

## User-Defined Metadata: Using Cues and Changing Perspectives

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### Abstract

User-defined metadata is useful for curating and helping to provide context for experiment records, but our previous investigations have demonstrated that simply providing the facility to add metadata is not enough to ensure that metadata is added, let alone to ensure that the metadata is of high quality. For metadata to be useful it first has to be present, but enforcing metadata generation is of no benefit if it is low quality, inconsistent, or irrelevant. Researchers need support. One strategy to encourage more effective metadata creation is to design user interfaces that invite users to add metadata by asking them questions. If we ask users specific questions about their experiments and other activities then we could capture more relevant or useful metadata, although there is a risk that asking the wrong questions may lead to loss of valuable metadata terms or the creation of irrelevant material. In this paper we report on a study to investigate how different questions could be used to generate metadata by eliciting information in three different conditions: free recall, changing perspective by thinking about search terms to help someone else, and providing cues by using a set of topic-based questions. We also investigate how responses varied with different information types. The results of the study show that different terms are created under the different conditions, as expected. The use of cues generates the highest numbers of terms and the most diverse range, including elements that are not captured in other conditions. However, important themes generated in other conditions are not produced because the cues to create them are missing. The study also generated a number of unexpected findings, including responses describing information that is not in the original material: personal opinions and experiences, and comments about the information text itself. These unexpected responses have both positive and negative consequences for the generation of metadata and the curation of scientific records. The results of studies using these techniques to capture metadata for chemistry experiments are also discussed.

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## Introduction

Scientific records include not only data but also details of ideas, plans, methods, observations, results and analyses. Science depends on these records being preserved and maintained, and therefore adequately curated in such a way that the information is both searchable and reusable (Bird, Willoughby, Coles and Frey, 2013a). Metadata is essential for efficient access, but also for search and retrieval, reuse, and providing context for the data (Gilliland, 2008; Zeng and Qin, 2008; Bird, Willoughby and Frey, 2013b). Effective metadata for scientific records can have value outside of archive systems to both help the original author of the record to locate and reuse their own materials, and to enable public or collaborator access to research data as soon as it has been produced. One of the most important elements that metadata provides for experiments is the context, without which digitally captured data in particular becomes meaningless (Borgman, 2008; Frey, 2008). The lack of formal curation as part of managing data in chemistry can lead to the loss of data that would have been useful if it had been preserved, and reinterpreting paper archives is difficult (Downing, et al., 2008).

Although some metadata can be created automatically, some tasks require ‘human-generated’ or ‘user-defined’ metadata to capture the full context (Currier, et al., 2004; Greenberg and Robertson, 2002). The humans required to create the metadata may or may not be subject specialists or information professionals, and may or may not be the original creator of an information object (Gilliland, 2008). Although there are potential roles for librarians and information specialists to assist with curating scientific records, particularly later in the process, the researchers themselves are best placed to provide the context for the experiment and therefore generate the experiment metadata (Bird, Willoughby, Coles and Frey, 2013a; Frey, 2008).

Curation should be a concern to the researcher, and not be seen as something that happens later, for example as part of the publication process. However, previous studies of researcher behaviour and attitudes have identified the so-called ‘burden of curation’ that leads to difficulties encouraging researchers to generate appropriate metadata for their data (Borgman, 2007, 2008; Crystal and Greenberg, 2005; Ryan and Walmsley, 2003; Frey, 2008). Content creators see metadata creation as extra work, owing to limited understanding of the rationale and value of adding metadata, combined with a lack of incentives for creating it (Greenberg, 2004; Currier et al., 2004). On top of a shortage of rewards for data management comes a reluctance to share research data in the first place, particularly by chemists whose data has high value to industrial funders (Borgman, 2010).

The expanding use of electronic laboratory notebooks (ELNs) provides an opportunity to assist the creators of scientific records by designing curation into the experiment process and encouraging ‘curation at source’, making metadata creation more effective, efficient, and less error-prone (Frey, 2008). However, just providing the capability to add metadata within experiment records is not sufficient to ensure that researchers will add it or that it will be useful for curation. In our own studies we have investigated the effectiveness of metadata use within an ELN developed at the University of Southampton, which enables users to add their own user-defined metadata to their scientific records<sup>1</sup>. Our findings indicated that metadata is not effectively used

<sup>1</sup> LabTrove: <http://www.labtrove.org>

and a large percentage of users have adopted a ‘minimum required approach’ where metadata has only been added to notebook entries because it is required by the system (Willoughby, et al., 2014). We also found that researchers do not necessarily understand what metadata is and how it can benefit them. Users may be willing to add metadata but they do not know where to start. Some of our users also expressed anxieties about using the “wrong” metadata and the effort involved in fixing problems later. Our previous study also indicated that different types of words were used for metadata depending on the information type – text or image – being annotated; in particular adjectives were more common on photographs than on text-based materials, and verbs were relatively low across all information types. The lack of certain word types may indicate that certain important information, such as techniques and processes used in experiments, is not represented in the metadata.

Researchers are not experts in the complex task of metadata creation and find it even more difficult to create metadata that will be useful for others (Borgman, 2008). A variety of strategies could be adopted to help with these difficulties, including better data management education for researchers, the use of predefined taxonomies, and using data mining to automatically extract metadata. Another strategy is to create well-designed systems that support researchers with creating metadata (Crystal and Greenberg, 2005; Greenberg et al., 2003). One approach is to design interfaces that make use of question-based invitations prompting researchers to add information about specific elements of their experiment.

### Using Cues and Changing Perspective

Previous experiences and knowledge influence what information we remember, but other factors can influence what we remember or choose to recall when asked (Tourangeau et al., 2000; Jabine et al., 1984). The conditions under which subjects are asked to recall information affects what they remember and how they present the information. Cues can act as reminders, but may also shape the information that is recalled (Tourangeau et al., 2014; Higham and Tam, 2005; Marian and Neisser, 2000). Subjects can also be prompted to recall different information when asked to recall something from a different perspective (Dudukovic et al., 2004; Tversky and Marsh, 2000). The findings from such studies have been used to enhance methods for information collection, including witness interviews (Memon et al., 2010) and designs of surveys and questionnaires (Schwarz, 2007; Tourangeau et al., 2000; Jobe and Mingay, 1989). That cues might be useful for aiding in metadata creation has been noted previously by Crystal and Greenberg (2005).

