A qualitative investigation into the efficacy of a visual note taking technique applied in the workplace

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Abstract

This qualitative study investigates the efficacy of using a visual note taking technique in the workplace. Though the analysis was not theoretically driven, the research focused on the impact of the technique on concentration and memory, the effectiveness of the technique in various contexts, and how easy it was to learn and apply the technique. As well as investigating the technique, this research builds on the limited research on note taking in the workplace. 9 participants (mean age 42) were trained in the technique then applied in several workplace meetings or briefings. Data was gathered from semi-structured interviews, and were analysed using thematic analysis. Five themes were uncovered, relating to concentration, memory, context, practice and the impact of others. The overwhelming finding was that while using the technique in a passive listening context improved concentration and memory, the technique was distracting when used in an interactive context. Implications for applying this technique in the workplace are discussed.

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> [W]hen they came to letters, This, said Theuth, will make the Egyptians wiser and give them better memories... Thamus replied...this discovery of yours will create forgetfulness in the learners' souls, because they will not use their memories; they will trust to the external written characters and not remember of themselves. The specific which you have discovered is an aid not to memory, but to reminiscence...they will be hearers of many things and will have learned nothing.

Plato, *Phaedrus*

Such was the view of Socrates on the ascendance of writing in Ancient Greece, that the ability to write would change the way we learn. There is some truth in this fear. In the oral culture of ancient Greece knowledge was governed by the capacity of human memory, and relied on clever use of rhythm and common turns of phrase to aid remembering. Poetry was not merely an art form as we see it today, but a central part of the Greek education system (Carr 2010). Today the written word provides us with a 'distributed cognition' (Hutchins 1995), whereby knowledge is not limited to the capacity of the individual, but distributed and propagated across other individuals and artefacts.

People use writing to aid their memories by way of taking notes. Within these notes they may record facts, action, opinions, ideas, decisions and summaries (Khan 1993). There are two major theories regarding the cognitive process involved in note taking, and how they aid memory; note taking as an encoding process, whereby the process of taking notes improves memory, and note taking as a storage process, where the review of notes provides the most benefit (DiVesta and Grey, 1972).

The idea that the act of note taking as a process facilitates recall through deeper encoding is based on the levels of processing theory (Craik and Lockhart, 1972), which posits that the deeper material is processed the more likely it will be remembered. Taking notes encourages deeper processing of material and leads to greater performance in tests of recall

compared to not note taking (Ryan 1982, Kobayashi 2005), reading other people's notes (Barnett et al. 1981) or simply transcribing verbatim (Bretzing and Kulhavy, 1979). The process of writing notes may also improve learning by encouraging the note-taker to generate connections between the information presented and existing knowledge (Peper and Mayer, 1986).

However the evidence for the encoding theory is modest and confounded by aspects such as quality of notes, speed of presentation (Kobayashi 2005) or note taking technique (Bretzing and Kulhavy 1979). Some studies found little or no effect of note taking as process aiding recall (Carter and Van Matre 1975, Dunkel 1985, Henk and Stahl 1985). And some even found that under certain circumstances writing notes hindered recall by distracting the students from listening to the speaker (Peters 1972, Hale and Courtney 1994, Hadwin, Kirby and Woodhouse 1999).

There is a greater weight of evidence for the benefit of reviewing notes on memory and learning. Many studies have shown that reviewing notes after writing significantly improves recall (Howe 1970, DiVesta and Grey 1972, Fisher and Harris 1973, Kierwa 1985). Carter and Van Matre (1975) studied the memory performance of participants who listened to a lecture and either took notes and reviewed them, took notes and but mentally reviewed what they had heard just after the lecture without the benefit of the notes, did not take notes but mentally reviewed the information, and participants who just listened to the lecture without review. They found that not only did participants who reviewed material perform better on recall, those that did not take notes but mentally reviewed material performed better than those who took notes and mentally reviewed. This suggests that the process of taking notes can actually interfere with memory. Hadwin et al. (1999) conducted a similar study but had students review notes provided by someone else. They found that participants who merely listened and did not take notes performed better in memory tasks than those who took notes and reviewed notes, supporting the idea of note taking as a storage function. In a memory task where participants' notes were unexpectedly taken away before they could be reviewed, participants who had taken notes performed on a similar level to those who had not taken notes at all suggesting that taking notes leads to 'intentional forgetting' of information, due to the belief it can be referred back to later (Sparrow, Liu and Wegner 2011, Eskritt and Ma 2013).

While serving as a memory aid, whether by encoding or as storage, making notes while listening to information can also have an added benefit of aiding attention to presented material (Frase 1970, Dunkel 1986). Students interviewed by Badger et al. (2001) stated that they sometimes took notes to stop themselves drifting off, and to force their concentration in boring lectures. Indeed, the 16th Century scholar, Juan Luis Vives, who wrote about emotions, learning and memory, advocated note taking for similar reasons, and believed that note taking kept "light or scabrous thoughts at bay" (Blair 2010: 25).

Most of the cited research has focused on traditional linear note taking. Much of the variation in results may be down to the quality of the notes taken (Kiewra et al. 1995, Katayama and Robinson 2000). Linear notes rely on the semantic content of notes, drawing on the verbal memory modality. The dual coding theory posits that verbal, or linguistic, information is processed independently of visual information. The two systems of processing can work separately, in parallel, and together when necessary (Paivio 1971). This theory is supported by the working memory theory of Baddeley and Hitch (1974) which suggests that the working memory system, a temporary storage mechanism (Baddeley 1992), is divided into a phonological loop, which deals with auditory verbal information, and the visuospatial sketchpad which is involved with imagery and spatial information. The existence of dual memory modalities in memory is well supported by research (Sadowski and Paivio 2001) including neuro-imaging studies (Crottaz-Herbette, Anagnoson, and Menon 2004, Paivio 2007).

Visual imagery and space have long been combined to aid memory, before reading and writing became commonplace. The Method of Loci mnemonic technique, which involves placing objects along a path in a familiar place, and then walking that path to recall that information, has been documented as far back as the 5th Century BC (Yates 1996) and has empirical support in the modern world (Bower 1970; Hoffman, and Senter 1978, Legge et al. 2012). It is extensively used by participants competing in national and international memory championships, where competitors vie for the position as the person who can remember the most from vast amounts of information (Foer 2011). Visual memory for images is robustly demonstrated to be superior to verbal memory (Shepherd 1967, Nickerson 1968, Standing 1973). In Standing's (1973) study participants were shown thousands of images and demonstrated almost limitless capacity to recognise images they has seen when presented with alternatives. Participants showed greater capacity for both recognising and recalling

images compared to words. In another study password mnemonics using images were shown to be more easily recalled than those using text based mnemonics (Nelson and Vu 2010).

Studies measuring the effect of spatial arrangement have found recall performance to be significantly better than words are presented in varying arrangements (Bellezza 1983, 1986) including maps (Dean and Kulhavy, 1981, Schwartz and Kulhavy 1981) compared to when presented in conventional formats. The studies suggest that information in maps and diagrams etc. are encoded and stored both spatially and verbally, and activating previously stored information in one modality store activates the other, leading to what the authors describe as the Conjoint Retention Hypothesis (Kulhavy et al. 1992, Robinson, Robinson and Katayama 1999). This supports the dual coding theory of Paivio (1972), who also believed that the modalities could work together. Further evidence of a connection between the two modalities was found by Gentner and Loftus (1979) who presented participants with a picture, and then a description that was slightly different to the original picture. In a subsequent recognition task participants were more likely to incorrectly select a picture that depicted the activity in the verbal sentence than the original picture. This suggests that while complementary information presented in dual modalities can aid memory, contradictory information can lead to false memories.

However, when information is correctly aligned or complementary, the combination of the two modalities has been proven very effective for learning. Repeated studies by Brunyé et al. (2003, 2006, 2008) have shown that multimedia presentation of information leads to better learning and memory outcomes than single formats. They suggest that using dual modalities reduces cognitive load, freeing up resources for increased processing (Brunyé, Taylor and Rapp 2008, Paas, Renkl and Sweller 2003, Van Merriënboer, Kirschner, and Kester 2003). The integration of information from different modalities encourages the construction of meaningful connections, which is a deeper form of processing and leads to greater retention (Mayer 1997, Mayer et al. 1999, Brunyé, Taylor and Rapp 2008).

Different theories of learning styles suggest that memory and learning are affected by our preference for receiving or interacting with information (Hawk and Shah 2007). It is thought by some that receiving information in the preferred learning modality will lead to quicker and easier learning (Brown, Cosgriff and French 2008, DiBartola 2006). The VARK Model (Fleming 2001) distinguishes between the sensory modalities of the input and output

of information; Visual (V), Aural (A), Read/Write (R), and Kinaesthetic (K). The use of mind maps, visual imagery, space and colour are often recommended for those who prefer the visual modality (Fleming 2011). Though described as a 'learning style', it is actually just one component of the many dimensions that make up a person's learning style. The VARK questionnaire (Fleming 2011) is considered a valid and reliable diagnostic tool to determine learning modality preference (Leite, Svinicki and Shi 2010). However, some large scale reviews have failed to find credible evidence for learning styles or their effect on learning outcomes (Coffield et al. 2004, Demos 2005), and Krätzig and Arbuthnott (2006) found no correlation between perceptual learning style preference and performance using that style.

The deficiency of verbal memory, in comparison to visual and spatial memory, is not the only challenge to tradition linear note taking formats. Traditional note taking can be inefficient, with listeners failing to note significant amounts of what they are listening to (Hartley and Cameron 1967, Kiewra 1985). This can affect performance, as Titsworth and Kiewra (1998) found that the amount of detail in notes can account for half the variance in test scores.

