(Partial credit given for many questions)

Prototypes and Evaluations – Mandatory question – All parts (14) worth 3 pts each

1. (42 points) You are working with a researcher, Dr. Phainopepla, on an application that will help people identify wildflowers. The normal searching that allows users to search/browse via color (e.g., blue flowers, red flowers, etc.) and shape (e.g., trumpet, cone, etc.) is included in the app. In addition, the application will allow searching/browsing based on relative plant height (i.e., on the ground, short, medium, and tall), and users can take pictures of either the flower or foliage (i.e. stems and leaves) and use these for identification. Further, the application will identify flowers from pictures taken at different stages of development such as buds, full blooms, and seeding. In any of these cases, foliage may also be used as additional information to make an identification. You have performed contextual inquiry interviews with both expert and casual users in the field and also in laboratory locations. You have prepared a prototype that you are sharing with Dr. Phainopepla. Your prototype shows the following screens:

- Main/welcome screen for the app.
- Screen where a person can search and browse through flower information.
- A history screen— what searches the person has recently performed (the screen allows customization of the history depth). This screen will also allow a user to enter information about where they located particular flowers if they want to keep track of this information.
- A screen of favorites where the user can drag information regarding flowers they want to keep handy.

(a) (Check all that apply.) What kind of a prototype is this?

- [✓] Low fidelity
- [□] High fidelity
- [□] Vertical
- [✓] Horizontal
- [□] None of these
Dr. Phainopepla tells you, “Well, that’s interesting, and clearly we have to change the name on the main page, but I really want to see how the searching on different parts of the flower/foliage is going to work. Can you please add more details on searching to this existing prototype? I think that is where the biggest challenge for the UI is going to be.”

(b) (Check all that apply.) What kind of prototype is Dr. Phainopepla requesting?

✓ Low fidelity
☐ High fidelity
✓ Vertical
☐ Horizontal
☐ None of these

So you go back to your contextual inquiry data, and really study the affinity where your team has added lots of design ideas. You look especially at issues and design ideas for searching. You find ideas like being able to enter or automatically get GPS coordinates in order to narrow down the potential species in an area, being able to enter or automatically get a date in order to look up weather information to narrow down potential species for the current timeframe, and being able to take a wide-field picture of the area to get a better idea of the general habitat, such as alpine, montane, riparian, prairie, desert, etc. A user will be able to take advantage of some or all of these ideas narrow their search.

You build a new prototype that incorporates all of these design ideas, and show it to Dr. Phainopepla. This time you have many more screens, so it is easiest to let her “use” the prototype and you provide the “computation” for the application.

(c) (Check only one.) This type of demonstration/evaluation is called a:

☐ Yellow-Brick-Road demo
☐ Low-fidelity demo
✓ Wizard-of-Oz demo
☐ Vertical demo
☐ Think Aloud demo
☐ None of these

You tell Dr. P. that you’d like to perform some evaluations with this prototype to make sure that other people can and will use it effectively. You explain the idea of an evaluation plan, and explain the iteration cycle.

(d) (Check only one.) The iteration cycle is: (NOTE: ‘aka’ is short for ‘also known as’)

☐ Continually evaluate (collect data and analyze it)
✓ Collect data and analyze it (aka evaluate), use it to understand user needs, design to those needs, and repeat
☐ Gather requirements and analyze them, design to requirements, evaluate (aka test with users), and repeat
☐ None of these
You make it clear that the interaction design will undergo additional changes based on evaluation results. Dr. P. thinks this is a good idea, but is rather concerned about how long it will take. There is a constraint on the project that a demo has to occur in a month. Dr. P. says that there are 4 experts and 2 wildflower clubs of both novices and hobby experts who have offered to help test early versions of the application, and at least some of them can be tapped to evaluate your prototype if it doesn’t take too much of their time.