Asking researchers specific questions with cues that prompt them to recall particular information of interest, or encouraging them to change their perspective, should change what information they provide compared to free recall, in which they choose the first information that comes to mind. What is not clear is exactly what these different responses might be and whether they will be beneficial for the generation of metadata. More relevant or useful metadata may be captured, but there is a risk that asking the wrong questions may lead to loss of valuable metadata terms or the creation of irrelevant material. In this paper we report on a study to investigate whether information that could be usefully used as metadata is generated when responses are elicited under the following three conditions:

- **Free recall:** The user is asked to write up to ten words or phrases that come to mind when they look at the photograph or read the text in a questionnaire.

- **Audience (change perspective):** The user is asked to write up to ten words or phrases that come to mind for use in a search engine when they imagine helping someone else to find a similar picture or piece of text on the internet.
- **Profile (cued recall):** The user is asked to provide word or short phrase answers to a number of questions to elicit specific information about the photograph or text, including locations, people, equipment, activities or actions, other objects, and any other words or phrases of their choice to describe the material type.

These conditions have been chosen to investigate whether these mechanisms are suitable for generating user-defined metadata for facilitating discovery (*audience*) by asking the participants to identify words that would be useful for performing a search for similar information, and for capturing context (*profile*) by asking the participants to describe elements that are important for a scientific record. The questions in the *profile* condition are derived from user-defined metadata we have observed to be commonly provided when describing chemistry experiments (Willoughby, et al., 2014).

Records in ELNs can be both structured, through the use of templates, or unstructured. For this study information types representing photographs, structured text-based material, and unstructured text-based material were included to investigate whether the information type had any effect on the responses produced in the different conditions. In our previous study we found that different types of words were used for metadata depending on the information type being annotated; in particular adjectives were more common on photographs than on text-based materials, and verbs were relatively rare across all information types. The lack of certain word types may indicate that certain important information is not being represented in the metadata, in particular the techniques and processes used in an experiment. For this reason we wanted to investigate whether the different conditions would result in a different pattern of word use. It was anticipated that more adjectives would be seen in the photograph, compared to the text-based materials, based on our previous findings, and that more verbs would be seen in the *profile* condition because a specific question would be asked about the activities present in the material.

## Methods

Our study used an online questionnaire to present information objects of different types: photographs, structured text, and unstructured text. Each of the photographs contains people engaged in activities, the structured texts are cookbook-style recipes, and the unstructured texts each describe a different procedure, such as fixing a puncture, to reflect the active nature of experiments. Participants were asked to complete a series of questionnaires in sequence, each containing one of the materials and associated cues (see Table 1, Appendix 1 and Appendix 2). Each participant was randomly directed to one sequence, enabling a comparison to be made with different cues to be used for the same materials.

**Table 1.** Information types and recall conditions used in the survey.

Information Object	Information Type	Condition
Plenary meeting	Photograph (1)	Free recall
Goan Chicken Recipe	Structured (1)	Free recall
Fixing a puncture	Unstructured (1)	Free recall
Indian band	Photograph (2)	Change perspective or Cued recall
Victoria Sponge cake recipe	Structured (2)	Change perspective or Cued recall
Changing oil in a car	Unstructured (2)	Change perspective or Cued recall
Business conference	Photograph (3)	Change perspective or Cued recall
Beef bourguignon recipe	Structured (3)	Change perspective or Cued recall
Changing guitar strings	Unstructured (3)	Change perspective or Cued recall

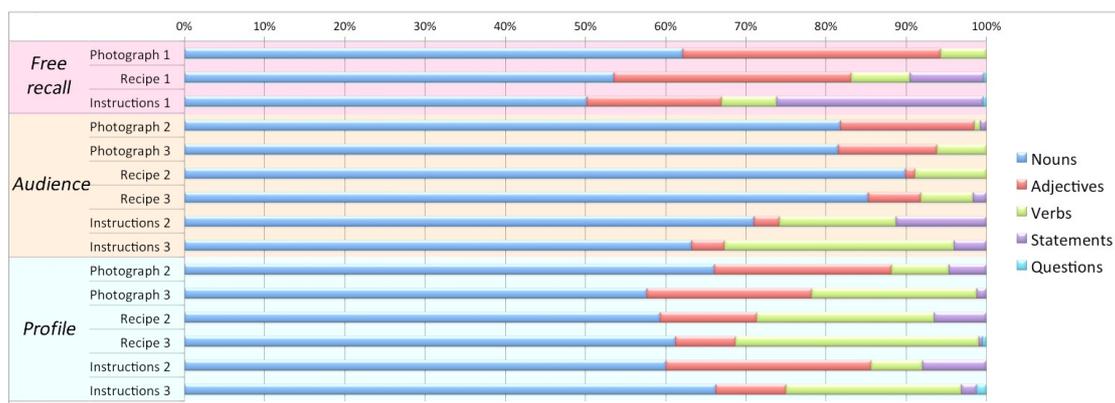
Each response was classified by word or phrase type into Noun-type, Verb-type, and Adjective-type. Single words are classified using their dictionary class. Where possible, phrases are classified using the appropriate type, for example ‘Indian classical’ is classified as an adjective-type whilst ‘Indian instruments’ is classified as noun-type. Longer phrases were sometimes given as responses, and these are classified as ‘statements’ or ‘questions’ depending on the content. Each response was also categorised into one of seven categories (People, Activity, Location, Materials, Event, Equipment or Other) to enable the distribution of topics to be examined. These categories were based upon common topics used for metadata in our previous study (Willoughby et al., 2014). Themes were also identified using qualitative analysis for each information object. The themes in the *profile condition* are derived from the question categories (Location, People, Equipment etc.) but the responses to each question are also analysed for sub-themes. For example, ‘appearance’, ‘behaviour’, ‘feelings’, or ‘roles’ might be themes describing responses when subjects are asked what words they would use to describe People for a particular information object.

