree also called "cactus"), 1 palm tree (Hawaiian yucca), \* (2 non-tree) tree, plant

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#### **Informant 4**

- (*Agave*, century plant) - S (with stalk) tree, S (without stalk) no response; \* (with stalk) tree

- (bald cypress) - S (green leaves) tree, S (reddish leaves, cones) tree, \*-2 tree, F tree
- (bluebonnet) - S bluebonnet, \* (in bloom with other wildflowers) flowers, (*Lupinus*, no blooms) plants
- (cactus - various species) - S (lace cactus) cactus, (prickly pear) prickly pear cactuses, \* (6 species) 3 cactus, 3 flowers
- OD - (clover, white) - S poison ivy, \* flowers
- OD - (clover, yellow) - F clover; small plants; grass burs
- (dandelion) - S dandelion
- (evening primrose, pink) - S wildflowers, \* flowers, F wildflowers or pink powder puff; buttercup
- OD? - (ferns - various species) - S-2 clover, poison oak; \*-3 plants
- OD? - (grasses - various species) - S (in seed) weeds, F speargrass, 1 weed, F-5 grass (turf and weedy grasses), \* (6 tall grasses, two in seed) 3 plants by the water, farm grass, (1 unclassified)
- (Indian paintbrush) - S (red flowers) Indian paintbrush, \* (green flowers) plants
- (juniper) - S (with cones) cedar - no, S (no cones) tree, \* tree, \* tree - no - bush, F-3 cedar tree
- (lichens) - S (orange lichen on rock) ; S (green lichen on tree) both fungus
- (*Ligustrum*) - S pecan tree
- (mescalbean) - S (without flowers) tree, \* (with flowers) tree with flowers
- (mesquite tree) - S (with pods) tree, 2-\* (without pods) tree
- (moss) - S algae
- (*Tillandsia*) - S (ball moss), S (Spanish moss) both moss
- (oaks without acorns) - S (live oak) tree, S (2 Spanish oak) tree; \* (several) tree; F (live oak) tree
- (oaks with acorns) - S (live oak) acorn tree, S (Shumard oak) tree
- (*Oxalis*) - S (with flowers) clover, \* (without flowers) plants, F (no blooms) grass

- (palms - various species) - S (*Sabal texana*) no response; S (*Sabal minor*) no response; \* (*Sabal minor*) tree; \* (*Sabal texana*) tree, \* (tropical palms) tree
- (pines) - S (with cones) pine tree; S (without cones) pine tree; \*-2 tree, plants and trees by the water
- (poison ivy) - S vine, F plants
- (railroad vine) - \* (with flowers) flowers, \* (no blooms) plants
- (rose) - S (flower only) rose; F rose
- (sunflowers) - S sunflower, \* flowers
- (various yellow composites) - S (cutleaf daisy) flower, S (Mexican hat) cattails; \* 2 flowers, 1 plants
- (water hyacinths) - S flower, \* flower
- (water lily) - S flower, \* plants
- (yaupon, in two forms) - S (distance - trimmed) bush; S (close up with berries) tree
- (*Yucca* - various species and forms) - S (tree-like form) no response, S (non-tree) no response; \* (3 tree-like) yucca, cactus, things with prickly stuff, \* (2 non-tree) things with prickly stuff on it.

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## Informant 5

- (*Agave*, century plant) - S (with stalk) cactus, S (without stalk) no response; \* (with stalk) tree
- OD - (bald cypress) - S (green leaves) maybe spruce tree - not coniferous, S (reddish leaves, cones) maple tree, no - not coniferous, \*-2 tree, coniferous
- (bluebonnet) - S bluebonnet, \* (in bloom with other wildflowers) wildflowers, (*Lupinus*, no blooms) plants
- (cactus - various species) - S (lace cactus) cactus, (prickly pear) cactus plant with prickly pears, \* (6 species) 5 cactus, 1 wildflower

- (clover, white) - S ivy like, \* flowers
- (clover, yellow) - F flowering weeds
- (dandelion) - S dandelion
- (evening primrose, pink) - S buttercup or perryrose, \* wildflower, F primrose
- OD - (ferns - various species) - S-2 wild fern, no response; \* (3 species) 2 ferns, 1 grass
- OD - (grasses - various species) - S (in seed) weeds, F (2 turf) regular grass, rabbit grass; \*-6 (tall, two in seed) bush, wild growth, grass
- (Indian paintbrush) - S (red flowers) Indian paintbrush, \* (green flowers) plants
- OD - (juniper) - S (with cones) spruce tree, S (no cones) bush, \* bush, \* tree, F cedar tree, coniferous tree, bush or tree
- (lichens) - S (orange lichen on rock) fungus; S (green lichen on tree) moss
- (*Ligustrum*) - S no response, F bush
- (mescalbean) - S (without flowers) acorn tree, \* (with flowers) tree, F bush
- OD - (mesquite tree) - S (with pods) mesquite tree, 2-\* (without pods) tree, pine trees and coniferous, F-2 mesquite tree
- (moss) - S fungus
- (*Tillandsia*) - S (ball moss) moss, F-2 (ball moss) moss; S (Spanish moss) peat moss, \* (Spanish moss) moss
- (oaks without acorns) - S (live oak) tree, S (Spanish oak - red, distant) maple tree, S (Spanish oak - red, close-up) maple tree or oak; \* (several) tree; F (live oak) acorn tree or oak tree, F (Spanish oak) maple tree, maple or oak tree
- (oaks with acorns) - S (live oak) oak tree, S (Shumard oak) oak tree
- (Oxalis) - S (with flowers) clover, \* (without flowers) clover
- OD - (palms - various species) - S (*Sabal texana*) palm tree; S (*Sabal minor*) bush; \* (*Sabal minor*) cactus; \* (*Sabal texana*) cactus, \* (tropical palms) tree, F-2 palm tree

- (pines) - S (with cones) pine tree; S (without cones) coniferous; \*-2 pine trees and coniferous, F pine tree
- OD - (poison ivy) - S poison ivy, F bush
- (railroad vine) - \* (with flowers), \* (no blooms) - both wildflowers
- (rose) - S (flower only) flower, rose
- (sunflowers) - S sunflower, \* sunflower
- (various yellow composites) - S (cutleaf daisy) weed, S (Mexican hat) flowers; 3-\* wildflowers
- OD - (water hyacinths) - S flowers, \* ivy
- (water lily) - S lily pad, \* lily pad
- (yaupon, in two forms) - S (distance - trimmed) bush; S (close up with berries) poison berries
- (*Yucca* - various species and forms) - S (tree-like) plant, S (non-tree) no response; \*-5 cactus (treelike and non-tree)

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### Informant 6

- OD - (*Agave*, century plant) - S (with stalk) related to palm tree, S (without stalk) related to cactus; \* (with stalk) tree, F (without stalk) cactus
- OD - (bald cypress) - S (green leaves) fern tree, S (reddish leaves & cones) pine tree, \* tree, F tree
- (bluebonnet) - S bluebonnet, \* 58 flower, \* (*Lupinus* without blooms) bluebonnet
- (cactus - various species) - S (lace cactus) prickly pear cactus, S (prickly pear) cactus, \*-6 cactus, F cactus
- OD - (clover, white) - S on a lily pad, \* weeds
- (clover, yellow) - F clover
- (evening primrose, pink - *Oenothera speciosa*) - S, \*, F all buttercup

- (ferns - various species) - S-2 fern; \* (3 species) 2 fern, \* 1 bush and weed stuff
- OD - (grasses - various species) - S (in seed) weeds, F (turf) grass, \*-6 (tall grasses, two in seed) bush, weeds, grain
- (Indian paintbrush) - S (red flowers) Indian paintbrush, \* (green flowers) bush and weed stuff
- (juniper) - S (with cones) spruce or cedar, S cedar, \* tree, \* bush, F-3 cedar
- (lichens - 2 species) - S (orange lichen on rock) algae or moss; S (green lichen on tree) algae or moss
- OD - (*Ligustrum*) - S grape tree, F redbud tree, F bush
- (mescalbean) - S (without flowers) tree, \* (with flowers) flowers or bush
- OD - (mesquite tree) - S (with pods) mesquite tree, 2-\* (without pods) tree, F mesquite tree, F mimosa or fern tree
- (moss) - S algae or moss
- (*Tillandsia*, 2 species) - S (ball moss) wasps nest; S (Spanish moss) moss
- (oaks without acorns) - S (live oak) oak tree, S (Spanish oak - close-up, red leaves) oak tree, S (Spanish oak - distant, red leaves) oak or maple tree; \* (several) tree
- (oaks with acorns) - S (live oak) acorn tree or oak tree, S (Shumard oak) oak tree
- OD - (Oxalis) - S (with flowers) wildflowers, \* (without flowers) bush and weed stuff, F flowers, F (no blooms) leaves
- OD - (palms - various species) - S (*Sabal texana*) palm tree; S (*Sabal minor*, dwarf palmetto) palmetto; \* (*Sabal minor*) cactus; \* (*Sabal texana*) tree, \* (tropical palm) tree, F palm tree
- OD - (pines) - S (with cones) pine tree; S (without cones) fir tree or spruce tree or some kind of Christmas tree; \*-2 tree
- (poison ivy) - S poison ivy, F poison ivy
- (railroad vine) - \* (with flowers) flower, (without flowers) weed
- (redbud) - S redbud or apple tree, \* tree

- (rose) - S (flower only) flower, rose; F rose bush
- (sunflowers) - S sunflowers, \* sunflowers
- (various yellow composites) - S (cutleaf daisy) wildflowers, related to daisy, S (Mexican hat) wildflowers; 3-\* flowers, flower or weed, flower
- (water hyacinths) - S lily pad, \* water lilies
- (water lily) - S lily pad, \* water lily
- (yaupon, in two forms) - S (distance - trimmed) bush; S (close up with berries) no response
- (*Yucca* - various species and forms) - S (tree-like form) related to cactus, S (non-tree) related to cactus; F-2 cactus; \* (3 treelike) 2 tree, 1 cactus, \* (2 non-tree) cactus

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### **Informant 7**

- OD - (*Agave*, century plant) - S wild plant tree (with stalk), S ivery (without stalk); \*-plant (with stalk), F ivery bush (without stalk)
- OD - (bald cypress) S pine tree (green), S tree that change color (reddish)
- (bluebonnet) - S bluebonnet, F bluebonnet, \* bluebonnet
- (cactus - various species) - S-2 cactus, \*-6 cactus
- (clover, white) - S plant, \* flower
- (clover, yellow) - F flower (with flowers), grass (without flowers)
- (dandelion) - S plant, F flower or plant
- (evening primrose, pink - *Oenothera speciosa*) - S flowers, \* flowers, F flowers
- (ferns - various species) - S-2 plant; \*-3 plant
- (grasses - various species) - S (in seed) grain or grass, F grass, \*-6 (two in seed) wheat or grass, grass

- (Indian blanket) - S flowers, \* flowers
- (Indian paintbrush) - S plant, \* plant
- (juniper) - S tree, S tree, \* tree, \* bush, F Christmas tree
- (lichens - 2 species) S fungus and algae (orange lichen on rock); S dead or dried leaves (green lichen on tree)
- (*Ligustrum*) - S tree, F tree
- (mescalbean) - S (without flowers) tree, \* (with flowers) tree
- (moss) - S moss
- OD? - (ball moss and Spanish moss - *Tillandsia*, 2 species) S dried leaves, F something that grows on old trees (ball moss); S plant (Spanish moss)
- (oaks - various species) - S acorn (two oaks with acorns); S tree (three oaks without acorns), F acorn (live oak)
- (*Oxalis*) - S green clover (with flowers), F plant, \* (without flowers) clovers - grass and plant
- (palms - various species) - S pine tree (*Sabal texana*); S cactus plant (*Sabal minor*); \* plant (*Sabal minor*); \* (tropical palms) tree
- (2 pines) S pine tree; S pine tree
- (redbud) - S tree, \* tree
- (rose) - S rose (flower only); F rose plant, F rose bush
- (sunflowers) - S sunflower, \* flowers
- (various yellow composites) - S (cutleaf daisy) daisies, (Mexican hat) daisies flower, 3-\* plant, flower, flower
- (*Verbena*) - F flower on a plant, \* flower or plant
- (water hyacinths) - S plants, \* plants
- (water lily) - S lily, \* plants

- (yaupon, in two forms) - S bush (distance - trimmed); S tree (close up with berries)
- OD? - (*Yucca* - various species and forms) - S plant (tree-like form), S ivery (non-tree); F tree (flower stalk); \* (3 treelike) tree, plant and cactus, bush (Joshua tree) \* (2 non-tree) plant

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### **Informant 8**

- (*Agave*, century plant) - S (with stalk) tree, S (without stalk) plant; \* (with stalk) tree
- (bald cypress) - S (green leaves) tree, S (reddish leaves, cones) fir or conifer, \*-2 tree
- (bluebonnet) - S bluebonnet, \* (in bloom with other wildflowers) flowers, (*Lupinus*, no blooms) plant, F (no blooms) bluebonnet leave
- OD? - (cactus - various species) - S (lace cactus) cactus, (prickly pear) cactus, \* (6 species) 3 flowers, 3 bush, F (prickly pear) cactus
- (clover, white) - S plant, \* plant
- (clover, yellow) - F grass
- (dandelion) - S flower
- (evening primrose, pink) - S buttercup, \* flowers
- (ferns - various species) - S-2 (maidenhair) plant, fern; \* (3 species) 2 bush, 1 plant (maidenhair)
- OD - (grasses - various species) - S (in seed) weeds, F plants, weeds, \*-6 (tall, two in seed) 4 bush, 2 plants
- (Indian paintbrush) - S (red flowers) flowers, \* (green flowers) plant
- (juniper) - S (with cones) cedar, S (no cones) cedar, \* tree, \* bush, F cedar, conifer
- (lichens) - S (orange lichen on rock) moss; S (green lichen on tree) moss; F moss
- (mescalbean) - S (without flowers) tree, \* (with flowers) bush
- (mesquite tree) - S (with pods) tree, 2-\* (without pods) tree, F tree

- (moss) - S moss
- (*Tillandsia*) - S (ball moss), F (ball moss), S (Spanish moss) - all moss
- (oaks without acorns) - S (live oak) tree, S (2 Spanish oak, red leaves) oak; \* (several) tree; F (several live oak) oak - no - acorn, F (bur oak) tree
- (oaks with acorns) - S (live oak) acorn tree, S (Shumard oak) acorn tree
- (*Oxalis*) - S (with flowers) clover, \* (without flowers) plant
- (palms - various species) - S (*Sabal texana*) palm tree; S (*Sabal minor*) plant; \* (*Sabal minor*) small plant; \* (*Sabal texana*) bush, \* (tropical palms) tree
- (pines) - S (with cones) pine tree; S (without cones) fir or conifer; \*-2 trees
- (poison ivy) - S ivy, F plant
- OD - (railroad vine) - \* (with flowers) flower, \* (no blooms) plant
- (rose) - S (flower only) rose; F rose bush
- (sunflowers) - S sunflower, \* flowers
- (various yellow composites) - S (cutleaf daisy) flowers, S (Mexican hat) wildflowers; 3-\* flowers
- (water hyacinths) - S water plant, \* flower
- (water lily) - S lily pad, \* plant
- (yaupon, in two forms) - S (distance - trimmed) bush; S (close up with berries) tree
- (*Yucca* - various species and forms) - S (tree-like form) plant, S (non-tree) plant; \* (3 tree-like) 2 bush, 1 tree, (2 non-tree) bush

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## Informant 9

- OD - (*Agave*, century plant) - S (with stalk) no response, S (without stalk) thorn-tipped plant; \*

(with stalk) tree, F (without stalk) big thorn plant

- OD - (bald cypress) - S (green leaves) pine tree, S (reddish leaves, cones) fern tree, \*-2 tree

- OD - (bluebonnet) - S bluebonnet, \* (in bloom with other wildflowers) flowers, (Lupinus, no blooms) bluebonnets, F (no bloom) 5-leaf clover

- OD - (cactus - various species) - S (lace cactus) Teddy bear cactus, (prickly pear) prickly pear cactus, \* (6 species) 1 flower, 1 Teddy bear cactus, 2 cactus, 1 bush (cholla), 1 leaves (prickly pear with fruit), F prickly pears

- OD - (clover, white) - S claw plant, \* flowers

- (clover, yellow) - F weeds

- (dandelion) - S yellow flower

- (evening primrose, pink) - S buttercup, \* flowers

- OD - (ferns - various species) - S-2 ferns; \* (3 species) 1 bush, 1 leaves, 1 unclassified

- (grasses - various species) - S (in seed) no response, F (turf) grass, (grass in seed) speargrass, fake speargrass, \*-6 (tall, two in seed) 1 bush, 5 grass

- (Indian paintbrush) - S (red flowers) no response, \* (green flowers) leaves

- (juniper) - S (with cones) pine tree, S (no cones) shrub, \* tree, \* bush, F pine tree or evergreen; tree

- (lichens) - S (orange lichen on rock) moss; S (green lichen on tree) no response, F moss (on tree)

- (*Ligustrum*) - S no response, F tree

- (mescalbean) - S (without flowers) tree, \* (with flowers) bush

- (mesquite tree) - S (with pods) pod tree, 2-\* (without pods) tree

- (moss) - S no response

- (*Tillandsia*) - S (ball moss) moss, F (ball moss) moss; S (Spanish moss) no response

- (oaks without acorns) - S (live oak) tree, S (Spanish oak - full shot, red leaves) no response, S (Spanish oak - close-up, red leaves) red maple leaves; \* (several) tree; F (live oak) fat leaf tree

- (oaks with acorns) - S (live oak) no response, S (Shumard oak) acorn tree
- (Oxalis) - S (with flowers) 3-leaf clovers, \* (without flowers) 3-leaf clover = leaves
- OD - (palms - various species) - S (*Sabal texana*) palm tree; S (*Sabal minor*) thorn-tipped plant; \* (*Sabal minor*) leaves; \* (*Sabal texana*) tree, \* (tropical palms) tree
- OD - (pines) - S (with cones) pine tree; S (without cones) cedar tree; \*-2 tree
- (poison ivy) - S 3-pointed leaves, F (no name given)
- (railroad vine) - \* (with flowers) flower, \* (no blooms) leaves
- (rose) - S (flower only) red rose; F shrub
- (sunflowers) - S sunflowers, \* flowers
- (various yellow composites) - S (cutleaf daisy) flowers, S (Mexican hat) no response; 3-\* flowers
- (water hyacinths) - S no response, \* flower
- (water lily) - S lily pad, \* leaves
- (yaupon, in two forms) - S (distance - trimmed) bush; S (close-up with berries) cherrie tomato
- (*Yucca* - various species and forms) - S (tree-like form) yucca plant, S (non-tree) yucca plant; F (with flower stalk) yucca; \* (3 tree-like) 1 tree, 2 bush, \* (2 non-tree) bush

## Appendix A-8: Overgeneralization

Evaluation of tendencies to call different species by the same name. Informant's names are outside parentheses. Acceptable common names of the various species included in parentheses. Possible sources of error are stated.

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### Informant 1

cactus - (includes all true cactus, various yuccas, agaves, purple thistle, ocotillo, stinking gourd, and *Sabal minor* - common adult errors and unexplained naive errors)

clover - (*Oxalis*, true clover - similar in form - common adult error)

dandelions - (dandelion, cutleaf daisy, Mexican hat - related species)

grass - (turf, tall grass, rain lily, clover - unexplained naive error)

lily pad - (water hyacinth, water lily, lotus, maidenhair fern - most are similar in form and habitat; fern = unexplained naive error)

maple - (maple, Spanish oak with red leaves - similar form)

moss - (*Tillandsia*, moss, lichens, Virginia creeper - unexplained naive error and common adult error)

spruce - (juniper, bald cypress - similar in form, related species)

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### Informant 2

cactus - (includes true cactus, 1 potted succulent - common adult error)

clover - (*Oxalis*, true clover, henbit - similar in form - common adult error and naive error)

dandelions - (dandelions, sunflower - related species)

not daisies - (Mexican hat, Indian blanket - related species)

water lily - (water lily, lotus - related species)

moss (moss, *Tillandsia*, fibers on Sabal palm tree)

pine tree - (pine, *Sabal texana*, Deodar cedar, juniper - similar in form, related species; *Sabal* - naive error)

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**Informant 3**

cactus - (includes various true cactus, Joshua tree yucca - common adult error)

clover - (only *Oxalis* - common adult error)

lily flower - (water lily, lotus - related species)

sunflowers - (sunflower, dandelion - related species)

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**Informant 4**

cactus - (includes true cactus, various yuccas - common adult error)

cedar tree (juniper, arbor vitae - similar in form, related species)

clover - (maidenhair fern, *Oxalis*, true clover - similar in form - common adult error and unexplained naive error)

grass - (turf, grass in seed, low leafy herbs)

Indian paintbrush - (Indian paintbrush, Lantana - unexplained naive error)

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## Informant 5

acorn tree (live oak, mesquite-distant - similar in form)

bluebonnets - (gayfeather, bluebonnets - similar flower color)

cactus - (includes true cactus, various yuccas, agaves, and green prickly herbs, ocotillo, marsh grass, *Sabal minor* and *Sabal texana* - common adult errors and unexplained naive error)

clover - (*Oxalis* only - common adult error)

grass - (true grass, both tall and turf, maidenhair fern, *Baptisia*, cattails, monkey grass - similar in form and unexplained naive error)

lily pad or water lily - (water lily, lotus - related species)

maple - (maple, Spanish oak, red bald cypress - leaf shape and color - realized error on closer examination)

moss (ball moss, Spanish moss, green lichen - common adult error)

pine tree and coniferous - (pine, bald cypress, mesquite, juniper - related species and unexplained naive error)

poison ivy - (poison ivy, Virginia creeper - similar in form, common adult error)

spruce tree (bald cypress, juniper - similar leaves)

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## Informant 6

cactus - (includes all true cactus, various yuccas, agaves, and green prickly herbs and *Sabal minor* - common adult error and naive error)

dandelions - (dandelion, *Sonchus* = "like a dandelion" - related species)

lily pad or water lily - (water hyacinth, water lily, lotus - similar in form)

moss - (*Tillandsia* - common adult error)

algae or moss - (moss, lichen - similar in form)

oak or maple - (Spanish oak, sycamore - leaf similar in form)

palm tree - (palm, *Agave* with stalk - unexplained error)

pine tree - (pine, bald cypress - related species, common adult error)

redbud - (redbud, *Ligustrum*, crepe myrtle - unexplained error, flower colors similar)

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### **Informant 7**

cactus (true cactus, agave, yucca, ocotillo, *Sabal minor* - common adult error, unexplained error for *Sabal*)

Christmas tree - (juniper, arbor vitae - similar in form, related species)

clover - (*Oxalis*, true clover - similar in form - common adult error)

daisies - (Mexican hat, cutleaf daisy - related species)

grass (true grass, cattails, low herbs in grass - similar form and unexplained naive error)

pine tree - (bald cypress - full green tree; palmetto, *Sabal texana*; two true pines, ornamental spruce, arbor vitae - similar form, related species; unexplained naive error for *Sabal*)

ivory - (*Agave*, *Yucca* - related species, unexplained naive error)

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### **Informant 8**

cactus - (includes true cactus, bull nettle - unexplained naive error)

clover - (only *Oxalis* - common adult error)

fir (pine, bald cypress - similar in form; may equate "fir" with the prototype "conifer")

grass - (various low herbs, not flowering; no true grass - unexplained naive error)

lily pad - (water lily, lotus - related species)

moss (moss, *Tillandsia*, lichen – common adult errors)

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### **Informant 9**

cactus - (includes only true cactus - no over-generalization)

clover - (*Oxalis*, bluebonnet rosette - common adult error and naive error)

grass - (cattails, turf, several tall grass in seed, Baptisia with grass - similar in form and naive error)

lily pad - (water lily, lotus - related species)

maple tree/maple leaves - (Spanish oak, grape vine, maple - similar in form)

moss (lichen, *Tillandsia* - common adult error)

pine tree - (pine, bald cypress, juniper - related species, similar in form, common adult errors)

## Appendix A-9: Botanical Definitions

(Note: Except where noted, the following definitions are derived from *The American Heritage Dictionary of the English Language*, 1979, Houghton Mifflin, Boston.)

**Cactus** (plural: cacti or cactuses) - A member of a botanical family, the Cactaceae. All cacti have areoles, pits or protrusions scattered across the surface of the plant. If the plant does have spines, they emerge in clusters (rarely singly) from these unique structures. Few cacti have true leaves. The spines replace leaves, and the thickened, greenish stems take up the job of photosynthesis. (Researcher's definition.)

**Flower** - The reproductive structure of a seed bearing plant, characteristically having male and female organs, as stamens and a pistil, enclosed in an outer envelope of petals and sepals (see grass for an exception). Dictionary definition # 3: A plant cultivated or conspicuous for its blossoms.

**Grass** - A member of a botanical family, the Poaceae. Grasses have round, typically hollow, jointed stems. The leaves, usually narrow, sheath the stem. Grasses produce non-showy flowers reduced to scaly bracts that enclose the male and female parts. (Researcher's definition.)

**Herb** - a plant that has a fleshy stem as distinguished from the woody tissue of shrubs and trees, and that generally dies back at the end of each growing season; also called herbaceous.

**Plant** - Any organism of the Kingdom Plantae, characteristically having cellulose cell walls, growing by synthesis of inorganic substances, and lacking the power of locomotion. (Modified from dictionary.)

(Note: this dictionary perpetuates a misconception in definition # 2: "A plant having no permanent woody stem; an herb, as distinguished from a tree or shrub". Nowhere in the definition is there any indication that a tree is a type of plant.)

**Shrub** - a woody plant of relatively low height, distinguished from a tree by having several stems rather than a single trunk; a bush.

**Tree** - a usually tall woody plant, distinguished from a shrub by having comparatively greater height and, characteristically, a single trunk rather than several stems. (Poor definition, as many trees have multiple trunks).

**Vine** - Any plant having a flexible stem supported by climbing, twining, or creeping along a surface.

**Weed** - a plant considered undesirable, unattractive, or troublesome; especially, one growing where it is not wanted in cultivated ground.

APPENDIXES B-1 TO B-7

TEXTBOOK REVIEW

## Appendix B-1: Botanical Propositions in *Silver Burdett Science*, 1985, Grades 1-6

(Notes: Not all statements are verbatim. Where appropriate, statements have been shortened. This appendix includes the codes for concrete "C" versus abstract "A" propositions. Raters presented in order, 1,2,3: 1=researcher, 2=sixth grade student, 3=adult coder.

(X = rater did not assess the proposition.

A-3= rater assessed three propositions within one statement.)

(\* = Major topics for each chapter)

### ***Silver Burdett Science*, 1985, Grade 1**

#### **Chapter 2 - Many Kinds of Plants**

C,C,C \* There are many kinds of plants.

(Drawing of various kinds of plants) tomato plant, evergreen, hickory tree, (saguaro) cactus, grass, geranium, mushrooms, wheat.

C,C,C Some plants are big, some are small, have many shapes, many colors. (Photos of giant sequoia, a sapling, wildflowers of different colors.)

C,C,C \* Roots, stems, and leaves are the main parts of many plants (illustrated).

(Drawing of large tree and carrot, pointing out they have different roots.)

C,C,C Leaves are different shapes, sizes (photos to illustrate).

C,C,C Stems can be long, short; hard, soft (photos of palm tree, fern).

A,A,C \* Most plants need air, water, and sunlight to grow.

A/C,A/C,C Most plants need soil.

C,C,C Some plants grow indoors; they need special care (photo of child watering houseplants).

C,C,C \* Many plants grow from seeds.

C,C,C Each kind of plant has its own kind of seeds (photos of pumpkin and seeds, acorn and tree, but text does not say that acorns grow on oaks).

C,C,C different plants grow from different seeds (experiment to show this).

C,C,C \* Plants grow in many places.

(Photo of saguaro cactus, lily pads on pond, crocus, tree on rock, ball moss on electric wire, ivy on house.)

C,C,C Some grow in soil, some in water.

C,C,C \* Plants provide people with food to eat.

(Photo of many fruits and vegetables.)

C,C,C People use plants for other things (photos of cotton and products, tree, violin, paper, baseball bat).

### **Chapter 5 - Living and Not Living**

C,C,C \* Animals, plants, and people are living things.

C/A,C,A \* Living things grow and change.

C,C,C \* Many living things can move on their own.

(A photo of animals running and flying by ocean illustrates this concept - may give the impression that water is living because it moves on its own.)

C,C,A \* Nonliving things do not grow or move on their own.

(Photos of various things, including some plants, for child to pick which are living and not.)

A/C,C,A \* To stay alive, living things need food, air, water, and a place to live.

(Experiment with two plants) Water one and see what happens to the other one.

C,C,A \* Living things produce other living things of the same kind.

C,A/C,C Plants make seeds;

C,C,C seeds grow into new plants.

(Nothing in this chapter would help the child define how a plant is different from an animal other than movement.)

### **Chapter 9 - You and Weather**

C,C,A The air becomes warmer in spring;

C,C,A many plants begin to grow;

C,C,A many flowers bloom (photos of buds and flowers).

C,C,A In the fall, the days are cooler;

A,C,A some plants stop growing;

C,C,A in some places the leaves change color,

C,C,C then they fall to the ground (photo of birch trees and dead leaves on ground). cause it moves on its own.)

### ***Silver Burdett Science, 1985, Grade 2***

#### **Chapter 2 - How Plants Grow**

C,C,A \* Plants grow in many sizes and shapes.

C,C,A \* Plants change as they grow.

C-4,C-4,C-4 Roots grow longer; stem grows longer; more leaves grow on stem; some plants grow more than one stem.

C,C,A \* Many plants produce and grow from seeds.

C,C,C There are many kinds of seeds; examples - sunflower seeds (photos) grow into sunflower plants, pumpkin seeds, peanuts (photos of both); trees make seeds, too, photo of orange tree and seeds.

A/C,A,C Seed coat = the cover of a seed;

A,A,A, keeps seed from drying out; some have a hard coat to protect the seed;

A/C,A,A, inside each seed is a tiny plant;

A,A,A, most seeds also have stored food;

A,A,A, the tiny plant grows inside the seed and uses the food, then breaks through the seed coat. Drawing showing these parts on beans, and showing stem, first leaves, roots.

C,C,C \* Some plants grow flowers.

C,C,C Flowers have many shapes and colors;

C,C,C each kind of plant has its own kind of flower (photos of colorful flowers).

C,C,A \* The flowers produce fruits that contain seeds.

C,C,A Flowers change as the plants grow (rather misleading statement);

A,C,A, many flowers change into fruits;

C,C,C seeds are found inside fruits;

A,C,C new plants grow from the seeds (Photos of hickory nuts, peaches, cherries);

C,C,C seeds are different in different fruits (Photos of orange, banana, grape, apple - perpetuates the myth that only edible things are fruits. Kids need to see lots of examples of non-edible fruits.)

C,C,A \* Plants change with the seasons.