(e) (Check all that apply.) The kind of evaluations you want to perform are:

- Formative
- Summative
- None of these

You and your team start developing an evaluation plan for the project, and one of the things you decide is to get some feedback quickly on the prototype you currently have. You decide that you really have 3 potentially very distinct types of users: researchers, enthusiasts (who may be experts or novices), and casual users with little knowledge of wildflowers. You plan to perform think-aloud evaluations with 1 researcher and 1 novice enthusiast. You expect to get information on different parts of the application user interactions from each of these evaluations, given the differences in the user types, so you will use the same prototype for both.

(f) (Check all that apply.) The paradigm you are using for these evaluations is:

- Quick and dirty
- Usability
- Field/naturalistic
- Analytic
- None of these

(g) (Check all that apply.) Your evaluation plan includes additional techniques from other paradigms, since you want to:

- Make sure everyone knows you are being thorough
- Make sure you reveal as many different ways that the same system can affect users as possible
- Take more time so that the project bosses understand that this takes lots of effort
- None of these

After the think-alouds, you plan to revise the prototype and proceed with more in-depth evaluations that will give you not only ecological validity, but also rich behavioral and other qualitative data. You hope to observe both a researcher in the field and a casual user in the field for these evaluations.

(h) (Check all that apply.) The paradigm you will most likely use for these evaluations is:

- Quick and dirty
- Usability
- Field/naturalistic
- Analytic
- None of these
You add the demo constraints into your evaluation plan so that you won’t forget them, and decide that it will be best to prepare a demo video using a prototype, with you providing the computation, to show the user experience. In order to create this video and make it look “real” you decide that at this point you’ll need a prototype that looks like the real app and you especially want to show off the novel searching capabilities.

(i) (Check all that apply.) This prototype will be:

- Low fidelity
- High fidelity
- Vertical
- Horizontal ← maybe this too since only 1 part (search) is detailed/vertical
- None of these

You know that researchers and wildflower enthusiasts will care about how hard the app is to learn and remember, but since they are enthusiasts they already have a certain knowledge about how to identify flowers that often takes many steps (you obtained this information from your original contextual inquiry). Casual users however, need tools that are easy to learn for a person without a lot of background knowledge. So you decide to include another kind of evaluation, performed by user experience experts, in your plan to help you figure out just how much mental effort will be required for a casual user to learn and use the app.

(j) (Check all that apply.) The paradigm for this type of evaluation is:

- Quick and dirty
- Usability
- Field/naturalistic
- Analytic
- None of these

(k) (Check all that apply.) The specific technique you will use is:

- Heuristic evaluation
- Cognitive walkthrough
- None of these
Over the course of the project, you have worked with Dr. P not only to refine the overall application goals, but also to define specific goals for the user experience for the different types of users. You especially want to find out which of the searching techniques causes the different types of users to identify flowers quickest and most accurately. You’ll need quantitative data to determine the answers to this question. You plan to design 3 different evaluations to collect enough data.

(l) **(Check only one.)** The paradigm you’ll most likely use is:

- Quick and dirty
- **Usability**
- Field/naturalistic
- Analytic
- None of these

(m) **(Check all that apply.)** The evaluation technique you’ll use is:

- Think-aloud
- **Experiment**
- Observation
- Heuristic evaluation
- Cognitive walkthrough
- None of these

(n) **(Check only one.)** The first thing you’ll need to do for these evaluations is:

- Define a detailed task for subjects to complete.
- Enlist several UX experts to perform evaluations.
- **Develop hypotheses from the evaluation questions.**
- Recruit subjects for the evaluations who represent a cross-section of the target user groups.
- Develop the survey you’ll use in some of the evaluations.
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Design-1
2. (30 points) This is the main web page for the National Radio Astronomy Observatory.

This is the same page scrolled a bit and cropped so that you can better see the navigation items in the banner, which got smaller when you scrolled the page.
(a-1) (4 points) (Check all that apply.) Which Gestalt principles do you see in this image? For each principle, circle it or otherwise make it clearly annotated on the image and label it with the abbreviation of the name of the principle, which is given in parentheses after the name in the list below.