Note taking is cognitively intensive task, especially in response to aural inputs (e.g. in meetings or presentations) (Piolat 2005). While listening to the presentation note takers must coordinate the attention and storage demands of both comprehension of what is being said, and of the production of written text, as well as the manual processes involved in writing. The note taker may try and reduce cognitive effort in one of two ways. They may give up trying to comprehend what is being said and simply transcribe what they hear (Piolat, Olive, and Kellogg 2005). Even that poses a challenge, as the rate of speech is 2-3 words per second, compared to the written average of 0.2 to 0.3 words per second (Foulin 1995 cited in Piolat, Olive, and Kellogg 2005). Or they may just reduce the amount of notes they take and concentrate on understanding (Piolat, Olive, and Kellogg 2005). The effect of verbatim transcription on learning is unclear. Bui, Myerson and Hale (2012) found that transcription using a computer, which increased the speed at which notes could be taken, lead to better recall. However, Mueller and Oppenheimer (2014) found that transcription on the computer lead to poorer results than organised longhand notes, even when participants were able to review their notes. This suggests some inherent benefit in handwritten notes, and that note takers benefit from using a generative note taking technique that forces them to process and rephrase what they hear rather than simply transcribing it.

The inefficiency of traditional linear notes has lead to a number of alternative note taking methods being developed, some of which are commonly used in education. Concept maps (Novak and Cañas 2008) and knowledge maps (O'Donell, Dansereau, and Hall 2002) arrange information into nodes and indicate relationships among them. Using concept maps helps students learn more concepts and more linking relationships (Nicoll, Francisco, and Nakhleh 2001). Learning from concept maps compared to text lead to better recall (Hall & O'Donnell 1996). And students on a biochemistry programme using concept maps performed better than those following a traditional method (Surapeneni and Tekian 2013). Huang, Chen and Yeh (2012) found that nurses using concept maps in clinical decision making showed evidence of improved critical thinking. Chmielewski and Dansereau (1998) found that not only did the use of knowledge maps improve learning outcome, but the knowledge of the technique lead to better recall even when the mapping technique was not explicitly used.

A popular note taking technique is Mind Mapping (Buzan and Buzan 2003), which involves drawing hierarchical, radial diagrams connecting single word concepts. The technique encourages the use of colour, space and graphical imagery to enhance learning. Mind Mapping and other forms of radiant note taking have been shown to aid memory and learning (McDermott and Clarke 1998, Farrand, Hussain, and Henessy 2002, D'Antoni and Pinto Zipp 2006, Spencer, Anderson and Ellis 2013) although performance is not always more effective than traditional notes (D'Antoni et al. 2010).

As well as improving learning and memory through imagery, colour and space, non-linear note taking techniques, such as those previously described, allow relationships to be identified and facilitate learning (Mayer 1984). Tulving (1983) gives the example of a lecture statement "The motivation for expressive creativity is to create a momentary flash of brilliance". The traditional note taker might write "Create a momentary flash of brilliance under the topic "expressive creativity", but if not also linked to "motivation", the essence of the point is lost.

Another advantage of non-linear note taking techniques is that they allow more space for notes. Hartley and Cameron (1976) used what they termed a 'linear' technique, but he varied the amount of space between topics and found a positive correlation between the quantity of notes taken and space allowed to write notes.

Though techniques such as graphic organisers and concept maps have been shown to be beneficial in learning, participants using the technique have not always outperformed those using traditional note taking (Arslan 2006), and they are best used as an interactive and collaboratory setting (Edelson, Gordin and Pea 1999, Cañas 2003). Their structured, often predetermined format leaves little room for creativity and may be restricting.

A more recent visual note taking techniques is variously identified in popular literature as 'Sketchnoting' (Rohde 2013), 'Info Doodling' (Brown 2014) and 'Mind Scaping' (Marguiles and Valenza 2005). This technique promotes the use of images, typography and space in taking notes, in a less structured and didactic form than the previously described graphic organisers and mapping techniques. There is usually still some sort of structure to the notes, but various options can be selected as best suited to the situation (Rohde 2013). An example of the technique can be seen in Figure 1.

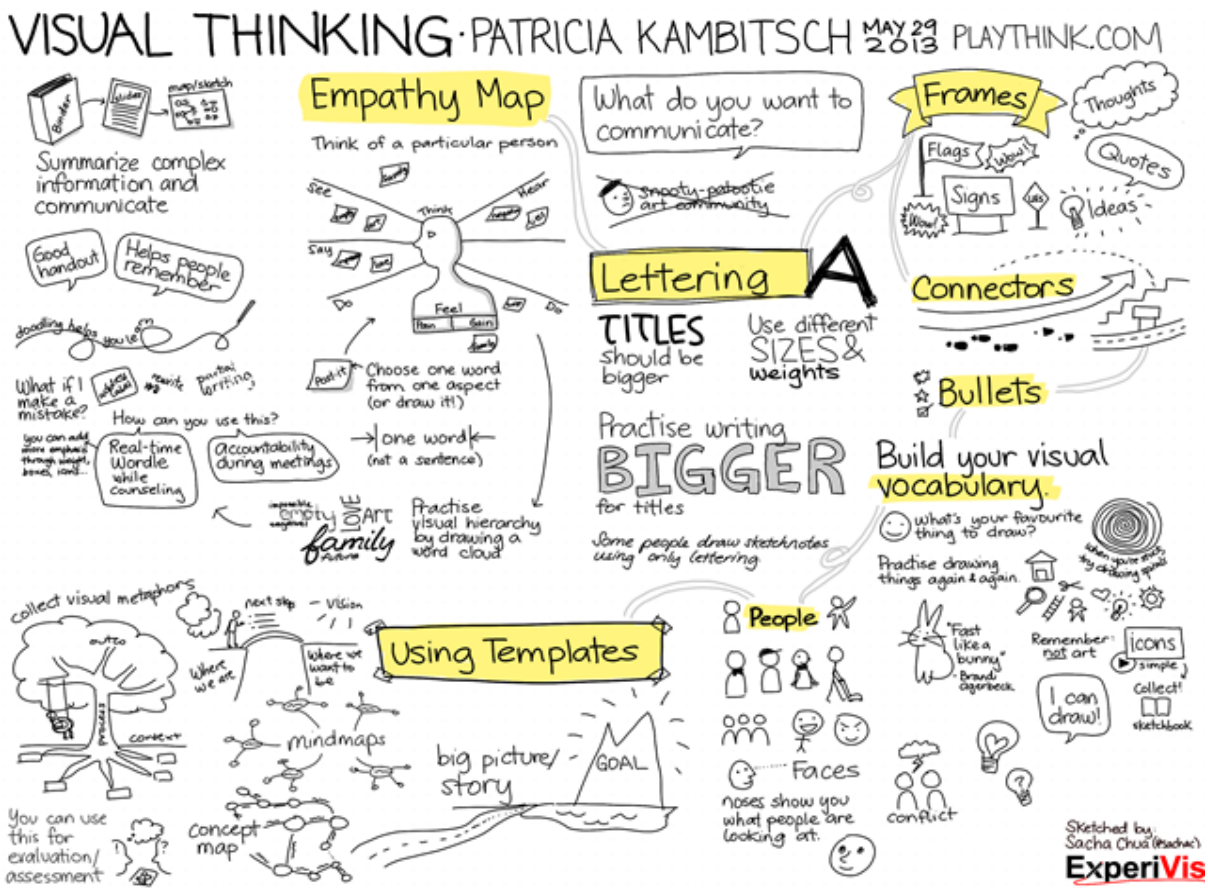

Figure 1

An example of visual note taking, otherwise known as 'Sketchnoting' (Chua 2013).

The technique in this format has not been explicitly tested, but the proponents extrapolate from existing research, such as the studies as cited in this paper, to suggest that the technique will improve memory, concentration and generative thinking when using it to take notes. While such research suggests that the technique should be successful, there is a risk in extrapolation. Much of the research into note taking has focused on notes from text rather than notes from auditory presentation (cf. the research into Mind Mapping and knowledge/concept mapping techniques). Taking notes from auditory presentations is time pressured and relies more heavily on the working memory (Piolat, Olive and Kellogg 2005). Those that have used auditory presentation have mainly focused on learning and memory in educational settings. There is comparatively little research into note taking in occupational settings, and even fewer that are naturalistic studies (Hartley 2002).

One of the few studies focusing on occupational note taking is a qualitative study by Khan (1993). From his results he divided up occupational note taking situations into 'communication' situations, e.g. meetings or briefing with more than one person, and 'no communication' situations e.g. noting one's own ideas and thoughts. Meetings are an integral part of the workplace, and are the main communication means by which organisations achieve important goals, make changes, display power and generate new ideas (Tracy and Dimock 2003). In meetings organisational knowledge and culture are created and shared (Boden 1994, Nielsen 2009) Employees spend an average of six hours per week in scheduled meetings, and this time increases for those working in larger organisations (Rogelburg et al. 2006).

Khan (1993) observed that during meetings people only take notes between 0.5 and 10% of the total time of the meeting. People took notes of (in descending order of regularity) facts, actions, opinions, ideas and summaries. The reasons given for not taking notes in meetings were because the meeting circumstances were not appropriate, e.g. a staff member was upset; someone else was charged with taking minutes which would later be distributed or because the information was technically complex and the listener focused on listening to the information. The main reason for taking notes was to aid recall later on, though only 44% reviewed their notes, and usually only when looking for a particular piece of information. 50% of those studied drew diagrams, but only when copied from diagrams presented in the meeting; though 80% said they doodled in meetings. 70% wished that they had sometimes written better notes.