C,C,C Most plants grow when it's warm,

A,C,C stop growing when it's cold (photo of maple tree in different seasons);

C,C,C new growth begins in spring;

C,C,C farmers plant seeds in spring;

C,C,C trees and bushes grow new leaves and stems;

C,C,A plants grow through the summer;

A,C,A many stop growing in the fall,

C,C,A some die

A,C,A and others rest.

C,C,C \* Many plants are used for food.

C,C,C Tomato plants grow tomatoes; apple trees grow apples.

C,C,A \* Seeds are dispersed in many ways.

C,C,A Seeds are carried by wind and animals, dropped on the ground; they stay there all winter; new plants grow from some of the seeds in spring (photos of seeds with wings, parachutes).

C,C,A \* Plants can grow from parts of plants.

C,C,C New plants can grow from stems, leaves, and roots (photo of a cutting that is rooting in water).

(Experiment) Grow a plant from a sweet potato.

(In the questions at end of chapter, the text calls a sunflower fruit a seed.)

### **Chapter 3 - Where Plants and Animals Live**

C,C,C \* Plants and animals live together in many places.

C,C,A \* Plants in the woods provide shelter and food for many animals.

C,C,C Trees grow close together in the woods;

C,C,C their branches make a roof over the ground;

C,C,C very little sunlight reaches the ground;

C,C,C it is shady in the woods;

C,C,C some plants grow well in the shade (photo of jack-in-pulpit, ferns).

C,C,A \* Plants and animals in woodland areas change with the seasons.

C-4,C-4,C-4 Some trees have large flat leaves; some have thin pointed leaves (photos of maple tree and pine); some lose all their leaves; others stay green year round.

C,C,A Some plants die during the winter;

A,A,A others rest (photos of eastern woodland in spring and covered with snow in winter.)

A,C,A \* Plants and animals that live in a certain environment are suited to that environment.

C,C,A Desert is hot and dry;

C,C,C soil is sandy (misconception) (Photo of saguaro cactus);

C,C,C little shade in desert;

C,C,C doesn't rain often, so few trees grow (the photo shows lots of large saguaro cactus, which look like trees so this statement may confuse kids. Also a photo of prickly pear.)

(Experiment) Why don't desert plants have leaves? (Misconception!!!) The students wet 2 paper towels, lay one flat and roll one up and place in window. They see which one dries out first, then are supposed to know what would happen if desert plants grew large flat leaves.

Drawing of a pond - lily pads, cattails in pond.

C,C,A Plants and animals in oceans are different from those on land;

C,C,C plants grow in the ocean where the water is not too deep

A,A,A so they can get sunlight;

C,C,C some ocean animals look like plants, they do not move around (photo of coral reef).

### ***Silver Burdett Science, 1985 Grade 3***

#### **Chapter 3 - Seed Plants**

C,C,A \* Most seed plants have the same plant parts, roots, stems, leaves, and other parts.

C,C,C \* There are different kinds of roots.

C,A,A The main function of roots are to anchor a plant,

A,A,A to absorb and conduct water and minerals,

A,A,A and sometimes to store food.

C,C,C \* Stems support the plant parts that grow above the ground,

A,A,A and conduct water and minerals to these parts.

C,C,A \* Stems are the basis by which seed plants are classified as being trees, shrubs, herbs, or vines.

A,A,A, \* Green plants make their own food.

A,A,A, Most of the food is made in the leaves.

A,A,A, Green plants use water, carbon dioxide, and energy from the sun to produce sugar and oxygen.

C,C,A \* Seed plants produce seeds

C,A,A from which new plants of the same kind grow when the seeds germinate.

(Photo of a forest and field of wildflowers; statement that these are all different kinds of seed plants.)

C,C,C Roots grow in the ground; may grow 6 meters deep in some plants.

A,C,C Carrot, radish, beet = roots with stored food.

C-2,C-2,C-2 Taproot = one large, main root; fibrous roots = many roots all about the same size.

(Drawing of) roots of dandelion, wheat, beet, cattail.

C,C,C Prop root = extra roots that grow out from the sides of stems or down from tree branches; examples (drawing, photo) - corn, mangrove trees.

C,C,C Stems of most plants grow above ground;

C,C,C support the leaves, flowers, and other plant parts;

C,C,C usually grow upward;

C,C,C strawberries and some other plants have stems that grow along the ground;

C,C,C potato has a stem that grows underground.

(Photos of) strawberries, potatoes, zinnias.

A,A,A Plants need water and minerals;

A,A,A taken in by roots and carried to stem and all parts of plant through tiny tubes.

A,X,X Plants need minerals to grow and to be healthy.

C,C,A Four main kinds of seed plants: trees, shrubs, herbs, and vines.

C,C,C Most trees have one main stem, a trunk = a woody stem.

C,C,C Trunk is stiff and hard and covered with bark. Examples, maples, oaks, pines; photos of sugar maple, pine.

C,C,C Shrub is smaller than a tree and has many woody stems.

C,C,C Some shrubs are called bushes; examples - rosebushes, French lilac bushes (photo of lilac). (Misleading - gives the idea that shrub is different from bush. Does not indicate that there is an overlap between bush, shrub.)

C,C,C Herbs are small plants with soft rather than woody stems (not always);

C,C,A many die at end of one growing season; examples - grasses, flowers, most weeds; goldenrod is a weed that is an herb; photos of goldenrod, grass, trout lily.

C,C,C Many herbs are used as food; herb gardens; parsley, chives.

C-3,C-3,C-3 Vine is another plant with a soft stem; cannot stand by themselves (not always true); climb by wrapping around other things or creep along ground; cucumber, pumpkin, ivy (photo of pumpkin and English ivy).

C-2,C-2,C-2 Bamboo is a grass that can grow as tall as a tree; has a hollow stem;

C/A,C,C grows very quickly;

C,C,C used in many ways, food, furniture, paper, baskets.

A-2,A-2,A-2 Leaves are like a factory; needs water, carbon dioxide - a gas in the air, and energy from the sun to make food.

A,A,A Water comes from the soil, is brought in by roots and carried by stems to leaves.

A,A,A Carbon dioxide enters the leaf through small openings on surface.

A,A,A The food plants make is sugar;

A,A,A plants use the food they make to live and grow.

A,A,A Plants make a gas called oxygen;

A,A,A needed by most living things to stay alive.

C,C,C Leaves are different sizes;

A,A,A, large leaves can make more food than small leaves.

C,C,C Leaves are different shapes; shaped like spines (text is referring to saguaro cactus but I doubt that the child would "get" that point; though botanically accurate, this concept deserves more explanation if it is going to be thrown in here), long and flat, smooth or toothlike edge, shaped like scales of a fish; photos of banana tree leaves, American elm leaves, Juniper (cones; scales not easy to see), palm leaf, saguaro cactus stems (not a close-up of spines - gives impression that the stem is the leaf).

(Observation exercise for different types of leaves) pointing out lobed, toothed, and smooth edges, shapes, patterns of veins.

C,C,A Many green plants are seed plants;

A/C,C,C some, such as trees and shrubs, live for many years;

C,C,A most herbs live only one growing season and then die (not true).

C,C,A Most seed plants first produce flowers; the flowers form on stems.

(Photos of) flowers on forsythia, alyssum, crab tree.

(Photo of) a tree in summer and autumn, color change (but no explanation - seems out of place here where the book is talking about flowers!).

C,C,A As a flower grows, it changes;

C,C,C outside parts dry up and fall off;

A,A,A inside part grows, changes into a fruit;

C,A,C seeds form inside the fruit.

C,C,C Fruits include apple, pear, walnuts, melons, pea pods, milkweed pod.

(Photos of) apples, peas, honeydew melon;

C,C,C some fruits are good to eat, many are not.

C,A,C Some seeds form inside cones;

C,C,C cones dry and open, and seeds fall out.

(Photo of pine cones on tree, seeds.)

A/C,C/A,A Seed has a covering = seed coat;

A/C,A,A inside seed coat is a small plant;

C/A,A,A plant has a tiny root, stem, leaf, and stored food.

C,C,C Seeds have different shapes and sizes;

C/A,C/A,A all can produce new plants.

(Photos of) shagbark hickory nuts, milkweed pod and seeds, beggars-ticks (*Desmodium?*), cottonwood pods and seeds.

A/C,A,A Seed can produce a new plant only if it germinates = when the tiny plant inside begins to grow;

A,A,A as it grows, it uses the stored food in the seed;

A,A,A when it has grown leaves, it will make its own food;

(Drawing of) bean seed germination and growth;

A/C,C,A need moisture and proper temperature to grow.

Experiment - times for seed germination, comparing radish, grass, corn seeds.

#### **Chapter 4 - Plants are Important**

A,A,A \* Of all living things, plants are the most important.

C,C,A \* Green plants are food for many living things.

C,C,C The roots, stems, leaves, fruits, or seeds of some plants are used as food.

C,C,C Some nongreen plants are also used as food.

C,C,A \* Plants are useful in many ways other than as food.

C/A,C,A \* Some plants are harmful either to living things or to nonliving things.

(Photo of child eating tomato soup with various plant products around, students have to guess

which come from plants.)

A,A,A Plants make sugar;

A,A,A extra sugar is changed into starch and other plant products;

A,A,A starch is the stored food in seeds; it may also be stored in roots, stems, and leaves.

C,X,X Potatoes, rhubarb, and asparagus are stems.

C,X,X Cabbage, lettuce, and spinach are plant leaves.

C,X,X, Radishes, beets, and carrots are roots.

C,X,X Corn, dry beans, and peanuts are seeds.

C,X,X Peaches, tomatoes, and cucumbers are fruits.

(Photos of) potatoes, carrots, peanuts, lettuce, beets, corn, tomatoes, spinach, cucumbers, radishes, cabbage, asparagus.

(Experiment to) show starch in a green leaf.

C,C,C Oatmeal and cornflakes are made from seeds called grains = the seeds of certain grasses, oats, corn, wheat, rice; many are used as foods.

(Photo of) wheat field, rice field; (drawing of) oat plant with seeds.

C,C,C Cocoa and chocolate are made from seeds of the cacao tree (photo).

C,C,C Coffee is made from seeds of a tree (photo).

C,C,C Leaves of other trees are used to make tea (photo).

A/C,A,C, Seeds and some fruits contain oil; some oils used for cooking; corn oil.

C,C,C Spices to flavor foods - mustard, cloves, nutmeg, pepper, cinnamon.

C,C,C Corn is used as food in many different ways (drawings).

C,C,A Some foods are not parts of green plants;

C,C,A milk, meat, eggs come from animals that eat plants;

A,A,A without green plants, there would be no milk and eggs.

C-2,C,C Mushrooms are plants that are not green plants. Most of the mushrooms that people eat are grown on mushroom farms.

(Experiment) to tell if a seed or fruit contains oil.

C,C,C Plants often used as decoration (photo of bouquet of flowers, landscaping);

C,C,A people grow houseplants (no photo) because they are pretty or smell nice, help to make a room bright and cheerful.

C,C,C Some plants grown for decoration outside also used for shade, windbreaks, living fences, grass and other plants on a hillside hold soil in place.

C,C,A Compost = rotted plant material; grass clippings, leaves, and other plant parts;

A,A,A mixed with soil, it returns minerals to soil and helps hold water in soil.

C,C,C Many medicines come from plants; penicillin (photo) from a mold; oil of wintergreen and castor oil; medicines used to ease pain; photo of aloe plant, juice used to soothe minor cuts and burns.

C,C,C Some plant materials used for cloth, rope, bags; cotton; rayon from other plant materials (photos of cotton plant, cloth).

C,C,C Anything made of wood comes from trees; lumber, paper, charcoal (photos of paper, charcoal).

C,C,C Rubber, chewing gum, cork come from trees (photos of cork and tree, rubber tree).

C,C,C Many trees produce oils made into waxes and paints and dyes for cloth and ink.

C,C,C Harmful plants: some molds spoil food; photo of mold on oranges;

C,C,C mildew ruins things it grows on - a nongreen plant that grows in shady, damp places, on leather, painted surfaces, water pipes, basement walls, bathroom; photo of mildew on leather.

C,C,A Some green plants harmful if eaten; sometimes just one part of a plant is harmful, sometimes the whole plant;

C,C,C touching some plants can make skin blister and itch.

(Drawings of) harmful plants with some information: poison ivy, poinsettia, yew, holly,

buttercup, some mushrooms.

## **Chapter 14 - Nutrition**

A,A,A \* Food provides energy for the body.

A,A,A Nutrients = the parts of food that help your body grow and give you energy; sugar and starch, fat, protein, vitamins, minerals, water.

(Some mention of) vegetables - lettuce, tomatoes; foods with sugar and starch - various fruits, bread, potatoes; minerals, vitamins, the four food groups.

A,C,C Water is a very important nutrient.

(This chapter tells the student that minerals and water are nutrients, thus are food. Thus the child makes the logical connection that plants eat food in the form of water and minerals.

### ***Silver Burdett Science, 1985, Grade 4***

## **Chapter 2 - The World of Plants**

A,A,A \* Plants can be classified by the way they reproduce, make new plants.

A,A,A \* Two major groups of plants are those that use seeds to reproduce and those that do not use seeds to reproduce.

C,C,C \* Flowering plants and conifers are two groups of seed plants.

A,A,A \* Ferns, mosses, fungi, and algae are plants that reproduce without seeds. (Scientific inaccuracy - fungi are no longer classified as plants.)

(Photo of a) "plant with a colorful flower, an orchid."

(Photos of various kinds of plants, calling them all "plants"; shows the diversity of forms plants can take; tree, mushroom - misconception, flower, water lily, cactus, rose - these names aren't in text).

C,C,C There are over 350,000 plants in the world.

C,X,X Scientists classify, or group, living things.

C,C,C Seed plants include trees and all the plants that have flowers.

A,X,X Classification helps you to identify plants.

(Exercise on leaf keys - six drawings, with a short key below them, keying out) oak, ginkgo, red pine, locust, hemlock, maple (several of these do not grow in central Texas so kids would not be familiar with them - better to use local plants and let kids develop their own key, then have a discussion on each key, decide which characteristics best to use. The text dictates what characters to use). (Characters used in key:) broad leaf or needle-shaped, made up of many leaflets, shape round or long, edges pointed (maple), leaf fan-shaped (ginkgo), length of needles.

A,C,C Two groups of seed plants - those with cones, those with flowers.

A,X,X More than half of all plants are plants with flowers.

C,C,C Not all flowering plants are small.

C,C,C Many trees are flowering plants.

C,C,C Not all flowers have bright colors.

C,C,C Flowers on some grasses have little color.

(Diagram of classification scheme, down to monocots and dicots.)

C-2,X,X Each kind of flowering plant has its own type of flower, but all flowers have the same basic parts (misconception).

C-2,C,C (Drawing of) flower parts: petals are usually the most colorful part; petals surround the pistil and the stamen.

A-3,A-3,A-3 Pistil - female part; stamens - male parts; stamens and pistils are the parts that produce seeds.

A,A,A Seeds develop inside the base of the pistil, the ovary.

A,A,A Monocots = plants whose seeds have one section.

A,A,A Dicots = plants whose seeds have two sections.

C,C,C The part of a peanut that you eat is the seed, a dicot.

C,C,C A kernel of corn is a seed, a monocot.

(Drawings of) apple, oats, wheat, peas, banana, almonds, and lemons, showing seeds.

C,C,C Count flower petals to distinguish monocot (3 or 6), dicot (groups of 4 or 5); photos of daffodil, daisy, day lilies, violets, trillium, rose.

C,X,X Daffodil has 6 petals so it is a monocot.

C,X,X Daisy has 8 petals (misconception) so it is a dicot.

C,C,C Cone-bearing seed plants are called conifers; they include pines, firs, hemlocks, spruces, cedars, larches.

C,C,C Flowering plants produce seeds in flowers;

C,C,C conifers produce seeds in cones.

C/A,A,A Seeds of flowering plants are protected by an ovary.

C/A,C,C Seeds of conifers are protected by the scales of the cone.

C,C,C Most flowering plants have broad leaves (misconception).

C,C,C Conifers have needle-shaped leaves or scalelike leaves.

C,C,C One way to classify conifers is by their needles. (Photos of various types). Only pines and larches have needles in clusters. A larch loses its needles each autumn, a pine does not. Firs and hemlocks have flat needles. Hemlock needles are usually shorter than fir. Spruces have needles with four sides. Cedars have scalelike needles. (Good photo exercise to tell these apart - but in Texas, most kids won't see most of these.)

C,C,C The cones of most conifers are brown and scaly.

C,C,C The cones of some, such as juniper, look more like berries (photo of juniper cones - doesn't explain that juniper and cedar are common names for same thing).

C,C,C Some types of junipers are trees and some are shrubs.

C,C,C The oils of junipers are useful, medicines, perfumes.

C,C,C You can tell pines apart by the cones (drawings of different cones); swamp, red, jack, mountain, scotch, and white pine (none of these in central Texas).

C,C,C Ferns are nonseed plants that do not have flowers but do have roots, stems, and leaves;

A,A,A reproduce by spores = found on underside of leaves, look like dark spots (photo).

C,C,C Nonseed plants that do not have true roots, stems, or leaves include mosses, fungi, algae; sometimes called lower plants.

C,C,C Mosses found in many damp places around world; grow on rocks, trees, and in soil;

A,A,A reproduce with spores; spores found in special structures, pods (photos of 3 types of moss).

A,A,A Fungi differ from all other plants because cannot make their own food (misconception - some true plants are parasitic);

A,A,A must get their food from living or dead plants and animals;

A/C,C,C types of fungi - slime mold, yeasts, rusts, smuts, rots, molds, mushrooms (photos of some); yeasts cannot be seen without microscope, slime molds have no definite shape and are able to move; molds grow on food; rusts, smut, and rots grow on other plants and harm them.

(Experiment) Grow mosses and ferns in a terrarium and watch for spores.

(Experiment) Bread molds and preservatives.

A/C,A,C Algae - the simplest of all food-producing plants;

C,C,A can be grouped by color; blue-green - only seen with a microscope, grow in fresh and salt water; green - many types, some grow to 1 meter, some microscopic; surface of ponds; red, brown = most in salt water; seaweed, kelp = brown algae that can grow to 600 meters (photos of different algae).

### **Chapter 3 - Food Chains and Food Webs**

A,A,A \* All living things get energy from food.

\* Green plants, which produce their own food, are called producers.

C,X,X \* Animals, which consume food, are called consumers.

C,X,X, \* Animals are classified as herbivores, carnivores, or omnivores according to the type of food they eat.

A-2,X,X All living things need energy to move and grow. They die if they do not get enough

energy.

A,A,A Green plants get energy from food;

A,A,A green plants can make, produce, their own food;

A,A,A use sunlight, water, and air to produce food in their leaves;

A,A,A plants store some of this food in their roots, stems, and leaves.

A,A,C Because plants produce their own food, they are often called producers.

(Drawing of "How Plants Make Food" shows a flowering herb getting "water from the roots," "light from the sun," and "food made in the leaves").

A,X,X All animals must consume, or eat, food to get energy.

C,X,X Since animals consume food, they are often called consumers.

C,X,X Some animals, like this mouse, eat green plants.

C,X,X Some animals, like this hawk, eat other animals. But what if a hawk eats a mouse?

A,X,X The mouse got its energy from green plants. By eating a mouse, a hawk gets energy that once came from green plants. In fact, all animals depend on energy that comes from green plants.

C-4,X,X An animal that eats only plants is called a herbivore. Herbivores may eat roots, leaves, stems, fruits, flowers, or seeds. Deer, rabbits, elephants, cows, and many insects are herbivores. So are elk, squirrels, bison, and prairie dogs. (Pictures of different animals eating plants).

C,X,X An animal that only eats other animals is called a carnivore. (Various stated and illustrated examples).

C,X,X Some animals eat both plants and other animals. These animals are called omnivores (various stated and illustrated examples).

A,X,X Living things need food for energy.

A,X,X, Green plants use energy from sunlight to make food energy.

A,X,X The plants store this food energy in their roots, stems, and leaves.

A,X,X Do you know how energy stored in plants is used by animals?

C,X,X The grasshopper munches on the grass. A green frog eats the insect.

A,X,X In doing so, the frog takes in and stores energy from the grasshopper (text describes and illustrates the various parts of a food chain, talking about energy going from one animal to the next.)

A,A,A \* A food chain is the path by which energy passes from one living thing to another.

C/A,X,X A food chain begins with a green plant, a producer. It continues with an animal that eats a plant, a consumer. This consumer is often a herbivore. A food chain may include one or more consumers. These consumers may be herbivores or carnivores.

C,X,X One simple food chain is made of seeds, mice, snakes, and hawks. (Drawing of sunflower "seeds," mouse eating "seeds," snake eating mouse, red-tailed hawk eating snake. Text describes the sequence in this food chain.)

A,X,X Some food chains are food in water. (Drawings of blue heron eating bass, bass, shiner, and mayfly nymph.) Mayfly nymphs eat tiny plants (text describes the rest of this food chain).

C,X,X A food chain begins with a green plant. It continues with an animal that eats the green plant. A food chain may include one or more other consumers. One simple food chain is made of seeds, mice, snakes, and hawks (gives an aquatic example, also).

C,X,X Most animals eat more than one type of food (examples described and illustrated).

C,X,X Plants and animals live close to one another.

C/A,X,X All the plants and animals in an area make up a community.

A,X,X A food web shows how all the animals in a community get their energy (illustration of a food web).

C/A,X,X A food web can be thought of as being like a spider web. All the threads of a spider web are connected to each other. All the living things in a food web are also connected to each other.

A,A,A \* A food web is a series of interrelated food chains that shows how animals in a community get their energy (gives examples).

#### **Chapter 4 - How Living Things Survive**

A,X,X A body part or an activity that helps a living thing to survive is called an adaptation.

Feathers, scales, and flowers are adaptations. Activities such as building a nest are also adaptations.

A/C,C,A \* Living things have adaptations that help them survive.

A,C/A,A \* Trees have adaptations that prevent excess loss of water.

A,A,A \* Plants have structural and behavioral adaptations that enable them to obtain the sunlight and water they need.

C,C,C A maple is one kind of tree that changes each season; bare during winter; covered with green leaves in summer; late summer, leaves turn red or orange.

C,C,C In winter, you can find buds on trees; begin to grow in spring; open up to become leaves. (Doesn't mention flower buds.)

A,A,A Maple trees take in water through their roots, lose water through leaves; if kept leaves in winter, would lose water, but in most places where maple trees grow, water in the ground freezes during winter;

A,A,A by losing leaves during winter, trees do not lose much water; an adaptation for survival.

(Photos of trees at different seasons) Norway maple.

C,C,C Needles are long thin leaves.

A,A,A Trees with needles lose very little water through needles, so do not have to lose all needles to survive in winter; adaptation.

(Photo) Ponderosa pine in summer and winter.

A-2,X,X Green plants need certain things to survive. One of these things is sunlight.

C,C,A Green plants grow toward light.

C,C,A Tall plants, such as trees (does say that trees are a type of plant) keep sunlight from reaching smaller plants.

A,X,X Smaller plants need adaptations to help them get sunlight;

C-4,C,C some climb - bean plants climb by twisting their stems around larger plants, roses climb by hooking their thorns into larger plants, ivy uses special roots, cucumbers and peas use structures called tendrils = thin coiled structures; photos of ivy, bean, and of grape tendrils.

C-3,C,C To get the sunlight they need, some plants grow on other plants; common in jungles; orchids and Spanish moss (photo).

(Experiment) Place plant in window and observe the change in orientation after a few days.

C,C,A Plants in desert have trouble getting enough water.

A,C/A,A Creosote bush - a desert plant that gives off chemicals from its roots that kill any plants growing nearby (misconception - not all plants inhibited),

A,A,A so bush can get water that would have been taken away by other plants.

A,C,A Cactus plants have adaptations to get and store water;

C,C,A roots cover a large area, do not grow very deep, so cactus plants can take in as much water as possible when it rains.

(Drawing and photos of saguaro and) prickly pear.

A,C,A Cactus plants store large amounts of water in stems (no picture showing which part is stem);

A-C-A,A-3,A-3 do not lose much water from stems or leaves; stems covered by thick waxy material; "leaves" are spines, lose very little water through spines.

C,C,C Spines or thorns of some plants, cactus plants and locust, keep animals from eating them.

A,C/A,A Some plants contain chemicals that harm animals - example, poison ivy (photo) (misconception - does not harm animals, other than people, and is not a feeding deterrent).

### **Science in Careers**

People with an interest in plants often look for jobs in forestry. The U.S. Forest Service, the National Park Service, state forest agencies, and logging companies need foresters. Foresters study the science of growing trees, fire protection, and disease control.

### **Chapter 7 - Heat Energy**

(Some information on energy in living systems.)

### **Activity sheets in back of book**

Leaf keys - lobed, toothed, simple, compound.

*Silver Burdett Science, 1985, Grade 5*

**Chapter 1 - Activities of Green Plants**

A,A,A \* Living things are alike because they are made of cells

A,A,A and use energy to carry out life processes.

A,A,A Cell = the basic unit of all living things; "the building blocks of life"; brick analogy; many cells needed to make up most plants and animals.

A,A,A Cells are very small but are different in different parts of a plant; need microscope to see cells.

A,A,A \* Materials needed by green plants for food making are transported through the roots, stems, and leaves in special tubes.

A,A,A \* Green plants make food by the process of photosynthesis.

A,A,A \* Green plants produce new plants of the same kind by the process of reproduction.

C,C,A In spring, weather becomes warm and green plants begin to grow from the soil.

C,C,A Soon, many plants produce beautifully colored flowers.

(Photograph of) stages of opening of daffodil flower (no details on which stage is first and last, though suggests that teacher talk about that, and have kids bring in different types of flowers to compare shape, size, color).

A,C,A Flowers do more than add beauty to the world.

A,C,A Without flowers many plants could not produce more of their kind.

A/C,C,A Humans and plants and animals need food, water, air to stay alive.

A,A,A Life processes = the activities that keep living things alive.

All living things carry out these life processes:

A,C,A - getting food: Most living things get food from plants and animals;

A,A,A green plants make their own food.

A,A,A - releasing energy: Living things break down food to release energy stored in food.

A,A,A - removing wastes: get rid of waste materials (not defined).

C,C,A - growing: living things grow in size;

A,A,A and replace old, worn out cells by growing new ones.

A,C/A,A - reproducing: produce more living things of same kind.

(Teacher suggestion in text:) get kids to say they are like elk because they drink, eat, and breathe. (discussion about people breathing at this point in text gives kids the impression that plants breathe.)

A,A,A Green plants do not eat food, they make it.

A,A,A Green plants need water, carbon dioxide and light energy to make food.

A,A,A Food making usually takes place in the leaf cells.

A,A,A The things needed to make food must be transported to the leaf cells by the roots, stems, and leaves.

Photo, microscopic photo, and drawing of root hairs.

A,A,A Roots important in transporting materials for food making.

A,C,C Root hair = part of a single cell that grows from a root into the soil;

C,C,C grows near the tips of roots;

A,A,A almost all the water taken in by roots is taken in by root hairs;

C,A,A root hairs enter spaces in soil

A,A,A and take in, absorb, water in these spaces;

A,C,C millions on plants roots;

C,C,A the more hairs, the more water it can take in (observation of radish and bean root hairs with microscope).

C,C,C The rest of the root helps anchor the plant in the soil

A,A,A and to store food.

A,A,A From the roots, water is transported to the stem.

C,C,C Stem = part of the plant between roots and leaves;

A,A,A transports water and food to all parts of the plant through tubes (drawing of cross section of stem with tubes).

A-3,A-3,A-3 Tubes occur in bundles; one kind transports water up from the roots to the leaves; one kind transports food from leaves down to all parts of plants.

A,A,A As they absorb water from soil, plants also take in minerals;

A,A,A minerals needed by plants to perform life processes;

A,A,C a few green plants, photo of venus flytrap, get minerals by eating insects. (Text does not clarify that the taking in of minerals is not eating and perpetuates the misconception that it is eating.)

A-4,X,X Water is transported from the stem to the leaves. Most leaves contain small thin tubes called veins. The veins are much like the tubes in the stem. They carry water and food to and from leaf cells.

C/A,X,X Bread making analogy - ingredients essential to make bread compared to ingredients essential to make food in plants.

A,A,A Leaf of green plant like a factory;

A,A,A water and carbon dioxide must be transported to the leaf factory (does not say that these are not food);

A,A,A sunlight provides energy to make the food;

A,A,A food is in the form of sugar;

A,A,A process of making food = photosynthesis.

A,A,A Chloroplast = small green body in the cell of a leaf;

A,A,A green from chlorophyll, a special material needed by the plant to make food.

(Drawing of) cells in a leaf, showing waxy covering, layer of cells to protect leaf from damage, stomata, water-carrying tubes, food-carrying tubes; vein surrounding the tube bundles; green

food making cells containing chloroplasts.

A,A,A Stomata - gases enter and leave plant through openings in the leaf.

A,A,A Around the food-making cells are air spaces, connected to stomata, allow carbon dioxide to reach the cells.

C,X,X Most leaves are flat and thin,

A,X,X which allows light to reach the food-making cells in the leaf.

A,A,A Vein contains cells that carry water to food-making cells.

(Drawing of) steps in photosynthesis.

A,A,A - Sunlight strikes the leaf and passes through to the chlorophyll in food-making cells, where it is trapped.

A-3,A,A - Water enters the roots and moves through the stem to the leaf, and is carried to food-making cells by the vein.

A,A,A - Sun's energy is used to change water into two gases, hydrogen and oxygen.

A,A,A The oxygen, a waste product, moves out of the leaf through the stomata.

A,A,A - Carbon dioxide, a gas in the air, enters the leaf through stomata and moves to the food-making cells.

A,A,A - Hydrogen joins with carbon dioxide to make food, a type of sugar.

A,A,A The sugar is carried by the vein to the rest of the plant.

A,A,A water + carbon dioxide + energy YIELDS sugar + oxygen

A,A,A Most plants make more sugar than they need.

A,A,A Sugar is stored in cells of plants; sweet-tasting fruits and vegetables contain much stored sugar.

A,A,A Some sugar is changed to starch.

A,A,A Starch is stored in cells of plant.

A,C,C. A white potato is an underground stem that contains large amounts of stored starch.

A,A,A Living things need energy to carry out life processes;

A,A,A they get energy from food (earlier, energy came from sunlight, so kids may think that sunlight is food for plants);

A,A,A energy is food,

A,A,A food is stored energy that must be released for use.

A,A,A Respiration = the process by which living things use oxygen to release energy in food;

A,A,A takes place in cells (Diagram of sugar transport and respiration in root cell); cells need food to carry out respiration.

How cells change sugar to energy:

A,A,A - Sugar is made in the leaf.

A,A,A - It is carried by veins to stem;

A,A,A food-carrying tubes in stem transport sugar to all parts of stem and to roots.

A,A,A - Oxygen enters cell in root;

A,A,A oxygen combines with sugar in the cell.