## Results

The first notable difference between the different recall conditions are the number of phrases that each condition generated. The *profile condition*, with an average of 16.8 words and phrases per participant, produced more than three times as many as the *audience condition*, at only 5.1 per participant, with an average of 6.3 produced in the *free recall condition*. In the *free recall condition* the average number of words and phrases did not vary greatly by information type, but in both the *audience* and *profile* conditions there was a slightly higher average for the photograph compared to both text types, suggesting it is easier to generate metadata terms for photographs.

## Word Type

Asking the subjects for words that come to mind when they look at information is similar to asking a user to ‘tag’ their data and we therefore expected to see a similar distribution of word-types in the *free recall condition* as seen in our previous study. A similar pattern is seen with high numbers of nouns and a relatively small number of verbs, but the number of adjectives is higher. The *audience* and *profile* conditions are also dominated by noun-type words and phrases. The *audience condition* in general has fewer verbs and adjectives than the *profile condition*, particularly for the photograph and structured text. The *profile condition* has the most consistent distribution of word types across both the images and text, and in general has the highest numbers of verbs. The photographs have the highest number of adjectives across all conditions, except for Instructions 2 in the *profile condition*, where many adjectives are used to describe the oil change, e.g. “dirty”, “dangerous”, and “difficult”. This information object also had fewer verbs in both the *profile* and *audience* conditions, in part because most subjects used the term “oil change” to describe the activity rather than “changing oil”. Statements were only produced in the *free recall condition* for the text, particularly in the unstructured text where 75% of the statements describe properties or comments about the material itself. The full breakdown of word-types for each condition and information object can be seen in Figure 1.

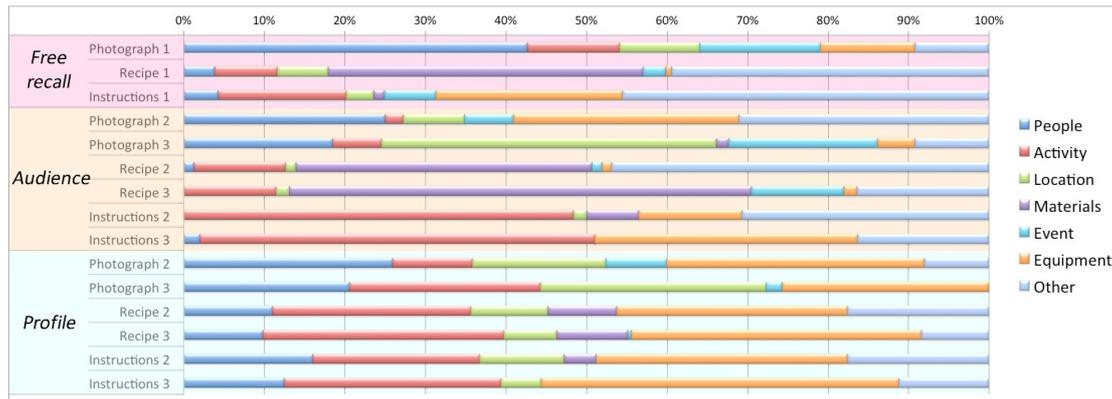


**Figure 1.** Word types for each condition and information object.

## Topics

Each response was categorised according to topic into one of the following categories: People, Activity, Location, Materials, Event, Equipment or Other. The topic classification exercise demonstrated that each information type generates a different pattern of topics based upon the content of the material in the *free recall* and *audience* conditions. People are important aspect of photographs, with the distribution of other topics depending on the content. For example, terms describing the instruments – classified as Equipment – are common for the Indian band photograph and terms describing the venue and furnishings – classified as Location – are common for the business conference photograph. The recipes are dominated by terms classified as Materials describing the ingredients and food. In the *free recall condition* the unstructured text is dominated by terms classified as Other describing the text itself, for example, “British English”, “complex”, and “diagrams needed!!!”. In the *audience*

*condition*, the unstructured text is dominated by terms classified as Activity describing the activities in the text. In contrast, the *profile condition* provides a more consistent balance of topics across all the information types, as was expected as a result of asking directly for responses matching these topics. However, the topics that have not had cues provided for them, Events and Materials, are significantly under represented in these responses. This is particularly noticeable for the recipes, where very few responses in the *profile condition* relate to the ingredients in the recipe. The full breakdown of topics for each condition and information object can be seen in Figure 2.



**Figure 2.** Topics for each condition and information object.

### Themes

The responses for each information object were analysed to identify themes. To a large extent the themes match the content of the materials themselves and are similar for each information type across the *audience* and *free recall* conditions. In the *profile condition* the majority of terms relate to the questions that were asked and therefore represent the major themes in this condition. Table 2 shows the major themes for each information object in the *free recall* and *audience* conditions.

**Table 2.** Information types and recall conditions used in the survey.

Condition	Information Object	Major Themes
Free recall	Photograph 1	Function of the event Equipment People: activities, attitudes, appearance
	Recipe 1	Food/Ingredients Taste Instructions / Recipe Personal
	Instruction 1	Fixing the puncture-activities Instructions Fixing the puncture-equipment Personal

Condition	Information Object	Major Themes	
Audience (change perspective)	Photograph 2	Function of the event	Instruments
	Photograph 3	People	
		Function of the event	People
	Recipe 2	Location	
		Recipe	Event
		Activities	Search suggestions
	Recipe 3	Food/Ingredients	
		Recipe	Event
	Instructions 2	Ingredients	Origin of dish
		Activity (high-level and steps)	Search suggestions
Instructions 3	Material type (instructions)		
	Equipment	Activity (high-level)	
		Material type (instructions)	

Compared to the other conditions, more terms are used, more objects are identified, and a greater diversity of terms is provided in the *profile condition*. This greater diversity of terms included more descriptive terms, including personal opinions or guesses about aspects of the content. The *profile condition* also includes terms that describe information that is not visible or mentioned in the material, for example, equipment or locations that are not mentioned in the text. These external elements and guesses are common responses for the People and Location questions for the structured and unstructured text because these are elements that are not described in the text. Although some subjects indicated confusion about the question, more than 75% provided responses for these questions that included personal terms describing people and environments related to but not present in the content. The *profile condition* is missing significant themes seen in the other conditions, such as the event for the photographs and the ingredients in the recipes, as mentioned before.