The challenge of visual note taking is that it relies heavily on images. Though the quality of images is not important, many people see their perceived lack of drawing ability as a barrier to the technique (Rohde 2013). The ability to draw is seen as an individualistic talent in which some people are more or less proficient. Cohn (2012, 2014) argues that drawing is a fundamental human system of expression, not unlike language in its use of syntax, symbols, and schemas. Like language, these facets need to be taught, both implicitly and explicitly, in the same way we teach children how to talk. The Western world does not largely have a culture of drawing as a communication tool, and the lack of immersion that is found in countries such as Japan, leads to a drop off in development of drawing ability in Western children that is not mirrored in Japanese children.

Some studies on non-linear note taking techniques have found that the effort needed to learn the technique may be a barrier to its effective utilisation. Chmielewski and Dansereau (1998) spent two hours training participants in the knowledge mapping technique before they could test it. D'Antoni et al. (2010) suggested that lack of familiarity with the technique was the reason that participants using mind maps did not outperform those using preferred note taking techniques. Farrand, Hussain and Hennessy (2002) found lack of motivation to use the mind mapping technique compared to tradition linear note taking. Participants using concept maps as learning aids often find them time consuming to create and complex to remember (Beitz 1998, Eppler 2006).

Whilst there has been a vast amount of research into structured or hierarchical techniques for visual note taking, there has been no research into the more free form style known popularly as 'sketchnoting' (Rohde 2013). There is also little research into note taking practices in the workplace. This research investigates the application of the visual note taking technique in a workplace setting. With a number of possible factors that might affect the test of the efficaciousness of the technique, this study with took an exploratory approach, qualitatively assessing the effectiveness of apply the technique in a work place setting.

Despite the lack of direct research, the balance of evidence for the benefit of other visual note taking techniques suggests that this technique may also aid learning and memory. However, the apparent effectiveness of the technique may be confounded by the challenge in learning it. People face psychological barriers when it comes to drawing, as well as actual

technical barriers from a dearth of practice in drawing (Cohn 2012). Several studies (e.g. Eppler 2006, D'Antoni 2010) found that visual note taking was a difficult skill for participants to adopt. The inefficiency of linear note taking (Makany, Kemp and Dror 2008) may be compensated for by years of practice, and the benefits of visual note taking may only be realised at a certain level of expertise. For this reason, this investigation into the efficacy of visual note taking in the work place encompassed the ease with which it can be learned. It was unclear what the training requirements would be in order to maximise the potential of the technique. This was a contributing factor in using a qualitative method for this study, as any quantitative results may have been confounded by lack of familiarity with the technique. This study investigates the efficacy of visual note taking in the workplace. "Efficacy" is defined as "the ability to produce a desired or intended result" (OED 2014), and in this case efficacy encompasses the ability to learn and the practicability of applying the technique as well as its overall effectiveness in producing useful notes. This study also assessed whether the learning modality preference was associated with the effectiveness of the technique.

Participants in an office based workplace setting were trained in the technique and asked to apply it in the workplace, in meetings and briefings where information is being orally presented, over the course of several months. They were asked to capture their experiences with the technique using written journals, interviews and examples of their visually recorded notes. The investigation focused on the effectiveness of the technique in aiding memory and concentration in meetings, and what their experiences were of learning how to use the technique and applying it in the workplace.

Method

Design

This is an exploratory qualitative study investigating the efficacy of visual note taking in the workplace, using thematic analysis to explore the data.

Definitions of qualitative research vary, and often focus on a researchers' philosophical stance (Guest, MacQueen and Neeny 2012), but at its most functional level “Qualitative research involves any research that uses data that do not indicate ordinal values” (Nkwi, Nyamongo, and Ryan 2001:1). While quantitative research is often seen as the standard for producing factual information, there is a sense that "the numbers do not seem to

add up" to a full picture. Qualitative research allows us to ask "what is missing?" (Gartner and Birley 2002), and is often the necessary precursor to quantitative research (Kuhn 1961).

As a nascent technique there is little direct research into visual note taking. In addition few studies have explored any sort of note taking technique in a real life occupational setting. As such, it is appropriate to use qualitative analysis to explore the experience of learning and applying the technique in the workplace. Though we can extrapolate from previous research how effective the technique might be with regards to certain cognitive processes, such research has often been confounded by the participants' experience of non-linear note taking techniques, difficulty with learning the technique, and participant motivation. This study allowed us to ask "what's missing?" and investigate the practical experience of learning and applying the technique in the workplace.

Participants

Participants were all employees of a large public sector organisation. They were recruited using self selected sampling in an opportunistic population via the medium of workplace-specific social media and posters in communal areas. Although self-selected sampling is inherently biased, given the commitment involved in participating, it was important that participation was entirely voluntary to ensure continued motivation. The different recruitment methods ensured the widest sample population thus mitigating the effect of self-selection. The recruitment materials offered the opportunity to learn a new note taking technique and participate in a study.

13 participants volunteered initially; however 4 withdrew at various stages, leaving a total of 9 included in the study. Guest, Bunce, and Johnson (2006) in their assessment of the optimal number of interviewees in non-probabilistic sampling suggest that 6 participants is enough to gather the major overarching themes, and saturation point in coding is reached at around 12 interviewees, so this number was satisfactory.

Participants were from a range of occupational backgrounds, including engineers, project managers and general managers, and were aged between 32 and 51 (mean 42). 5 were male and 4 were female. Detailed occupational descriptions were not recorded in to retain anonymity in the small sample. Participants were not excluded on any grounds. The study

was conducted within an organisational setting, and participants could take part during working hours with the agreement of their line manager. One participant reported short term memory problems due to a head injury.

Materials

The materials included an information sheet for participants (Appendix A) and their line manager (Appendix B), and a consent form (Appendix C). A 90 minute training session introduced participants to the method under investigation, and used videos and interactive practical exercises to enable the participants to be comfortable with the method (See Appendix D for an outline). The training materials comprised drawing techniques and information on common spatial structures of notes. They also included practical exercises such as developing icons for common words and a TED talk to view (Treasure 2013) while practising the technique. The training session was piloted using 3 participants with some small changes made in response to feedback. The training materials also contained links to further useful information and suggestions for further practice. The training was partially based on the content of Rohde (2013), with permission from the author.

A set of questions we developed for the participants to answer after each session of using the technique (Appendix E).

Semi structured interviews were conducted using a set of questions driven largely by the findings of previous research, and as such focused mainly on cognitive aspects of the technique (Appendix F). Interviews were recorded using a Dictaphone.

Participants were assessed for learning modality preferences using a VARK learning styles test (Fleming 2011). Leite, Svinivk and Shi (2010), in a preliminary analysis, assessed the VARK questionnaire as being a valid diagnostic tool.

Finally, participants were given a debriefing sheet (Appendix G).

Procedure

This research was undertaken using a qualitative design. All participants were trained in the visual note taking technique, and their experiences were recorded using brief journals and semi structured interviews.

Participants were recruited via posters and work place based social media. Respondents were initially briefed additional details by email and were invited to attend a 30 minute information session that clearly set out the parameters of the research, including the time commitment involved. It was not until after this session that they were asked to give informed consent. Prior to this, gateway consent was obtained from the organisation within which the participants were employed.

Participants were given a 90 minute training session on how to conduct visual note taking. This was conducted on three separate sessions (with participants only required to attend once) to ensure full attendance. During this session they conducted practical exercises to familiarise themselves with the technique, and had the opportunity to ask questions of the researcher regarding application of the technique. Participants were then requested to use the technique in at least 10 workplace sessions requiring note taking over the course of 2 to 3 months. After each session they were requested to make notes using prompt questions, the results of which were to be provided to the researcher in advance of the interviews. Each participant was individually interviewed approximately three months after the initial training session. Each lasted approximately 20 minutes. Interviews were recorded and transcribed. The interview questions explored the learning experience of the participant in applying the technique, its efficacy in aiding memory and comprehension of the material noted, and its use in different settings (e.g. structured training, meetings), and their use of their notes when completed. This was to ensure that the issues raised by previous research were covered. However open questions were also included to ensure a free flow of information and a full account of participants' experiences, avoiding the narrowing of parameters, and ad hoc questions were asked as appropriate. Though qualitative analysis is exploratory, it is not atheoretical, and existing literature can guide towards a starting point for questioning (Guest, MacQueen and Neeny 2012). Participants were asked, where possible, to provide copies of the notes that they took during the research period. At the time of the interview participants were also given a VARK questionnaire to take away and complete, which they either did on paper or online, as was their preference.

In practice only one participant returned journal notes. Another made notes and brought them along to the interview. 3 participants provided copies of notes taken during the trial. 6 participants completed the VARK questionnaire. All participants reported using the technique in less than 10 sessions, ranging from 0 to approximately 9 sessions.

Ethics

Prior to the start of the study gatekeeper permission to conducted the research in the workplace was requested from, and granted by, the organisation. The research was submitted to and approved by Coventry University Ethics Committee (Appendix H). Although the participants were self selecting volunteers they were expressly informed that they were at liberty to withdraw from the experiment at any time. Due to the recruitment method and sample population some of the participants were acquainted with the experimenter, which may have led to demand characteristics. They may also have been concerned about the assessment of their ability to use the technique. To this end, participants were reminded during the interview that this was not a test of them but a test of the technique. Because this study was conducted in an organisational setting there may have been a concern by some participants that if the technique was not effective for them the note taking process may have had an impact on their work. Participants were advised to request permission for participation from their line manager. In addition, although participants were requested to use the technique for 10 sessions, this wasn't mandated, and those that discontinued with the technique at various stages, but were still happy to complete the interview, were still included. Most participants, in fact, did not complete this number of sessions, and less than half provided the requested notes. This proved to be a challenge for the data analysis; however section 1.4(i) of the British Psychology Society (2009) Code of Ethics and Conduct ensures participants' right to self-determination. As volunteers in the process, participants can choose the level to which they commit to the research process. Analysis was conducted on the data available.