A,A,A - When oxygen and sugar combine, energy is released;

A,A,A energy is used by the cell to carry out life processes (by this time, I've forgotten what the life processes are).

A,A,A - Carbon dioxide and water are given off as waste products.

A,A,A sugar + oxygen YIELDS energy + carbon dioxide + water

A,A,A The process of respiration is the opposite of the process of photosynthesis.

(Chart comparing the two processes:)

A-6,A-6,A-6 Photosynthesis: takes place only in cells with chlorophyll; food (sugar) is made; sun's energy is stored in sugar; carbon dioxide is taken in ; water is taken in; oxygen is given off.

A-6,A-6,A-6 Respiration: takes place in all cells; food (sugar) is broken down; energy stored in

sugar is released; carbon dioxide is produced and given off; water is produced and given off; oxygen is used.

A,C/A,A Reproduction = process by which living things produce new living things of the same kind.

C,C,C Many flowers have three main parts (diagram of flower, parts labeled): petals, stamen, pistil.

CACC,CACC,C-4 Petals = leaflike outer parts; protect the inner reproductive parts (from what??); often brightly colored; may have sweet odor.

A,C/A,C Stamen = male reproductive part;

C,C,C is a long stalk with a sac at the top;

A,A,A produce pollen grains = a tiny body that contain the male reproductive cell;

A,A,A millions form in the sac;

C,C,C if you rub it, colored dust comes off made up of pollen grains (microscopic photo of sunflower and daylily pollen).

A,C/A,C Pistil = female reproductive part;

A,A,A bottom contains ovary, which contains ovules = small round body that contain female reproductive cells

(Lab) Observe parts of large flowers, identify the parts, shake off pollen.

A-3,A-3,A-3 Pollination = process by which pollen grains move from stamen to pistil; for reproduction, pollen must reach the top of the pistil; flowers are pollinated by insects and by wind.

C-4:A-1,C-5,C-5 Some insects, such as honeybee, are attracted to flowers that have sweet odor and colorful petals; honeybees feed on a sweet liquid produced by flower, brushes against pollen grain, pollen stick to bee, bee carries pollen to pistil.

A,C,C Plants that do not have sweet odor and colorful petals often pollinated by wind carrying pollen from stamen to pistil.

A,C/A,C Grasses and trees are pollinated by wind (photos of black birch flowers and wheat). (Misconception - give the impression that all trees are wind pollinated.)

(Drawing of) pistil, tube, pollen grain on top of pistil.

A-3,A-3,A-3 Pollen grain sticks to top of pistil, grows a tube to ovule, fertilization = male cell combines with female cell.

A,A,A Fertilized ovule becomes a seed containing a tiny young plant and stored food.

A,A,A Tiny young plant = an embryo.

A,C,A Embryo grows = germination (photo of germination process).

A,A,A As it grows, it uses the stored food (Gives the impression that the plant is eating food).

#### **Chapter 4 - Living Communities**

A,C,A \* An ecosystem is a group of living things and their nonliving environment.

A-2,X,X An ecosystem includes all the ways living things in a group interact with each other. It also includes all the ways the living things interact with their nonliving environment.

(Several verbal and illustrated examples of ecosystems.)

A,C,A \* A community = all the plants and animals in a place.

C,X,X Communities are often named for the kind of place in which they live. There are forest, marsh, and pond communities. (Several verbal and illustrated examples of communities.)

A/C,X,X Communities are made up of populations.

A,C,A A population = a group of the same kind of living things;

A,X,X populations in a community interact. (Several verbal and illustrated examples.)

A,C,A \* Succession is the series of changes in the communities of an ecosystem.

A,X,X Environment = everything that surrounds and affects a living thing.

A,X,X Ecology = the study of how living and nonliving things affect each other.

(Photo of) desert (ocotillo, various cacti).

C,C,C Desert is a hot, dry place.

C,C,A Fish and plants in an aquarium need water to live.

A,A,A Plants give off oxygen, which goes into the water.

A,A,A Fish take the oxygen from the water.

A,A,A As they breathe, fish give off carbon dioxide.

A,A,A Plants use it to make food.

A,C,A Without the fish, the plants would die (Misconception - now I know why my kids think this). Without the plants, the fish would die. (Photo of aquarium with fish and plants)

A,X,X Habitat = the special place in a community in which a plant or animal lives. You can think of an ecosystem as the neighborhood that a living thing is part of. The habitat can be thought of as its address.

A,C,C Geese feed on marsh plants, thus making room for more plants to grow;

A,C,C geese wastes enrich the soil, which helps new plants to grow.

A,X,X Within a community there are many habitats (examples given).

C,X,X In a forest the soil is the habitat of ants and earthworms.

C,C,C Rotten tree stump is the habitat of termites.

C,X,X Squirrels live in the trees.

C,X,X Mosses grow on the forest floor, in the shade of trees.

A-4,X,X The habitat of a plant or animal supplies it with many of the things it needs to survive. Some living things can live in more than one habitat. Others can live in only one habitat. Some animals are very limited in their habitat.

C,C,C Photo of saguaro cactus with elf owl; the cactus plant is the habitat of the elf owl. (misconception)

C-2,C,C Koala eats only one kind of plant, eucalyptus tree leaves (photo). So the koala can only live where this kind of tree grows.

C-2,C,C Panda eats only bamboo (photo). Food limits its habitat.

A,X,X Niche = the role that each living thing plays in a habitat (examples given).

CACC,X,X Some squirrels and birds share the same habitat. Yet these animals each have a different niche. Squirrels gather nuts and stay close to their habitat. Some birds are insect eaters.

CCA,X,X They travel great distances from their habitat to get food (misconception - habitat includes all the places the animal goes). Both animals share the same habitat. But they do not have a great effect on each other.

AC-4,X,X Sometimes the niche of one population does affect other populations. A creek is the habitat of a population of beavers. The beavers build dams across the creek. The dams they build create ponds. The ponds become the habitat of fish and plants. The beavers also cut down many trees. How does this affect the tree population (Illustrations of animals in nature)?

ACCA,X,X Ecologists study communities of living things. They try to find out what living things are present. They also want to know the size of each populations. They try to learn whether the populations are changing in size. Ecologists want to know if populations are getting larger, getting smaller, or staying the same (photo of man looking at a bird on a nest).

A,X,X When an animal population changes in size, it often means that there is a change in the birth rate or the death rate. Birth rate is the number of animals that are born in a period of time. What is the death rate? (Further discussion, with only examples of animals.)

A,C,A \* Birth rate, death rate, the amount of food, and the number of predators are factors that affect the size of a population. (all examples are of animals.)

C,X,X A sudden major change, such as a fire, can affect the size of populations. Sudden changes can also affect whole communities.

C,C,C (Text discusses) Volcano at Mt. St. Helens and fires destroy many animals and trees, plants, shrubs, grasses.

C,C,C So do human clear cutting. Photos of forest, log jam, and felled lumber in redwood forest.

C/A,X,X What happens after a sudden major change destroys an ecosystem? The same community does not come back right away.

A,X,X It may take 100 or more years for it to return.

A,X,X During this time there are many changes in the kinds of living things in an ecosystem. The series of changes in the communities of an ecosystem is called succession.

A,C,A Succession in a forest after a fire: beech and maple trees in a forest; those and other plants burned down; area becomes a field with grasses and other low plants and animals; shrubs and young trees grow; beech and maple trees reappear after 100 years (Drawings show

the succession); first stage = pioneer stage; last stage = climax stage, usually stable. (Not meaningful for students in central Texas - do not have forests here; we live in a fire climax, not a stable climax area, and it has all been disturbed.) (Example given of a pond succession.)

(Drawings and explanation of gradual succession in a pond, showing it filling up).

### **Science in Careers**

If you have an interest in plants, you may want to prepare for a career as a botanist. Botanists are scientists who study plants. Many botanists are teachers or researchers.

Flowers are used to add beauty indoors and outdoors. They can help people express feelings. A floral designer is someone who arranges flowers into designs for other people. Classes in flower arranging are offered in many adult education programs. Some people who become floral designers are trained on the job.

### **Chapter 9 - Changes in the Earth**

A/C,C,C Plants can cause rocks to crack and break.

C,C,C Small plants and trees can grow in soil found in cracks of rocks.

C,C,C Plants push against the sides of cracks.

A,C/A,A Mosses and other tiny plants called lichens weather rock by chemical action.

A,A,A The rootlike parts grow into openings in the rock.

A,A,A They produce acids that dissolve some of the rock.

## ***Silver Burdett Science, 1985, Grade 6***

### **Chapter 1 - Living Things**

C,C,A Living things are plants, animals, and some microscopic organisms.

A,C/A,A Living things carry out certain activities called life processes.

C,C,A, \* All living things can grow.

C-3,X,X In the spring, plants grow from the soil. New leaves grow on trees, and trees also grow in size. (Examples of animals and humans).

A,X,X Nonliving things, like rocks and stones, do not grow the way living things grow.

A,C,A Living things can respond to the world around them.

A,X,X Plants may respond to the sunlight by turning toward it.

C/A,X,X Flowers may open in the morning and close at night. (Examples of animals and humans.)

A,X,X Nonliving things do not respond in such ways.

A,C/A,A Living things can produce more living things like themselves. This process is called reproduction.

A,X,X Different things may reproduce in different ways.

A/C,C,A Plants produce seeds that can grow into new plants. (Examples of animals.)

A,X,X Nonliving things cannot produce more of themselves.

A,A,A Living things need energy to grow, to respond to the world, and to reproduce.

A,A,A All living things need food to get energy to carry out the life processes.

C,C,A organisms = label for living things.

C,C,C Trees are organisms.

C,C,C Bark is not an organism.

A,X,X All organisms are alike in that they perform the life processes.

A-2,C/A,A \* Living things are made up of cells - the smallest living part of an organism.

A,X,X There are some differences between animal cells and plant cells.

A-5,A-5,A-5 \* Plant cells have a plasma membrane, cytoplasm, nucleus, thick cell wall; and may contain chloroplasts.

A-3,A-2,A-2 \* Cells reproduce by mitosis, cell division (photos and description of the process); chromosomes contain the cell's genes; genes control the cell's activities.

A,A,A Nucleus - controls the cell's activities.

A,A,A Nucleus contains chromosomes, genes - units that control most of the cell's activities.

A,A,A Cytoplasm - jellylike; has small structures that carry out many activities, such as breaking down food, that keep the cell alive.

A,A,A Vacuoles - clear area in cytoplasm, contains stored food for the cell.

A,A,A Plasma membrane - thin, a living part of the cell; helps control movement of materials into and out of the cell.

A,A,A Cell wall - thick, nonliving; gives shape and strength to the plant cell.

A,A,A Chloroplast - plant cells make their own food in the chloroplasts;

A,A,A contains a green chemical, chlorophyll, that makes the plant green (leaves).

A,A,A Chlorophyll - traps energy from sunlight;

A,A,A energy used to make food.

A-3,A-3,A-3 \* In most plants and animals, cells are organized into tissues, organs, and systems.

A,A,A Tissue - a team of cells that does a special job (example, covering on outside of leaf, several animal examples).

A,A,A Organ - a group of tissues working together to carry out an important activity (no plant examples).

A,A,A System - a team of organs (human examples).

## **Chapter 2 - Plant Growth and Responses**

A,A,A \* Growth in plants occurs only in specialized areas called growth regions (found at tips of stems, branches and roots).

A,C,A \* Plant responses to environmental stimuli often involve growth.

A,C/A,A \* Plants possess adaptations that help them to survive under different environmental conditions.

A,A,A \* Plants contain biological clocks that cause certain activities to take place at certain times during their life cycles; a chemical clock.

A/C,C,A Trees grow without changing the location of limbs on the tree.

A,A,A As cells divide and increase by mitosis in a growth region, this causes the region to grow longer.

C,C,C trunk = stem ("that is how the trunk, or stem, of a plant grows taller.")

A,A,A A ring of growth tissue near outside of stems, branches, and roots causes them to get bigger around.

C,C,C Seasonal changes in plant growth.

A/C,C,C Some kinds of plants grow from seeds in the spring and die in the fall.

A,C,A Before they die, they produce seeds that will sprout when spring returns.

C,C,C Many plants live several years.

A,C,C Some trees live hundreds of years.

A,C,A In some areas in winter, plants that survive for several years are inactive, dormant, but they are still alive.

A,A,A In spring, the growth tissue becomes active again;

A,A,A the cells divide again;

C,C,C in plants that lost their leaves, new leaves develop;

A,A,A the food making process begins again,

A,A,A and energy is available for growth.

C,C,A The stems of trees produce annual rings;

A,C,C each represents a year's growth;

A,C,C in rainy years, the rings are thicker;

A,C,C in drought, growth is slow and rings are thin.

(Teachers' note:) The South has a longer growing season, so rings will be wider (misconception - not true in the deserts).

A,C,A Environment = all the living and nonliving things in an area.

A,C,A Plant's environment must have conditions suitable for growth = sufficient light, water, a proper temperature range. (Teachers' note includes "air" - not in the book?)

A,C,A If a plant cannot grow, it will die.

A,A,A Plants react to light, gravity, and water.

A,C/A,A Response = the reaction of an organism to something in its environment.

A,A,A Stimulus = something that causes a response (example, heat and humans).

A,C,A Phototropism - the response of a plant to light;

A,C,C plants grow toward light;

A,A,A a chemical in the stem moves to the side that is away from the light, causing it to grow faster (experiment to show this).

A,C,A Plants need light to survive.

C-2,X,X Plant stems grow in the opposite direction to the pull of gravity, upward. Plant roots grow in the direction of the pull of gravity, downward.

A,X,X Adaptation = any structure or response that helps an organism to survive.

A,A,A Seeds compete with parent plant for water and light, so need to be spread around in different ways.

(Photograph of) milkweed and maple "seeds" (misconception - these are actually fruits).

C,C,C Apple seeds are hidden in fruits (perpetuates the misconception that fruits are always edible things).

C,C,C Animals eat fruit, seeds are not digested, seeds pass out of the animals and into the soil (This may explain one of my student's misconceptions that when fruit decays, it goes into the soil to produce new plant).

C,C,C Some seeds, such as cocklebur, have stickers that cling to animal fur and carried by the animal.

(Photograph mislabeled; not a "cocklebur").

C,C,A Seeds germinate.

C,A,A Seeds do not germinate if temperature is too low (winter).

C,C,C Pines, firs, and other evergreen trees have needles instead of broad leaves (misconception).

A,C,A Needles have a small surface area;

A,A,A trees lose little water through needles.

A,A,A Needles are an adaptation for conserving water.

A,C,C Evergreen trees are abundant in places where rainfall is not great (That's true, if you know that not all evergreens are needle-bearing.)

(Germination/temperature experiment)

A,C,A Desert plants, such as cactuses, have adaptations to hot, dry places;

A/C,C,A thick stems to store water for use during dry periods;

A/C,C,A long roots close to the surface for absorbing water;

A,A,A seeds have chemicals in the seed coat to keep from germinating until conditions are favorable;

A,A,A rain dissolves the chemicals (Drawing of saguaro cactus).

A,C,A Seeds of some plants are adapted to forest fires: example, seeds in pine cones; seeds of some shrubs (no illustrations).

(Photograph of) saguaro cactuses.

C,C,C Some flowers bloom at different times of year. Photos of day lily, morning glories, moonvine, crocus, mums (may perpetuate the category of "flowers" as including only small plants).

C,C,C Some flowers open at certain time of day.

C,C,C Nearly all the flowers of any one kind of plant bloom at the same time.

A,C,A As a result, pollen can be transferred among the flowers.

A,A,A Many seeds will then be produced.

A-3,A-3,A-3 Biological clock causes plant to respond to changes in the environment (such as, length of day and night.) Ragweed plants (photo) produce flowers when daylight is long, but in Maine, when day is long enough, air is cool, so cannot produce seeds that far north.

A,X,X A biological clock is not a specific part of a plant. It is a kind of "chemical clock" inside the organism. This biological clock causes certain activities to take place at certain times (Various examples).

#### **Chapter 4 - Climate and Life**

(\* chapter concepts)

(Note: This chapter is not included within my concept maps.)

A/C,C,A \* Different regions of the earth contain different biomes. Each biome is characterized by specific types of plants and animals and a particular climate.

(Note: The full text is not included - just a summary. Climatic information was included in text. Numerous photos included.)

A,A,A Water and temperature are critical factors of climate that are important to a biome (more information given).

A/C,C,A \* tundra - biome of the far north; small plants, short growing season; examples, lichens (photo, defined as a type of plant - misconception), grasses, mosses, no trees (information given on animals).

A/C,C,A \* taiga - biome south of tundra; characterized by conifers; examples, fir, spruce, pine (photo, information given on animals).

A/C,C,A \* deciduous forest - a large biome characterized by deciduous trees and definite season each year; eastern US; examples, wildflowers, mosses, ferns, trees - maple, oak (photo of oak, red, deeply lobed), walnut, elm, beech (information given on animals).

A/C,C,A \* tropical rain forest - biome with the greatest number of plants and animals; receives the most rainfall; near the equator; broad leaves that stay green all year because climate does not vary; leaves of tall trees form a roof that keeps out sunlight so few plants grow on forest floor; orchids are vines that grow toward sunlight (photo of red flowers); soil is very poor; when a plant or animal dies, it decays, the nutrients are taken up by the growing plants (information given on animals).

A/C,C,A \* grassland - biome with a large variety of native grasses and a small amount of rain;

prairie; grasses and grains (photo of wheat), few trees; native grasses have been plowed under; grains have been planted - wheat, corn, oats, barley, rye, cereal grains (text doesn't say that grains are type of grass). (Information given on animals.)

A/C,C,A \* desert - biome with very little rain; in US, enough rain for shrubs such as sagebrush; adaptations - cactuses store water; other plants have thick, leathery leaves, little water lost through these leaves; shallow roots extend very far (information given on animals).

A/C,C,A \* aquatic habitat - a body of water in which organisms live; freshwater habitat - cattails, water lilies; marine habitat - kelp (poor photo) and other types of seaweed (information given on animals).

A-4,A-4,A-4 The source of all food in the oceans is plants that carry out photosynthesis (not explained); need sunlight; cannot get sunlight deep in ocean; microscopic plants float on surface - plankton; ocean food chain example given.

C,C,C Palm trees live where it is warm (no photo).

C,C,C A cactus lives where it is dry (photo of saguaro cactus).

C,C,A Trees important for lumber for buildings, furniture, pulp for paper.

C,C,C Many trees produce fruits and nuts that are eaten by animals (no photo).

C,C,C In autumn, leaves change from green to red, gold, or brown;

C,C,C leaves fall;

C/A,C/A,A leaves decay and enrich the soil.

C-3,C-3,C-3 Conifer = trees that produce seeds in cones; most are evergreens; most have needlelike leaves (examples given).

C,C,A Deciduous trees are broad-leaved trees (misconception);

C,C,C most lose their leaves in autumn.

(Photo of) oak leaf and distance shot of forest, leaves red.

(Photograph of) algae.

### **Science in Careers**

C,C,C Botanist - a person who studies plants.

A-4,X,X Some botanists study plant growth. Botanists also attempt to develop new types, or strains, of plants. Botanists may develop strains of food plants that give higher yields. Or the new strains may be resistant to diseases.

### **Chapter 14 - Growth and Development**

(focuses on animals but has a few mentions of plants)

C,C,C. A new plant can often be grown from a leaf taken from the parent.

A,A,A Dominant and recessive genes - beans

A,C,A Life cycle = the stages that a living thing goes through (all examples, humans)

## Appendix B-2: Names for Plants in *Silver Burdett Science*, 1985

(\* = plant names that the researcher believes would be unfamiliar to children in Central Texas)

### First grade

tomato plant, \* hickory tree, geranium, wheat (all with photos or drawings). Categories: plants, evergreen, grass, mushrooms, cactus, \* saguaro (photo).

### Second grade

beans, sunflower plants, sunflower seeds, pumpkin, peanuts, orange tree, tomatoes, tomato plant, apple tree, apples, lily pads, cattails, sweet potato. Categories: \* seed plants, plants, bushes, tree.

### Third grade

cotton, mold, mildew, oranges, carrot, radish, beet, dandelion, rhubarb, dry beans, peanuts, wheat, bean, cattail, strawberries, potatoes, zinnias, corn, houseplants, \* mangrove trees, sugar maples, oaks, pines, aloe plant, parsley, chives, cucumber, pumpkin, ivy, English ivy, bamboo; photos of goldenrod, \* trout lily, banana tree leaves, American elm leaves, juniper, palm leaf, \* saguaro cactus; photos of \* forsythia, \* alyssum, \* crab tree; photos of potatoes, carrots, peanuts, lettuce, beets, tomatoes, spinach, cucumbers, cabbage, asparagus; oatmeal, cornflakes; (grains = the seeds of certain grasses) oats, corn, wheat, rice; photo of wheat field, rice field; drawing of oat plant; cocoa, chocolate; \* cacao tree (photo); coffee, tea, (spices -) mustard, cloves, nutmeg, pepper, cinnamon; drawings of poison ivy, poinsettia, \* yew, holly, buttercup (*Ranunculus*); (vegetables) lettuce, tomatoes; bread, potatoes. Categories: plants, bushes, weeds, shrub, herb, vine, \* seed plants, vegetables (illustrated), mushrooms (illustrated), grass, grains, spices.

### Fourth grade

(drawings of) apple, oats, wheat, peas, banana, almonds, and lemons, showing seeds; (photos of) daffodil, daisy, day lilies, violets, \* trillium, rose; oak, \* ginkgo, locust, \* hemlock, maple; \* orchids; Spanish moss (photo); pines, \* firs, \* spruces, cedars, \* larches (= \* conifers); \* swamp, \* red, \* jack, \* mountain, \* scotch, and \* white pine; (fungi =) \* slime mold, \* yeasts, \* rusts, \* smuts, \* rots, molds; (photos of mushrooms include) \* shaggymane mushroom, \* flytrap mushroom, \* intricate morel, \* creosote bush; prickly pear; roses, bean plants, \* Ponderosa pine, poison ivy, peanut, corn, juniper, \* kelp, ivy, peas, cucumber. Categories: ferns, mushrooms (photos of some), mosses, algae, \* fungi; trees, plants, green plants, \* seed plants, bush, shrub, grasses, \* conifers, cactus plants (\* saguaro, illustrated), \* monocots, \* dicots, \* flowering plants, \* cone-bearing seed plants.

### Fifth grade

daffodil flower, radish, bean, \* venus flytrap (photo), potato; sunflower, daylily, wheat (photo), \* black birch (photo), bamboo, \* eucalyptus tree, \* redwood trees (clearcutting photo), \* beech trees, maple trees, \* marsh plants, \* saguaro cactus. Categories: grasses, mosses (photo), trees, plants, green plants, shrubs, \* lichens (photo on rock), cactus plant.

### **Sixth grade**

(flowers =) day lilies, mums, and \* crocuses; apple, \* orchids, \* plankton, palm trees; \* saguaro cactuses; \* fir; bean; milkweed; \* cocklebur; \* moonvine (*Datura*); morning glories; four o'clock; ragweed plants (photograph); evergreen, \* spruce, pine (photo), (trees =) maple, oak (photo of oak leaf, red, deeply lobed), walnut, elm, \* beech; (grains =) wheat, corn, oats, barley, rye, cereal grains; cattails, water lilies; \* kelp (poor photo). Categories: seaweed, algae (photo), plants, shrub, vines, flowers, trees, ferns, grains, wildflowers, \* conifers, evergreen trees, \* deciduous trees, \* broad leaf trees, \* lichens, cactuses, grasses, mosses.

## Appendix B-3: Terms for Botanical Concepts, in *Silver Burdett Science*, 1985

(\* = newly introduced scientific terms; not folk terms)

### **First grade**

Defined by text: Categories: living things, plants.

Not defined by text:

- Poor verbal definitions: food, seeds.

- Defined by illustration only: bloom, flower, leaves, roots, stems. Categories: cactus, evergreen, grass, mushrooms.

### **Second grade**

Defined by text: seed, \* seed coat. Categories: plants.

Not defined by text:

- Poor verbal definition: branches, desert, flowers, food, fruits. Category: tree.

- Defined by illustration only: leaves, root, stem.

- Illustrated only, no caption: Category: cactus.

- Not illustrated, not defined: \* dispersed, \* environment. Categories: bushes.

### **Third grade**

Defined by text: compost, food, fruit, \* germinate, \* nutrients, roots (including) \* taproot, \* fibrous root, \* prop roots; seeds, seed coat, starch, stems, trunk. Categories: grains, \* seed plants, spices.

Not defined by text:

- Poor verbal definition: \* carbon dioxide, cones, flowers, leaves (well-illustrated), \* minerals, \* oxygen (both carbon dioxide and oxygen may be adequately defined for third grade usage), \* protein, scales, sugar, \* vitamins. Categories: herb, grass, green plant, living thing, plant, shrub, tree (definition too limited), vegetables, vine, weeds.

- Defined by illustration only: branches. Categories: bushes, flowers, cactus, mushrooms.

- Not illustrated, not defined: \* absorb, bark, \* classified, \* conduct, \* energy (defined in other chapters but not in relation to living systems), wood.

#### **Fourth grade**

Defined by text: \* adaptation, classify, \* community, \* consumers, flower, needles, \* food chain, \* food web, petal, \* producers, \* pistil, \* stamen (though flower parts are defined, not enough examples shown to enable student to recognize diverse forms in nature), \* tendrils. Categories: algae, cone-bearing seed plants, \* conifers, flowering plants, fungi, living things, seed plants.

#### Not defined by text:

- Poor verbal definition: structural adaptations, behavioral adaptations, buds, desert, food, leaves, \* ovary, \* reproduce, \* spores, spines = needle-shaped leaves, roots, seed, stems. Categories: cactus plants, \* dicot, ferns, green plants, \* monocot, mosses, mushrooms, plants, trees.

- Defined by illustration only: cones, \* leaflets, (types of leaves) \* simple, \* compound, \* lobed, \* toothed (these terms are not in text but are in one of the activities), scales. Categories: bush.

- Not illustrated, not defined: \* chemicals, energy (defined in other chapters), thorns. Categories: shrub, grasses.

#### **Fifth grade**

Defined by text: absorb, \* birth rate, \* cells, \* chloroplasts, community, \* ecology, \* ecosystem, \* environment, \* fertilization, flower, germination, leaves, \* life processes, \* niche, \* ovary, \* ovule, petal, \* photosynthesis, pistil, \* pollen grains, \* pollinate, \* population (adequately defined but not enough example), \* reproduction, \* respiration, roots, \* root hairs, seed, \* succession, stamen (flower parts defined in more detail, but still not enough examples), stems, \* stomata, vein. Categories: living things (text gives much information about characteristics of living things without giving adequate examples of living things).

#### Not defined by text:

- Poor verbal definition: \* chlorophyll, \* death rate, desert, \* embryo, food, \* habitat, \* reproductive cells. Categories: green plants, \* lichens, plants.

- Defined by illustration only: forest. Categories: cactus plant, mosses, trees.

- Not illustrated, not defined: carbon dioxide, chemical, energy, \* hydrogen, \* interactions, minerals, oxygen, starch, sugar, \* transported, \* waste materials. Categories: shrubs, grasses.

#### **Sixth grade**

Defined by text: adaptation, \* aquatic habitat, \* annual rings, \* biome, \* botanist, cells, \* cell wall, chloroplasts, chlorophyll, \* cytoplasm, desert, environment, germination, \* grassland, life processes, \* mitosis, needles, \* nucleus, \* organ, \* organism, \* plasma membrane, \* phototropism, \* response (defined but not illustrated adequately), \* stimulus (defined but not illustrated adequately), \* system, \* taiga, \* tissue, \* tropical rain forest, \* tundra, \* vacuoles. Categories: conifers, living things.

Not defined by text:

- Poor verbal definition: \* biological clock, branches, \* chromosomes, cones, \* critical factors, \* dormant, \* environmental stimuli, food, \* genes, \* growth tissue, leaves, reproduce, roots, seeds, stem, trunk (= stem). Categories: \* broad leaf trees, cactus, \* deciduous trees, evergreen trees

(= conifers), flowers, lichens, plants, trees.

- Defined by illustration only: acorns, flowers, forest, limbs, sprout, stickers. Categories: algae, ferns, grains, grass, moss.

- Not illustrated, not defined: bark, bloom, \* conserving, chemical, energy, fruit, \* gravity, habitat, nuts, nutrients, photosynthesis, pollen, producers, \* surface area. Categories: broad leaf trees, shrub, vines, wildflowers.

### **Composite Lists of concepts**

**Terms for botanical concepts defined by text (Grades in which defined):**

absorb - 5; adaptation - 4,6; aquatic habitat - 6; annual rings - 6; biome - 6; birth rate - 5; botanist - 6; cells - 5,6; cell wall - 6; chloroplasts - 5,6; chlorophyll - 6; classify - 4; community - 4,5; compost - 3; consumers - 4; cytoplasm - 6; desert - 6; ecology - 5; ecosystem - 5; environment - 5,6; fertilization - 5; flower - 4,5; food - 3; food chain - 4; food web - 4; fruit - 3; germinate - 3; germination - 5,6; grassland - 6; habitat - 5; leaves - 5; life processes - 5,6; mitosis - 6; needles - 4,6; niche - 5; nucleus - 6; nutrients - 3; organ - 6; organism - 6; ovary - 5; ovule - 5; petal - 4,5; photosynthesis - 5; phototropism - 6; pistil - 4,5; plasma membrane - 6; pollen grains - 5; pollinate - 5; population - 5; producers - 4; reproduction - 5; respiration - 5; response - 6; roots - 3,5, taproot - 3, fibrous root - 3, prop roots - 3; root hairs - 5; seed - 2,3,5; seed coat - 2,3; stamen - 4,5; starch - 3; stems - 3,5; stimulus - 6; stomata - 5; succession - 5; system - 6; taiga - 6; tendrils - 4; tissue - 6; tropical rain forest - 6; trunk - 3; tundra - 6; vacuoles - 6; vein - 5. @UN[Categories defined:] algae - 4; cone-bearing seed plants - 4; conifers - 4,6; flowering plants - 4; fungi - 4; grains - 3; living things - 1,4,5,6; plants - 1,2; seed plants - 3, spices - 3.