Personal opinions and guess responses, such as guesses about the type of music, origin of the band, location and roles of the people in the photographs, are seen in the *audience condition* but they are less common. Uniquely, the responses in the *audience condition* include ‘search suggestions’, such as “good food (website)”, “halfords car manual”, and “site:youtube.com how to change oil on car”. Personal opinions and external elements are even more common in the *free recall condition*, making up a large percentage of the responses. For example, in this condition subjects provided responses on the perceived feelings and activities of people in the photograph; the taste, smell, and appeal of the food in the recipe; feelings about the activity; suggested improvements; and personal experiences or an imagined situation (e.g. “glass”, “rain”, “dirty hands”, “teaching my child to repair”) for the instructions.

See Appendix 3 and Appendix 4 for visualisations of the *free recall*, *audience* and *profile* results.

## Discussion

We expected to see different responses generated for the different information types – text or image – when we presented subjects with cues or asked them to change perspective compared to using *free recall*. We also expected that different word types would be generated if the information type was text-based or a photograph. The results show that both of these expectations were correct, although the results of the word type analysis were more complex than originally anticipated. The request for “what words or phrases come to mind for use in a search engine?” in the *audience condition* generates terms that would be useful for searching for similar material, although the terms most commonly used could have been derived from a suitable title for the materials. The *profile condition* generated significantly more terms with a greater breadth and diversity for the topics requested than seen in the other conditions. On the negative side, however, important context about the content was missing because the relevant cues were not provided, such as the missing ingredients in the recipes. This matches findings from other studies where the inflexibility of templates or questionnaires restricts what an author enters (McGlade et al., 2012) and information that is not specifically asked for is not recorded (Swinglehurst et al., 2012).

To understand whether the responses in the *profile condition* are useful for curation, we assessed whether the terms produced are relevant to each question category. In general, the most relevant responses were for the Equipment, Activity and Other objects categories. The People and Location topic sections had the least relevant responses because of the confusion around these categories, but the vast majority of responses were in fact relevant, although some slightly unexpected terms for Location were produced, such as kitchen objects and parts of a guitar or car.

An unexpected finding during the analysis of the results of the study was that many of the responses described information not included in the photograph or text. For example, in the *free recall condition*, the terms “dinner” and “wifi” are used to describe the photograph, “naan bread” and “lime” are not in the recipe instructions, and “stuck at roadside” and “glass” are not mentioned in the unstructured text. Other responses include terms that describe personal opinions or personal experience, for example, in the *free recall condition*, terms such as “bored” and “disinterested” describe feelings of subjects in the photograph; “delicious”, “too hot” and “my child won’t eat this” describe opinions about the recipe, and “tedious” and “I couldn’t do this” describe opinions about the activity in the unstructured text. Examples of external elements and personal responses are seen in all of the conditions, but are highest in the *free recall* and *profile* conditions. The *profile condition* may promote the inclusion of information not mentioned in text because questions are asked about elements not mentioned, leading to guesswork by the participants, and providing cues prompts recall of previous experiences. More external elements are included for the photographs in the *audience condition* suggesting that participants are willing to make guesses about locations, events, activities, objects and people that they can see, or perhaps the visual content of the photographs itself cues more personal recall. Despite the inclusion of external elements, terms have been produced in all the conditions that could be valuable for curation, and it could be considered that the unexpected terms provide useful additional context.

Another unexpected finding was that many of the responses described properties, formatting, or opinions about the information objects themselves, for example “verbose”, “familiar format” and “needs bullets”. In general, the number of responses

describing the information objects increased with the increasing complexity of the material. Unstructured materials generated the most terms, particularly in the *free recall condition*, with nearly three times as many responses about the information itself when compared to the structured text. Responses included comments about the structure, complexity and language of the text, as well as personal opinions about improving both format and content (e.g. “methodical”, “well-laid out”, “wrong order”). A large number of responses disagree with the instructions and are contradictory, for example “nobody patches things anymore” and “patches are fine”.

In order to see how the results relate to what terms an expert would use to classify the different information sources, an experienced librarian was asked to provide an expert opinion about the terms they would use if they were asked to curate the information objects used in the study. Usual practice for the librarian would be to select tags/categories from a prescribed list (effectively a controlled vocabulary). Appendix 5 shows the descriptive categories or label assigned by the librarian to each of the information types in the study compared to the results from the different cues in the study. The results show that none of the different capture conditions closely matches all the terms that the expert would use, suggesting that including a specialist to add metadata at a later stage would be very beneficial for consistency in curation, although the metadata generated by the non-specialists using these methods is much richer in contextual detail.

### **Capturing Experiment Metadata in Practice**

The results of the study suggested that using these different approaches to gather metadata was worth further investigation. Additional research has included using these different methods to capture experiment metadata in two studies with chemistry researchers. One study included 60 academics, divided into small groups of staff and research students, completing an experiment using Alka-Seltzer to power Lego cars. Each team was asked to record their experiments on one of three different templates, each employing a different way to capture metadata: ‘free recall’, ‘cued recall’, and ‘keywords’ based on the conditions in this study. The results of the free recall were similar to those seen reported in this study, with 62% nouns, 15% adjectives and the remainder equal numbers of questions and statements. Themes included components of the experiment (e.g. “Lego”, “car”, “aerodynamics”), conditions (e.g. “weight of car”, “how much water”, “shape and design”), results (e.g. “Passenger survived in second go”, “We are happy with the final result of 3.2 meter”), and personal elements (e.g. “childhood memories”, “fireworks”, “fun”, “exciting”).