Data Coding

This study used Thematic Analysis to analyse the textual interview data. There is no agreed upon definition of thematic analysis; Boyatzis (1998) describes it as tool that is the bases of various different methods, but Braun and Clarke (2006) consider it to be a method in

its own right, and Guest, MacQueen and Neeny (2012) describe 'applied' thematic analysis as comprising various aspects of qualitative approaches, making it flexible and pragmatic. The data were analysed using Braun and Clarke's (2006) stages of Thematic Analysis.

Few participants used the technique for the 10 sessions requested, and few returned written notes. However, all who took part in the study were interviewed. Interviews lasted between 7 and 25 minutes. The interviews with the participants were all transcribed by the researcher, which ensured familiarity with the data. Participants' responses were transcribed verbatim and then coded.

Key points within each code were noted from each interview, and then compared across participants to identify any common themes. As themes emerged, the transcripts were re-examined for additional information relating to them. In this way the thematic analysis was deductive, led by previous research. The nature of the note taking technique under examination means that the supporting research, and consequently the topics of investigation are largely, though not exclusively, cognitive in nature. The analysis was based on the data being a realistic account of participants' experiences, and concentrated on semantic themes rather than latent themes. While recurring themes, both within and across participants, were identified, prevalence of themes is not necessarily a good indicator of importance in this data, as the topics discussed were directed by the researcher.

Results

The purpose of this research was to explore the efficacy of the application of a visual note taking technique in the work place.

General Results

Table 1 details the participant demographics, their primary learning preference according to VARK, and their primary feeling about the technique. This last field is taken from participants' answer the first question of the interview "How did you find the technique in general", and gives a representation of the each participant's overall feeling towards the technique.

Table 1

Participant Details

Participant	Sex	Age	Learning Preference VARK	Primary Feeling
1	M	51	K	"Not very useful"
2	F	NK	NK	Did not use as " it didn't seem like it would capture the information I needed to get"
3	M	50	R	"I think I found it promising and very interesting"
4	M	35	A	"bit of a mixed bag"
5	F	NK	NK	"disappointed in myself that I haven't used it more"
6	M	32	A	"Different...I think as a note taking device it's fine, but as a way of taking notes while actively taking part, I found that really hard"
7	M	39	NK	"I found it an interesting tool to use"
8	F	47	A	"Good in some cases and not appropriate for others"
9	F	38	R	"I found elements of it really useful"

The overall feelings were mixed, with most finding elements of the tool useful. The main exceptions were P1 and P2. P2 felt that the technique would not adequately capture the information she required, and did not use the technique at all in the workplace. This is discussed in more detail in the thematic analysis. P1 struggled with the technique and did not

find it useful. P1 suffered from a brain haemorrhage around two years previous to the study, and as a result suffered with short term memory difficulties. It is not clear the extent to which that affected his use of the note taking technique, but found the concurrent note taking while listening the most challenging. Interestingly, the interview uncovered that P1 was already a regular user of images in his notes; however, he did not align this technique with the visual note taking technique trained during this research. The diagrams tended to be related to engineering constructs, which are usually represented with box and line diagrams (Bryce 2006).

> *...they tend to be, because I'm a technologist, the pictures I draw are pictures that I understand so there are no stickmen and none of those abstract concepts. They're all either logical constructs or physical constructs that mean something to me, but probably mean nothing to anyone else.* (P1)

So, although P1 did not find the visual note taking technique assessed in this research, he relies upon a basic form of visual note taking, with which he is familiar and comfortable.

The overwhelming finding was that while using the technique in a passive listening context improved concentration and memory, the technique was distracting when used in an interactive context.

VARK

Participants were asked to complete a VARK questionnaire (Fleming 2011) to assess whether they had a learning modality preference and whether this would correlate with the impact of the technique.

Table 2
Mean VARK Scores

Visual	Auditory	Read/Write	Kinaesthetic
23	34	34	22

While the technique being researched is a visual note taking technique, none of the participants who provided VARK scores had a visual modality preference. This may be because participants were keen to learn a new technique, unlike one they already use. People

with a visual modality preference may have felt that they would not learn anything they were not already aware of in the research. Table 4 shows the average VARK scores. Visual and kinaesthetic scores are lower than auditory and reading and writing scores. This may have impacted on the result. The low visual modality scores may account for the lack of practice and visual literacy that the participants professed and the negative effect of the technique during active meetings. It should be noted that these extrapolations are based on a qualitative analysis of the figures, and the sample size is too small for the scores to be subject to qualitative analysis. It is also important to interpret the VARK scores with caution. While VARK and other learning style theories are commonly used in education and learning contexts, large scale reviews have failed to find credible evidence for learning styles or their effect on learning outcomes (Coffield et al. 2004; Demos 2005, Krätzig and Arbuthnott 2006).

Thematic Analysis

The data collected from the participants contain 5 key themes, and various subthemes. The key themes are (i) the effect the technique had on concentration in a meeting, which was dependent on (ii) the context or type of meeting the technique was used in; (iii) the effect the technique had on users memory of the meeting; (iv) the practice the technique requires to use it successfully; and (v) the effect other people had on the use of the technique.

Almost all of the themes were interconnected, and some of the themes overlapped. The themes varied in prevalence but almost all of the main themes affected at least half of the participants. The only exception was the effect of other people, which just under half reported. But for those that did report it, it was a salient feeling professed without direct questioning. Table 3 indicates the prevalence of the themes across the participants.

Table 3

Key Themes and Subthemes and their Occurrence Across Participants

Theme	Subtheme	No. of participants out of 9
Concentration (and Context): The technique had a varied effect on concentration	Helped concentration in a passive context	7
	Hindered concentration in an active context	6
Context: The context affect the efficacy of the technique	Was not useful for meetings where detail and accuracy are required	4
Memory: The technique aided memory		7
Practice: participants lacked practice and feelings of confidence in using the technique		8
	Lack of time to practice	4
	Don't want to risk using the technique in a workplace setting	3
	Lack of graphical literacy, or knowledge of how to represent an idea	7
Effect of other people: other people's expectations negatively impacted on the use of the technique		4

(i) Concentration and (ii) Context

Visual note taking has a differential effect on concentration depending on context.

Though the effect of visual note taking on concentration is a theme within itself, it is impossible to consider it without also considering the theme of situational context, and the interaction of the two.

On the whole visual note taking helped participants concentrate and listen in meetings more than traditional linear note taking, or not taking notes.

> *[Visual note taking] forces you to listen on a different level, you're thinking about what things mean...what are the important points, rather than trying to scribble everything down...it forces you to think about the meaning of things, rather than the words of things (P4)*

> *I'm blocking everyone else out and just listening (P5)*

> *...you listen more (P7)*

> *It's more immersive...being in the present moment (P4)*

P7 alluded to the fact that the trial itself may have contributed, suggesting that knowing that he was being studied helped his listening skills, rather than the note taking technique.

> *"you listen more, because it's kind of more focus. Maybe that's part of this trial... (P7)*

Both P4 and P6 suggested that visual note taking avoids the stupefying effect of meetings when not using the technique:

> *I probably would have drifted off if I wasn't thinking about what it meant (P4)*
> *It's harder to fall asleep when you are drawing...you don't drift off (P6)*

Participants felt the technique forced them to listen more attentively, and consider the meaning of what was being presented, in order to convert it into images. The process

encouraged greater reflection on the message of the presentation rather than simply writing what they heard. Participants could convey more meaning through images than reams of writing, and this efficiency gave participants more time to reflect within the meeting.

Visual note taking improves concentration when the flow of information is towards the user.

An important factor in whether or not the visual note taking technique was successful as helping with concentration in a meeting is the context of the meeting. Participants used the techniques in a range of 'meetings' some of which were briefings to large numbers of people and were less interactive; others were smaller team meetings which required active participation and in some cases chairing of the meeting.

Context was very important in determining the effect of the technique on concentration. It was clear from the data that the technique was most beneficial in sessions where participants were passively receiving information, such as general corporate briefings, training sessions, or meeting where the participants were not required to interact.

> *I have found it very useful for when I am in receive mode, so I go to a presentation and I'm just there and I'm listening, it's fantastic for making notes, and that's predominantly where I've been doing it (P6)*

> *...in those kind of broadcast kind of meetings I have picked up more (P8)*

> *...longer sessions where I was on the receiving end of information, really useful (P9)*

In situations of passive listening, people may be susceptible to 'mind wandering', where their cognitive functions shift away from the primary task, resulting in degradation in performing the primary goal (Smallwood and Schooler 2006). Doodling while performing a listening task has been shown to improve listening skills (Andrade 2009). Andrade (2009) suggests that this improvement is because doodle prevents 'mind wandering' by engaging the cognitive process but leaving enough capacity to accomplish the primary task. In the case of visual note taking it may be that the act of drawing images, especially simple ones, such as arrows and boxes, engaged participants enough to maintain their focus on the meetings.

However, doodling is generally considered 'mindless' (Andrade 2009); when drawings are more meaningful or require more processing capacity they can have a detrimental effect.

The data suggested that as much as the technique can be focusing, sometimes the focus might be away from the meeting and on the technique itself.

I wasn't very good at doing it and listening at the same time...I lost track (P1)

Much of the issue of concentration related to the previously mentioned sub theme of lack of graphical literacy.