**Botanical concepts not defined in any grade:**

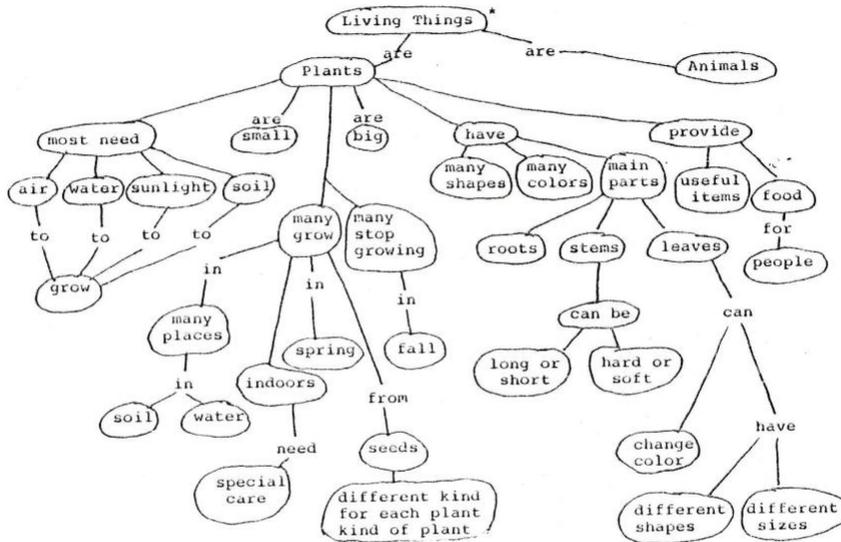
acorns; (adaptations - ) structural and behavioral; bark; biological clock; bloom; branches; buds;

carbon dioxide; chemicals; chromosomes; conduct; cones; conserving; critical factors; death rate; dispersed; dormant; embryo; energy; environmental stimuli; forest; genes; gravity; growth tissue; hydrogen; interactions; leaflets; (types of leaves) compound, simple, lobed, toothed; limbs; minerals; nuts; ovary; oxygen; protein; reproductive cells; scales; spines; spores; sprout; stickers; sugar; surface area; thorns; transported; vitamins; waste materials; wood.  
@UN[Categories not defined:] broad leaf trees; bushes; cactus; deciduous trees; dicots; evergreen trees; ferns; flowers; grasses; green plant; herb; lichens; monocots; mosses; shrub; tree; vegetables; vine; weeds; wildflowers.

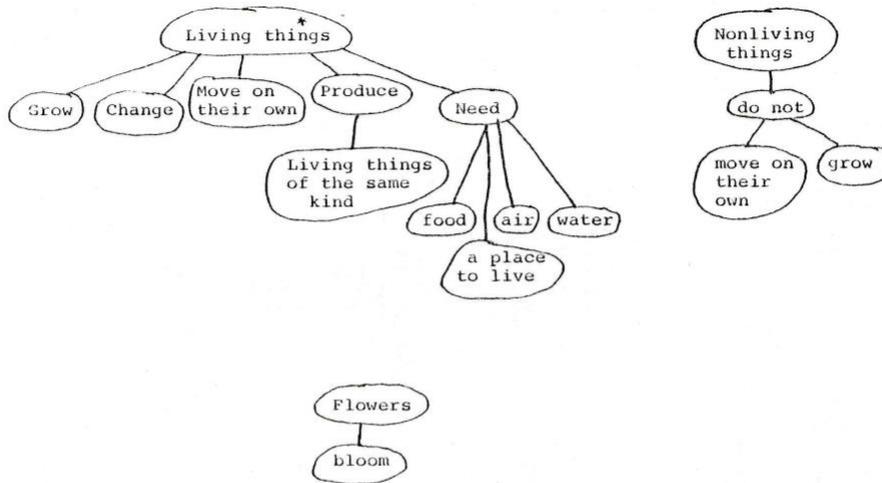
#### Appendix B-4: Concept Maps of Botanical Propositions from *Silver Burdett Science*

Note: \* = Concept continued elsewhere on concept map

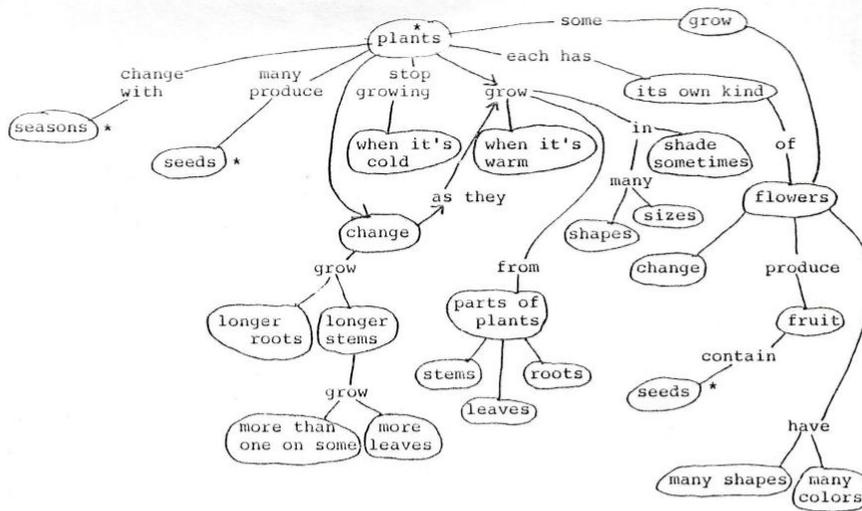
These concept maps have been photocopied from my original dissertation book, which is why the edges are peculiar.



Grade 1, botanical propositions

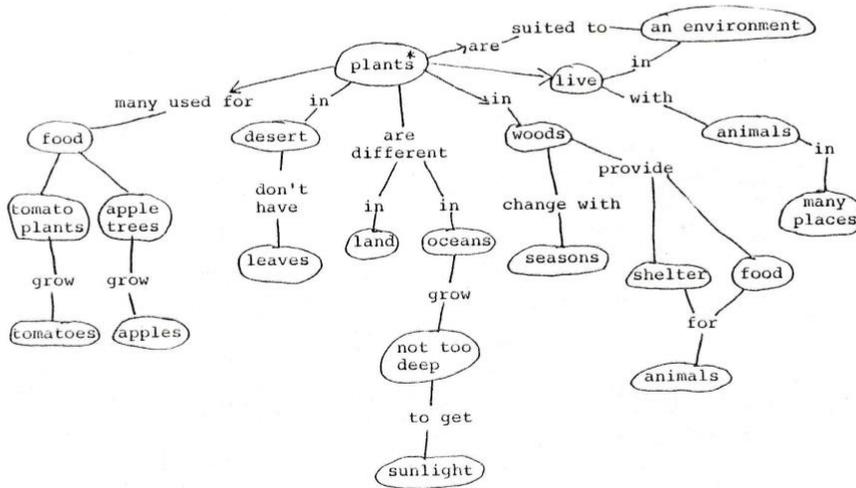


Grade 1 (continued).



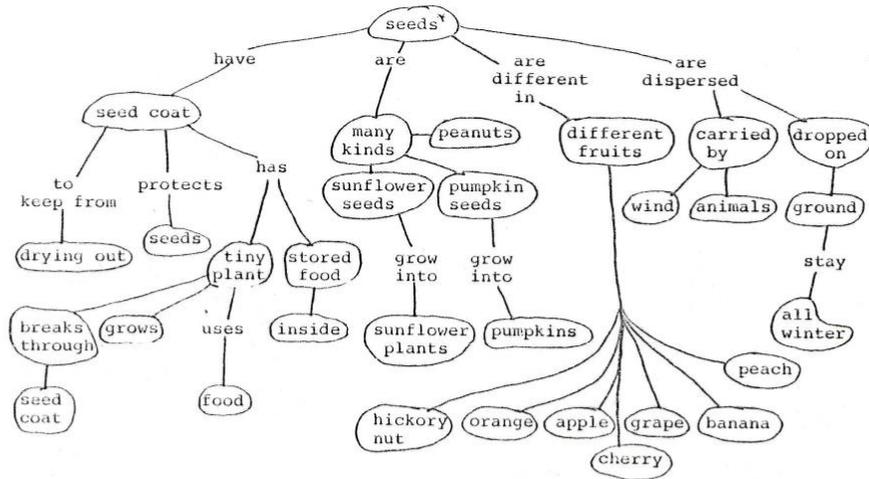
Grade 2.

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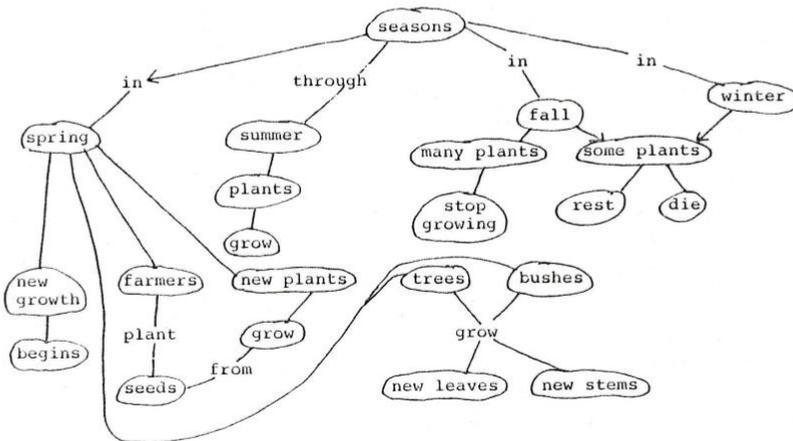
Grade 2, continued.

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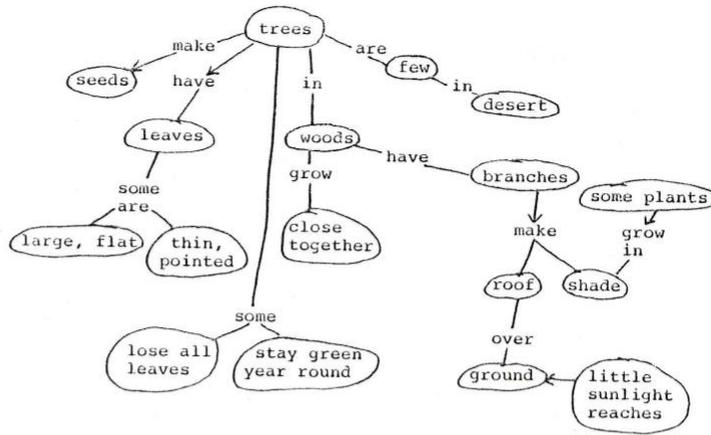
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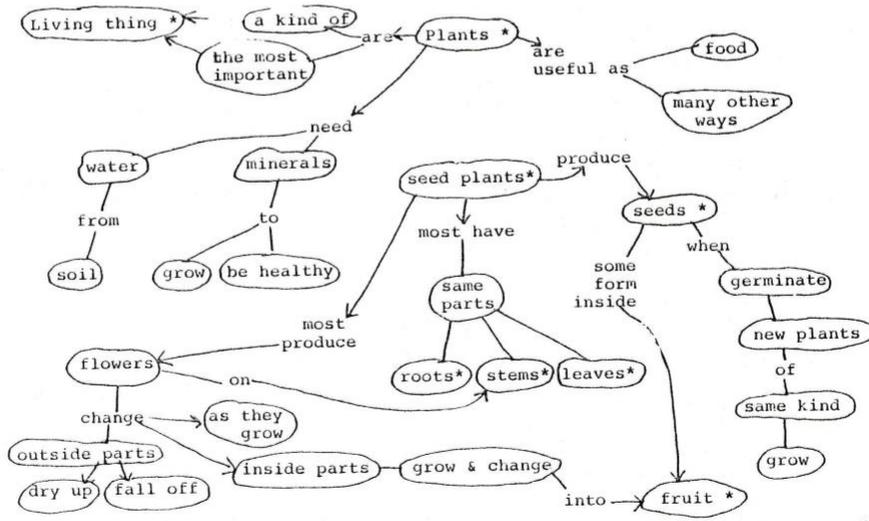
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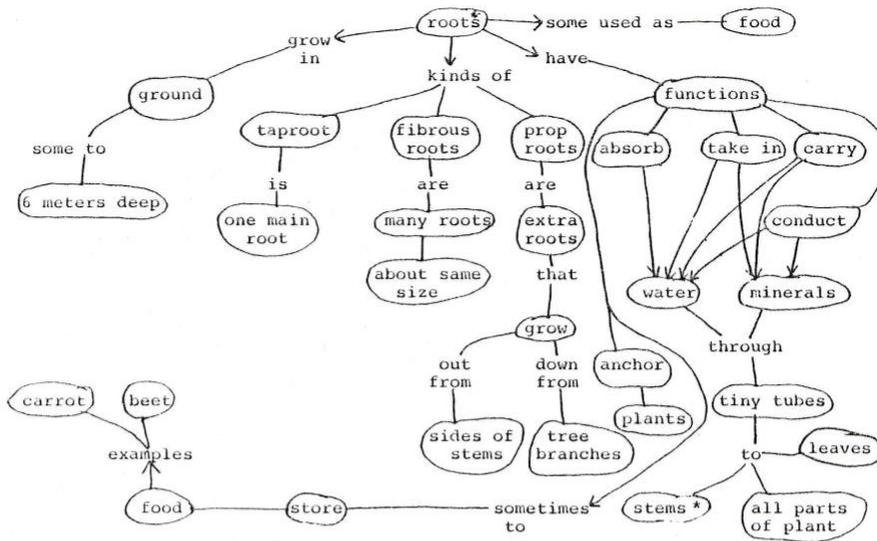
Grade 2, continued.

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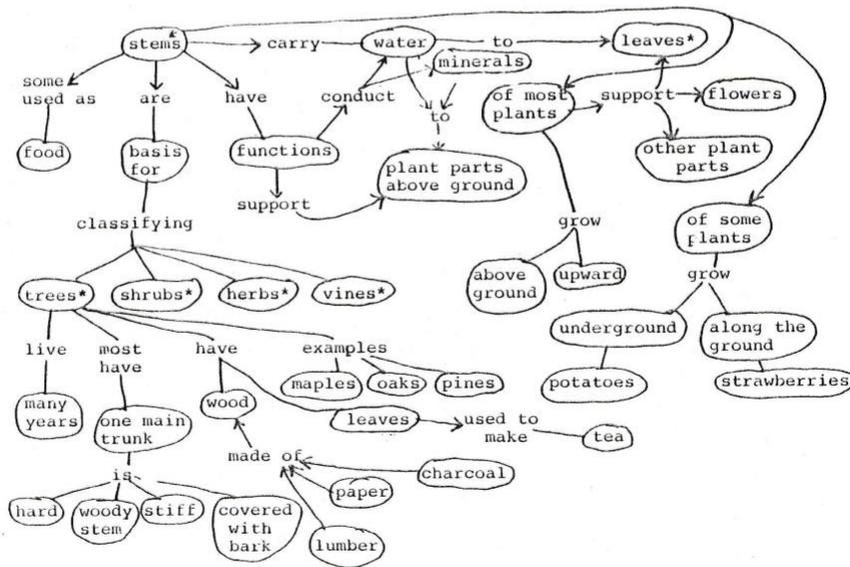
Grade 3.

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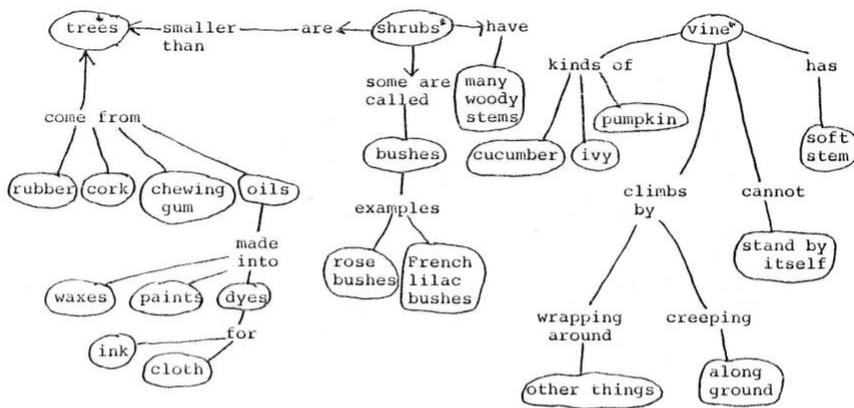
Grade 3, continued.

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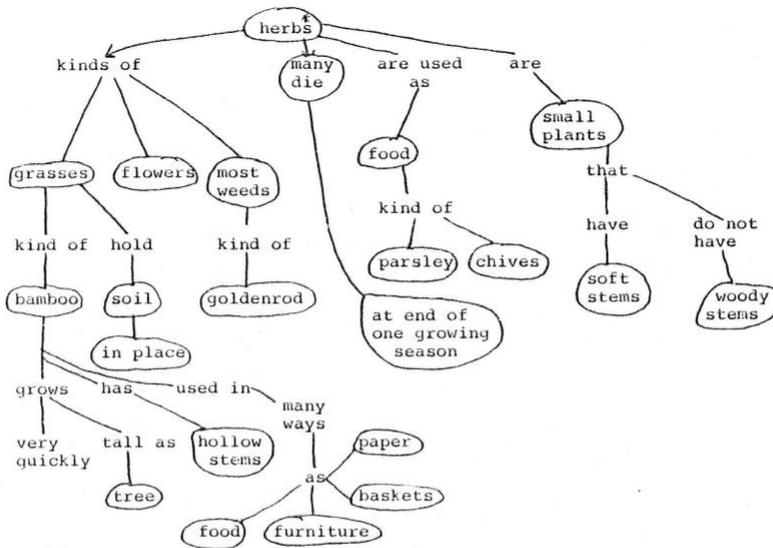


Grade 3, continued.

622

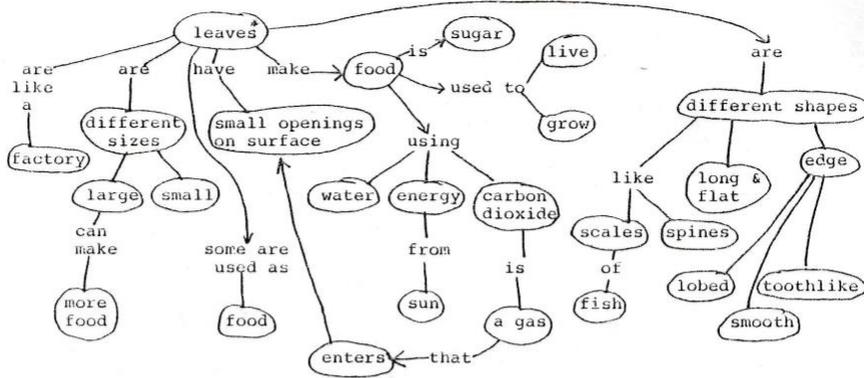


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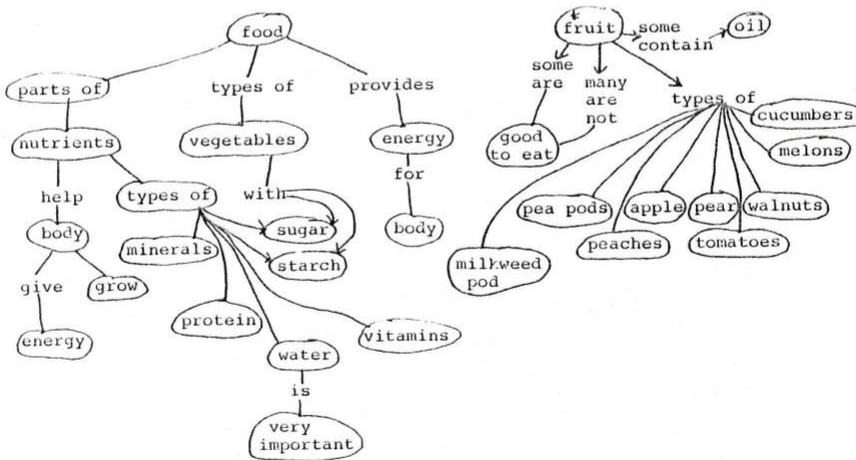
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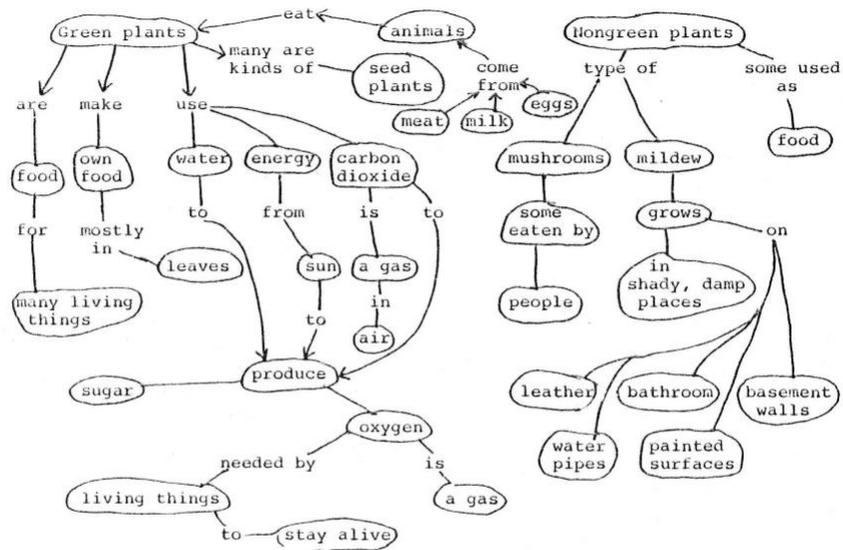
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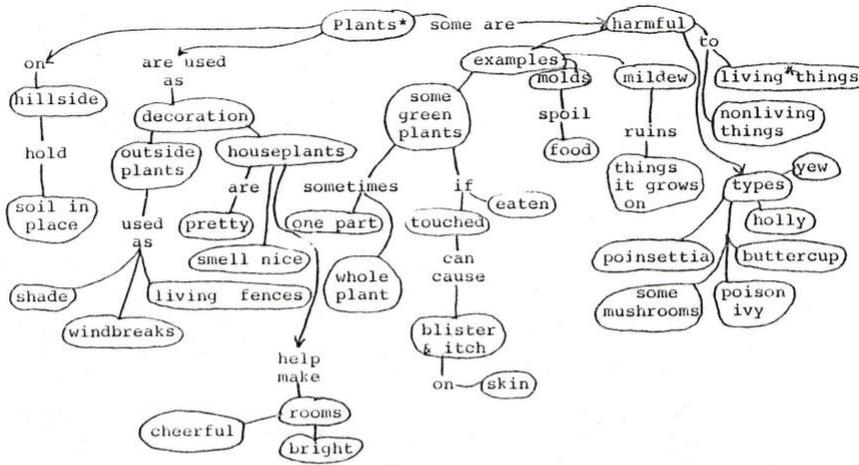
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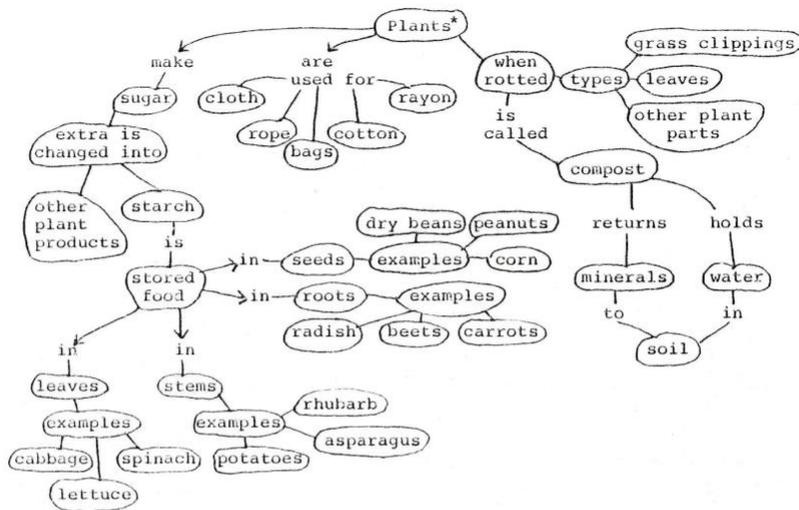
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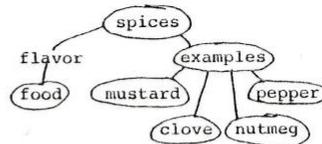
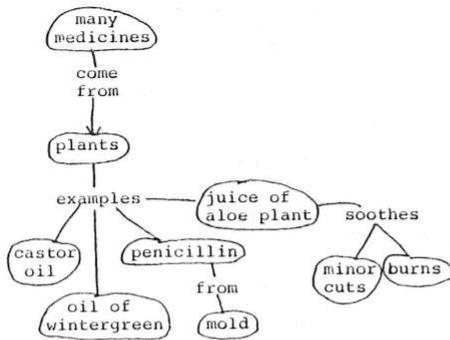


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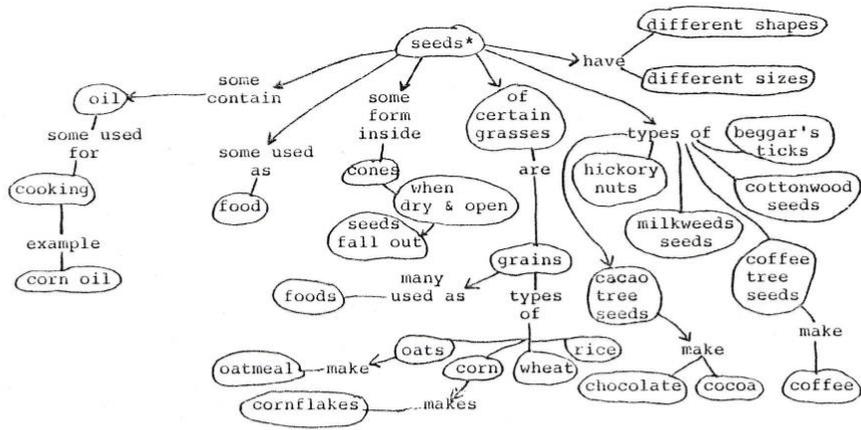
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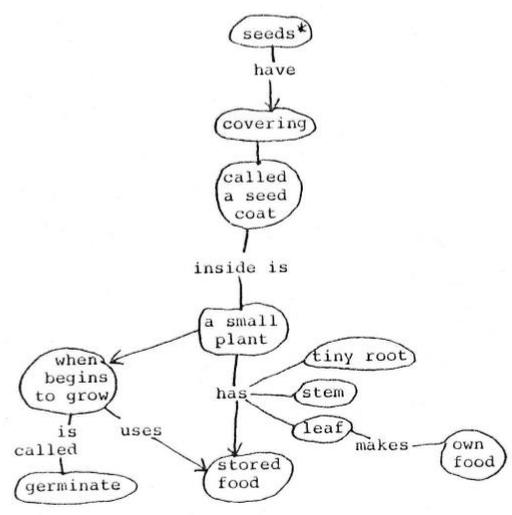
Grade 3, continued.



Grade 3, continued.



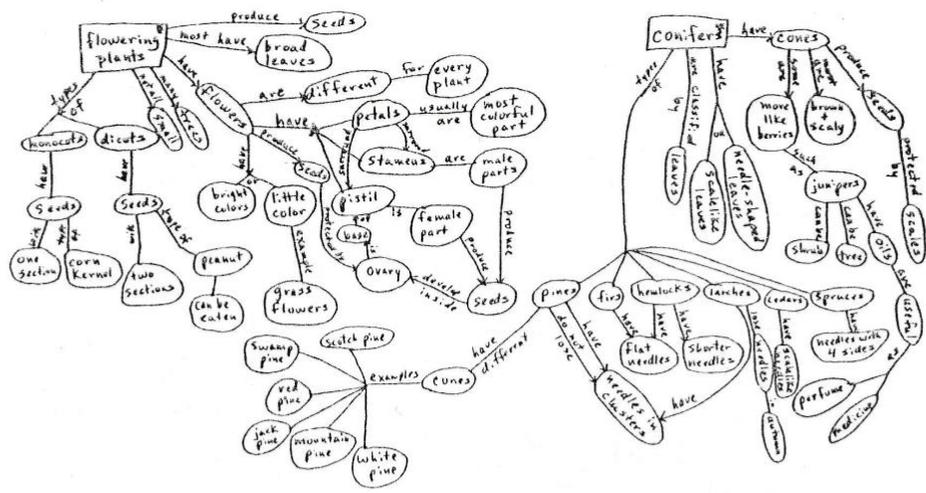
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Grade 3, continued.

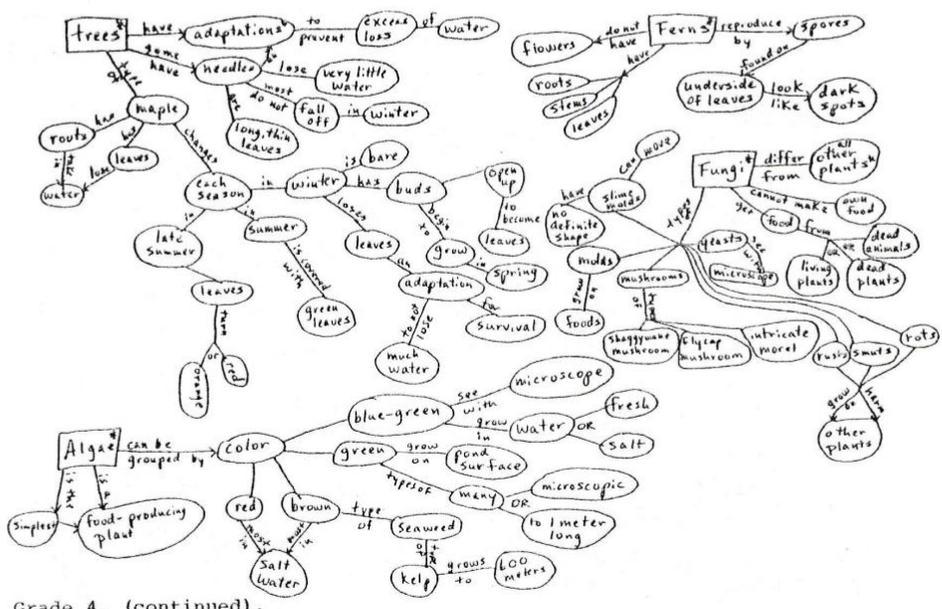
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Grade 4, (continued).