- Proximity (Prox) ← navigation buttons
- Similarity (Sim) ← 2 telescope pics; size, location on page
- Continuity (Con)
- Closure (Clo)
- Area: figure/ground (Ar) ← logo on banner, message on big nebula pic
- Symmetry (Symm) ← telescopes in 2 pics both facing out
- None of these

(a-2) (2 points) (Check all that apply.) What structural properties do you see in this page?

- Hierarchy ← navigation at top
- Relationship ← navigation buttons
- Balance ← 2 telescope pics where both are facing out
- None of these

(a-3) (3 points) Give 1 example of each of the structural properties you chose; or ‘N/A’ if no structural properties exist on the page:

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If you select ‘Visit Us’ from the top banner on the main page you get this page. The top banner has the same navigation choices, and this banner gets smaller if you scroll the page.
(b) (6 points) (Check all that apply.) What items that we discussed in class are evident on this page? For each principle, circle it or otherwise make it clearly annotated on the image and label it with the abbreviation of the name of the principle, which is given in parentheses after the name in the list below.

- Structure principles: hierarchy (Hier) ← navigation at top
- Structure principles: balance (Bal) ← 4 pics of sites; teles facing out, text/pic and pic/text
- Structure principles: relationship (Rel) ← navigation
- Structure principles: grouping using gestalt principles (Ges) ← nav, symm of site pics (above)
- Gulf of execution (GEx) ← ‘learn about’
- Gulf of evaluation (GEv)
- Affordances (Aff) ← ‘push’ buttons
- Mapping (Map) ← maybe type in search bar & it will find stuff (but search scope not clear)
- Constraints (Constr)
- Visibility/feedback (FB) ← ‘cookie’ crumb train
- Consistency: you can consider both this page and the home page (Consis) ← banner/nav
- Metaphors (Meta) ← search – magnifying glass
- None of these
If you click the link to learn about visiting ALMA, you get this ‘ALMA Page’.

If you scroll down a bit, you see this.
This page intentionally left mostly blank.
And if you click the link to take a virtual tour you get this page. When the cursor is over the map, it turns into an outspread hand. However, the map doesn’t move if you hold the mouse button down and try to move it UNLESS you’ve previously zoomed in on the map.

If you mouse-over the right-most accordion shape, a message is displayed.
(c) (5 points) (Check all that apply.) What do you notice about the ‘cookie-crumb’ trail of web pages on the ALMA Page (page 12) and the ALMA virtual tour page (page 14)? To what concept(s) we studied in class does this relate?

- [ ] Structural principles: balance
- [x] Consistency ← doesn’t reflect how we got here
- [ ] Structure principles: hierarchy
- [x] Gulf of Execution ← we know where we can go back to
- [ ] Constraints
- [x] Gulf of Evaluation ← cookie-crums are feedback regarding where we are
- [ ] None of these

(d) (5 points) (Check all that apply.) For the 2 ALMA Explorer page images (page 14), which of the principles we studied, listed below, do you see represented? For each, circle ONE example or otherwise make it clearly annotated on the image and label it with the abbreviation of the name of the principle, which is given in parentheses after the name in the list below. For items where there are multiple elements on the image needed to demonstrate the item, either make it clear which items are involved, or in 1-2 phrases indicate them on the image, along with which item they demonstrate.

- [x] Hierarchy (Hier) ← map name with pics under it on right
- [ ] Balance (Bal)
- [x] Gulf of execution (GoEx) ← what symbol goes with what pic? Open hand to move map
- [x] Gulf of evaluation (GoEv) ← cookie-crumb trail, message on bottom image re tele site map
- [ ] Affordances (Aff)
- [ ] Mapping (Map)
- [ ] Constraints (Const)
- [x] Visibility/feedback (V/FB) ← cookie-crumb trail, message on bottom image re tele site map
- [x] Metaphors (Meta) ← accordion icon is really unfolded map
- [x] Conceptual models (ConMod) ← how map moving works
- [ ] None of these

Optional: In no more than 2 sentences, justify your examples.