I discovered I was sitting there thinking how do I draw this, and by that point in time the world had moved past (P1)

You start thinking how am I going to represent that, instead of what is it they're talking about (P4)

I think the thing that didn't go so well was the whole fatigue thing, of thinking 'how am I going to capture this?' sometimes (P7)

In participatory meetings visual note taking can be a distraction.

In the more active meetings, which required participation such as preparing and generating verbal responses, or controlling a meeting, there was a definite disadvantage to the technique, resulting in a degradation of the ability to listen, the quality of notes that were taken, or the participants' input into the meeting.

If you're actively participating in the talk...you don't really want to think well where in the page am I going to put these notes shall I draw a picture because your brain is already 80% used up (P8)

Again I think if I was listening to something with the intent of responding, it felt like there wasn't that spare capacity to do it (P3)

...not very useful when I was trying to lead something, because my brain - I couldn't have that creative thing going, you know, right side left side thing going on (P9)

...[I] tried to do it in a meeting I was actively leading, chairing, I didn't do very well. Just because I was spending a lot of time trying to capture what someone was saying but then also thinking about what I wanted to say next, how I was going to actually reply to that in the meeting (P6)

P3 used the phrases "spare capacity", "spare effort" and "spare brain power" and the lack of them, to describe the impact of that lack of graphical literacy had on the capacity to listen and make notes at the same time, drawing on the metaphor of the brain as a computer processor with a limited capacity, with not enough available when actively participating in a meeting.

P7 described how leading a meeting while trying to visually take notes lead to poorer concentration.

...especially when I was leading as well, thinking too much about the technique without listening to what the person was saying. When I was an observer I had more time to think and that's when I felt more comfortable (P7)

In an active context visual note taking can be as distracting, taking focus away from the speaker, as had been found with traditional linear note taking (Peters 1972, Hale and Coutney1994, Hadwin, Kirby and Woodhouse 1999). Although Baddeley and Hitch's (1974) working memory model, separating the phonological loop and visuo-spatial scratch pad suggests that tasks of separate modalities, i.e. visual and verbal, should suffer less interference than for example verbal speech and verbal writing, Pashler's (1994) review of dual task interference suggests that interference can happen at different stages of cognition. The visual note taking technique appears to draw too heavily on cognitive resources to be combined with active participation in a meeting.

Concentration was not the only thing the context of session had an effect on. Several participants were concerned about the effect on the quality of notes they took. Certain types of meetings required them to take detailed and accurate note in order to record customer

requirements. In such meeting participants found the technique ineffective, or perceived it as being in effective and didn't try it at all.

> *It wasn't appropriate for actual requirements...the actual requirements probably needed to be accurately recorded in a sentence...I had to stop using it while I was gathering requirements (P8)*

> *...it's important I capture [information] concisely because there might be follow on questions later when I report this back into programme, there's no ambiguity in what I remembered (P4)*

> *...when I've been in internal meeting where I need to be absolutely clear I've reverted back to doing long hand note taking (P5)*

The visual note taking technique did not allow certain participants the accuracy they required to perform their jobs when in certain types of meetings. These meetings required participants to capture exactly what was being said or agreed at the meeting.

Use in other contexts.

This research investigates visual note taking as a personal note taking technique, however, some participants found the technique useful as a more facilitatory technique, using it to demonstrate a point with others.

P4 described a situation in a meeting where he visualised a calendar, and with the group in the meeting used it to figure out the most appropriate time for various project management ideas by populating it with relevant information. The technique forced the group to take a bottom up look at the problem, rather than top down and was constantly referred back to.

> *So the approach we would have taken before was around trying to get a date, then trying to confirmation that people could make it, finding out people couldn't make it, trying to schedule a different day, then finding out different people couldn't make it. Whereas taking this approach that was scribbled down in a notebook, and getting all the dates and all of the resources became quite a useful tool (P4)*

Others used the technique to relay back to others what they were thinking.

> *...when it's a one to one or a one to a couple meeting, and I use my book to draw out what I mean (P9)*

> *...you can use it to play back, so I say to somebody this is what we've been talking about. Does this represent what you think you've just been telling me? (P1)*

Eppler (2006) compares the use and effectiveness of various visual note taking techniques and suggests that different techniques better support different learning contexts and that some techniques are better suited to personal note taking and some to group facilitation. The impact and effectiveness of this technique may be different when applied in a broader way. Graphic Facilitation is visual note taking on a large scale. It is used to either record a meeting or to facilitate a group, and is becoming increasingly popular in occupational contexts (Sibbet 2001).

(iii) Memory

Visual note taking improves memory for notes or the meeting itself.

On the whole participants found that visual note taking improved their memory of meetings. The improvements occurred for two main reasons, the power of viewing the images, and the depth of processing from creating the images.

Images are more vividly remembered.

The use of images in their notes was, for several participants, visually captivating. P4 remembered the images "vividly". P5 also used the word "vivid", and used "fresh" to describe the notes upon review. P7 said of the use of images "it's helped stick things in my head". The use of images and space were easily remembers. It wasn't only the images that were pervasive in memory; participants were able to quickly access the meanings underlying the images:

> *...so in meetings when I have been able to use the technique, it's been much easier for me to look at the notes and say oh right, so I remember that meeting, the page looks different, it stands out and I can associate the pictures with the meeting and*

remembering from the notes is easier, it's much quicker to get back to what the meeting was, that's very helpful (P3)

...there are loads of things I have to refer back to, and if I'm referring back to it I can visualise what that page looks like in my head now, because it's not this boring stream of blah. There's bright, there's different colours and symbols and things, so yeah, it's really helped

...so the John Amaechi talk, I've drawn a couple of little pictures that convey whole stories he talked about. And I know what those stories are about from much less than if I'd had to write the story down but I also know what they symbolise, I can't remember the detail of the story but I can remember the underlying message (P4)

The images provided shorthand for a longer narrative which would have been more difficult to write longhand. The colours and symbols have given each page of notes a unique quality, making it stand out more. Only one participant did not find it useful, and that was P1 who found "it was out of context for me". This may be an artefact of his memory difficulties.

The findings are consistent with previous research that suggests visual memory is superior to verbal memory (Shepherd 1967, Nickerson 1968, Standing 1973, (Nelson and Vu 2010); and that information in different spatial arrangements is more likely to be remembered than traditional left to right presentation (Kulhavy et al. 1992, Robinson, Robinson and Katayama 1999). It is impossible to tell from this data, but it may be the case that the increased attention encouraged by the visual note taking technique, at least in passive contexts, contributed to the positive effect on memory. It is well established that attention is a key mediator of memory (Norman 1968).

Creating images leads to deeper processing.

For some, it was the process of creating images and links between them that stood out as helping their memory.

I don't know whether it's because of the drawing or if it's because it forces you to think about things. Things appear to resonate more deeply when you are thinking what are the relevant points...So it's almost more immersive (P4)

This is definitely better in terms of memory, I do remember things that I draw more actually, there's something, it lodges better in my brain because I am making connections rather than just reams of words, so yeah, that is useful (P9)

That process of converting words into pictures, that reinforces it (P7)

For the talks where it worked most well I can remember more about it because I remember how I linked ideas together (P8)

Participants also specifically mentioned the process of making links between words or ideas and pictures as being key in helping their memory. This is as predicted by the levels of processing theory (Craik and Lockhart 1972) which suggests that deeper processing based on meaning leads to better memory outcomes. The use of multiple modalities in memory, as used when combining visual note taking and the verbal/aural modality, has been shown to improve memory (Brunyé et al., 2003, 2006, 2008). This also suggests that the benefit of making notes is in the encoding process (DiVesta and Grey 1972) rather than the review process. The visual note taking technique had little effect on participants' propensity to review their notes, with only a small number regularly reviewing notes, and the rest only reviewing when they needed to refer back to something.

Review is need driven and not increased by the use of visual note taking.

The use of the visual note taking technique did not have an effect of the likelihood of participants reviewing their notes.

I haven't actually gone back to any of these since I've done them...I guess I haven't felt the need to go back to them because mentally I've taken away what I wanted to take away from them (P6)

Few regularly reviewed their notes even before the trial, and only looked back when they specifically needed to check or review something.

I tend not to refer back to my notes very often, unless there is a problem or a need to (P4)

I've found that I used to go to meetings all the time and take notes and I would never look at them (P5)

Though P7 said "It's not really changed" he also suggested that the increased retention effect of visual note taking was one of the reasons it wasn't necessary to review his notes.

I think I'm more confident then to talk to others about what the main messages really were, because before I'd go back and have a look at what was said, but now, it's there, so it's pretty helpful really. (P7)

These results are remarkably similar to those of Khan (1993), who found that notes from workplace meetings were rarely referred back to, and one participant found the note taking process was enough to aid recall. In this way the visual note taking technique had no more impact than traditional linear note taking.

(iv) Practice

The technique requires practice to become successful and confident in its use.

The time allowed was not adequate for sufficient practice.

One of the key themes to emerge from the data was a lack of practice and confidence in using the technique. Within this theme are the subthemes of time and risk, which acted as barriers to practice; and the concept of the requirement of visual literacy, which participants described as knowing what to draw or how to draw something. This requires practice to develop, and the perception of themselves as lacking in visual literacy, in some of the participants, proved a barrier to feelings of proficiency. This theme of practice was prevalent across most participants:

Maybe if I did it a lot more I would have got better at both [listening and visual note taking] (P1)

I think a lack of practice in going from words to pictures made that [knowing how to draw something] hard...I feel like it's a technique I'm learning but not proficient in (P3)

I don't think I've used it enough to be comfortable doing it at speed (P5)

...when I was doing some in quick succession I found that was easier but in terms of getting into the frame of mind to do it I didn't find that getting easier (P6)

Though participants had approximately three months to practice and make use of the technique, for some that wasn't adequate when fitting it in to a daily job:

I think maybe me personally would have liked a bit more of the session group where we practise because I find as a lot of people do, you know, the job's busy (P5)

There's no luxury of time...I wish I'd have had some time to have sat down and thought beyond those symbols that I am actually using. I just haven't had the luxury to do that (P9)

Users are reluctant to risk using a technique, with which they do not feel confident, in essential workplace settings.