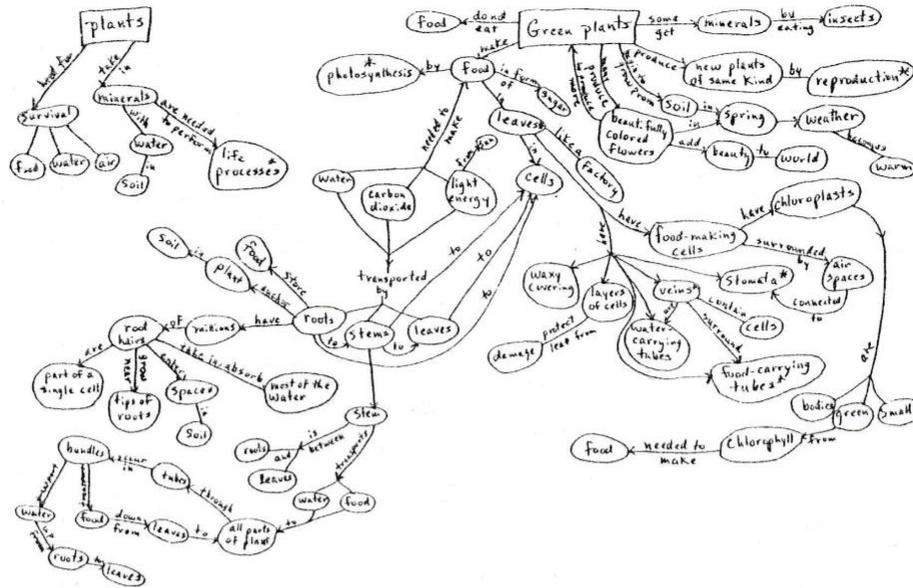
635



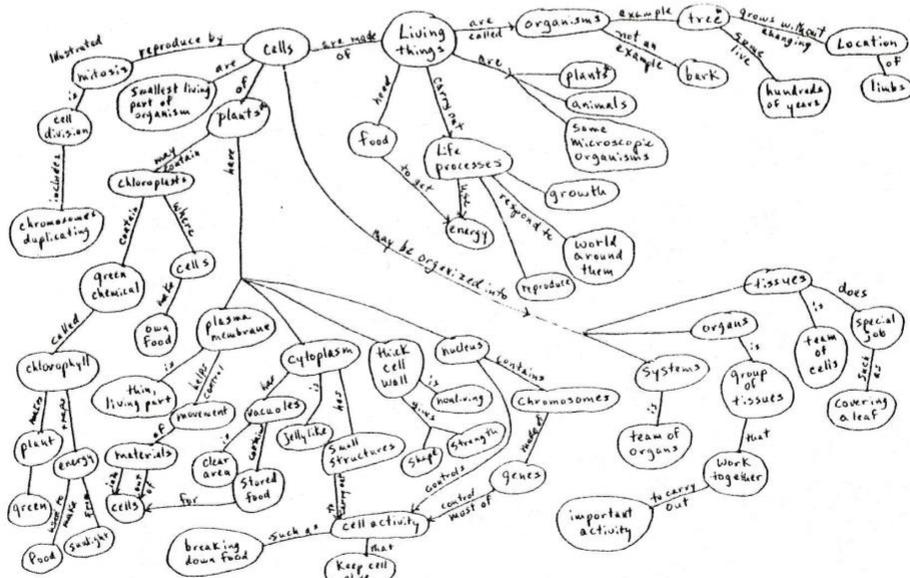
Grade 4, (continued).

636





Grade 5, (continued).



Grade 6, botanical propositions.

Note. Chapter 4 is not included.



## Appendix B-5: False and Misleading Statements in *Silver Burdett Science*

### Grade 1

Chapter 5: A photograph of animals running and flying by the ocean accompanied the statement, "Many living things move on their own." The juxtaposition would not assist in eliminating the naive childhood concept that water is a living thing. At age 12 at least one of the informants (number 2) still believed that inanimate objects can be living things. She stated that water is living because it moves, and dirt is living because it needs water and sun. For most informants in this sample movement was the most important character for distinguishing between living and non-living things.

### Grade 2

Chapter 2: The text used fruits in reference only to edible, fleshy fruits, and seeds in reference to the dry, non-fleshy fruits of the sunflower. Laymen commonly mistakenly call dry fruits seeds and use fruits only in reference to edible foods. Those meanings of the terms were evident in the responses of the children.

The statement, "Inside each fruit is a tiny plant," is misleading. An embryo is not quite the same thing as a tiny plant. This misleading concept was repeated in grades 3 and 5.

The statement, "Flowers change as the plants grow," is nonsensical.

In an illustration of examples of seeds in fruit, a banana was shown. In fact, the seeds of bananas are undeveloped and virtually unnoticeable.

Chapter 3: In an experiment, the text posed the question, "Why don't desert plants have leaves?" In fact, many plants in the desert have leaves. The text stated that desert soil is sandy. In fact, many areas of the Chihuahuan and Sonoran Deserts are not sandy. The text needs to reflect a wider selection of American deserts or else regional supplements are needed for students living near deserts.

### Grade 3

Chapter 3: The text stated that "seeds plants are classified as trees, shrubs, herbs, or vines." These categories are not part of a scientific classification scheme.

The statement, "Green plants make their own food," was repeated in grades 3,4,5 and 6. Because of the confusion about eating food versus producing food, the text may serve the students better by describing to photosynthesis as a carbohydrate production mechanism. Food is used in so many different manners in the text that confusion arises about its meaning. Most of the informants in this research did not seem to know that plants make their own food, and most thought that plants get their food from the soil.

The statement that some roots, "may grow 6 meters deep," provided arbitrary and useless information. In fact, some roots can grow several hundred meters deep!

The text stated that "some shrubs are called bushes." The text may create the impression that bush is a subset of shrub rather than simply an alternate name for the same concept. The terms are used interchangeably in the adult vernacular, but bush tends to be more of a folk term, and shrub is used more by horticulturalists and botanists. Only one informant used the term shrub, and then only as a restricted subset of bushes.

The text stated that some leaves are "shaped like spines". An adjacent photograph of a saguaro cactus may help an alert person recognize that the text is referring to cactus spines in this statement. Though it is botanically accurate to refer to cactus spines as modified leaves, such a statement used in a third grade text deserves some explanation. The illustration needs a caption. Spines are also called "leaves" in grade 4, chapter 4.

The statement, "Most herbs live only one growing season," is false. The text did not acknowledge the culinary use of the term herb.

The statement, "A vine has a soft stem," is misleading as many vines are woody. Several informants classified only herbaceous vines as vines. Did they learn that restricted usage from the text or is it the common lay usage?

A photograph of a tree in summer and autumn, showing the leaves changing colors, had no caption and was unrelated to the text.

Chapter 4: The statements, "Mushrooms are plants," and, "Mildew is a nongreen plant," are false. Modern botanists consider that the fungi belong to a distinct kingdom and are not plants.

Chapter 14: The text called water a nutrient. Though others may disagree, the researcher considers this an inaccurate, or at least misleading, use of the term nutrient. The text stated that water and minerals are two of the nutrients in food. From that statement, a child might assume that if water and minerals provide nutrients, ie., food, for animals they also provide food for plants. The usage of water as nutrient may cause a conflict for the child when the concept of photosynthesis is introduced. Most of the informants thought that water is part of a plant's food.

#### **Grade 4**

Chapter 2: The text (p. 27) classified fungi and mushrooms as types of plants. Modern taxonomists classify fungi in a kingdom distinct from plants.

Misleading information, p. 30: "Most flowers have the same basic parts" (the petals, stamens, and pistil). The text does not point out that some flowers lack one or more of these parts.

The statement, p. 33, "Most flowering plants have broad leaves," is misleading. The term "broad leaves" was not defined. The author may have meant to refer to the difference between "broad leaf trees" and "needle-bearing trees."

The text stated that the daisy (photograph page 32) has 8 petals. The daisy is a member of the sunflower family. The photograph showed an inflorescence known as a head which is composed of numerous tiny flowers densely arranged on a single receptacle. The textbook author has made the common error of counting the individual flowers as petals.

The text (p. 34) stated that "only pines and larches have needles in clusters." Though not found wild in the U.S., a number of ornamental cedars (*Cedrus* species) have needles in clusters. The names "cedar" and "juniper" are used in the text as though they were referring to different types of plants but the common names are both commonly used to refer to various *Juniperus* species, and the illustrations both appear to be of *Juniperus* species.

The text, p. 38, stated that "Fungi differ from all other plants because they cannot make their own food." Again, the text makes the error of calling fungi plants. Some flowering plants are true parasites and do not make their own food. The text classifies slime mold as a type of fungi. Modern taxonomists would object to that classification.

Chapter 4, p. 74: An illustration of poison ivy accompanied the statement, "Some plants contain chemicals that harm animals." To the best knowledge of the researcher, humans are the only animals that poison ivy harms.

## **Grade 5**

Chapter 1: The text suggested that the teacher get students to compare themselves to elk because they drink, eat, and breathe. Discussion about breathing in this part of the text may give students the impression that plants breathe the same as humans.

The text, p. 9, stated that the venus flytrap "gets minerals by eating insects." This statement perpetuates the misconception that minerals are food for plants and that plants eat.

Photosynthesis is portrayed here (p. 12) and throughout the grades primarily as a food making process. Problems with this portrayal are discussed elsewhere.

The textbook statements (p. 16), "Living things get energy from food," "The energy in food is stored energy," and that sugar changes to energy in cells, may lead one to misconceptions about the relationship of energy to matter. Combined with earlier statements about plants getting energy from sunlight, these statements can lead one to believe that sunlight is food for plants. In fact, plants convert solar energy to electrical energy, which is used to bond molecules (matter) together to produce carbohydrates.

The statement (p. 21), "Grasses and trees are pollinated by wind," is misleading as many trees are insect pollinated. Though some informants used the term pollen, none of them understood its function.

Chapter 4, p. 83: In the section of life in an aquarium, the carbon dioxide/oxygen cycle was discussed. The text stated that, "Without the fish, the plants would die. And without the plants, the fish would die." The misconception that plants would die without animals, as here stated, was repeated by some of the informants. In fact, plants receive carbon dioxide from several sources other than animals.

Chapter 4, p. 87: The caption, "The cactus plant is the habitat of the elf owl," accompanied a photograph of a saguaro cactus with an elf owl in a nesting hole. The term habitat refers to more than just the nesting place of an animal; it includes the entire area in which the animal spends time.

Chapter 9, p. 219: The text referred to lichens as plant. In fact, lichens are made up of algae and fungi. Some algae are considered plants by some botanists, but fungi are in a separate kingdom.

## **Grade 6**

Chapter 2, p. 31: In mentioning the ring of growth tissue near the outside of stems of trees, the text did not differentiate between dicots and monocots. In fact, monocots do not have such rings.

The statement in the teacher's edition that, "The South has a longer growing season, so rings will be wider," may be true for the wet southeastern United States, but is not necessarily accurate for the arid Southwest where drought can retard ring growth.

In a photograph, p. 36, maple samaras, dry fruits, were mistakenly labeled seeds. This is a common layman's mistake.

The statement, p. 37, that, "evergreen trees have needles," is false and misleading. It is a common adult misconception that all evergreens are conifers. In fact, many evergreen trees in the desert do not have needles. The term evergreen was not defined in the text. In chapter 4, the text stated, "Most conifers are evergreens," but did not offer any examples. The few informants who used the term evergreen used it exclusively in reference to needle-bearing trees.

A photograph (p. 37) of a *Geum* was incorrectly labeled as a "cocklebur".

Chapter 4, p. 81: The text mistakenly calls lichens plants.

With the information on tropical rain forests, the statement (p. 90) was made that "nutrients (in soil) are immediately taken up by growing plants." In grade 3, the text equated nutrients

with food. This statement perpetuates the misconception that plants get food from soil.

## Appendix B-6: Repetition of Botanical Topics in *Silver Burdett Science*

(Notes: "7" indicates which topics were also included in the seventh grade text, *Life Science*, Macmillan, 1986)

"Community" - defined in grades 4 and 5

Conifers have needles instead of broad leaves and produce seeds in cones - grades 4 and 6

Needles are adaptations to conserve water - grades 4 and 6

Discussion of cactus adaptations for water conservation - grades 4 and 6 (chapters 2 and 4)

All living things can grow, respond to the world around them, reproduce, and use energy - grades 5,6,7, with parts redundant in grades 1,2,3,4.

Living things are made up of cells - grades 5,6,7

Needs of plants - grades 1,3,4,5,6,7

Plants change seasonally - grade 2 (chapters 2 and 3) and grades 4 and 6

Plants grow in many sizes and shapes - grades 1,2

Plants produce new plants of the same kind - grades 1,2,5,7

Some plants produce flowers - grades 2,3,4,5,7

Flowers have three main parts, petals, stamens, pistils (function described) - grades 4,5,7

As a flower grows, the inside part changes into a fruit; seeds form inside the fruit - grades 2,3,7

Plants produce seeds that can grow into new plants - grades 1,2,3,6,7

A seed has a covering called a seed coat; inside the seed coat is a tiny plant - grades 2,3,7

Seeds have different shapes and sizes - grades 1,2,3

Germination discussed - grade 3,5,6,7

Function of roots and stems - grades 3,5,7

Living things need food to get energy - grades 3,4,5,6,7

Green plants are food for many living things - grades 1,2,3

Plants make their own food (photosynthesis) - grades 3,4,5,6,7

The products of photosynthesis

- sugar, some of which is changed to starch - grades 3,5,7

- oxygen - grades 3,5,7

Chlorophyll makes the leaves green, is needed by the plant to make food - grades 5,6,7

The leaf of a green plant is like a factory - grades 3 and 5

Appendix B-7: Summary of Botanical Topics in *Life Science*, Macmillan, 1986

(\* = Topics duplicated in elementary textbooks, *Silver Burdett Science*)

**Chapter 1 - What life science is**

\* Botany is the study of plants.

\* Activities of living things; basic life processes:

- \* Nutrition - the intake and use of food; food provides substances for growth and repair of cells, provides energy. \* Energy = the ability to do work. Work means activities such as moving, growing, getting rid of wastes. \* Plants make their own food.

- \* Respiration - process by which energy is released from food.

- Excretion - removal of wastes.

- \* Response and movement (example, plants bend toward the light.)

- \* Growth and development - increases in size, changes in appearance.

- Death and \* reproduction.

\* Needs of living things:

- \* Oxygen for respiration.

- Water - living bodies are between 60-90 % water; helps breakdown of food and transportation of oxygen by blood.

- \* Energy - plants use energy from sun to make food.

- Temperature.

- \* Light - plants use energy from sunlight; example of barley growing in different states, dependent on hours of daylight.

Organization in living things.

\* Cells, \* tissues, \* organs, \* systems.

**Chapter 2 - Basics of life science**

\* Cells

\* Parts of cells and their functions.

Atoms.

Transport in cells.

\* Photosynthesis, \* chlorophyll, \* chloroplasts.

Releasing energy from food; fermentation.

Growth and reproduction in cells - \* mitosis.

### **Chapter 3 - Problem solving in life science**

Classifying living things - taxonomy, kingdoms, phylum, order, family, genus, species, scientific names.

Kingdoms: Monera, Protista, Plantae, Fungi, Animalia.

Classification keys (one short paragraph - very poor coverage of what ought to be a major part of the book).

### **Chapter 4 - Viruses and monerans (\* bacteria and \* blue-green algae) - one-celled organisms**

Nutrition and reproduction in monerans; helpful and harmful activities of monerans.

Algae have chlorophyll, can make own food.

### **Chapter 5 - Protists and Fungi - one-celled organisms**

\* Protists that produce their own food.

Protists that capture food - \* protozoans.

Nutrition and reproduction in protists.

Helpful and harmful activities of protists.

Fungi - structure and activities.

\* Yeast, molds, mushrooms, slime molds, lichens.

\* Helpful and harmful activities of fungi.

## **Chapter 6 - Classification of Plants**

\* Plants need light, water, and carbon dioxide for food making, oxygen for respiration.

Vascular tissue - \* tubelike cells that carry water and food; xylem, phloem.

Nonvascular plants: \* No true roots, stems, or leaves: \* algae (misconception - not a plant); \* mosses and liverworts.

Features of vascular plants: \* have roots, stems, leaves.

Seedless vascular plants: ancient land plants - psilopsids, club mosses, horsetails; \* ferns.

\* Seed plants.

\* Seed = young plant with stored food in a sealed cover.

Gymnosperms - \* seeds but no flowers - ginkgoes, cycads, \* conifers.

Angiosperms - \* seeds and flowers, \* seeds produced inside fruits.

\* Monocots, \* dicots; cotyledons.

\* Flowers involved in reproduction.

## **Chapter 7 - Structure and Function of Plants**

\* Roots, \* taproots, \* fibrous roots, \* root hairs, root cap.

\* Roots absorb water and minerals.

Stems; pith; cambium; herbaceous, woody.

Leaves; \* photosynthesis = food making; epidermis, \* stomates; \* guard cells; \* veins.

\* Function of stomates, veins.

\* Function of roots, stems, leaves.

Compound leaves, leaf arrangement (one paragraph, brief mention without explanation - need more on this topic.)

Life activities: \* photosynthesis, transport, \* respiration.

Why some leaves turn red.

## **Chapter 8 - Plant Growth and Reproduction**

Plant reproduction without seeds.

\* Vegetative reproduction (first time to use this label, but concept discussed twice in elementary text).

\* Spores; reproduction in mosses - sex cells, eggs, sperms, \* fertilization, zygote; life cycles in mosses and ferns.

\* Reproduction in seeds plants.

\* Cones.

\* Parts of a flower; \* pollen , \* pollination, \* bees, self- and cross - pollination.

Seed - a product of \* fertilization; zygote; \* embryo.

\* Forming seeds in flowers; \* seed dispersal.

\* Fruit = a developed ovary with seeds inside.

Plant growth: \* growth from seeds, embryo, \* germination, seedlings; \* root growth, \* stem growth.

Woody stems - examples, branches and tree trunks; they grow longer by forming buds at tip of stem; a bud is an undeveloped, shortened section of a stem. (This is the only mention of buds that I found in the book.)

\* Growth responses; \* stimulus, auxins, \* phototropism, geotropism, hydrotropism, thigmotropism.

\* Flowering (still no mention of buds; life cycle of flowering plants poorly stated).

## **Chapters 9, 10, 11, 12 - Animals**

**Chapters 13 - 20 - Humans**, genetics (\* pea plants), \* chromosomes, \* genes, evolution.

## **Chapter 21 - Ecology**

\* Food chains, \* food web, food pyramid.

\* Biomes.

\* Populations, \* communities, \* ecosystems.

\* Habitat, niche.

Symbiosis, mutualism, commensalism, parasitism.

\* Producers, \* consumers, decomposers.

Water cycle.

Oxygen, carbon dioxide cycle.

Nitrogen cycle.

\* Plant succession.

## **Chapter 22 - Environmental Balance**

APPENDIXES C-1 TO C-7

VERBATIM TRANSCRIPTS OF INTERVIEWS

## Appendix C-1: Slide Sets I & II: Coded Responses, Informant 7

The researcher includes the responses from only one informant, as an example. Refer to Appendices A-1 and A-2 for a list of the names of the plants in each slide.

### Objectives of the slide sets:

1. Examine the informant's names for plants.
2. Discover the informant's categories (such as tree, bush) for a wider range of plants than might be encountered in the field.
3. Examine the informant's use of life-form, generic or specific names for plants.
4. Evaluate the effectiveness of using slides for teaching botany in the classroom.

Notes: Spelling is that of the informant. The researcher asked the informant to tell her the name of each example.

### Codes:

P = As predicted, the informant was not able to name this specimen at the generic level of abstraction.

L = Life-form name; G = Generic name; S = Specific name

X = inaccurate name

D = description given spontaneously

N = no response given

Error codes: EA = common adult layman's error; EN = mistakes a plant for a non-plant; ER = error, related species; ES = error, similar in form; EU = error, cause undetermined; M = made-up name.

### **Informant 7, February 17, 1988**

#### **Slide Set I**

1. tree - L,P
2. wild mushroom - L,P
3. cactus - L
4. dried leaves - X - not a category?

5. trees - L, P
6. moss and plants - L,L,P
7. cactus - L
8. daisies flower (scratched out "plant") - G,X,ER
9. wild plant - L,P
10. a plant growing from a tree - L,D
11. a plant that you can use as medacine - L,D,ES (mistaken for aloe)
12. tree - L,P
13. watermelon vine or food for snakes - G,X,M,D,P
14. daisies - G
15. a plant - L,P
16. long grass - G,X,M,ES
17. tamotes (tomatoes) - G,X,ES
18. stuff that bee make honey from - D
19. a bush - L,P
20. a pine tree - G,X,ER,P
21. flowers - L
22. flower - L
23. fungus and algae - L,P
24. flower (scratched out "plant") - L
25. tree - L,P
26. pine tree - G,X,EU

- 27. leaves - X (not a category?)
- 28. dead or dried leaves - X (not a category?),P
- 29. grain - G,X,ER,P
- 30. weed or wild plant - L,P
- 31. pine tree - G
- 32. vines of a plant - L,D,P
- 33. a tree - L
- 34. tree - L,P

#### **Slide Set II**

- 1. rose - G
- 2. plant - L
- 3. vine - L
- 4. tree - L,X,ES
- 5 & 6. bean tree - G,X,M
- 7. ivery (informant's word for "ivy"?) - G,X,M,EU
- 8. plant that have seed on top of them and can go a long way. - L,D
- 9. posin iveri - G
- 10. a plant that hold water on top of the leaves - L,D
- 11. wild plant tree - G,X,M
- 12. berries - L (or not a category?)
- 13 & 14. a tree - L

- 15 & 16. a plant that flotes around in a river and was not really from San Marcos - L,D
17. a plant - L
18. a flytrape - G,X,EU
19. lilies - G
20. green clover - G,X,EA,EO
21. a grape vine - G
- 22 & 23. tree that stay green all year around - L,D
24. a flower - L
25. a cactus plant - L,X,EU
- 26 &27. a tree - L
- 28 & 29. a sunflower - G
- 30 & 31. bluebonnet - G
- 32 & 33. acorn - G,X,M
- 34 & 35. a pine tree - G
36. ivery - G,X,M,EU
- 37 & 38. tree - L
- 39 & 40. a tree that change colors every year - L,D
- 41 & 42. an acorn - G,X,M

## Appendix C-2: Listing Tasks, Informant 7

The researcher only included the responses of one informant, as an example.

Notes: D = the researcher's verbatim statements; I = the informant's verbatim statements, with the child's spelling. The researcher's commentary is in parentheses.

March 17, 1988

D: Make a list of all the different kinds of trees.

I: (5 minutes) (Informant writes own list, own spelling)

Pacon tree (pecan), apple tree, orange tree, Some kind of tree that animals get salt from, peach tree, walnut tree, pear tree, pine tree, pineapple tree, coconut tree, plum tree, grapefruit tree.

D: Make a list of the different kinds of flowers.

I: (7 minutes) Daisies, roises, tulup, ivory, avocado plant (then scratched it out and said, "No, that's a plant, avocado plant"), poinceta, corsage.

D: Are there different kinds of: (I write as informant responds)

I: (mushrooms) - Yes. White, most are poison, black, spotted. There are others.

(cactus) - Yes. (Informant draws pictures of several) That's all I know.

(moss) - Yes. Seaweed; algae. That's all I know.

(vines) - Yes. Grape vines; plants sometimes leave a vine; watermelon vine.

(grass) - Yes. Wheat; hay - but that's wheat, right?

(bushes) - Yes. I don't know names.

(weeds) - No. I think a weed is just some kind of tree that grows in your yard (After some discussion, I realized that informant literally meant a specific type of tree, the hackberry, that grows in the yard. Informant took me outside to show me the "weed tree.")

D: Tell me all the categories of plants.

I: Wild; fresh.

D: Tell me all the vegetables.

I: Asparagus, broccoli, spinach ? (informant is unsure if this is a vegetable), potato, squash, avocado, peas, green beans, beets, carrot, onion - no, it's not, okra.

D: Tell me all the fruits.

I: Apple, orange, grapes, peaches, pineapple, tangerine, plums, coconut, grapefruit, pears, bananas, nectarines, watermelons, strawberries, cherries.

D: How do you tell a tree from a bush?

I: A tree usually grows straight up, then it branches out.

A bush, when it's growing, it starts spreading out, branching before it gets tall. It's bushy.

D: How are they similar?

I: Bush also has a trunk. Both got branches.

D: How are the things you called flowers different from plants?

I: A think a plant and a flower is just about the same thing. Oh, what am I thinking. They're not the same. There's a plant (points to a house plant, a pothos). Plant usually has more than one stem. I'm not sure.

Flowers, it grows out like that (draws lines that stick up and out). Well, I don't know for sure, compared to all plants.

D: How are they similar?

I: They all have stems that look similar.

(Now, I ask a series of questions in which informant must tell me the last part of the sentence.)

D: A tree is a kind of what?

I: A living thing.

D: A bush is a kind of what?

I: A living thing that grows and needs food and water.

D: A flower is a type of?

I: Plant.

D: A plant is a type of?

I: Grass.

D: A grass is a type of?

I: Grass.

D: A weed is a type of?

I: Tree. (Although in the slides, informant called small ragweed a "weed," when asked about weeds, informant clings to the idea that there is only one thing that is a weed, the hackberry tree.)

D: A vine is a type of?

I: Plant. Oh, it's like in between a plant and a tree.

D: How are a tree and a plant different?

I: Plant doesn't have a trunk, I mean, the wooden part that a tree has. There ain't much difference.

D: How are they similar?

I: They have leaves. They need the same things to live, water, soil, and dirt, and sunlight.

D: A tree is a type of?

I: Bush.

D: A bush is a type of?

I: Tree.

D: A flower is a type of?

I: Plant.

D: A plant is a type of?

I: Grass. No... A grass is a type of a plant. I was thinking that a plant grows like grass, but it doesn't. A plant is a type of a flower.

D: Are soil and dirt different?

I: Yes. Soil is like dirt and water mixed up. No, they are the same, I guess. When dirt gets wet, it turns into soil.

D: So you think they are the same?

I: When something, like a dead tree or a bone, fades away in the ground, and it gets covered up, doesn't soil come?

D: Yes.

I: I think dirt and soil are the same. I'm not sure.

(Excellent thinking aloud process going on; informant trying to figure out what to do with his own categories, boundaries.)

### Appendix C-3: Neighborhood Walk, Informant 7

Researcher includes only one interview, as an example.

Notes: D = the researcher's verbatim statements. I = the informant's verbatim statements. The researcher's commentary is in parentheses.

(For speed in transcription, some questions have been abbreviated here. "Describe" = "Describe this to me"; "What?" = "What is this?"; "How?" = "How can you tell?")

February 29, 1988, 5-6 pm

(We walked around the neighborhood near informant's home. Warm, sunny day. Deciduous trees have no leaves, but many evergreen shrubs do. Redbuds and henbit have suddenly burst into bloom in the last few days - the first signs of spring. It was 80 degrees today. This session was not tape recorded. I recorded the conversation by hand, therefore did not always have the full, exact quotes. Most of the plants grow in yards.)

D: What? (*Lonicera sempervirens*, coral honeysuckle, an evergreen vine)

I: A vine.

D: What? (*Garrya lindheimeri*, silktassel, an evergreen shrub, about 3 feet tall, covered with leaves)

I: A tree.

D: What? (last year's growth, dead twigs sticking out of ground - *Malvaviscus*, Turk's cap.)

I: Weed bushes.

Grass (general reference for all the low growing green stuff in a flower garden plot. I asked informant to tell me what some of the specific things are in the plot).

Just a plant (*Sedum*).

A plant (*Sonchus*, sow thistle, without flowers).

D: What? (*Quercus fusiformis*, live oak)

I: An acorn tree.

D: Describe (*Quercus fusiformis*).

I: It has green leaves, some brown. Acorns on the ends of the branches. Part goes straight up, then grows up (referring to branches, informant is motioning with hands).

D: What? (*Tillandsia* - ball moss)

I: You had that in the slide show. Something that grows on old trees.

D: Describe the leaves (*Quercus fusiformis*).

I: It has brown spots. It's solid (What do you mean?) You know, like solid, liquid, gas. It has vines (then informant corrects this to "veins") in it where it gives water to the leaves. It's egg-shaped.

D: What do leaves do?

I: They help the tree. They hold some of the food. Make the tree look pretty. Help it grow bigger. (How do they make it grow?) (Informant points to the leaf petiole, which looks like a twig.) It grows a stem on the leaf, the leaf falls off, leaving the stem there, another leaf grows on, leaving a stem there, so the tree grows. The leaf helps reproduce (Later I discover that informant uses "reproduce" to mean "photosynthesis." In this instance, informant may in fact be using it in its correct usage, but I have to find out whether informant understands the function of acorns. Informant seems unsure of information - says it in a questioning voice.) (How does it do that?) It makes the acorns. (How does it do that?) I don't know.

D: What? (gall on ground, fallen from live oak.)

I: Probably an old acorn or something.

D: What? (yellow jasmine in bloom along fence)

I: a flower vine.

D: How can you tell it's a vine?

I: It has long stems you can bend. It has a lot of stems. They're straight.

D: What? (*Celtis* - large hackberry with leaves gone.)

I: A tree.

D: How can you tell a tree?

I: It's usually big. It has branches. Most have leaves. Has bark. The trunk is probably brown.

D: Describe (hackberry)

I: It's white. It's an old tree.

D: How can you tell it's old?

I: It's pretty big around. You can slice a tree and count the rings. You can tell from the way the bark is green (Points to bits of mistletoe growing on trunk). Things are growing on it. The stuff you walk under at Christmas grows on old trees. Has a lot of branches on it.

D: What? (*Arbor vitae*)

I: (Informant feels the leaves, smells them.) Probably an old Christmas tree. Some kind of pine tree.

D: How?

I: The way the limbs, the branches (points to the scale-like leaves) grow out tree-shaped (motions with hands to show the shape).

D: What? (*Lamium amplexicaule* - henbit without blooms)

I: a wild plant or some kind of grass.

D: What? (a prickly pear stem on the ground. The cactus plant is nearby.)

I: a cactus limb or leaf.

D: What? (*Taraxacum officinale* - dandelion with seed head, no flowers.)

I: a plant, a flower.

D: What? (*Magnolia* tree)

I: A tree with those pine cone like things (meaning the seed pods, which are not on the tree at this time).

D: Is this a pine tree?

I: (Informant looks doubtful. Is unsure.) The leaves don't look like pine.

D: Describe (*Magnolia* leaves).

I: It's big. Has veins. A line through the middle (mid-vein) for the veins to get the food from the soil. The food comes up through the veins. It stores food in the leaves. The food makes the leaf

bigger. It stores food in vacuoles or the nucleus or something. (Informant is trying to remember school information. Shows uncertainty about information. Asks me if those are the right words. I don't respond.)

D: What does the tree need to grow?

I: Sunlight, water, dirt... soil - that's dirt... rain - oh, that's water.

D: Describe (ornamental verbena in flower).

I: The flowers on the plant have 5 leaves (points to the petals). They're red. Each leaf (petal) of the flower has 2 bumps (lobes). These (the true leaves) look like little pine trees because they have little limbs (lobes) on each side. What's the word for those little limbs? (I put off an answer.)

D: What? (Catalpa pods on ground below tree.)

I: Beans probably grow in them. They come from the tree.

D: What? (rose bush without leaves or flowers)

I: a rose bush.

D: As we walk along, point out all the things that are trees. (Everything he points to is a tree - most quite large. He points to one small bush without any leaves.) How can you tell that is a tree?

I: It's brown, has branches on it. (Informant ponders a while, looking at big trees.) It may be a bush, but it's shaped like a tree. It's hard to tell.

D: How do you tell the difference between a tree and a bush?

I: A bush usually has leaves covering mostly all of it (points to hedgerow of evergreen bushes across the street as an example. I think he doesn't realize about evergreenness). A bush has a little stem down below the leaves.

(We turn down an alley.)

D: What's along the fence? (A mass of various vines)

I: Weeds.

D: Show me what you are talking about.

I: This is a vine (*Clematis drummondii*, old man's beard).

This is a wheat plant (Johnson grass with seed heads). It's the stuff that cows eat, what's that called,... hay.