The cued recall asked questions about participants in the experiment, chemicals and materials, instruments or equipment, location, activities and techniques, and any other things that it might be useful to know. All of the groups provided useful and relevant responses to the majority of questions, including the other information question, where 40% responded and provided useful information. Naming of the chemicals used was variable, with a mixture of specific chemical names, formulae and common names, depending on the team. One team chose “H<sub>2</sub>O + aspirin”, as though representing the reaction. There was some confusion between Materials and Equipment, with groups including the same terms as each other but in different sections. An unexpected response from all the teams was including equipment they used for recording the experiment. Location had different levels of specificity, from a precise location within a room and full address, to only a room name. One group provided a useful description of the environment: “Regular wooden floor, relatively smooth”. Responses to the request for

'keywords' were more restricted and produced similar results to the *audience condition* in the main study, with a small number of responses like the title, main components (e.g. "Lego", "rocket"), and terms related to the Alka-Seltzer reaction.

A more formal study involved 20 undergraduate students in an Organic Chemistry Summer School, who were asked to create a write-up of their experiments after the event using different templates. Each template included a free recall section, where the students were asked to write down up to ten things that came to mind when they thought about the experiment, and one of the templates included 'profile-style' questions asking about chemicals or materials, equipment or instruments, location, activities or techniques, and other useful information that they had used in their experiment. 361 free recall responses were collected from three chemistry experiments. 67% of the responses were statements rather than words or phrases. The responses were consistent for each individual, with some choosing mostly personal responses, and others providing a mixture of chemicals, equipment and technique. Overall activities, including techniques, procedures and conditions of the experiment, were the dominant theme of the responses at 40%; followed by materials and details about the reaction at 25%; personal comments, such as the students' feelings about the experiment, what they learnt and personal worries or problems accounted for 14% of the responses. Less common responses for the free recall were Equipment (9%), Safety (6%), and results of the experiment (6%). Only one response mentioned the location of the experiment.

The results of the cued recall were similar to the Lego cars study. All students provided relevant answers for all the profile questions except for 'Other useful information', where 80% provided a response, but the majority were only ideas of what could be recorded and not useful information. The ideas mirrored exactly the examples provided in the template: sample identifiers, safety information, and settings for the analysis. The useful responses included specific safety information, strongly suggesting the examples themselves acted as a cue (Crystal and Greenberg, 2005).

Terms used for the responses are consistent between subjects for all of the specific profile questions. The majority of words and phrases produced were noun-type, but the activities and techniques question generated a mixture of nouns and verbs, including nominalized activities such as "extraction", "rotary evaporation" and "vacuum desiccation". The materials question generated a range of chemicals with a mixture of chemical names, common names and molecular formula, illustrating the problems of consistency with the myriad different ways of representing chemical structures. Data mining could be used to extract chemical names from the text of the student's reports, for example using ChemSpider (Day, 2013). However, our results suggest that many names may be missed or incorrectly identified because of unrecognised abbreviations, typos and ambiguous values. Metadata collected by asking what materials were involved in the experiment would actually be more accurate. Tools such as ChemSpider could be used to convert responses using the InChi standard or the SMILES specification for the purposes of metadata use and linking. In the reports, only 50% of the students included any mention of equipment at all, whereas the profile question generated an average of 5.8 responses, again indicating that data mining would have limited value. For Location the majority provided the specific laboratory, with some including bench location and university address, while others used less specific terms such as "in labs" and "fume cupboard". Giving an example Location would help generate consistent responses.

## Conclusions

Different metadata terms are useful for the purposes of search and providing context (Greenberg, 2001). Using free recall, cues, and changing perspective are ways of generating terms for a specific purpose, such as search terms for a particular audience, or to produce terms that are valuable for particular areas of the scientific record, such as describing activities, equipment or location that might not otherwise be captured. The findings of the studies demonstrate that these techniques have both positive and negative consequences. On the one hand, valuable personal knowledge and insights can be captured to add context, but on the other irrelevant and possibly misleading information may have to be removed as part of a later process. Ensuring that the correct questions are identified is also important to ensure that all the relevant information is captured. When applied to actual scientific experiments, cues are useful for capturing context for the experiment, without generating personal elements that are perhaps less useful, as produced by free recall. Asking for search terms or 'keywords', together with input from an information specialist, may be helpful for providing high level metadata that is useful for search purposes.

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## Appendix 1: Materials and Conditions Used in the Questionnaires

### *Free Recall Only*



**Figure 3.** Plenary meeting (photograph).

### **Goan chicken recipe (structured)**

#### *Simple Goan Chicken Curry*

This mild Indian-style dish is spicy rather than hot and relatively low-fat. Marinate the chicken slowly for more flavour.

#### **Ingredients**

4 large skinless chicken breasts, cut into chunks  
3 tbsp vegetable oil  
1 tsp yellow or brown mustard seeds  
1 large onion, sliced

3 garlic cloves, finely sliced  
1 x 400ml can coconut milk  
Salt

#### **For the marinade**

1 tsp paprika  
½ tsp ground turmeric  
1½ tbsp ground coriander  
1 tsp ground cumin  
1 tsp cayenne pepper  
1 tbsp lemon juice  
½ tsp salt  
75ml/2¾fl oz water

#### **Preparation**

- Mix together all the marinade ingredients to give you a loose, smooth paste.
- Add the chicken pieces and coat them in the paste. They are best left to marinate for around 30 minutes to 1 hour, but if you're in a hurry a few minutes will do.
- Heat the oil in a deep frying pan and add the mustard seeds.
- When they start to pop and jump about in the pan, add the onion and garlic.
- Cook until they're golden brown before adding the chicken and any extra paste from the marinade.
- Fry over a gentle heat for about 8 minutes before adding the coconut milk. Increase the heat slightly and bring to a simmer.
- Cook for a further 10-12 minutes until the sauce has thickened slightly before seasoning with salt if necessary and serving with rice or naan bread.