For other participants the issue with lack of practice appears related to a reluctance to take the risk of using a new technique in an occupational setting, with one participant describing himself as "wary" and "tentative" about applying the technique. A key concern was that the technique would not enable them to take accurate notes, and that might impact on their ability to do their job. P2 did not attempt to use the technique at all after the training session.

as part of my role as a Business Analysts I have lots of meetings with customers...and as part of those meetings I'm trying to capture their requirements, so when, so for me, doing the visual note taking, it didn't seem like it would capture the information I needed to get. So when I needed word for word when they are drafting their requirements 'as I user I need to do XY and Z' I couldn't, I didn't feel the pictorial version would give me that because then I'd have to translate that anyway, and write it up into a requirements document. (P2)

P5 was content to use the technique on a topic that wasn't directly related to her job, and wanted to practice on pretend notes.

...the time that I used it most was on an external briefing...I think because it wasn't the sort of thing where I had to look back on those notes and necessarily remember them I was able to use it a lot more, bring in a lot more of the technique... I had all good intentions that I would practise on pretend notes (P5)

These participants didn't want to risk using the technique, when they weren't well practiced, on crucial work situations for fear of missing out critical information and impacting on their job.

There are two main issues that stem from the theme of practice, and the subtheme of risk. The first issue is the challenge of participants' compliance with instructions. Participants were asked to use the technique at least 10 times. The reasoning behind this was that it was expected that participants would take some time to become competent enough in the technique, and only then could its full potential be assessed. As it is, it is difficult to know whether the results of how effective the technique was are due entirely to the technique or due to participants' lack of proficiency. This is not unusual in psychological research, especially those involving memory techniques. Motivation for new learning techniques imposed during research can be low (Soler and Ruiz 1996, Farrand, Hussain and Hennessey 2002), and non-compliance with memory tasks in research can be up to 57% (Campos, Lopez and Perez 1998-1999).

On the other hand, the fact that participants were at times reluctant to use the technique is a measure of the efficacy of the technique in itself. The goal of this research was not just to assess how effective the visual note taking technique is, but also to see how effectively the technique could be applied in workplace setting. The amount of practice required for the technique hindered the motivation for applying it. The participants' reluctance to risk using the technique in crucial workplace meetings suggests that it is not a technique that can be learned 'on the job', increasing formal training and consolidation time in learning the technique.

Lack of graphical literacy hinders successful use of visual note taking.

The concept of graphical literacy, essentially an ability to represent something graphically, or a lack thereof, was a concern for almost all the participants. P3 described himself as lacking "graphical literacy", and P4 didn't have a "graphical lexicon" to draw from.

P9 would have liked time to sit down and think about symbols she regularly wanted to use, whereas P8 would have liked a "cheat sheet" given to her to take away and refer to. This lack of visual literacy meant a lot of time using the technique was spent trying to figure out what to draw or how to draw something.

> *I discovered I was sitting there thinking how do I draw this, and by that point in time the world had moved past (P1)*

> *You start thinking how am I going to represent that, instead of what is it they're talking about (P4)*

> *I don't even think about it [writing]. Whereas I think 'oh I've heard that, now how do I do it graphically?' I've got to think about that and reflect on it. It's a way of recording information that I'm not used to so it's hard. (P3)*

These comments echo the claims of Cohn (2014) who suggests that fluency of drawing does not come from the articulation of perception from vision or memory, as commonly believed, but from the acquisition of graphical schemas, which store information of the component parts and 'production script', or how to draw, the required figure. The participants' problems in figuring out how to represent what they had heard suggests they had insufficient schemas available. These schemas are built through imitation and learning, and as such tie into the theme of practice. Traditional Western art education has for a long time recommended against imitation (Willats 2005, cited in Cohn 2014). However research has shown that imitation in drawing can improve creativity (Ishibashi and Okada 2004), and Cohn (2012) suggests that drawing is a communications device which develops in much the same way as verbal language, for which imitation and repetition are essential to fluency. He also suggests that much like language there is a critical period of development, around the teenage years, after which, without adequate nurturing, drawing as a skill may never be acquired fluently. This suggests that users of the visual note taking technique who are not skilled in creating visual images as adults may never reach the fluency required for the technique to be at its most effective.

(v) Impact of other people

Visual note taking users are sometimes concerned about colleague's views of their use of the technique.

The use of visual note taking made participants concerned about the perception of colleagues. This sometimes had a detrimental effect on usage. Although this theme was not prevalent across all participants, for at least four of them it manifested in different ways.

P1 was not comfortable with the technique throughout the trial and this self-consciousness and his concern over his drawing skills may have contributed to that. It was not something he could see himself over coming.

> *I discovered I wasn't very good at doing it and listening at the same time and because I was not good and I was self-conscious (P1)*

> *...but I got myself in a position where I was too self-conscious just to openly do it...(P1)*

> *I think if anything I was getting more self conscious, so it was a probably negative reinforcement (P1)*

> *Sometimes it made me feel a little bit conscious there, and it's understandable, it's a new technique and people are probably thinking 'what's he up to?' (P7)*

P4 was concerned that when using it in meetings where he was an active participant the speed at which he was using the technique was affecting the meeting and keeping people waiting.

> *...if it's people reporting the information to me I almost feel like I'm holding things up if I'm trying to draw stuff, which sometimes can take longer (P4)*

P7 stated that concern about distracting other people in meetings affected his decision to not use colour.

> *But some of it was not wanting to draw attention to, or to distract proceedings by using colour (P7)*

P9 was concerned about the assumptions other people were making about her use of visual note taking. She thought that people might think she was doing it because she was bored, when actually it was a sign of her being more engaged.

> *The only problem is that I think that other people think they've lost me. And actually it's the opposite...in the past I've purposely stopped myself [doodling] so that people don't think that. But because I've been trying to do this it's sort of freed me to do it. But I still think people think I'm just wasting time and drawing pictures (P9)*

For P7, other people's expectations affected the output of his notes. While he was comfortable to use the notes, when it came to sharing a record of the meeting, he suggested that his colleagues expected notes in a traditional linear format.

> *at the end, there were my colleagues who needed me to write it up in a proper order...I think it's a status quo there, and professional standard you have to write up in a formal interview standard. But hopefully they'll see the light! (P7)*

For these four participants, their feelings about how other people perceived them were concerns that arose spontaneously, without any direction questioning on the issue. For P1 it was a recurring theme and a barrier to using the technique. For others, though it may not have stopped them using the technique, it did force them to modify their behaviour.

Self consciousness may indicate a lack of confidence, which has been identified as a barrier to creativity in the workplace (Sadi and Al-Dubaisi 2007). A key aspect in improving employee creativity in the work place is leadership (Tierney, Farmer and Graen 1999), specifically empowerment and encouragement of creativity (Zhang and Bartol 2010). Scheier and Carver (1982) found that people with low self confidence show less persistence in a task after failure. This may explain why so few of the participants persisted with the technique after initial challenges.

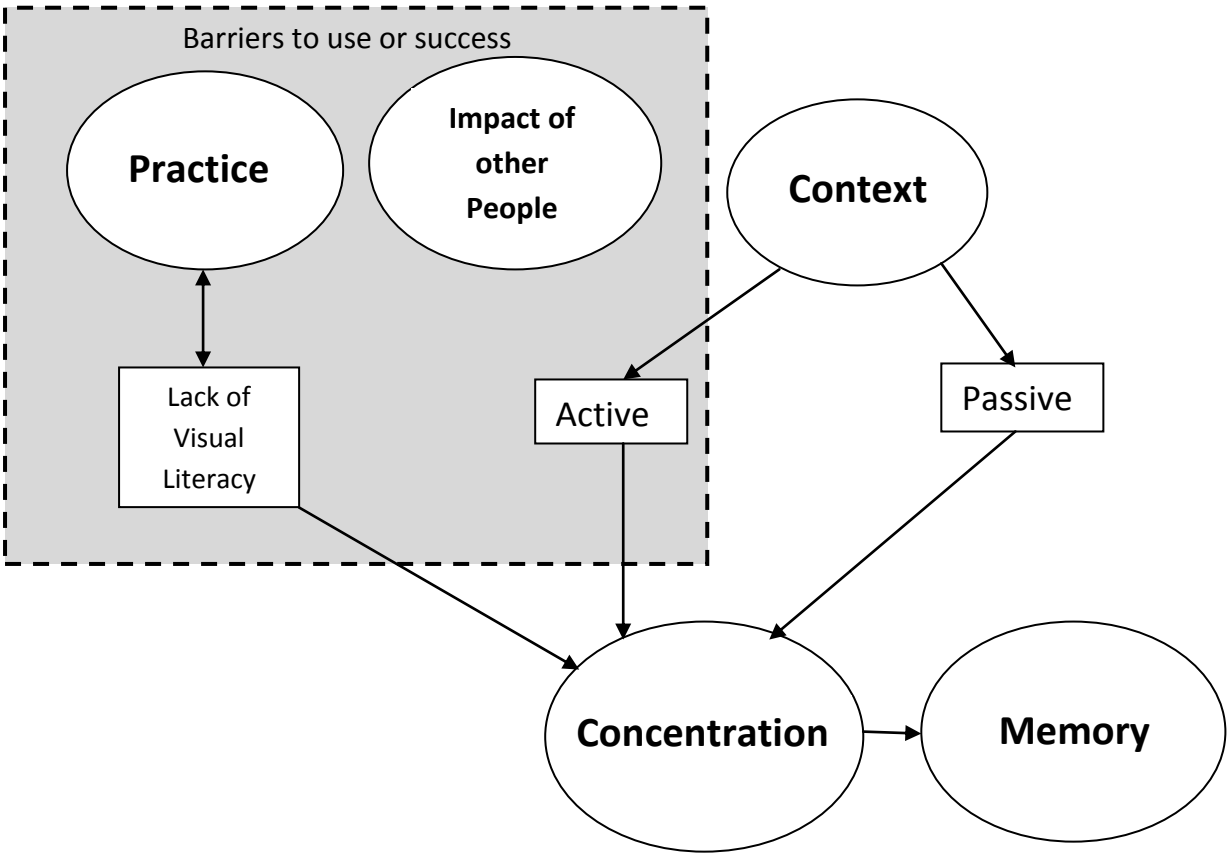

Figure 2. A representation of the main themes and their interaction.