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If you click on the accordion shape to go to the Telescope site, you get the following page. However, you have to scroll down the image list on the right until you see ‘Telescope Site’, and then expand that to see the images and videos associated with this map.

(e) (5 points) (Check all that apply.) What user issues may exist on this Telescope Site page?

- Simplicity
- Gulf of Execution ← should open to map’s list
- Regularization
- Gulf of Evaluation
- Hierarchy
- Balance

Optional: In no more than 2 sentences, justify your choices.
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Surveys

3. (26 points)

3-1. (8 points – 2 pts each) Consider the following survey question, designed to find out people’s opinions about dealing with limited water resources.

“Should responsible Colorado Front Range communities institute water conservation by limiting the amount of water wasted on non-native water-guzzling laws this summer to avoid wasting more water and also encouraging destruction of native plants and grasses? ____ Yes ____ No”

(a) (Check all that apply.) Which of the question goals does this example meet?

☐ Measure the underlying concept of interest
☐ Don’t measure anything else
☐ Interpreted the same by all respondents
☑ None

Optional: In no more than 2 sentences, justify your choice(s).

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(b) (Check one.) What kind of question is this?

☐ Open-ended
☑ Close-ended
☐ Neither
(c) (Check all that apply.) Which of the following tips are NOT followed in the question?

✓ Avoid vague/imprecise terms; questions need to be specific

☐ Answers must be independent – they need to be mutually exclusive

✓ Avoid complex sentences

✓ Avoid double-barreled questions

✓ Avoid leading, emotional, or evocative language

☐ None – all tips listed are followed

Optional: In no more than 2 sentences, justify your choice(s).

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Pick ONE of the tips that isn’t followed, and re-word the question to fix this issue.

Tip I’m fixing: ___leading____________________

Re-worded question to adhere to the tip:

“Should responsible Colorado Front Range communities institute water conservation by limiting the amount of water wasted on non-native water-guzzling laws this summer to avoid wasting more water and also encouraging destruction of native plants and grasses?”
3-2. (6 points – 2 pts each) Consider the following survey question:

“How many computing devices do you own?

☐ 0-2    ☐ 2-5    ☐ 6 or more”

(a) (Check one.) What kind of question is this?

☐ Open-ended
✓ Close-ended
☐ Neither

(b) (Check all that apply.) Which of the following tips are NOT followed in the question?

☐ Avoid vague/imprecise terms; questions need to be specific ← maybe
✓ Answers must be independent – they need to be mutually exclusive
☐ Avoid complex sentences
☐ Avoid double-barreled questions
☐ Avoid leading, emotional, or evocative language
☐ None – all tips listed are followed

Optional: In no more than 2 sentences, justify your choice(s).

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(c) Pick ONE of the tips that isn’t followed, and re-word the question to fix this issue.

Tip I’m fixing: _______ independent ________________________________

Re-worded question to adhere to the tip:

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Consider a university sample survey that has 4 parts. The purpose of the survey is never stated, but it seems to be about some university courses.

The instructions say to answer all the questions as truthfully and accurately as possible. It later says that participation is voluntary and will help the survey-givers greatly. So, if you volunteer you have to answer all questions. Assume, for the tips below, that a person HAS volunteered to participate in the survey.

The first part of the survey (labeled ‘Individual Background and Demographic Information’) consists of 12 questions including current GPA and marital status.

The second part (labeled ‘Family Background Questions’) has 5 more demographic questions regarding the respondent’s family, including income questions.

The third part (labeled ‘Questions About University Courses’) has 9 questions on university courses. There are 2 questions that branch; that is, if the respondent hasn’t taken the course discussed in the question then they are instructed to skip to a subsequent question. However, one of the skipped and one of the “skip-to” questions have the same number. The university course section has questions on statistics, math, and sociology courses.

The fourth part of the survey (labeled ‘Personal Behavior, Attitudes and Beliefs Questions’) has 20 questions regarding the respondent’s attitudes and behavior.