#### **Fixing a puncture (structured)**

Having a puncture can be annoying, but it should be easy to fix. It is generally faster to replace the inner tube with a spare rather than try to patch a tube that is on the bike. If you get a puncture, first check the tyre to see if you can find anything that may have caused the puncture. If there is something obvious you may be able to pull out that section of the tube and patch the spot without removing the wheel and then the tube. If you cannot find the object that caused the puncture remove the inner tube, inflate it and listen, or feel, for escaping air. Once you have established where the air is coming from, check that section of tyre for a piece(s) of glass or other sharp object(s) and remove it. There is no point in replacing an inner tube only for it to be punctured again.

Remove the wheel, undo the valve cap, remove the threaded metal collar (if there is one), empty any air out of the tube and push the valve back into the rim. Fit 2 or 3 tyre levers into the rim about 2cm apart and pull them back, levering one side of the tyre out and over the side of the rim. Take care you are not pinching the tube while you lever the tyre out. Remove the middle of the 3 levers, and hook it under the tyre about 2 cm past one of the other two. You then have 3 levers in place again, but a longer section of the tyre is hooked over the rim.

Take the middle lever out and repeat the process a few times. Once about a third of the tyre is hooked over the rim, the remainder will come off more easily. The tyre should remain sitting on one side of the rim. Grab the inner tube at the valve hole, push the valve up through the rim and pull the valve out from the tyre. Pull the rest of the inner tube out.

To replace with a new inner tube, starting at the valve hole, put the inner tube onto the rim under the tyre. Then hook the tyre back onto the rim with your hands, making sure that the inner tube does not get pinched, and that the tyre is seated properly on the rim. You may need to use a tyre lever to get the last section of tyre back on the rim. Replace the threaded collar, pump up the tyre and replace the dust cap.

### *Audience and Profile*



**Figure 4.** Indian band (photograph).

### Victoria sponge cake recipe (structured)

#### *Victoria Sponge Cake*

This simplest of sponge cake recipes has a fresh berry and whipped cream filling that takes the classic Victoria sponge to new heights.

#### **Ingredients**

225g/8oz butter or margarine, softened at room temperature

225g/8oz caster sugar

4 medium eggs

2 tsp vanilla extract

225g/8oz self raising flour

Milk, to loosen

#### **Preparation**

- Preheat the oven to 180C/350F/Gas 4.
- Grease and line 2 x 18cm/7in cake tins with baking paper.
- Cream the butter and the sugar together in a bowl until pale and fluffy
- Beat in the eggs, a little at a time, and stir in the vanilla extract.
- Fold in the flour using a large metal spoon, adding a little extra milk if necessary, to create a batter with a soft dropping consistency.
- Divide the mixture between the cake tins and gently spread out with a spatula.
- Bake for 20-25 minutes, or until golden-brown on top and a skewer inserted into the middle comes out clean.
- Remove from the oven and set aside for 5 minutes, then remove from the tin and peel off the paper. Place onto a wire rack.
- Sandwich the cakes together with jam, lemon curd or whipped cream and berries or just enjoy on its own.

### Changing oil in a car (unstructured)

To change the oil in your car you must first lift the car using jacks or ramps. On a flat even surface, place the parking brake on and jack your car up, bracing it with jack stands. Improper jack-placement can damage your car badly, so always refer to the owner's manual for the instructions for your specific car. It's also extremely dangerous to work under a car that's still on a jack, so make sure you brace it first.

Let car heat up a bit to get the oil warm. 2 or 3 minutes of idling should be sufficient to get the oil churned up a bit so it will drain more quickly. Solid particles of

dirt and grime are caught in the oil and tend to settle to the bottom when the oil is cold. Letting it run ensures you're getting the crankcase cleaned out thoroughly. Open the hood and locate the oil cap on top of the engine. This is where you'll add oil after you're done draining the old oil. Doing this will help the oil drain more easily because air can flow in as the crankcase empties.

Under your car, look for a flat metal pan closer to the engine than the transmission. It should have a bolt or plug toward the bottom. This is the oil plug you'll need to remove to let the oil drain. Directly under the plug, place your pan and a couple of newspapers for catching the oil. Loosen the plug counter-clockwise using the proper sized socket or crescent wrench. The oil will come out of the pan as soon as you do this and can be tricky to catch. Once you've loosened the plug with your wrench, remove it the rest of the way with your hand. Make sure you've got your big catch-pan and newspapers placed before you remove the plug. Also be careful not to drop the plug in the oil, it's a messy job trying to find the plug in the black stuff. If you do drop it in the pan, you can easily find it with a magnet.

It will take several minutes for all the oil to drain out of the car. When the oil has ceasing running out of the crankcase, replace the plug. Hand tighten to make sure you're not cross-threading the oil plug when you screw it back in, and tighten the rest of the way with your wrench. Don't forget to install a replacement gasket or washer.



**Figure 5.** Business conference (photograph) – *Audience and Profile.*

## Beef bourguignon recipe (structured)

### *Beef Bourguignon*

Rich and rib-sticking, this slow-cooked supper extraordinaire is well worth the wait.

#### **Ingredients**

1.5kg/3lb5oz chuck beef or braising steak, cut into 5cm/2in pieces  
3 tbsp olive oil  
1 large carrot, peeled and cut into chunks  
1 large onion, peeled and cut into chunks  
2 sticks celery, rough chopped  
2 bottles red burgundy wine  
2 sprigs fresh thyme  
1 head garlic, cut in half horizontally  
4 bay leaves  
50g/2oz unsalted butter  
225g/8oz whole piece of smoked bacon or pancetta  
450g/1lb shallots, peeled  
2 tbsp plain flour  
375g/12oz chestnut mushrooms  
290ml/½ pint fresh beef stock  
5 tbsp brandy  
Freshly chopped flatleaf parsley