Figure 2 shows a graphical representation of the main themes and subthemes and how they interact. Context was an important factor in whether the visual note taking technique was useful or not, and impacted on participants concentration. Where the context involved passively absorbing information the technique proved successful in maintaining participants' concentration and improving their memory. They also found the technique much easier to use in these circumstances.

When the context involved a participatory meeting, where participants were engaging in debate, actively speaking, or trying to chair the meeting, they found the technique very challenging to use. They found it difficult to conduct this form of note taking and be an active member of the meeting at the same time. They often found themselves distracted by trying to figure out how to represent an idea. This links to the subtheme of a lack of visual literacy, which comes under the main theme of practice. Participants felt like they lacked common

visual schema for readily representing things. Some of this was due to lack of practice in using the technique.

Another theme was the impact of other people on the participants. Whether through self-consciousness at their drawing skills, fear of distracting proceedings, or expectations of output, other people's perception concerns the participants, and often impacts their use of the technique. Other people, along with lack of practice and active participation in a meeting are all barriers to effective use of the technique. Sometimes this barrier prevents use of the technique completely, for others it just means their use of the technique is less effective or expansive.

Future use

Though not a key theme it is worth noting the ongoing and future use of the visual note taking technique, as a marker of its effectiveness.

> *I'd like to [continue using the technique], I found it valuable (P3)*

> *I have incorporated some of those techniques into long hand notes, so boxes round things and arrows and highlighting things much more... I haven't given up on it (P5)*

> *It would be really great if once a fortnight or once a month someone was to run a session where you would come along and you would graphically record something, so if someone wants to present something like a TED talk or something and everyone who turns up has to graphically record it, like a secret club or something. (P6)*

> *I definitely will [continue to use it] (P9)*

These quotes suggest that despite some of the barriers, participants recognised that the technique could be effective in the right context and many were keen to continue using it.

Discussion

The purpose of this study was to investigate the application of a visual note taking technique to a workplace setting. This was explored through interviews of participants trained

in the technique, for the purpose of this study, and asked to apply it in their workplace meetings.

The success of the technique, both in its application and its effectiveness, was varied. The results were classified into themes that were common across the data: (i) the effect the technique had on concentration in a meeting, which was dependent on (ii) the context or type of meeting the technique was used in; (iii) the effect the technique had on users memory of the meeting; (iv) the practice the technique requires to use it successfully; and (v) the effect other people had on the use of the technique.

When in a passive context where participants were not required to participate, the majority of participants found the technique to be beneficial to concentration and memory. Using the technique helped to focus them, and forced them to listen to the meaning of what they were hearing. In essence when in a passive context they were more active note takers. This supports research that suggests that visual images, and the use of space and colour improve memory (Standing 1973, Bellezza 1983, 1986), as does the use of dual modalities in encoding (Paivio 1972, Kulhavy et al. 1992, Robinson, Robinson and Katayama 1999).

When in an 'active meeting', one where they had to provide input, almost all participants found the visual note taking technique a distraction, negatively affecting their concentration. Participants found that they could not generate images and listen and plan their input or direct a meeting at the same time. It is well established that performing more than one task at one leads to diminished performance (Pashler 1994). In these situations the note taking technique competed with other cognitive functions for capacity. This suggests that the technique is not suitable for use in active contexts, and if applied in the workplace, should be limited to non-interactive sessions. This contradicts the findings for other types of visual note taking such as concept or knowledge maps (Chmielewski and Dansereau 1998). It may be that the more structured format and the lesser reliance on images in these techniques reduces the cognitive load experience by the participants using the visual note taking technique in this study.

It is difficult to establish from this research how much of the challenge in using the note taking technique in active sessions, and the cognitive demands it required, was to do with lack of familiarity and fluency in the technique. All participants felt that they had not

practiced enough. Coupled with this, participants reported spending a lot of time trying to think about how they would represent things, a process which took up valuable time and took attention away from the speaker. Similar outcomes were found in tests of other visual note taking techniques (D'Antoni et al. 2010). Were these images to be more readily available, and with increased practice, it may be that the technique would not be so distracting in active meetings. For some participants the lack of practice and fluency in the technique made them reluctant to risk using it in a workplace meeting. Greater opportunity to practice in a less crucial environment may help participants become more confident using the technique. Indeed, one participant suggested running lunch time group sessions to practice and share ideas. Increased practice would increase the number of schema available to draw upon enabling them to be processed unconsciously, and would reduce the burden of the technique on working memory capacity (Paas, Renkl and Sweller 2004). Future research may find that the technique, when well practised, may be suitable for all types of sessions, whether interactive or not, however further research is required to ensure that the benefits of proficient use of the technique outweigh the time cost of practising it.

An unanticipated finding was that participant feelings about or use of the technique were affected by the ostensible feelings of colleagues. It seemed that concern regarding other people's view of their actions, either within the meeting or in terms of output, made some of the participants feel self-conscious, and at times less inclined to use the technique, or certain aspects of the technique, e.g. colour. This disinclination to use the technique contributes to the lack of practice, which in turn may contribute to the lack of confidence in the technique, which gives another reason to avoid using the technique, thus creating a vicious cycle. This makes it more difficult to accurately assess the effectiveness of the technique, though it does speak to the practicalities of applying the technique in the work place. Encouraging people to use the technique is likely to require business change processes. Influential role models are the key to implementing successful change (Kotter 1995) and a key aspect in improving employee creativity in the work place is leadership (Tierney, Farmer and Graen 1999). If this technique were to be applied in the workplace it would require encouragement from influential figures in the workplace in order to break down this barrier to use.

There were some limitations to this research. The self report nature of the data collection means that the results of the assessment of the technique are subjective, and may not necessarily be accurate. This limitation is inherent to the method of research, but as an

exploratory piece of research is designed to give a sense of direction and a foundation on which to build more objective measures.

Due to the research method it was very clear that this research was investigating the efficacy of a note taking technique. In order to attract participants, to encourage them to use the technique in the workplace, and ensure that line managers consented to allow participants to take part, it was necessary to provide some information on the potential benefits of the technique. Because of this participants may have shown demand characteristics (Orne 2009), subconsciously changing their behaviour to affect the results. One participant alluded to the fact that the benefit in listening he experience may have been because of the trial rather than as a result of using the technique. Future research using quantitative methods would benefit from a control group which would mitigate any demand characteristics.

Finally, the lack of practice in the technique meant that it wasn't possible to assess the full potential of the visual note taking technique. As a novel piece of research, it has been important to explore the practicalities of learning and applying the technique, but it does mean that the assessment of the impact the technique had on concentration and memory may have been confounded by lack of practice and fluency in the technique. Further research could follow the participants as they become more experienced, or could compare people confident in visual note taking with people confident in linear or other note taking techniques.

This research was limited to note taking in meetings where the input is mainly auditory. Further research could investigate use of the technique in other note taking situations, such as brainstorming, documenting personal thoughts, or taking notes from other types of sources. Khan (1993) divided note taking into 'communication' and 'no communication' situations. Communication situations are settings of two or more people, such as meetings or lectures; no communication settings are about noting one's own thoughts and ideas or features of the environment. Using the technique in no communication settings would remove the time pressure caused by having to keep pace with a speaker, and would leave users time to think about how they might represent ideas.

Though some of the findings have shown visual note taking is not beneficial in certain circumstances, this research did not directly compare the technique with traditional note taking. Previous research has found note taking in general to be cognitively intensive (Piolat

2005), insufficient (Khan 1993), and distracting (Peters 1972, Hale and Courtney 1994, Hadwin, Kirby and Woodhouse 1999), suggesting that some of the issues of visual note taking may be endemic to the practice of note taking in general. Future research making a direct comparison between the techniques would be establish the relative effectiveness of visual note taking.

Programmes to encourage the use of visual note taking in teams or by more senior leaders could investigate the impact this has on the participants' self-consciousness, and on the normalisation of the technique in the workplace.

Technology is fundamentally changing the way we communicate. While the use of computers hindered effective note taking (Mueller and Oppenheimer 2014), the evolution of technology means that there is less disparity in drawing in a digital medium compared to paper drawing. Tablets and styluses replicate the traditional tools, and increasingly sophisticated software translates the stylus movements into digital drawings. Such tools also provide flexibility in appearance such as colour and visual texture without the need for additional materials. Digital connectively would allow notes to be interactive and easily shared or replicated. Future research could investigate the impact of digital technology on the effectiveness of visual note taking in the workplace.