This is a vine. (Greenbriar vine in tree)

This is grass (points generally to low growing things in middle of alley).

D: Show me which ones are grass.

(Points to mowed grass without seed heads, clover, *Stellaria media* - none have flowers).

D: How do you tell grass from a plant.

I: (Still holding *Stellaria*, a light goes on in informant's head - a moment of insight, some excitement.) Well, it couldn't be grass because here's my description. Grass is straight. It's green or brown, sometimes red. I don't think this is grass now because it got a stem. It's some kind of plant. And these are plants (clover, *Torilis arvensis*).

D: What? (clover with yellow flowers)

I: a flower.

D: What kind of a thing is a tree?

I: A tree is a living thing.

D: How?

I: It moves and drinks. (Informant says this instantly, then stops to think about it.) Oh - wait a minute... let me remember... It responds, it grows (Informant counts on fingers as though trying to remember a list teacher taught).

D: What do you mean? How does it respond?

I: To where the sun is, to where the food is. It grows to where the sun or food is. (seems uncertain about all this).

D: What's the difference between grass and plants?

I: Grass doesn't have a stem. A plant has a stem (Picks up a small herb to demonstrate). It grows outward, not straight up.

D: What kind of a thing is grass?

I: A living thing.

D: What? (*Agave* - small, fairly narrow-leaved species)

I: Ivery bush? (Informant is asking with voice)

D: Describe.

I: It's long (leaf). Thorns at edge of each limb-like thing. Green. Sharp at the end. It's used for medicine. It stays green all year long. No, it doesn't. Yes it does.

D: How do you know it stays green all year? (I expect informant to cue into the fact that this is mid-winter and it is still green. Informant does not do this.)

I: I don't think they'd use it for medicine if it didn't stay green all year. The rotten part (brown spot on leaf) shows that it's been around a pretty long time.

D: What? (*Lonicera japonica* - honeysuckle vine)

I: a vine.

D: Describe.

I: It has veins on the leaves. The leaves are turning colors.

D: Why are they turning colors?

I: Because it's getting hotter, it gets brown, yellowish (Informant does not realize that this is mid-winter - air temperature is nearly 80.)

D: What? (*Galium* - bedstraw)

I: It sticks to your clothes (demonstration). We call it sticky grass.

D: Is it a kind of grass?

I: I think so because it don't have no limbs on it (Informant seems to be reflecting on the definition given earlier for grass, decides this one fits.)

D: What? (*Rumex* - dock, basal rosette)

I: A plant.

D: Describe.

I: It grows flat on the ground. Spreads out on the ground (Points to leaves) sort of like a vine. The vein is red, like it drank some red water or because it is summer (February! but 80 degrees). It has thorns, no, fuzz (Feels hairs on stem of leaf).

D: What? (*Ligustrum*)

I: A tree.

D: (I point out two different types of trees, both without leaves, a large hackberry, and a smaller unknown species.) Are these different types of trees?

I: Yes.

D: How can you tell they are different?

I: The bark is different. the way it's growing. (Hackberry) grows straight up (a single, large straight trunk). This one splits out (trunk divides).

D: Are these vines different? (*Clematis drummondii* and *Lonicera japonica*, honeysuckle, both with leaves)

I: Yes.

D: How?

I: The leaves are different. (*Clematis*) leaves look like poison ivy (they certainly do!).

D: What? (loquat seen from a distance, without fruit)

I: Chinese peaches (excellent common name, but one I've never heard). You can eat the fruit.

D: Describe.

I: The leaves are shaped like a cucumber.

D: How is it different from that (hackberry viewed from a distance, without leaves)?

I: (Hackberry) leaves are small (This is from informant's memory, cause the trees has no leaves at this time). (Chinese peaches) doesn't get big, the stem (trunk) is smooth. (Hackberry) gets big, stem (trunk) is rough.

D: What? (Chinaberries on ground below tree)

I: Some kind of berry. They grow on trees. (Looks up to find tree.) That tree.

D: What? (*Tradescantia* - spiderwort, basal rosettes only)

I: It's a grass or a plant. It's kinda hard to tell. Because the leaves all grow in one spot, it may be a plant. Grass would grow all over.

D: What? (henbit with blooms)

I: Some kind of flower growing on a plant.

D: Describe.

I: It's long, purple. (Pulls on flower) pulls out real easily. (What's that? I point to flower buds.) Little ones that will grow out to be a flower. (Do you have a name for it - I mean the bud?) No.

D: What does grass need to grow?

I: Water, dirt, soil, energy from the sun.

D: What does the sun do?

I: The sun gives the grass food.

D: How does it do that?

I: It shines on the grass. Grass gets the light, takes it in , and takes it through all the veins. Is it reproducing. No. I don't know what happens.

(Informant seems so perplexed at not understanding this that I explain that photosynthesis is a very difficult process that even scientists don't fully understand.)

D: What? (*Yucca*, low plant without flowers, but old flower stalk in middle of cluster of plants.)

I: It's like a ball (the leaf head), like a porcupine. It has long leaves with thorns at the end. They're rough, they curl, have little hairs (on edge).

D: What? (old flower stalk of yucca, about 5 feet high)

I: A big tree that these things (yucca) grow around.

D: What? (Boston ivy covering a large dead tree)

I: Vine growing from a tree.

D: What? (from a distance, looks like a non-pine conifer, maybe a spruce)

I: A pine.

D: How?

I: The limbs (branches) spread out. I just know how it looks (gestalt).

#### Appendix C-4: Sorting Tasks, Informant 7

The researcher includes only one interview, as an example.

Notes: Refer to Appendix A-2 for a list of the species used in the sorting tasks.

D = the researcher's verbatim statements; I = the informant's verbatim statements. The researcher's commentary is in parentheses.

April 22, 1988

(The researcher gave the informant instructions to sort the pictures into categories. I have listed which photos he included in each of his categories)

Bushes: (Informant selected photos 1, 28, 29, 41)

D: What do the bushes all have in common?

I: They had a stem. I just know 'cause I know. Cause they're pretty. They don't look like a tree or a flower or a plant. (Informant looks through the pictures.) The leaves are pretty close together. They're all green.

(Leaves hide trunks on all but Joshua tree.)

D: Which are most like a bush?

I: (Photo 29: trimmed hedge).

D: Which are least like a bush?

I: Probably these (1 - understory shrubs in forest, 41 - Joshua tree).

D: So these would be sort of in between? (28 - Juniper - trunks hidden by leaves)

I: Yes. Well, no I think this one is probably at least not a bush.

Flowers: (Informant selected photos 42 [claret cup cactus], 46 [railroad vine with flowers], [various herbaceous plants in bloom, including tulips:] 54, 55, 56, 57, 58, 62, 65)

D: What do the flowers all have in common?

I: They all got a stem with a flower at the end of it.

(All the photos have flowers; all are herbaceous but one.)

D: Are there any that are more typical, more like a flower than others.

I: The bluebonnets, they're more like a flower than some of these others. And these (55, 56, 57, 58, 62, 65 - herbaceous plants - but the researcher cannot ascertain why some other showy flowering herbs were not designated as typical.)

These kind of look like plants (54 - very colorful flowering herbaceous plants - Verbena and blue-eyed grass), but I think they're flowers because they have a flower at the end.

D: What makes them like plants?

I: The stem is dark green and it's pretty thick. (Does informant mean "leaves"? Very poorly defined characteristic - I cannot differentiate these from other flowering herbs in "stemness.")

Stuff like this looks sort of like a plant (46, informant points at the railroad vine).

This one was pretty hard, it kind of looked like a cactus bush and a flower, so I just put it with the flowers (42 - claret cup cactus in bloom).

(When informant looked at the prickly pear in bloom, informant asked, "Do you mean the flower or the plant?" I said, "The flower is growing on the plant." Informant started to put the picture with "flowers", then changed to "plants." Did the same with 40, another cactus in bloom. Recognizes boundary overlap.)

I: This one to me looks exactly like a flower (55 - gay feathers).

What is this one? (42)

D: It's called claret cup.

I: So is it a flower or a bush or a tree?

D: You could put it as a cactus or a flower, either one. And some people might call a cactus a bush and some people might call a cactus a tree.

Trees: (Informant selected photos 2, 3, 4, 6, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 30, 31, 32, 72)

D: What makes them all trees?

I: They have a little thick, I mean, a pretty big stem (though informant uses the word "trunk" occasionally, usually calls it a "stem"). Usually they're pretty straight up and then they start going in different directions (branching out). Most of them have leaves on them, depending on

what time of year.

D: What time of year would you expect them to have leaves?

I: Spring. Around fall, they would be all off mostly.

D: Anything else?

I: No.

D: Pick out the ones that are most like a tree and least like a tree.

I: Most like a tree: (Informant selected photos 2, 3, 5, 7, 8, 9, 10, 11, 12, 13 - Christmas trees, 15, 16 [two palms], 17, 18, 19, 20, 21, 22, 23, 72)

(Woody; tall; all with single trunks except the very large live oak; with or without leaves; leaves small and numerous, except on palm; only redbud has flowers).

Least like a tree: (Informant selected 24, 25, 26, 31, 32).

(Three woody shrubs with flowers – the researcher is surprised that these were not placed with "bushes"; Hawaiian yucca; red leaves of tallow tree.)

This is like in between (4 - leafless trees, 6 - thorny African acacia, 14 - juniper, multiple trunks visible, 30 - mesquite).

D: Tell me why these are least like a tree?

I: (25 - tallow leaves) I can't see the branch; it's all kinds of little skinny things sticky up. This one has weird leaves (32 - some other informants did not recognize the leaves on yucca). These (24, 26 - cenizo, mescalbean) are all bushed up with flowers; can barely see the main part of it, the trunk. This one (31 - azalea) seems like a wild weed that grew up.

Plants: (Informant selected photos 27, 33, 34, 35, 36, 37, 38, 39, 40, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, 59, 60, 61, 63, 64, 66, 67, 68, 69, 70, 71, 73, 74)

(three yuccas, tree-type and non-tree; agave; railroad vine without flowers; 6 grasses, including 51 - with dead wildflowers; *Sabal minor*; 5 cacti, with and without flowers; ocotillo; 3 ferns - no names; 11 herbaceous plants with and without flowers - no logical difference from "flowers.")

D: What do these have in common, that makes them plants?

I: Mostly all of them, they're green. They have like something weird just sticking out, like it's going to grab you or something (refers to two yuccas, 33, 74; 36 - *Sabal minor*, 47 - railroad

vine, 68 - green *Castilleja*). These looks like plants that someone would have outside their house, in their house or something (70 - herbaceous plant without flowers).

All these, in common, their leaves like, they have like a green stem (69 - clover with flowers). Most of them go in all different directions on the ground and stuff.

I said that this is a plant, because I call it cactus (34 - tree-type yucca). I think they're trees and plants, too. (Indication that informant can recognize some overlapping boundaries.) This is pretty much the same (35 - *Agave*). I think this is different from all the rest because it has a bush right there and the plant just shoots up through the middle.

These just look like grass, and grass is pretty much like a plant (50, 52, 53 - grasses).

This is wheat, right? (49 - wheat)

D: Yes. So why did you put it in with plants?

I: Because it didn't go with flower or tree. It fits best for a plant.

These are more like bushes (63 - *Baptisia* - branching herb with flowers). But when I looked at it at first, I didn't see that stem.

I classify these as plants because you can see the plants that grow from the grass and stuff (51 - dead wildflowers emerging from grass). And you can see the plants in between them that grows. And this is grass, and I think that grass is pretty much plants.

These are wild plants (59 - yellow composite flowering herb), so I classify it as "wild plants".

And this is another plant that somebody would have at their house, 'cause it has a green stem with green leaves (67 - *Lupinus*, leaves only).

And I knew this was a plant because I saw somebody, they had one in a plant pot. And it looks pretty much like a plant. It doesn't look like a tree (45). This is the same (43 - two ferns).

And I knew that was a wild plant 'cause you could tell from the way the stem was (71 - thistle).

That's a cactus (40 - devil's head cactus).

It's some kind of cactus (27 - ocotillo).

I consider these as plants because they have like a stem, like a green stem, with things growing out on the side (44 - maidenhair fern).

These are like grass (yes) with the plants (seeding heads) right there in the middle. That right

there looks pretty much like a plant, and I classified them as a plant because I consider grass a plant (48 - sea oats).

Because that's grass (64 - Is informant calling *Oxalis* "grass," or is this a reference to the true grass next to it in the photo?). You can tell from the stem that it's pretty much like a plant because I've seen it in my back yard. They're like clovers.

These are in the river. They float around in the water. You can tell from the stem that they're like plants, and they have flowers in them (60 - water hyacinths, water not shown).

D: So even though they have flowers, they're more like a plant than a flower?

I: 'Cause there aren't too many flowers that float in the water.

These are cactus. I consider those plants (37, 73 - prickly pears).

This is a plant type (66 - herb, leaves only).

Cactus, I consider plants (38, 39 - cholla and saguaro cacti).

I didn't know what that is. It looks like some kind of thing that floats in the water, and I just figured it was probably a plant because I looked at that stem, it was green. And the leaf is (61, water lily).

D: So how do you decide if something is a plant?

I: The way I classify most plants is because, like when their stem is a greenish color. You know how trees are like a brownish color. Plants most time it's like a greenish color. So if I see a green stem, with some kind of weird shape on it, like a green leaf, that look smooth or something, and a green stem, I mostly classify it as a plant.

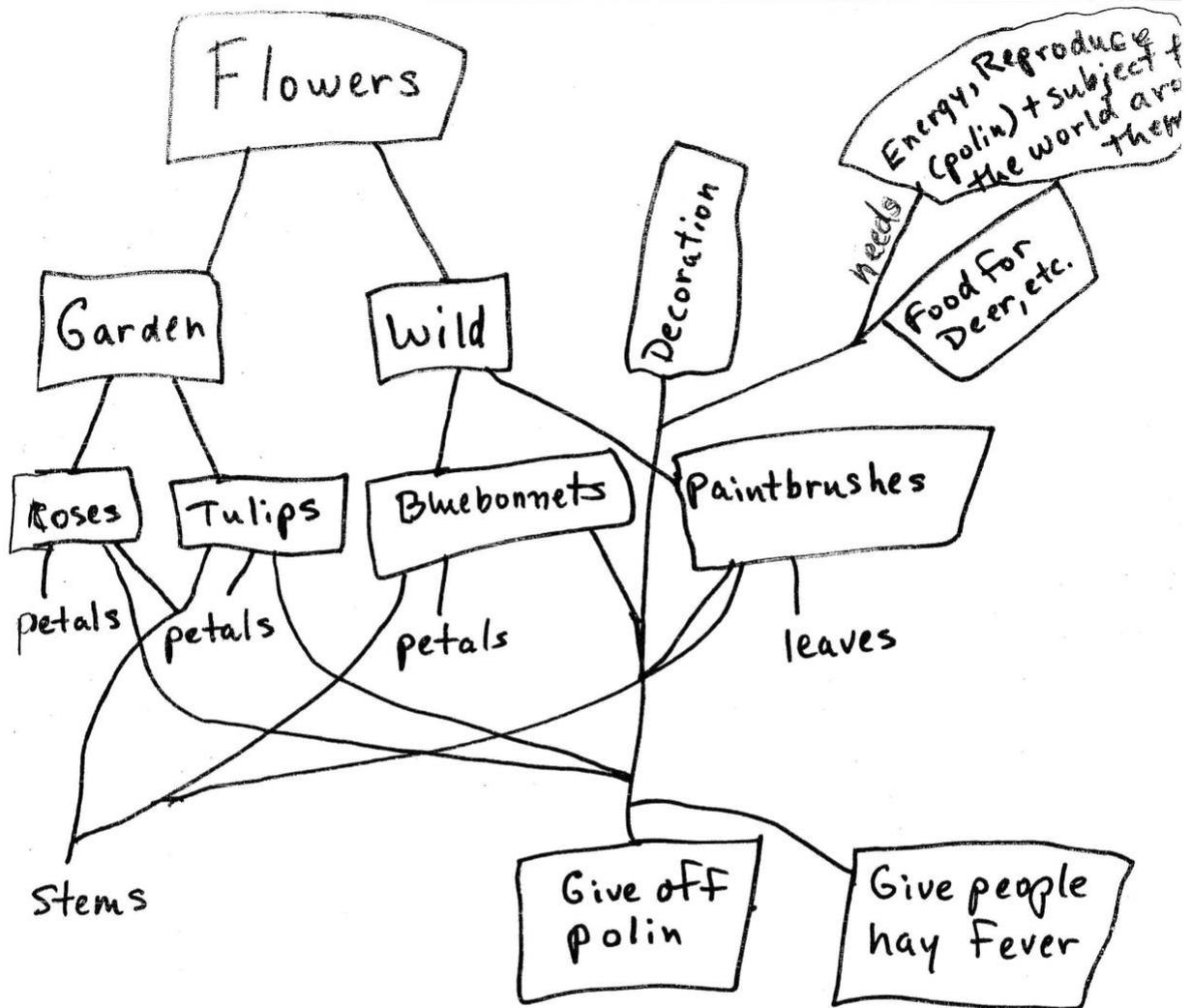
## Appendix C-5: Informants' Concept Maps

The following concept maps were drawn by the informants, with their own spelling. But for informants 2 and 9, the researcher drew the maps, as the child talked. Informant 6 spent more than an hour drawing her complex maps.

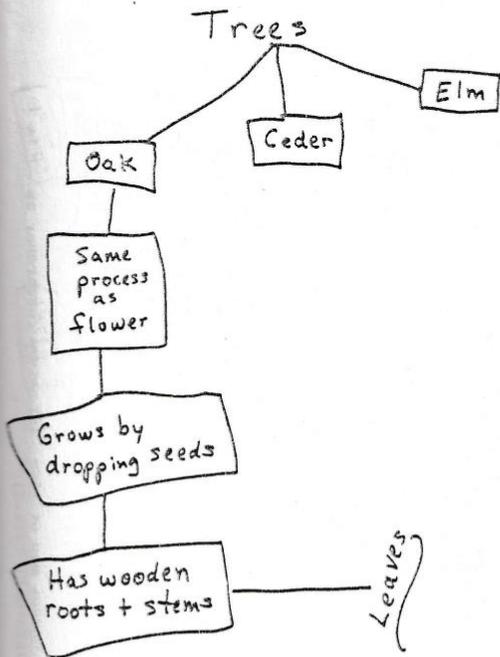
The researcher took the child's drawing, originally on a large piece of poster paper, and redrew it to fit the page.

Appendix C-6 has the transcript of the dialog held with informant 7 while he completed the concept mapping exercise.

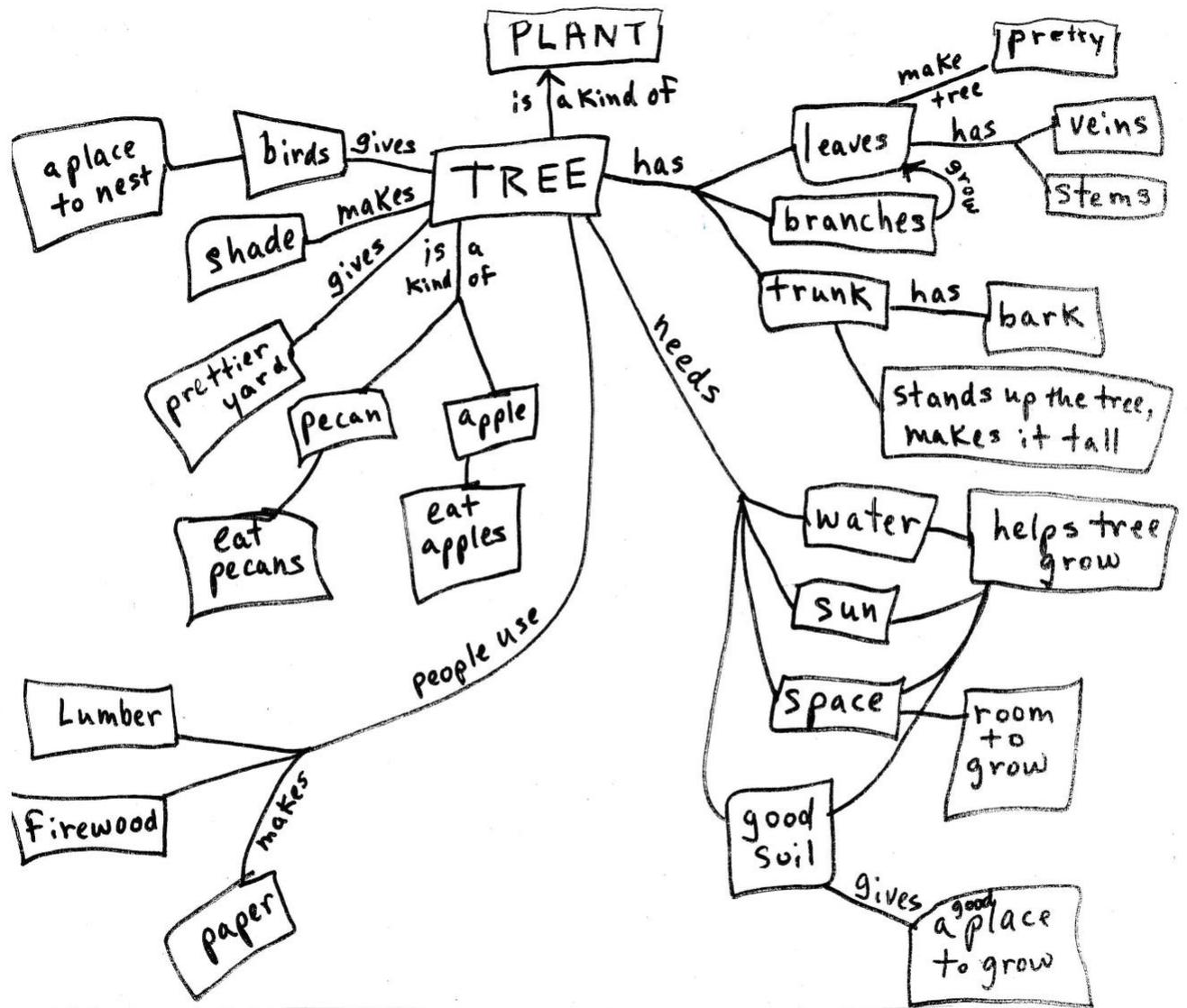
These concept maps have been photocopied from the original dissertation book, which is why the edges are peculiar.



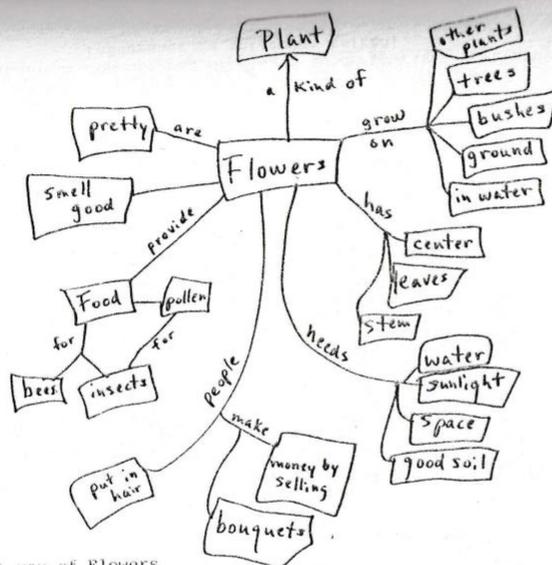
Informant 1. Concept map of Flowers



Informant 1: Concept map of Trees.

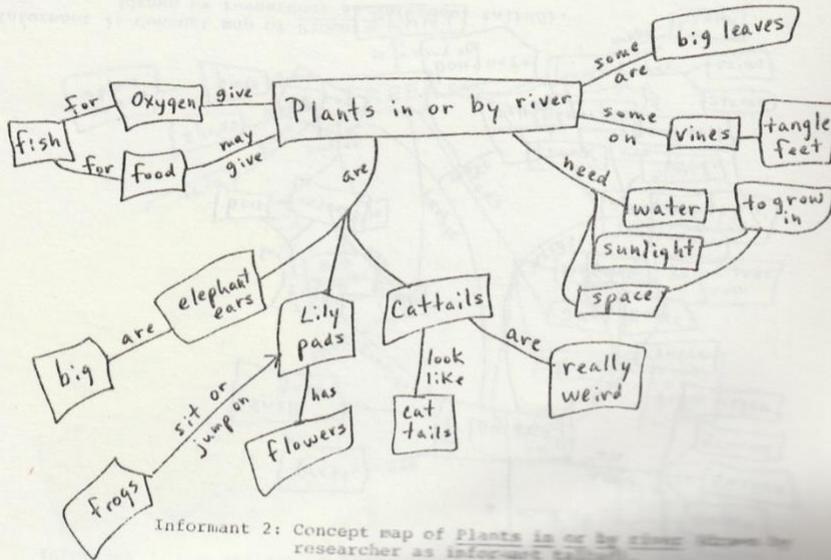


Informant 2. Concept map of Tree (drawn by researcher as the informant talked).

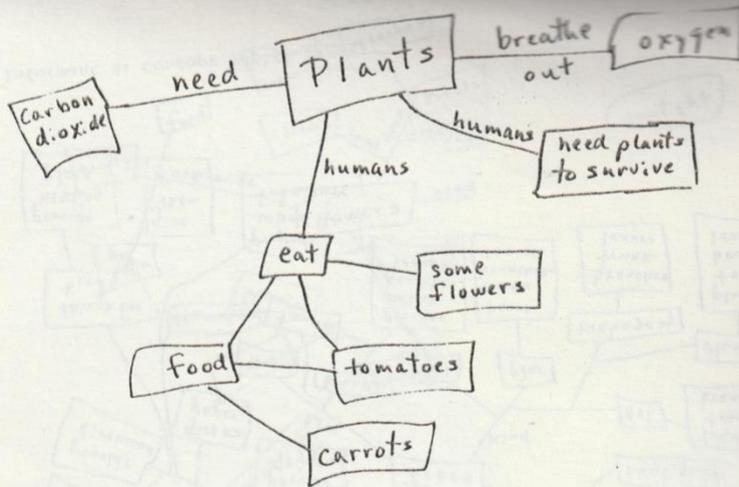


Informant 2: Concept map of Flowers  
 (drawn by researcher as informant talked).

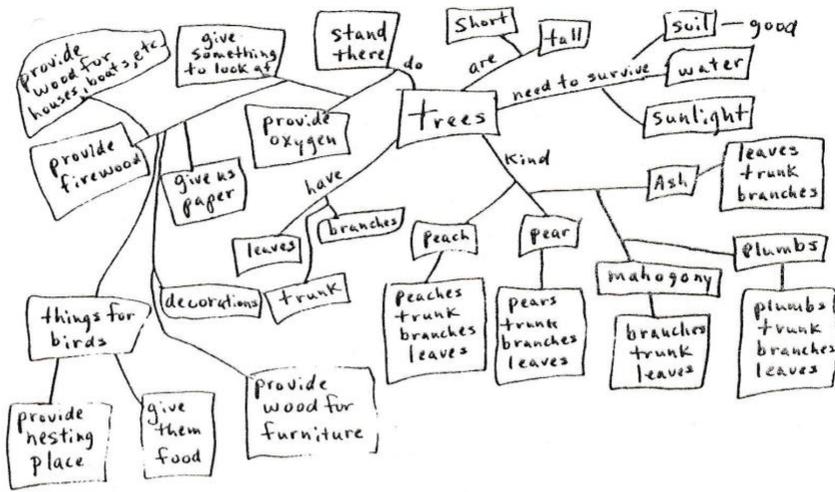
006



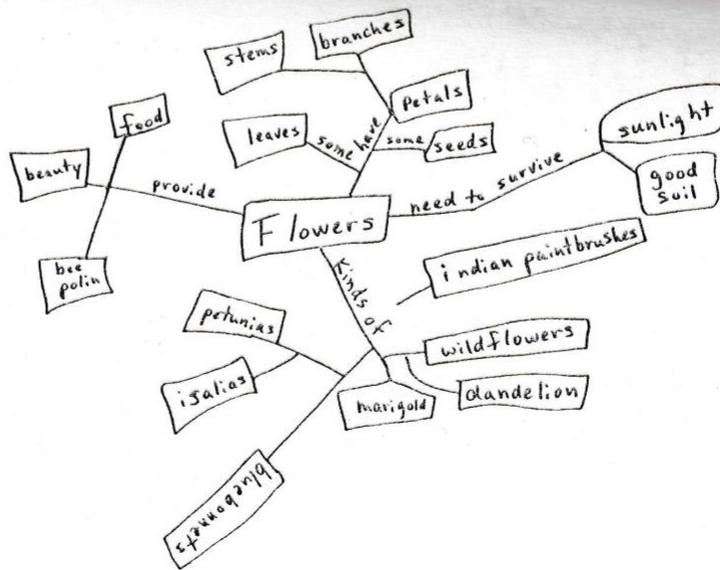
Informant 2: Concept map of Plants in or by river drawn by researcher as informant talked.



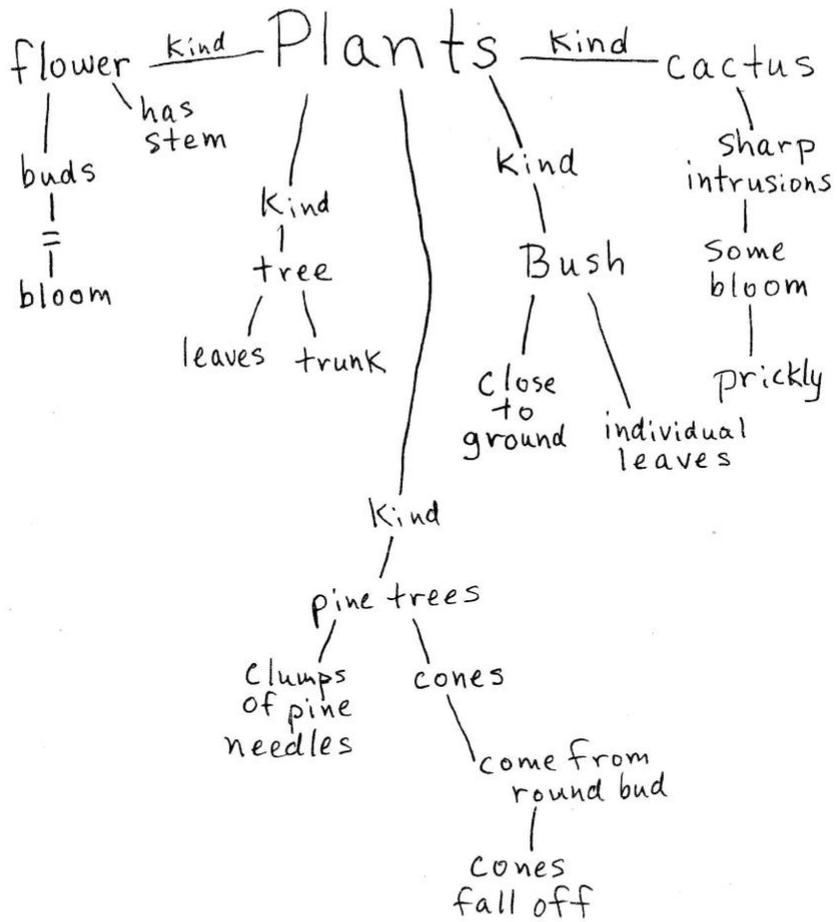
Informant 2: Concept map of Plants (drawn by researcher as informant talked).