#### **Preparation**

- Heat 1 tbsp of the oil in a large saucepan. Add the carrot, onion and celery and cook for 2-3 minutes. Add the wine, thyme, garlic and 2 bay leaves. Bring to the boil and simmer for 15 minutes. Allow to cool.
- Place the beef in a large bowl and pour over the wine marinade. Cover and place in the fridge overnight. This is known as a cook marinade.
- Preheat the oven to 150C/300F/Gas2. Drain the beef from the marinade into a colander over a glass bowl. Reserve the marinade and set aside.
- Heat 25g/1oz butter and 1 tbsp of the oil in a large frying pan. Add the bacon and cook until golden and brown. Add the shallots and transfer to a large casserole dish.
- Heat 1 tbsp oil in a large frying pan. Pat dry the cubes of beef from the marinade mixture using absorbent kitchen paper. Add half of the beef to the pan and cook until brown on all sides. Remove the beef and transfer to the casserole dish with the bacon, shallots and vegetables. Repeat with the remaining beef and add to the casserole dish.
- Stir in 2-3 large spoonfuls of the reserved marinade mixture to deglaze or remove any sediment from the pan. Pour into the casserole dish.

- Stir in the plain flour, the remaining marinade mixture and beef stock into the casserole dish.
- Bring to the boil, cover and place in the oven for 3-3½ hours or until the beef is very tender.
- Halfway through cooking, heat the remaining oil and butter in a large frying pan and cook the mushrooms until brown. Add the brandy and cook for a few minutes.
- Add the mushrooms to the casserole dish, stir and return to the oven the remaining cooking time.
- Serve with new potatoes, sprinkled with freshly chopped parsley and purple sprouting broccoli.

### **Changing guitar strings (unstructured)**

You will need to set aside about an hour of time to restring an electric guitar correctly. First thing to remember, do not remove all six strings at the same time. The guitar neck is designed to withstand the tension of the strings and if all of the tension is removed for any significant amount of time you could damage your guitar. If your guitar has a locking nut tremolo (whammy bar) system you will have to unlock it. It works best if you remove the clamps completely and work with just the nut until the restringing process is done and the strings are stretched and tuned. Then replace the locking clamps and fine tune using the tuners on the tremolo bridge.

Use your string winder and loosen the string until there is enough slack that you can unwind the string from the tuning post by hand. Use your wire cutters to cut off the curled end of the string and discard. Do this to minimise the chance of scratching the finish of your guitar. Push/pull the string back through the bridge slowly making sure it does not drag across the body. Next, unwrap the appropriate new string. Insert it through the bridge of the guitar, over the saddle, up the neck, over the nut and into the hole in the tuning post. Start turning the tuner by hand making sure the string wraps over the top of the tuning post. Turn the tuner until the slack is out and the string is properly seated in the nut and over the bridge saddle. Next clip the excess string off close to the tuner and use your string winder to bring the string up to pitch.

Use your digital tuner and tune to pitch. Next, grab the string with your picking hand halfway between the bridge and the nut and lightly tug the string away from the fretboard. Tune to pitch and repeat the stretching process until the string stays in tune. Now repeat the entire process for the remaining five strings. Know that the pitch of the new strings may fluctuate as you work on the remaining strings. This is especially true with a Floyd Rose or similar type floating bridge. When you have replaced and stretched the last string make sure all six strings are still in tune. If you have a locking tremolo system, replace the clamps for the locking nut, tighten, and use the bridge fine tuners to get the proper pitch.

## Appendix 2: Questions in the Questionnaires

### *Free Recall Condition*

- Looking at the picture above, what words or phrases come to mind? Write up to 10 in the boxes below.
- When you think about the text above, what are the first ten words or short phrases that come into your mind?

### *Audience Condition*

- Imagine you are helping someone else to find a similar picture to this on the internet, what words or phrases come to mind for use in a search engine? Write up to 10 in the boxes below.
- Imagine you are helping someone else to find similar information to this on the internet, what words or phrases come to mind for use in a search engine? Write up to 10 in the boxes below.

### *Profile Condition*

#### **Photograph**

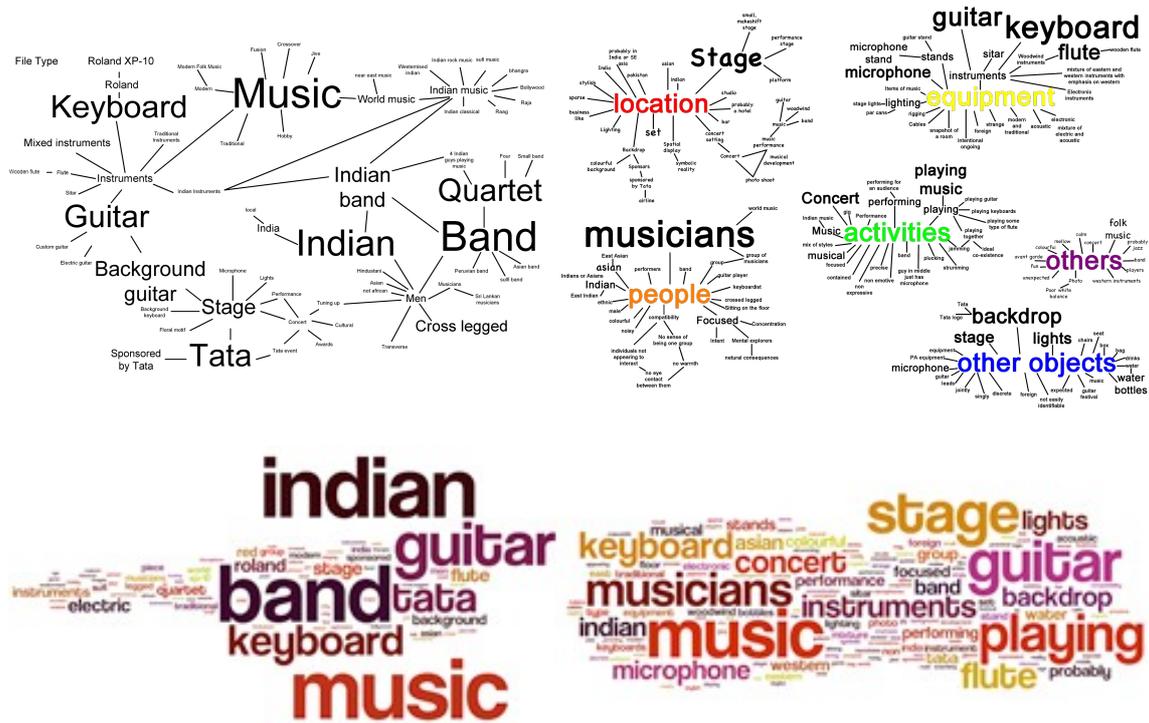
- What list of words or short phrases would you use to describe the locations in this picture?
- What list of words or short phrases would you use to describe the people in this picture?
- What list of words or short phrases would you use to describe the equipment in this picture?
- What list of words or short phrases would you use to describe the activities in this picture?
- What list of words or short phrases would you use to describe other objects in this picture?
- Are there any other words or short phrases you would use to describe this picture?