This research has contributed to the sparse research on note taking in workplace, with high ecological validity due to its naturalistic setting. The results from this exploration into visual note taking suggest that in certain circumstances the technique has a positive effect on concentration and memory. These effects were noted in meetings when the note taker could passively listen without interacting in the meeting. In more active meetings where the participants were required to interact, they found the technique distracting. Lack of practice and graphical literacy, and concern about the opinions of others proved to be barriers to effective use of the technique. This is a technique that takes time to gain proficiency, and any application of the technique in the workplace would have to take this into account. However, the technique created on-going positive changes in the way some of the participants take notes, and the majority of them expressed a desire to continue to practice and apply the technique. Future research removing barriers to the technique, such as practice and self-consciousness, may yet find more robust positive effects.

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Appendix A

Participant Information Sheet
Efficacy of visual note taking in the workplace

What is the purpose of this study?

This study is investigating the effectiveness of the technique of visual note taking in the workplace. I am interested in finding out how useful you find the technique and how easy it is to learn and apply in workplace settings.

Why have I been chosen?

This technique will hopefully help you take more effective and memorable notes in the workplace. You have been selected to take part after you responded to a request for expressions of interest in the study.

Do I have to take part?

No. Participation is entirely voluntary. If you change your mind about participation you can withdraw at any point during the experiment. Furthermore, you can also withdraw at any time in the two weeks following the study. This can be achieved by contacting the researcher (Kathryn Coster) on the email address below and providing your unique participant information number. If you decide to withdraw, all your data will be destroyed and will not be used in the study. There are no consequences to deciding that you no longer wish to participate in the study.

What do I have to do?

You will be asked to take part in a 90 minute training session to become familiar with the visual note taking technique, during which you will be given time to practice. You will then be asked to use the technique in at least 10 sessions, such as meetings, briefings or training, after which you will be asked to write a short journal, answering prompting questions. After

10 sessions you will be asked to come along to an approximately 20 minute long tape-recorded interview discussing your experience of using the technique. Prior to the study you will also be asked to complete two short questionnaires investigating memory and learning styles. It is estimated that this will take a total of around 5 hours over the course of 2 months (not including the workplace sessions in which you will use the technique). As well as your journal entries I would like to take copies of your visual notes in order to investigate your progression in the technique over time.

Are there any disadvantages to taking part?

There are no known disadvantages to the technique.

What are the benefits of taking part?

You will learn a new technique for taking notes which you can apply in any arena. It is hoped that you will find the technique helpful in making your notes more interesting and memorable, and that using the technique will help you stay engaged in the session in which you are taking notes.

Will my participation be confidential?

While the subject of your participation will not be confidential (as your line manger is likely to know and you will be in a group training session) all output will be confidential. You will be given a unique participant number which will be used instead of your name to identify any material that you produce, and no reference to your employer will be made anywhere. Any data in the write up will be anonymised. All data will be stored in a locked cabinet, and the visual notes will be kept within the organisation building to comply with classification policies.

What will happen with the results of the study?

The results will be written up into a Master's thesis, and may potentially be published in a peer-reviewed journal or presented at a British Psychology Society conference. The results

will hopefully be able to be used to further refine the visual note taking technique, and contribute to producing effective training.

What if I want to make a complaint?

This study has been through the Coventry University Ethics approval process. If you wish to make a complaint with respect to any component of this experimental procedure that you were dissatisfied with, you may contact Prof. Ian Marshall (Chair of Coventry University Ethics Committee) – email: Ian.Marshall@Coventry.ac.uk

For further information please contact:

Kathryn Coster
3 Marlstone Drive
Churchdown, GL3 2BB
kathryncoster@gmail.com
07843573651 Work ext: 58925

Supervisor:

Dr Christine Grant
Psychology & Behavioural Sciences Department
Tel: 02476 88 7024
Room JS251 James Starley Building, University of Coventry, CV1 5FB

Appendix B

A study into the efficacy of visual note taking - Line Manager Information Sheet

Your member of staff has volunteered to take part in a study investigating the usefulness of a visual note taking technique in the work place. The study is being undertaken as part of my Master Degree dissertation, via Coventry University. Visual note taking is thought to benefit memory and comprehension over traditional linear note taking. People using the technique report feeling more engaged in briefings, and having better memory for the information delivered. The technique also encourages creativity and strategic thinking. I hope that whatever the outcome of the research that your staff member will benefit from taking part in the part, and learning a new and creative technique.
I intend to give them training in the technique, and will ask them to apply the technique in at least 10 sessions over the course of 2 months (such as meetings, briefing etc.) and fill in short journal entries to assess its success. Finally, there will be a short interview to discuss their experience with the technique.
With the time to fill in the journal, a 90 minute training session, and a final 20 minute interview, I estimate that participation will take approximately 5 hours over 2-3 months, plus use of the technique in the required sessions.
The research project is subject to ethical approval by Coventry University. I have agreement to conduct the study in the workplace but use of work time is at management discretion (for further details contact [redacted]). I hope that with the potential benefits of the technique, and the contribution to applied psychological research in the workplace, that you will consider this to be a good use of your employee's time.
Your employee's output in the research will be confidential and anonymised, but you are welcome to request a copy of the final project at the end of 2014.
For further details concerning the study please contact me:

Kathryn Coster
3 Marlstone Drive
Churchdown, GL3 2BB
kathryncoster@gmail.com
07843573651 Work ext: [redacted]

Appendix C

Visual Note Taking Consent Form

About this study

This study is investigating the effectiveness of the technique of visual note taking in the workplace. I am interested in finding out how useful you find the technique and how easy it is to learn and apply. Participants will be given training in the technique and asked to apply it in the workplace, feeding back via journal entries and an interview. Please see your Participant Information Sheet for further information.

	Please tick
1. I confirm that I have read and understood the participant information sheet for the above study and have had the opportunity to ask questions.	☐
2. I understand that my participation is voluntary and that I am free to withdraw at anytime without giving a reason.	☐
3. I understand that all the information I provide will be treated in confidence	☐
4. I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded (*insert deadline here*).	☐
5. I agree to be recorded as part of the research project	☐
6. I understand that a copy of the research project may be made available to my employer and may also be written up for publication.	☐
7. I agree to take part in the research project	☐

Name of participant: .....

Signature of participant: .....

Date: .....

Name of Researcher:.....

Signature of researcher: .....

Date:.....

Appendix D

Visual Note Taking Training outline

Training will be delivered using power point, instructional videos and paper exercises. Training will take around 90 minutes and will cover topics as follows:

1. What is visual note taking - examples
2. But I can't draw...
3. How to draw simple objects with simple shapes (instruction and practice)
4. How to draw people (instruction and practice)
5. How to draw abstract concepts (instruction and practice)
6. Writing and drawing balance
7. Typography
6. Internet video on visual note taking
7. How to draw common work specific concepts (group exercise)
8. Turning drawings into notes
9. Different ways to structure visual notes
10. Video TED Talk and practice of visual note taking technique
11. Further information resources
12. Further queries and wrap up

Appendix E

Journal Questions

1. In what type of session did you use the technique? (e.g. team meeting, training session)
2. How easy did you find the technique to use in this session?
3. What affect did the note taking technique have on your experience of the session?
5. How well do you feel you captured the relevant information?
6. Any other thoughts on the technique at this stage?

Appendix F

Interview Questions

1. How have you found using the technique?
2. How did you find learning how to use the technique?
3. Do you feel the technique has helped you in any way?
4. What type of session do you feel best suited the technique?
5. Will you continue to use the technique?
6. Would you recommend the technique to other people?
7. Any further thoughts on the technique?

Appendix G

Debriefing Sheet:

Study title:

The Efficacy of Visual Note Taking in the Workplace

Thank you for your participation. The currently study was investigating the efficacy of visual note taking in the workplace. The aim was to teach employees a technique for taking notes using imagery and space and investigate how much it improve memory and engagement in meetings and briefings, and to understand how practical the technique was to learn and apply.

A small group of participants was used to enable collection of an in depth response. These responses will be assessed for common themes, and will be compared to your responses on the learning styles and memory questionnaire.

This study will form the basis of my Master's Degree dissertation. This dissertation may be shown to your employer for their information and may also be written up for publication. You are welcome to request a copy of the dissertation for your own information.

Once again, your participation is greatly appreciated. If you have any further questions, please ask the experimenter or contact the study supervisor Dr. Christine Grant email: christine.grant@coventry.ac.uk Furthermore, you are permitted to request the withdrawal of your data from the study within 2-weeks from the completion of the study.

In the event that you seek to make a complaint regarding your treatment within the experiment you may contact Prof. Ian Marshall (Chair of Coventry University Ethics Committee) – email: Ian.Marshall@Coventry.ac.uk

If you would like to read more on the topics covered in this study, the following references may be of interest.

Marguiles, N., and Valenza, C. (2005) *Visual Thinking*. Connecticut: Crown House
Rohde, M. (2013) *The Sketchnote Handbook*. Peachpit: San Francisco

Appendix H

Ethics Approval

The following ethics request has been set a status of approved with minor conditions by Elaine Cartmill. All the relevant documentation will be available for you to download within the next 24 hours. Please log back into Ethics and select the request from your listing. Select the Downloads tab to retrieve the documentation.

Please proceed with good ethics.

Ref: P20821

Project Title: Efficacy of visual notetaking in aiding recall

Applicant: Kathryn Coster

Supervisor: Christine Grant

Module Code: M49PY

Module Leader:

Go to ethics.coventry.ac.uk to view this request in more detail.