Informant 4: Concept map of Trees.

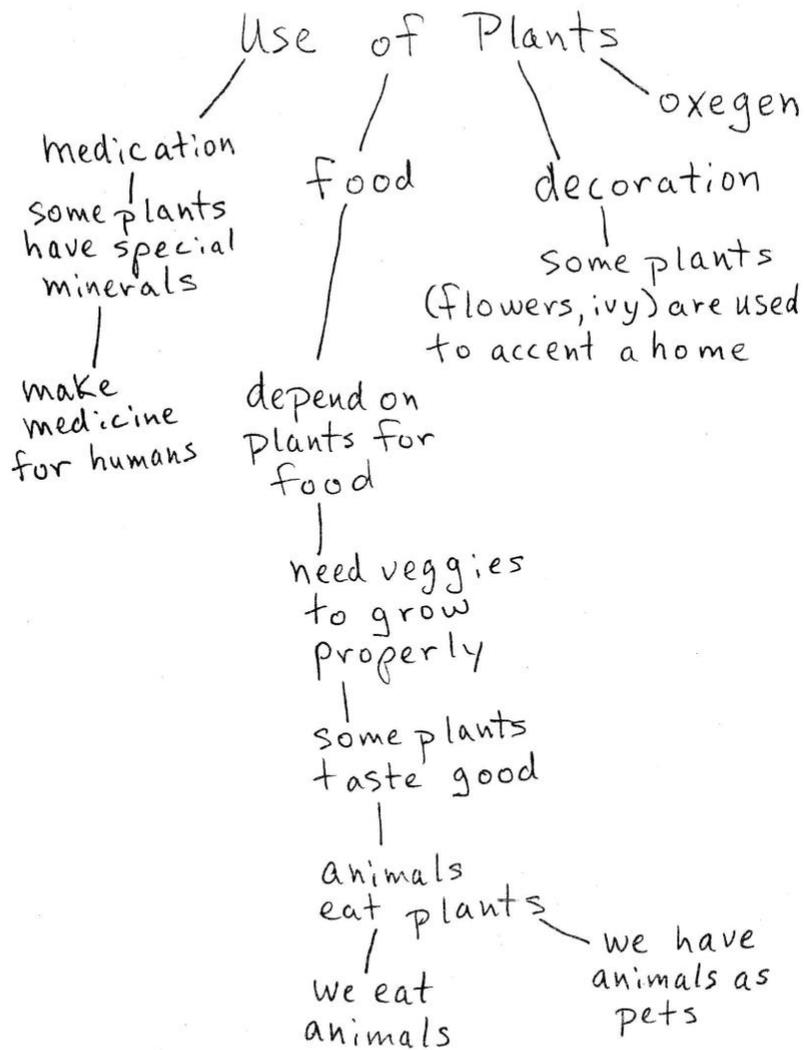


Informant 4: Concept map of Flowers.

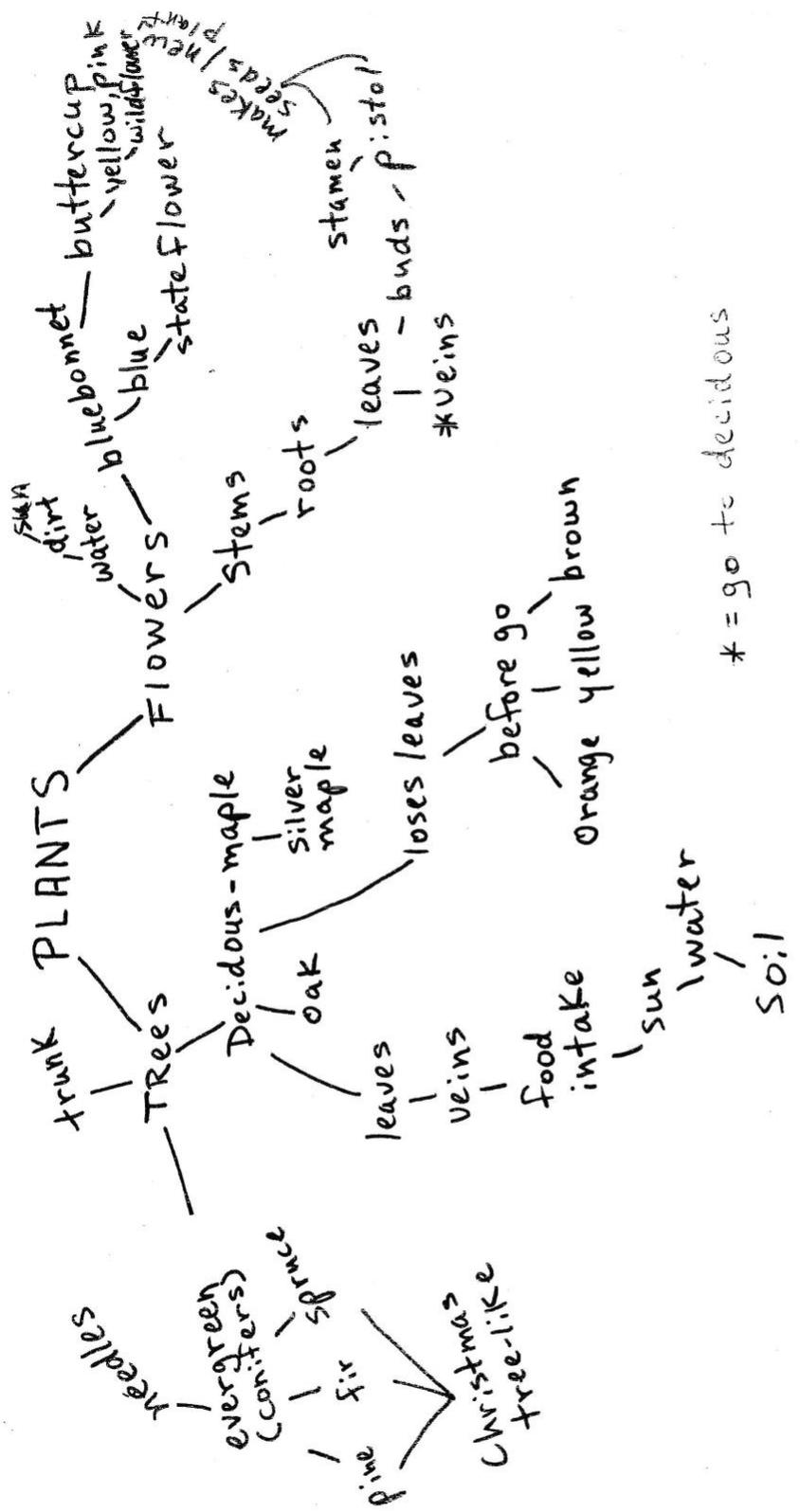


1. respond to light
2. reproduce
3. grows
4. needs energy

Informant 5. Concept map of Plants

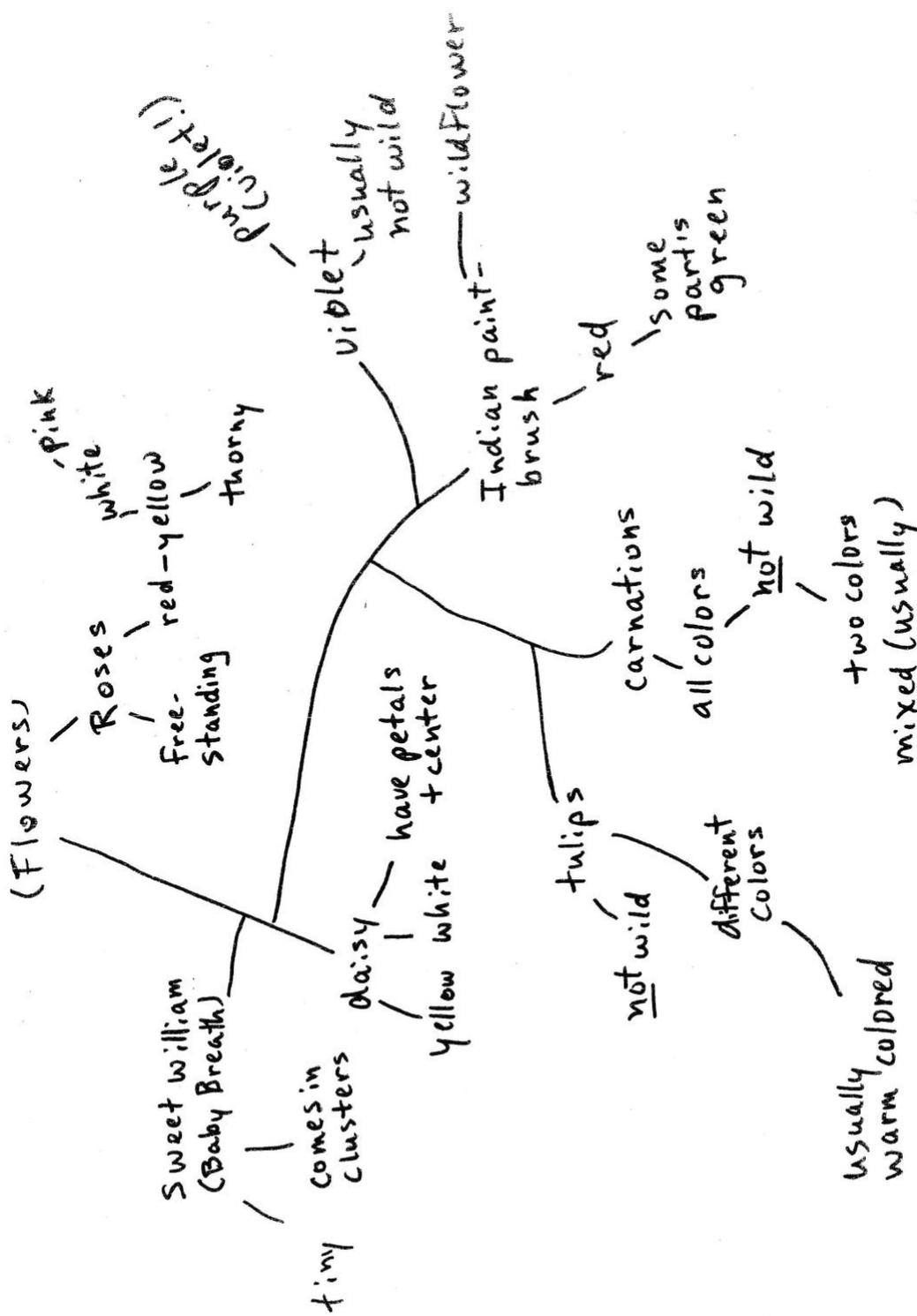


Informant 5. Concept map of Use of Plants

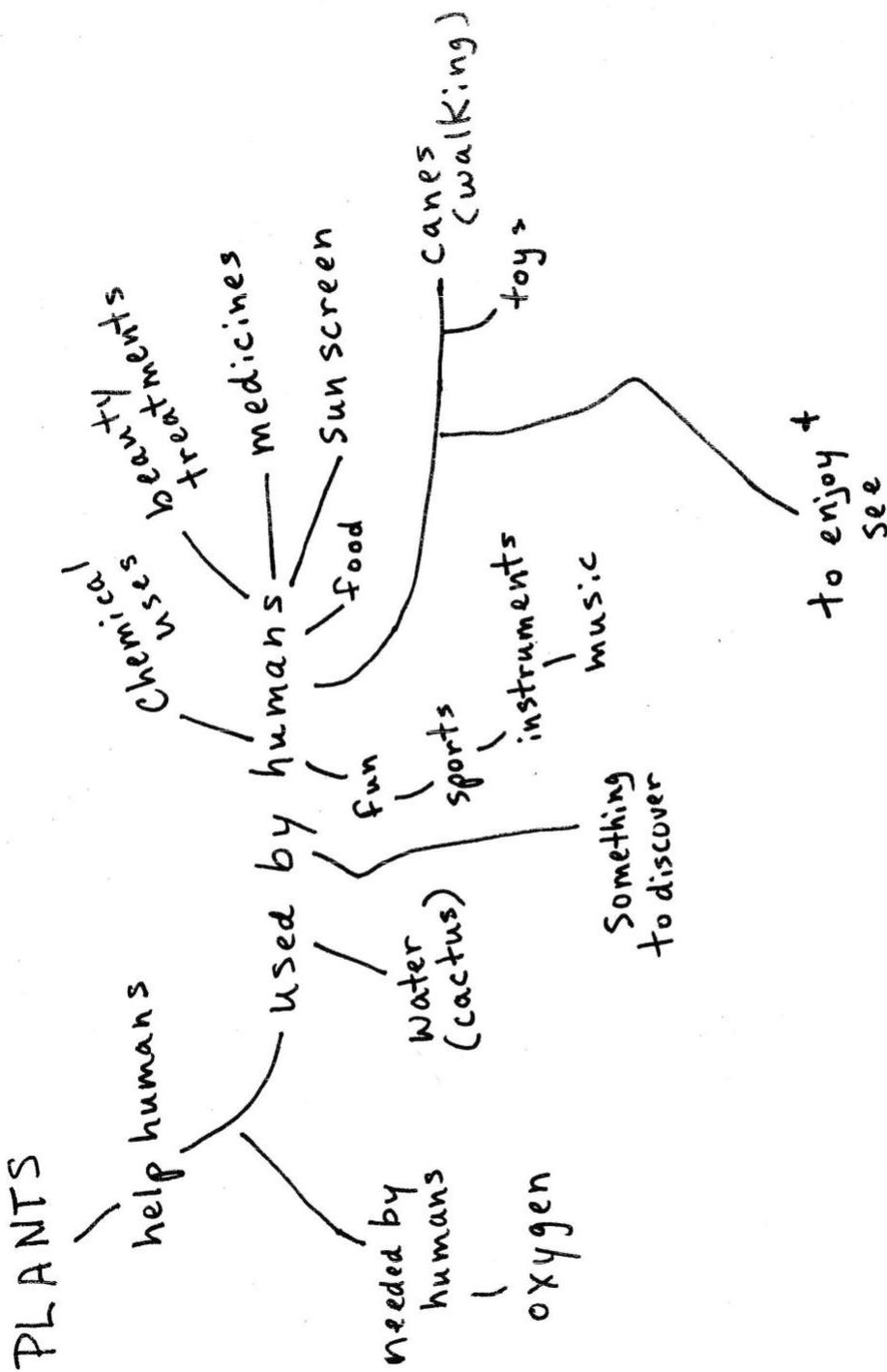


\* = go to deciduous

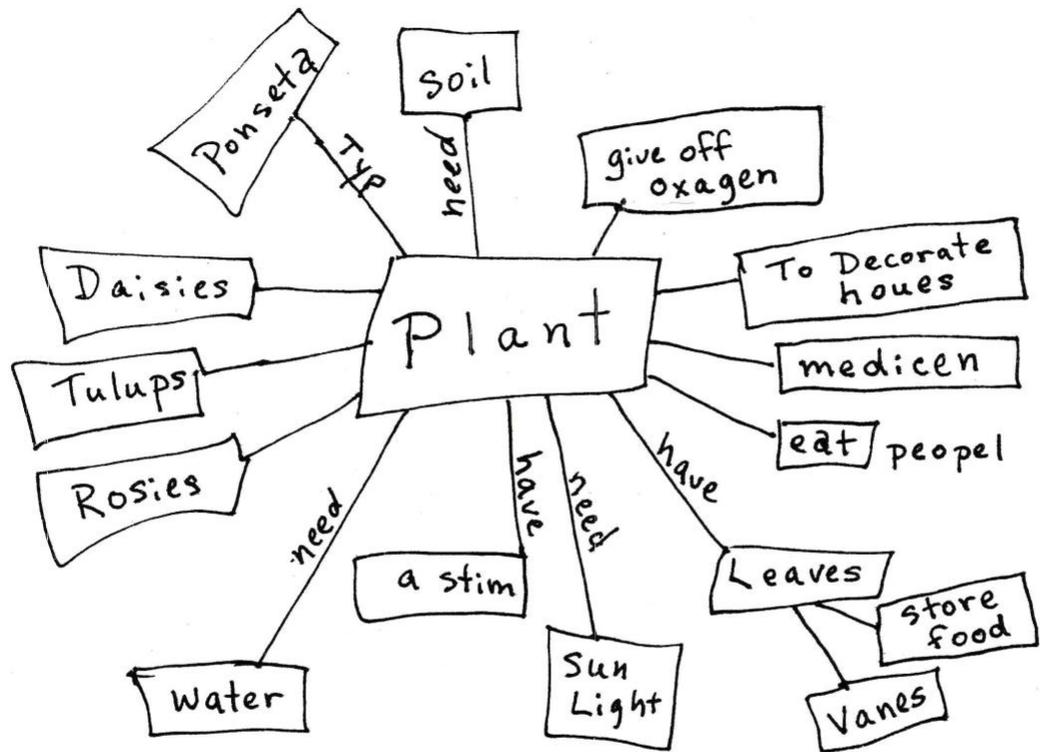
Informant 6. Concept map of Plants



Informant 6. Concept map of Plants (continued)

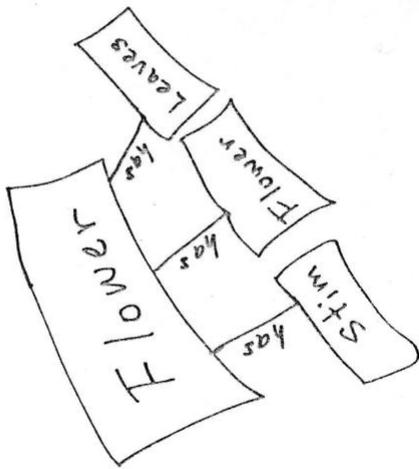


Informant 6. Concept map of Plants (continued)



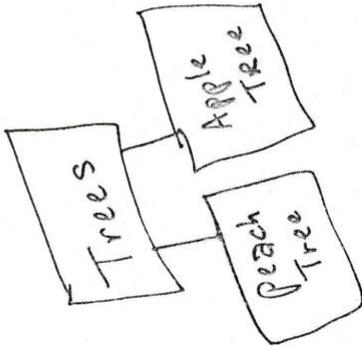
Informant 7: Concept map of Plant

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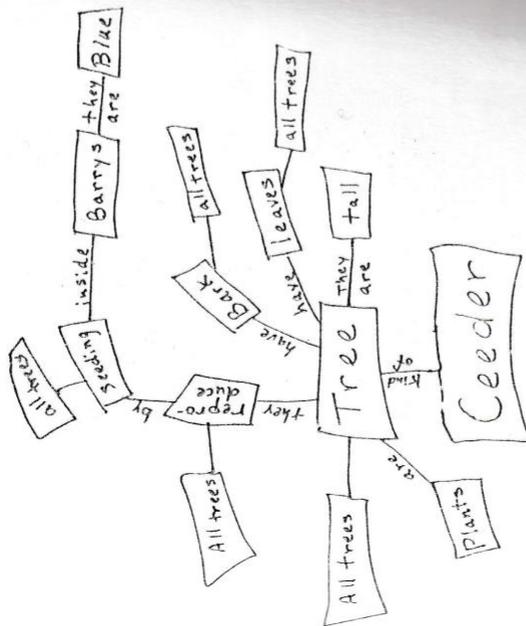


Informant 7: Concept map of Flower.

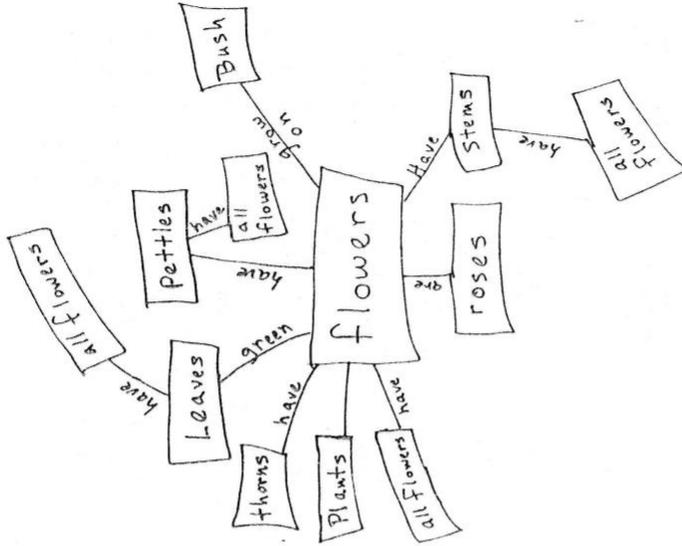
698



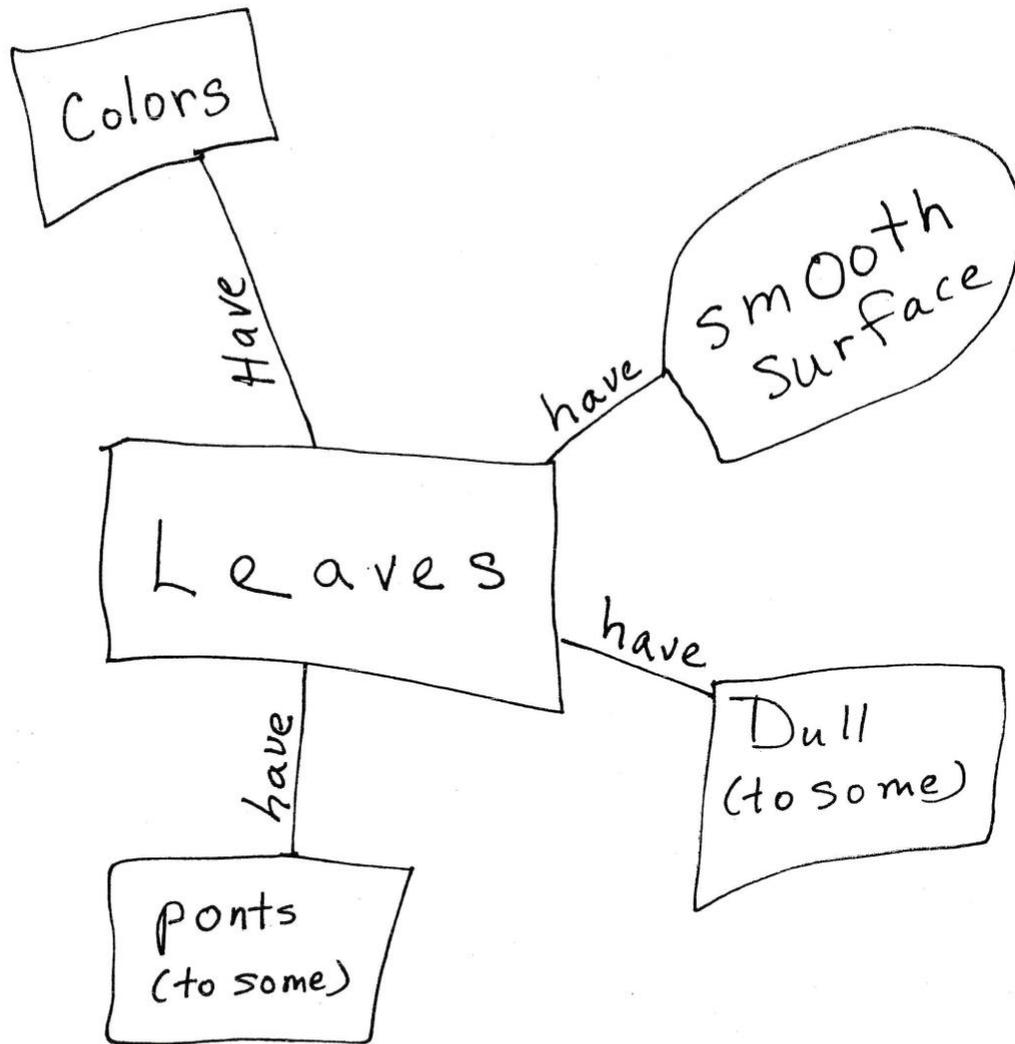
Informant 7: Concept map of Trees.



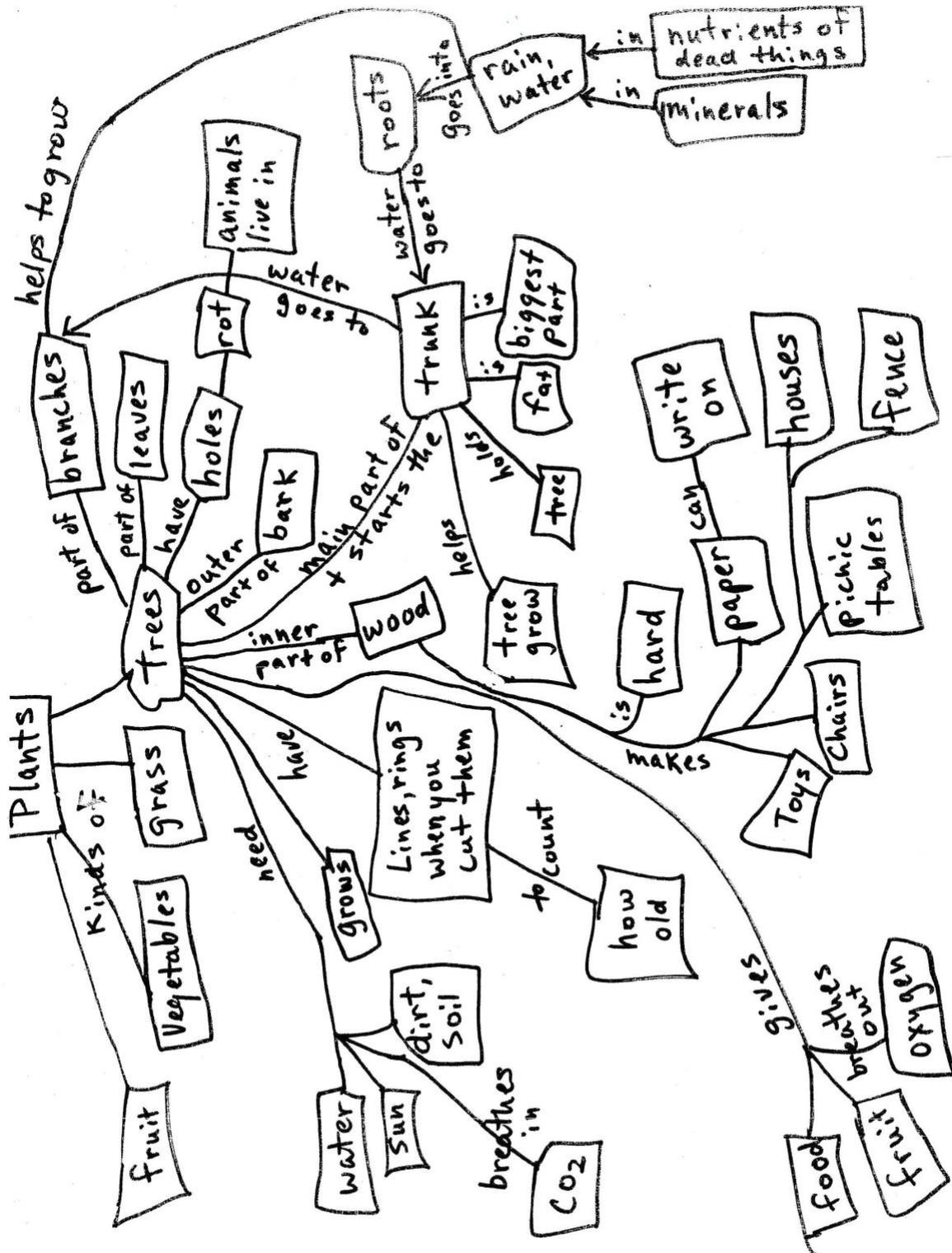
Informant 8: Concept map of Cedar (Cedar).



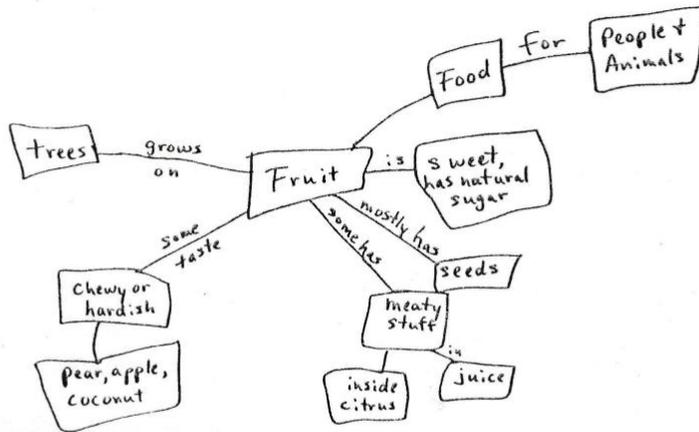
Informant 8: Concept map of Flowers.



Informant 8. Concept map of Leaves

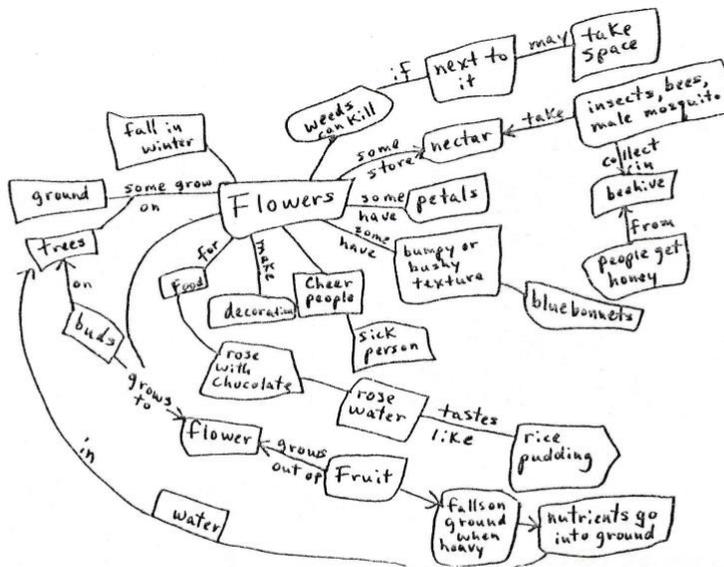


Informant 9. Concept map of Plants (drawn by researcher as the informant talked).



Informant 9: Concept map of Fruit (drawn by the researcher as 9 talked).

703



Informant 9: Concept map of Flowers (drawn by the researcher as 9 talked).

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## Appendix C-6: Dialog for Concept Mapping Exercise, Informant 7

The researcher only included one interview, as an example.

Notes: D = the researcher's verbatim statements. I = the informant's verbatim statements. The researcher's commentary is in parentheses.