## Appendix 4: *Audience vs Profile Results*

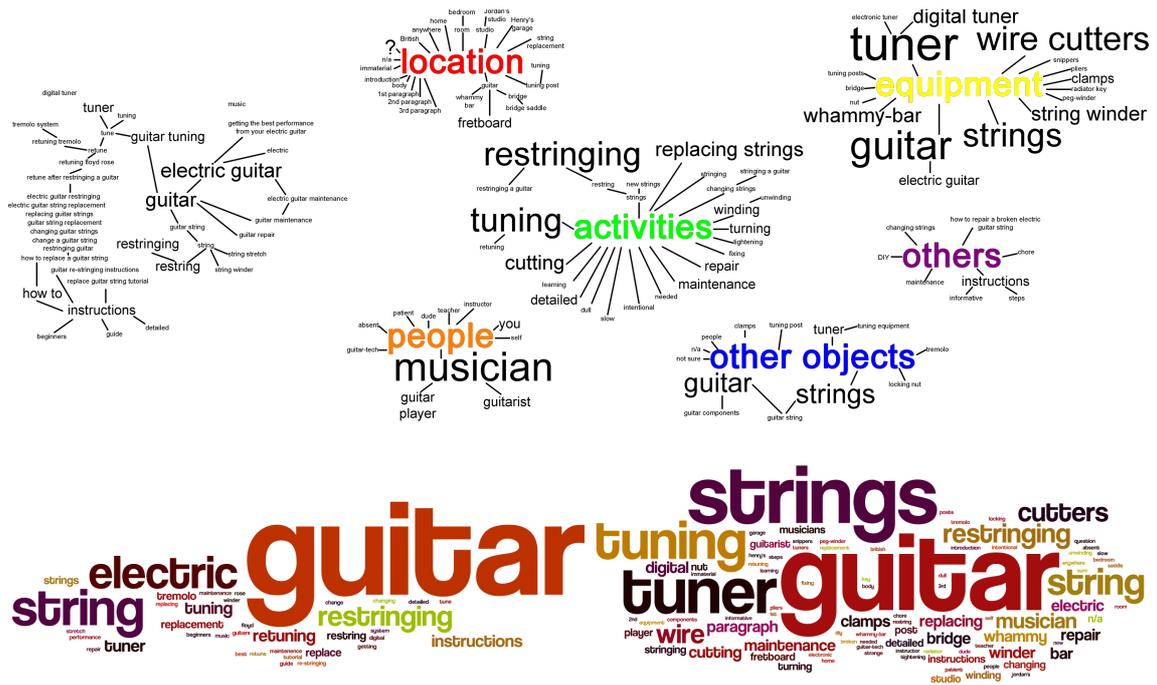
### Visualisations of Responses



**Figure 9.** Comparison between Change Perspective (l) and Cued recall (r) results for Indian Band Photograph







**Figure 14.** Comparison between Change Perspective (l) and Cued recall (r) results for Changing guitar strings (Unstructured).

## Appendix 5

**Table 3.** Comparison of results to formal classification with descriptive tags.

ID	Descriptive Tags	Comparison with Results
1	Image	Almost no use – Free recall
	Lecture	Commonly used term – Free recall
	Conference	Commonly used term – Free recall
2	Instruction	Rarely used – Free recall
	Recipe	Commonly used – Free recall
	Cooking	Quite common – Free recall
	Indian Cuisine	Rarely used – Free recall
3	Goan Cuisine	Rarely used – Free recall
	Chicken	Commonly used – Free recall
	Instruction	Commonly used – Free recall
	Cycling	Rarely used – Free recall
	Tyres	Quite common – Free recall
	Repair	Commonly used – Free recall

ID	Descriptive Tags	Comparison with Results
4	Image	Rarely used – Profile only
	Music	Commonly used – Audience / Rarely used – Profile
	Indian music	Rarely used – Audience only
	Band	Commonly used – Audience / Rarely used - Profile
5	Instruction	Rarely used – Audience / Rarely used – Profile
	Recipe	Commonly used – Audience / Commonly used – Profile
	Cooking	Rarely used – Audience / Commonly used – Profile
	Baking	Commonly used – Profile only
6	Instruction	Commonly used – Audience / Rarely used – Profile
	Motoring	Not used
	Car maintenance	Rarely used – Audience / Rarely used - Profile
7	Image	Rarely used – Audience only
	Business	Rarely used – Profile only
	Employment	Not used
8	Instruction	Rarely used – Audience / Rarely used – Profile
	Recipe	Commonly used – Audience / Quite common – Profile
	Cooking	Rarely used – Audience / Commonly used – Profile
	Meat	Rarely used – Profile only
	Beef	Commonly used – Audience / Rarely used - Profile
9	Instruction	Quite common – Audience / Quite common – Profile
	Music	Rarely used – Audience only
	Instruments	Not used
	String Instruments	Not used
	Guitar	Commonly used – Audience / Commonly used – Profile
	Electric Guitar	Commonly used – Audience only
	Maintenance	Quite common – Profile only