(a) (Check all that apply.) Which of the following survey tips have been followed in this survey?

- None of these tips are followed
- Create a clear hypothesis that is testable using your survey.
- Keep it short.
- Do NOT require respondents to answer questions, especially ones regarding private information.
- Start with an introduction
- General questions first
- Ask sensitive questions near the end

✓ Only give questions applicable to each respondent (branching in surveys) ← SORT OF...

Pick 2 tips that weren’t followed, and in no more than 2 sentences state what would need to be done to fix the survey with respect to the tip.

(b) Tip #1: __________ shorter ______________________

How the survey would need to be changed:

________________________ remove 3, 4, shorten 1 ____________________________

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(c) Tip #2: __________ don’t have to answer __________________________

How the survey would need to be changed:

________________________ instructions ____________________________

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3-4. (6 points – 2 pts each) Consider the following survey question:

“Did you first hear about the devastating avalanche:
___ from a friend
___ from a newspaper
___ from the TV or radio or other electronic media
___ from a relative
___ at work?”

(a) (Check one.) What kind of question is this?

☐ Open-ended
✓ Close-ended
☐ Neither

(b) (Check all that apply.) Which of the following tips are NOT followed in the question?

☐ Avoid vague/imprecise terms; questions need to be specific
✓ Answers must be independent – they need to be mutually exclusive
☐ Avoid complex sentences
☐ Avoid double-barreled questions
✓ Avoid leading, emotional, or evocative language
☐ None – all tips listed are followed

Optional: In no more than 2 sentences, justify your choice(s).

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(c) Pick ONE of the tips that isn’t followed, and state what has to be done to fix the question with respect to this issue.

Tip I’m fixing: ______ language____________________________________

Required fixes:

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Research Claims
4. (17 points)

4-1. (6 points) “We want to determine if the changes we are proposing for our system increase the efficiency of entering new items into the database. We created a high-fidelity prototype of the proposed new system for new item entry. We then recruited (1) 5 current users of our existing system and (2) 5 developers of the new system. We had the 1st set of users enter 5 new items into the database using the existing system. We had the 2nd set enter the same 5 new items into the “database” using the proposed new system prototype. Our independent variable is which system is being used, and the dependent variable is the efficiency of entering the new items. This is considered a within-subjects study. We are measuring efficiency in 2 ways: the time it takes to “enter” the new item and the number of mouse clicks needed to do this. Results from our tests indicate it took the 2nd set of users 45 seconds and 30 mouse clicks, on average, to input a new entry into the database using the proposed new system prototype. By contrast, the averages for the 1st set of users testing the existing system were 50 seconds and 5 mouse clicks. We feel confident saying that the new system will be 10% more efficient than the old system.”

(Check all that apply.) Which of the following are true?

☐ This is a good example of a within-subjects study because all of the 10 subjects did the same tasks.
☐ Validity of the results is fine; we are measuring what we say we are measuring. ← learning
✓ This isn’t even a good between-subjects study because there were only 2 tasks (1 using the old and 1 using the new system) and they were not distributed across the user types (existing users and developers).
☐ There are no confounds in the study that could have influenced the results we saw.
✓ We don’t know if the time differences are statistically significant.
✓ We do know that fewer mouse clicks were needed on the old system.
✓ Confounding could easily occur with respect to mouse clicks since the old system might have keyboard shortcuts or something similar that existing users would know about and use and the new system might have similar shortcuts that the developers know about.
✓ The test only covered one task in the system, but the “10% more efficient” implies that this is true of the entire system.
☐ The 2 sets of subjects accurately reflect the target user population.
☐ None of these are true.

Optional: In no more than 2 sentences, justify your choice(s).
4-2. (6 points – 3 pts each) “To test our interface, we recruited 30 users that are representative of our target user set. Subjects first performed 10 tasks using the current interface. Subjects then performed the same 10 tasks using our new interface. Results indicate that our new interface improved task performance by 70%.”