April 22, 1988

(The researcher explained the process of concept mapping to the informant. Informant 7 started the first map by putting plant in a box. The rich development of plant, along with the rich explanation of each type of plant in the sorting task indicated that informant attended more to this category than did most other informants.)

I: Should I put like what makes a plant?

D: Yes.

I: (Adds stem, leaves). Now what?

D: What are some kinds of plants?

I: (Adds names)

D: What do plants do?

I: Give off oxygen.

D: How do people use plants?

I: Some people eat them, right? ("Some people" - does informant think that not all people eat plants? Informant adds other types of human uses.)

D: What do plants need to survive?

I: (adds "needs" sections)

D: What does the stem do for the plant?

I: Like when you put the water in the plant, the roots, it holds it up, and it goes into the stem, and the stem gives it to all other parts that needs it on the plant.

D: What happens to the water when it gets to the roots, then?

I: The stem takes it and gives it to all the other parts that needs it.

D: What about the stem on a tree? What else besides that would the stem on a tree do?

I: Doesn't it do the same thing?

D: Yes. Does it do anything else?

I: (no response.)

D: What would happen to the tree if it didn't have a stem?

I: It wouldn't have any leaves. I don't know what else the stem is used for on a tree.

D: OK. Why don't you do "Flower."

I: OK. Parts of a flower, right?

D: Yes.

I: (Adds parts. Then, tells me to change all of the names informant put with "plant" to "type of flower." He believes they are not types of plants.)

D: Why does a flower have a flower?

I: For decoration.

D: Anything else?

I: When it grows, when it gets bigger... I don't know. When it grows a flower... No, I think, no, no, no. The flower gives, they're like seeds, it makes more plants. When the leaves, and .... I mean, the flower... When the stuff in the middle of the flower, the seeds and stuff, it falls off, it makes new plants.

D: So the seeds falls off, and a new plant grows out of that. And then what happens? So a new flower grows out of that?

I: (Pause) What do you mean?

D: How does the flower get to be a seed, or how does the seed happen out of the flower? Any idea?

I: (Pause) It grows.

D: We already talked about what leaves do, the leaves store food. Is there anything else that the leaves do for a flower.

I: Probably, I don't know.

D: What do flowers do?

I: Same thing as plants, they give off oxygen.

D: OK. Do they do anything else.

I: ... Probably give... Oh! Bees, um... They give pollen to the bees. (This may be the only informant who displays this knowledge.)

D: What do the bees do with the pollen?

I: Make honey.

D: Does the pollen have any other use?

I: (Pause)... Um, um, um.... Hummingbirds.

D: What do hummingbirds do?

I: They feed off of it?

D: The pollen?

I: They feed off of the pollen.

D: Anything else that you can think of that flowers do?

I: No.

D: What does a flower need to survive.

I: Soil, water, and sunlight. Soil is like dirt.

D: Do you want to do anymore.

I: Sure. Trees.

D: What do trees have?

I: Roots, leaves, stem. I guess that's all.

D: How do people use trees?

I: For paper, for building houses and tables. Fences and all that. Furniture, chairs, which is furniture. Pencils, toys, and pot holders and all different kind of things. Bowls.

D: Are there any other ways that people use trees?

I: For their fruits. To eat them.

D: Anything else?

I: No.

D: Anything else that trees do for people?

I: They give us oxygen.

D: What else do they do for us? Imagine a world with no trees, and no plants, and no flowers.

I: We wouldn't have oxygen.

D: What else?

I: (Pause)... There would be no place for birds... Shade... Oh, and the wind.

D: What would happen with the wind?

I: It would just be stiff.

D: How do trees affect the wind?

I: OK, like, trees are blowing, and other trees are blowing, and...

D: So that's what makes the wind.

I: Yes. (Wow - major misconception!)

D: Anything else that trees do?

I: (No answer).

D: What kind of a thing is a tree?

I: A living thing. What do you mean?

D: It's a living thing. Is it anything else?

I: (No response.)

D: A peach tree is a kind of a tree, and a tree is a kind of a what?

I: A tree is a kind of a... Oh! A tree is a kind of a bush. Is that what you mean?

D: Like that, or let me try to think of a different way to say it. OK, a type of. What is a tree a type of? Is it a type of a bush.

I: (No response.)

D: I think we covered that before, so we don't need to talk about that. (This conversation emphasizes that informant does not know that a tree is a type of a plant.) Can you think of anything else about trees that you want to add?

I: Yes, good for a clubhouse. Good for like worms and ants, inside the bark. Some trees are good for Koala bear (textbook concept). That's about it.

D: Since you decided to put all these names under flowers, can you think of any to put under plants?

I: Plants are hard.

D: Do you have any names for plants?

I: I don't think I know any names for plants.

## Appendix C-7: River Walk, Informant 6

The researcher only included one interview, as an example.

Notes: D = the researcher's verbatim statements. I = the informant's verbatim statements. This session was tape recorded.

April 29, 1988; time: one hour

(The informant tells me she needs to collect leaves for school plant collection, so we collect leaves as we go. I find out that the informant has never been to this site. She touches everything we talk about - textures are very important. She gives remarkable attention to fine details.)

D: Describe the leaf of this. (Magnolia)

I: The leaf of this is kind of like a bowl. Some of them are kind of flat. Then they have normal veins, just right down the center of them. And they're kind of hard, they're kind of leathery. And they're kind of smooth and shiny. And on the back they're kind of soft, but there's little, tiny, tiny bitty hairs. And they have little veins growing out from the big veins, in a V-shape. And its pretty big, it's kind of like my hand without the thumb (size). And it's kind of in an oval shape. And then, on the tree, they have these little things, they look like hairy bananas (the buds). And they're yellow, they have brown hair on them. And they're kind of in a cone shape. (All this without a pause).

D: Do you know what they are?

I: I'll bet they're buds for new leaves. Right?

D: That's what they look like to me.

I: We know the name of this tree (reading label). Magnolia.

(Side talk - includes leaf in collection for school).

D: Do you want to look at this one? (Crepe myrtle)

I: I think we have these in our back yard. Remember?

D: I don't remember.

I: They have, like a redbud tree or something, I think that's what they're called. (Check notes from first field trip to see if informant calls the same plant redbud, although the common name

is wrong.)

D: What are these things? (seed pods of crepe myrtle)

I: These things, I don't know. They look like (pause)... they look like something used to be in them, 'cause you can tell that they sit up like that. And they look like a seed or something maybe sprouted out of them.

D: Tell me about seeds.

I: Seeds? Well, which kind?

D: Seeds of this.

I: Seeds of this. I bet that these seeds are similar... Oh, see, there's an unopened one. (Opportunity for hypothesis checking.)

D: Let's check it out.

I: These are kind of wet. Oh, nothing is in them. The seeds aren't in here. I don't know what are in here. Maybe they become leaves. (Hypotheses was tested, evidence not found, so new hypothesis presented.)

D: OK. We'll talk about seeds when we find some seeds.

I: Wait a minute. Let me get some leaves (Collects leaves from crepe myrtle). What is this called ? I bet it's a redbud tree. Is that what it is?

D: It's a crepe myrtle tree.

(Informant writes this down.)

I: Oh. And that looks like the same thing, a crepe myrtle.

D: Yes.

I: This looks like a peach tree, maybe. Is that what it is?

D: Yes.

I: Oh, I was right! First time! And, let's see, the leaves, they look, they're kind of skinny, and they're pointed at the end. They come to a point. And you can't really make out the veins real well, but you kind of can. And that's what gives them their color difference because in between the leaves (means veins) they're kind of lighter green. And on the back, they're pretty

much the same as on the front. Look, a little black lady bug. So, they have one big long vein, and then they have little teensy, weensy little veins coming out from them. And most of them are chewed (insect damage). I'm sure that's not the way they grow though.

(Informant collects a leaf.)

D: Let's go down to the river.

I: I've never been here. This is pretty. Can you come here anytime you want?

D: Yes, it's part of the park.

I: Is it part of Sewell Park?

D: No.

I: Oh, these are honeysuckles right here (Yes). Our honeysuckle bush, there are honeysuckles all over them, and they're a lot better than these (smelling test), but it's not quite as big. There are honeysuckles all over it, and they usually smell a lot stronger than this. They're very, very, very, very strong.

D: I remember we saw these in your yard, but why don't you tell me about these? (flowers)

I: Well, these are flowers. The flowers have 3 or 4 little like fingers on the end (petals). And a thumb on the other side (The petal that curls backward - excellent descriptive terms - demonstrates that informant notices the bilateral symmetry).

D: What are those parts called?

I: Petals? I guess. It looks like one long petal until at the very end they split up into a couple of them. (Excellent - informant notices that the petals are united.)

D: Yes.

I: And then there's one long green thing and a bunch of little brown things.

D: OK. Do you know what those parts are? (Stamens and pistil)

I: Stamens is one of them.

D: OK. I'll tell you what this one is, this is called the pistil, the female parts.

I: Oh, yeah. And these are the male parts or something. Then if you pull this out, you get honey.

D: How come some of these (flowers) are white and some are yellow?

I: They're born that way (laughs). I don't know why. Why are some people brown and some white? It's just the way they are. I guess there are just different color pigments in each one. But I have noticed that, like in this one, the yellow ones are always more wilted. But they always have more honey. (Excellent - the longer informant talks and thinks about it, the more creative the thinking gets, the more past observations enter into the hypothesis formation.) Sometimes they do. Sometimes they don't have any honey in them at all. But the bees get most of it.

D: OK. What are these?

I: Buds. They're buds.

D: Buds of?

I: Buds of honeysuckle plant... flowers. And if you break them open you can see those little parts in there. (Excellent - informant has already figured out how to distinguish a flower bud from a leaf bud by observation and field testing).

D: So a bud, you can have a bud for both a leaf or a flower?

I: Yes. But leaf buds are a little bit different from flower buds because leaf buds, OK, when they start growing they're real little, you know they kind of look like a leaf, though. They're like, they're like little bitty teeny little leaves, like a whole bunch of them crowded into one. And that's what makes it. But then, flower buds, they're a little bit different...

Oh, elephant ears (accurate). Look at the drops of water on it.

And so, flower buds, they're still all together, they're not separate little things. They're all together. But leaves, they start out as little bitty leaves and then they just grow bigger. But the buds of flowers, they're all one thing. And then they break apart. There's not much difference but they are different.

(Informant has a very strongly defined separation in mind based on previous observation. However, informant may not realize that leaves can be enclosed in a covering like flower buds are. Or are they?)

D: Let's look at this stuff over here. (*Sonchus*)

I: These are... I don't know what they're called. They're kind of like dandelions, but I don't know what they are.

D: Yes. They're related to dandelions.

I: Yes, because of these little things.

D: What are those little things?

I: These are the flowers and they have little seeds on the end. Like little parachutes. (Excellent analogy and recognition of seeds, but this is not a flower, it's the fruit.)

D: It's the flowers? What's this yellow? (flowers)

I: It's the same thing. It's a flower but..., they're kind of like people. The hair on this one is yellow, but then when you're like an old grandma and your hair turns gray and everything. And it falls out, see. The yellow ones won't fall out. But these fall out real easily. (Wonderful analogy for the aging of the flower to a fruit. However, indicates some possible misconceptions about how the flower becomes a fruit - more than just aging is involved.)

D: OK. That's a good analogy. What's this? (bud)

I: It's a bud. See, here's what I was saying. (Pulls one apart - notices that there are both yellow and white parts inside - causes some uncertainty about the white being an indicator of age). But these aren't exactly... You open it up, and then these little... I guess some of them are yellow and some of them are white. I don't know. I don't know anything. (Seems discouraged that hypothesis didn't seem to hold up under scrutiny. Actually, the hypothesis was good, but it didn't take into account all variables - the fruiting stage is white, but so is part of the bud.)

D: You know some things! Did we look at those pink flowers before when we went walking?

I: Buttercups, or primroses, whatever you want to call them. Yes, we did. Are they really primroses, and not buttercups?

D: They're evening primroses. People call them buttercups. It's a common name. It doesn't matter what you call them.

I: Is there a difference between the yellow ones and the pink ones? Cause the yellow ones are the same as the pink ones, but they're a different color (Is able to recognize closely related species despite color differences).

D: They are different species of evening primroses. There is something else called a buttercup that is yellow, but when you look at it closely, it looks different.

What are these green balls growing on here? (hackberry seeds, unripe)

I: They're probably seeds. Either that or plant buds. But they look like berries.

D: How could you tell it's a seed and not a bud?

I: How could I tell? Because, look at it. It's all one solid thing. See, look. (Informant throws it on ground.) It didn't break. And when I held it in my hand, I was for sure, because I squeeze it...

D: It's hard.

I: It's hard. And buds would just kind of break open and smither in your hands and get your hands all green. (We laugh)

D: That's a good way to tell.

I: And you can tell by looking at them. It's cause they're kind of round. And buds are never perfect. You know, they're kind of this way. (Demonstrates shape with hands.) Especially leaf buds. Flower buds are more normal.

D: What's the function of those seeds? What are they for?

I: To make new trees. I guess.

D: How do they make new trees?

I: Well, they plant in the ground. And then you have to give them water, and soil, and sun. And some things you don't have to give. Oh, just, you know, normal things. And then, they're a little bitty plant, and then a bigger plant, and a bigger one, and then it's a big tree. And it makes leaves. And then you do the whole thing again.

D: How does a tree make seeds?

I: How does a tree make seeds? How it makes leaves. It just does.

D: Is the seed anything before it's a seed?

I: (Pause - no answer.)

D: It just comes out on the tree?

I: Well, no..., yes. It's just a seed. It's not anything else. (Major misconception - abstract concept, cannot observe in the field.)

Hold on, let me get some of this. Baby's breath. This is baby's breath, right? Or sweet william (No - *Torilis arvensis*)

D: Why don't you tell me about those.

I: Oh, is this broomweed? (*Brassica*)

D: It does look similar to broomweed.

I: What is it?

D: Mustard.

I: OK, because I have it as broomweed because that's what my science teacher told me. And I will go and tell her that she is wrong.

Now this (*Torilis*) looks like some other leaves that I've seen, like fern, or, but not exactly fern. They look kind of like, not fern, like mint leaves or something, I don't know. Something like that, something that you just don't find every single day. They look kind of like weeds, too. They are weeds aren't they?

D: Yes.

I: Well, they're called sweet William or baby's breath. They're tiny and they kind of smell good. And they always ??? (can't tell what was said here). And these little things are green before they get their tiny little flowers. And stem is pretty normal, it's kind of rough, though. Like a corn shuck.

D: Show me what would be a whole leaf.

I: A whole leaf. Well, that would be a whole leaf (one leaflet only). The reason this whole thing wouldn't be a whole leaf, even though it's all together, is because it has one line (not sure or this word, may have been "vine"), and they're each little separate things off of it. (Informant recognizes the compoundness principle but has never been given an explanation for it, so tries to come up with own explanation - indicates that informant knows there is something special about this arrangement of leaves.)

D: The common name that I've heard for this one is beggar's ticks. I haven't heard the common name that you gave, but that sounds like a good one, too. It's called beggar's ticks because the seeds stick to you like ticks.

I: I know there is something called baby's breath. I don't know if it's that or not but everybody I know calls it baby's breath. Cause they don't know what else to call it. Nobody really calls it sweet William. I just think that's another name for baby's breath. And if it's not, I don't know what I'm talking about.

D: All right, let's look at this. Why don't you describe the leaf? (*Chinaberry*)

I: Well, it's kind of different from any other leaf I've ever seen. At least this one is. All of these

other ones are kind of normal. They kind of start out fat, and then they go to skinny (shape). But this one, it starts out fat, and then (train whistle drowns out voice)... all of a sudden it's real skinny. I don't know what this is called, but this is a whole leaf (one leaflet). What is this called, do you know?

D: Chinaberry.

I: Chinaberry. Oh, Chinaberry!

D: The berries of it are poisonous.

I: Is it an ancient method of killing bad Chinese people?

(We explore along by the water.)

I wonder if somebody planted these elephant ears here. Oh, look at the water on it. It looks like glitter. It's pretty.

D: Let's look at this (Grape vine, examining flower buds).

I: These look like some kind of berries, like grapes or something.

D: Yes, it is. Very good. What are these things? (grape flower buds)

I: Baby grapes.

D: It looks like baby grapes?

I: Are they? They're not seeds.

(Side talking)

D: Do you know what this is?

I: Poison ivy?

D: Yes! OK. How do you recognize poison ivy?

I: Because it has 3 leaves on the same one. And 'cause I guessed.

D: OK. Looking at it, what else besides the 3 leaves would help you remember it?

I: Nothing. I'd probably walk right into it.

D: It's pretty hard to recognize a lot of times.

D: And also, I probably wouldn't look down and see that it had 3 leaves, 'cause it looks like any other, just foliage you'd find.

D: Yes, it does. A lot of times it will have that little red stem on it, but not always. Sometimes the leaves are real shiny.

I: That one is.

D: The shape changes a lot. They're all kind of different leaves.

(Side talking)

D: OK. What are those? (elderberry flower buds)

I: Flowers.

D: How can you tell those are flowers and not seeds?

I: OK. The first thing is, there's so many of them grouped together, and they kind of even look like flowers, see. And, if you look at them real close, you can tell that they're not balls. See. You can tell that they're not all one thing. They're a whole bunch of little things. Especially these ones cause they're pretty big. On these, I might not have been able to tell. Oh, these are hard. I think... Oh, there's some of those things over there. See, now I know they're flowers.

D: Why do those flowers look different from these flowers?

I: Cause they're full grown. (So informant is able to distinguish mature flowers from flower buds, but uses the same term for both.)

D: So what would these be? Would they be just little flowers or would they be buds of flowers?

I: They'd be buds of flowers. Not big flowers. (accurate here - informant does know that the term "bud" is applicable but does not always use it when referring to unopened flowers.)

Here's some more honeysuckle (accurate).

D: Describe this leaf. (Sycamore)

I: It's kind of like a maple tree. Or an oak tree. I always get those confused. It's kind of soft. And there's not one big major leaf, see. Oh, look, here's a leaf bud, and it's like I was saying. It's little bitty leaves (It's a small leaf - no longer a bud - incorrect use of term "bud".) It's not all grouped together. And there's not one big major one. If I go like that, fuzz comes off (Rubs hairs off leaf).

And they look kind of misty because of this fuzz stuff on them. And if you wipe it off, you can see it. It's like I said, there's not one big leaf. I bet it's to protect them (the fuzz) cause see these baby ones have a lot of fuzz on them (Good inference).

D: How would it protect them?

I: How? I guess from dust. Oh, I'm not sure, maybe just from yucky stuff in the air. I don't know. But it just protects them cause they're new, little baby ones.

(Collects a leaf)

I: What kind is it?

D: Sycamore.

I: Oh, it's a sycamore?

D: Yes. What are these things? (Pecan catkins)

I: Oh, these are bad, they get things everywhere. Um. I guess they're seeds. And they're little seed things, 'cause I think there's seeds on them. Cause they're going to be flowers. Can't be flower buds cause they're going to bud after they fall off. And they always fall off. (Reveals confusion about buds and seeds - does not understand function of the structure). These have little seeds all on the same little thing (examines the catkins closely). Hey, maybe there's a whole bunch of little seeds in each one. And maybe these are so little, you have to plant a whole little thing for a tree to come up. (Reveals misconception about germination - thinks it may take more than one seed to produce a tree).

D: Let me tell you something about these seeds. They are flowers, but they're not going to ever have pretty petals on them.

I: That's the flower? Ugly flowers. I don't like them. Too ugly for me.

I would suspect that's poison ivy.

D: Yes. It sure is!

(Side talking)

D: What does a flower do for a plant?

I: Well...

D: Do trees have flowers on them?

I: No. Flowers usually just grow on a plant. But trees, every once in a while, like, they probably all have flowers. But I can never see them. Like these things (catkins), I didn't even know they were flowers. I thought they were seeds the whole time.

D: Why would a plant or a tree have flowers. What's the purpose of a flower?

I: Well, to tell you the truth, I really don't know. Well, maybe it has a seed in it. Maybe it's to give off seeds. Maybe they're for bees to come along and pollinate them. But I don't know what that's for. I mean, I don't know what in the world you have to pollinate them for. But...

(Another example of an abstract concept - the child has the right words, which may lead the teacher to think they have the concept to go with the word, but they do not).

Are these blackberries?

D: They're dewberries, which are like blackberries.

I: We used to have some of these in our back yard. Will dragonflies bite you?

D: No. OK. Describe these leaves. (Anacua)

I: OK. These leaves are hard. They're rough, like a corn shucks. If you rub them a certain way. If you rub them the other way, they're kind of smooth. But if you rub them another way, it's bad, they're rough (texture is definitely the most distinctive thing about these leaves). And they're just kind of your basic leaf shape, they're not very exciting. They're kind of shiny. They're sticky. After a while, if you keep touching them, they get sticky. Maybe it's just my hands but. And the main line that went through them (vein). The main vein that runs through it, and the little things around it (smaller veins), but I don't think they're in an exact V-shape.

D: Well, here's a strange kind of question. How do you tell a flower from a leaf?

I: Well, for one thing, the way I always tell, and I don't know if this is right or not, it's how I tell. It's 'cause flowers are prettier than a leaf. And they have color, and they have different shapes and everything. But leaves are just, they're basically all the same. None of them are very different except, you know, the ones that are on the Canada flag, and you know. But these are the main kind of ones. You know, they come in different variations, like ovals and round and everything. Oh, weird, look at this.

D: Describe it to me. (*Aesculus* leaf)

I: It looks like it's cramped, to tell you the honest truth.

D: Crimped?

I: Yes, and the leaves, they start out skinny, and they get bigger and bigger and bigger, and they start to go back skinny, but they don't all the way back make it like the first. And there's kind of like a point on the end. They have one central thing (vein). And I guess that's what makes it look that way, it's cause each... If there's a line on this edge, there's a line exactly right there on the other side (secondary veins), and it's really like a V. And they're really deep and sharp and I guess that's what makes it look like that.

D: So would this part be one leaf? (one leaflet)

I: Yes.

(Side talking - we see an anole)

D: How would you describe these? (bur oak leaves)

I: They're kind of like a Christmas tree but they're the wrong way (Informant notices the fact that they are wide at the tip). If you put it this way (upside down), it would be a better Christmas tree. They start out skinny, and then they go out and in, and out and in, and out and in (describing the lobes), and then they go out and they never come back in (informant's voice gets louder at each lobe). But if you turned it this way, it would be kind of like a Christmas tree, and it would be better. And it has one big vein. But they're not like that other crimp plant that has one, and then there's another to make a V, and one and another to make a V on the other side (secondary veins differ from Aesculus - remarkable observations and comparisons).

(Collects leaf)

I: What is it called, do you know?

D: This is called a bur oak. What would you think that these things on the end are? (leaf buds)

I: These are either new leaves, or they're flowers. But I don't see any flowers on this tree, so they're probably new leaves (Again, informant does not use the term "bud".)

D: Are they leaves or are they the buds of leaves.

I: Oh, yeah, these are the buds of leaves. See, buds of the leaves, they're when... It's only a leaf if it's in the shape, like the big leaf. If you're wondering if it's a leaf or a bud, when it's real little, if it's in the shape of a big leaf, then it's a leaf. But if it's still, you know, up tight like that, in a little ball or something, then it's a bud. (Informant seems to be formulating a definition of bud as we go along - compare to two previous descriptions of bud. Informant has spent quite a bit of conversation on this problem. Each time, the definition gets modified a bit by what we see in the field. The evolution of a definition!)

D: Let's go sit down. I have something I want you to do.

I: And also, buds, they're always a little bit of a different color. Maybe not much you know, but those white ones we saw (the baby sycamore leaves - which weren't really buds, even by informants current definition - it would have been nice if I could have asked about that definition when looking at those leaves), those were a different color, 'cause they were kind of green, cause the veins came up around them, and the other ones were real white.

(I have informant do the leaf sort here, with the tape recorder off.)

(As we walk back, I ask the following questions.)

D: How would you tell a plant from an animal? For example, how would you tell a tree from a horse? (Informant doesn't need the horse analogy, is able to make comparison with animals in general and self in particular.)

I: That's very easy. You see, because, number one, animals move around. And they're always moving. They're always, always, always moving. And I mean, I can do that (informant stands still), but I'm still moving whether I like it or not, my heart's beating. But plants can stand perfectly still. There's no warm blood or anything. And also another thing, they don't have control over what they do. Like, well... no, they really don't. They don't have control. You couldn't look at one and say, "Oh, I can tell it's a plant because it doesn't have control over what it does." But that's a difference between them. I mean, if you're comparing me to some honeysuckle bush or something, it doesn't have any control over whether it gets blown in the wind, whether it gets rooted up, whether it gets blown away in a hurricane. But you know, like, I do. I mean, maybe not get blown away in a hurricane. I might not have any choice about that. But I have my own decision if I want to keep walking, or if I want to stand here. Or if I want to do anything. And also because most plants are green.

D: OK.

I: Well, that's the reason I always can tell. And also if you just look at them, you can just tell, you know. Some animals you can't tell, like insects and stuff, if they're those weird ones, you know. But still, they still move and they have control over what they do. And they think.

D: And so what are insects?

I: What do you mean? They're animals. Sometimes someone will say, no, no, insects aren't animals, they're reptiles or whatever you call it, but I call them animals. (Informant knows that insects are animals - something that a lot of people don't acknowledge. But this comment about reptiles brings in the question of how informant defines animal; is informant only thinking of mammals? Probably not. Probably informant knows that reptiles are animals also.)

D: Yes, you're right, they're animals. OK. Anything else?

I: Well, when you think about it, they're rooted there, they'll stay where they are. Unless they're a little bitty seed or something, but they're not really a plant. Well, they are but they're not a big plant.

D: Anything else.

I: I don't think so. They're just green. And also, you just look and, I don't have to sit here and think whether you're a plant or an animal. (Indicates gestalt recognition)

D: Let's look at this. (paper mulberry)

I: It's soft. In fact, it's real soft. It's real furry, cause even the little stems (petioles) are furry. Except where there's bark, then it's not furry. It still kind of is, see, you barely rub it. And then these leaves. They're pretty big. They're pretty good size. They're not big. But they're good size. They're not little bitty ones. And on the back they're kind of white, whitish, and on the back you can see the veins better. So that's where I'm going to describe the veins from. There's a big vein running along here, and, like I said, it's that... what will I call it. I don't know what you call it, it's that kind that goes, one thing here... well, it really doesn't do that. It's kind of a V one. (referring to the secondary veins making a V-shape.)

D: What about, are they different from each other, how the veins go?

I: All of them are going to be different a little bit. These little bitty one may run to different places and stuff. That's really the only difference. Cause they both have this main vein.

D: OK.

(Collects a leaf)

I: What is this called?

D: It's called paper mulberry.

I: Oh, it's a mulberry tree?

D: It's not a mulberry, but it's related to a mulberry. (I tell about the tree uses.) People in Samoa use the bark to make paper, and they used to make clothing out of it.

I: Clothing mulberry.

D: I want to show you this. Do you know what this is? (Mesquite)

I: It looks like a fern but it might be a mimosa. It's probably a mimosa. But it might be a fern. The leaves, they're all on the same central line. And the leaves, I would say that this is one leaf

(one leaflet), not that this whole thing is a leaf (the compound leaf), you know, but still the leaves are kind of small and they're all grouped together. (indication that informant notices compoundness. Mesquite and mimosa are in the same plant family.)

(Collects the leaves)

D: The reason it looks like a mimosa is because it's related to a mimosa. It's a mesquite tree. Like the one that grows in ... yard.

I: Oh, yeah, if I had seen the tree I would have... 'cause I know that tree because it's thorny. (We must be looking at a small tree that doesn't look much like the one informant knows.)

D: Also, when the leaves are real close in groups like this, sometimes it's because they are all one leaf. Sometimes it's hard to tell. You have to find the bud.

(We examine it together. Then we look at a Chinaberry.)

(We see a turtle laying her eggs. We talk about it.)

D: How do you tell if something... Tell me what are the things that are living things?

I: Living things? Well, if, maybe, if they breathe. Or if they (pause)... if they respond to things. Like if you slap me and I go, "Hey, man!" Or like if you cut a hole in a tree, maybe it would grow it back up or it would just go and let it die, but it would probably try to make it grow back up, and start responding to it. And if a frog, you cut it's head off, it will jump around and get upset. It will probably die if you cut it's head off. And to make baby things, like a baby plant. Like a rock doesn't have a baby rock.

(Side talking)

D: OK. How can you tell if something's living? (Need to get informant back on the subject.)

I: OK. It can reproduce. And it can respond to things. And maybe it needs something, like it needs food. Or it needs water. Or it needs some kind of energy. Like maybe it needs shelter or something. Like, if you put a tree out in the middle of a hurricane, it didn't have any shelter, it probably would get blown away. Or even if you put a tree out in the middle of anywhere without nothing else by it, it probably wouldn't live as long as these trees with things all around it, covering them or something like that. Which isn't a real good reason but it's all I can think of.

D: OK. Any other ways you can tell something's living?

I: Well, maybe it breathes. Cause I know plants breathe. And I breathe. And I know animals breathe. I think all animals breathe. Even fish breathe. And so, all animals breathe, I think, all living things. Cause I know plants breathe. They don't breathe in the same thing we do. But they

still breathe.

D: How do trees get energy?

I: How do trees get energy? Well, energy like (pause)... what kind of energy?

D: Any kind of energy.

I: Well...

D: What kind of energy do trees need?

I: Hum. I don't know. They need energy to live. I guess. I don't know. I don't know. I don't know.

D: That's fine. You don't have to know. But if you did know, I was going to get you to tell me.

I: Well, they need energy like... What kind of energy do they need. I don't know what kind of energy. They need energy to make leaves, I guess. Or to make little seeds. Or to make buds. Yeah, they need energy to do that. And they get energy by the sun. By the sun, and the water, and the soil, I guess. And I guess that's all. I guess that's the only kind of energy they need.

D: OK. Here's a different kind of question. Why do flowers have petals?

I: Why?

D: Can a flower get by without a petal? Or how does a petal help a flower?

I: Really, I think, A flower can by without a petal, because petals, all they are, it could just be one big circle. It couldn't be without the little flower parts. Say you take a primrose, and it didn't have the little slits, it was just all together (petals united into one circle), it would probably survive. It probably needs that flower part for some reason, like to protect it from, I don't know what.

D: I want to ask you one more question. Describe the different things that would happen if there were no plants left in the world, there were no trees or flowers...

I: Well, for one thing, we would all die.

D: Why?

I: Because we need the oxygen that they breathe out. And oxygen is just one of those things that you don't buy. You have to get it from plants. And if we didn't have plants, well, that's the main thing, we'd all die because we couldn't breathe. Well, no, we'd live for a while, it's not as if we used up all the plants right now we'd all die right here, but after a couple days, maybe a

couple hours, we'd all die. And without plants (pause)... I don't know.

D: What else.

I: Without plants. That's all I can think of. I don't know what other... Without plants, it wouldn't be so pretty. But that's not a real big reason. That's all I can really think of. I don't know why we need plants.

D: Ok