(a) (Check all that apply.) Which of the following are true?

☐ Validity of the results is fine; we are measuring what we say we are measuring.
☐ There are no confounds in the study that could have influenced the results we saw.
☐ The results are reliable – we tested the same tasks for each subject. ← maybe not - learning
☑ Confounding could occur because of learning between doing the task the first time and the second time.
☑ The subjects accurately reflect the target user population.
☐ None of these are true.

(b) What is ONE thing that if you assume it occurred in the study, would make the above statement more credible? Use no more than 3 sentences.

_____ Need to randomize tasks across users between new and old interface to counter learning _____

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4-3. (5 points) “We added shortcut keys, switched to a multiple-document GUI, ported it to the Mac, eliminated the need for a mouse to be used, and added type-ahead capabilities to our application. Our hypothesis is that users would prefer the type-ahead capabilities the most, and that this new feature would make tasks using it take less time to perform. We tested 20 volunteers who use the current product as follows. First, we developed 5 tasks that took advantage of different combinations of the new features, then we assigned the subjects to tasks using a between-subjects design so that the users all did the same tasks but tasks were randomized across the subjects so that they did the tasks in different order. We timed how long the subject took to perform each task. We gave them a survey after they were done with the tasks that included questions such as ‘How well did you like new feature X?’ where X was shortcut keys multiple-document GUI, etc., with responses on a 5-point Likert scale. After they had finished the survey we asked which new feature they thought made the tasks the most efficient. We found that on average our users are 50% faster because of the type-ahead feature.”

(a) – 3 pts. (Check all that apply.) Which of the following are true?

☐ This is a good example of a between-subjects study.
✓ There is no control experiment to compare against.
☐ Validity of the results is fine; we are measuring what we say we are measuring.
✓ This is a within-subjects study.
☐ There are no confounds in the study that could have influenced the results we saw.
✓ There are too many independent variables being tested at the same to say anything about correlation between one of them and the time it takes to do a task, let alone claiming causality.
☐ None of these are true.

(b) – 2 pts. What is ONE thing you would change in the described study to make it more credible? Use no more than 3 sentences.

_________Only change 1 thing; really need to do 5 different experiments________________

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5. (20 points)

5-1. (5 points) Consider this image.

(Check one.) The black knob on this shower control must be pushed in in order to turn the handle past a certain point to get hotter water. This is to prevent accidentally burning yourself. This is an example of which of the following?

☐ Semantic constraint
☐ Cultural constraint
☑ Physical constraint
☐ Logical constraint
☐ None of these

Optional: In no more than 2 sentences, justify your choice(s).

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(Check one.) For a non-Mac user to turn off the computer, one of the easiest ways (besides using the power button) is to use the Apple menu. Knowing about that menu is an example of what?

☐ Semantic constraint ← maybe: users have to depend on their knowledge/experience to determine actions they need to perform under certain conditions to get the product to do what they want

✓ Cultural constraint

☐ Physical constraint

☐ Logical constraint

☐ None of these

Optional: In no more than 2 sentences, justify your choice(s).
5-3. (5 points) Consider the following image of a car seat control that is located on the door of the car, adjacent to the door opener.

(Check one.) Which of the following concepts have been used in this interaction design?

- [✓] Natural mapping
- [ ] Cultural mapping
- [ ] None of these

Optional: In no more than 2 sentences, justify your choice(s).

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5-4. (5 points) Consider a motorcycle.

(a) – 2 pts. (Check one.) The decision to put red lights on the back is an example of a:

- Semantic constraint
- Cultural constraint [✓]
- Physical constraint
- Logical constraint
- None of these

Optional: In no more than 2 sentences, justify your choice(s).

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(b) – 3 pts. (Check one.) If the motorcycle has 1 tire on the front, knowing that the second tire should be put on in the back is an example of a:

- Semantic constraint
- Cultural constraint
- Physical constraint
- Logical constraint [✓]
- None of these

Optional: In no more than 2 sentences, justify your choice(s).

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