

*The influence of QuikScan (QS) on  
reading comprehension, recall and  
information search by blind and visual  
impaired readers*

Master Thesis

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## Abstract

**Background:** QuikScan (QS) is a new and innovative text design that implies several text signaling devices such as headings and numbering. It is designed in order to facilitate text comprehension & recall but also information search. By using several within-document summaries, the reader gets informed about the gist of each segment of the text. The summaries consist of numbered sentences that correspond to topic sections.

**Aim:** Research on QS has mainly focused on the effects for comprehension, recall and text search by sighted readers. This study aimed to examine effects of QS texts on the reading processes of blind and visually impaired readers.

**Method:** Three experiments were conducted in this study. During the first experiment, effects of QS on high-level comprehension and recall were tested by means of a summary writing task. In the second experiment, the effects of QS on low-level comprehension and recall were tested by means of a free recall task. The third experiment examined whether QS facilitates high level, medium level and low level information search. Additionally a short analysis is done of the search strategies blind and visually impaired readers apply when searching in QS and NQS texts.

**Results:** After reading QS texts, participants wrote qualitatively better summaries than after reading non-QS (NQS) texts. No significant results were found for QS supporting low-level comprehension and recall by blind and visually impaired readers. These results were in line with the hypothesis. Additionally, no significant differences were found for the search success in QS or NQS texts. Participants used significant more synonyms when searching in QS texts than in NQS texts. There are indications that blind and visually impaired readers apply different reading strategies when searching in QS and NQS texts.

**Conclusions:** Blind and visually impaired readers benefit of QS texts when writing summaries. This suggests that QS facilitates high-level comprehension and recall, by providing the reader with macrostructure information. Further research is needed with larger amounts of participants to get a more complete view on the effects of QS on information search by blind and visually impaired readers.

*Keywords:* QuikScan (QS), high-level comprehension & recall, information search, low-level comprehension & recall, macrostructure

## Samenvatting

**Achtergrond:** QuikScan (QS) is een nieuw en innovatief tekst design dat gebruik maakt van meerdere tekst signalen zoals koppen en nummering. Het is ontworpen met als doel tekstbegrip, recall en informatie zoekgedrag te vergemakkelijken. Teksten geschreven in het QS design bevatten meerdere samenvattingen die door het hele document zijn geplaatst. Via de samenvattingen wordt de lezer zowel over de tekst structuur als ook de inhoud van elke paragraaf geïnformeerd. De samenvattingen bestaan uit genummerde zinnen die naar paragrafen in de tekst verwijzen en op die manier navigatie binnen de tekst ondersteunen.

**Doelen:** Tot nu toe heeft zich onderzoek naar QS voornamelijk op de effecten op tekstbegrip, recall en informatie zoekgedrag bij ziende lezers gericht. Deze studie richt zich daarom op de effecten van QS op tekstenbegrip, recall en informatie zoekgedrag bij blinde en slechtziende lezers.

**Methode:** Drie experimenten zijn uitgevoerd. Tijdens het eerste experiment, zijn de effecten van QS op *high level* tekstbegrip en recall getest door participanten samenvattingen te laten schrijven. In het tweede experiment werd het effect van QS op *low level* tekstbegrip en recall getest met behulp van een vrije recall taak. Het derde experiment onderzocht of QS het informatie zoekgedrag van *high*, *medium* en *low level* vragen ondersteunt.

**Resultaten:** Na het lezen van QS teksten, schreven deelnemers kwalitatief betere samenvattingen dan na het lezen van niet-QS (NQS) teksten. Er werd dus in experiment 1 een significant verschil gevonden tussen QS teksten en NQS. In experiment 2 daarentegen werd geen significante verschil gevonden bij het beantwoorden van *low level* vragen. Dit is in lijn met de verwachtingen. Daarnaast werden ook geen significante verschillen gevonden voor het antwoorden zoeken van *low-level*, *medium-level* en *high-level* vragen. Participanten beantwoordden vragen niet beter als zij in een QS tekst gingen zoeken dan in een NQS maar gebruiken wel synoniemen. Er zijn aanwijzingen dat een andere lees strategie gebruiken bij het zoeken in QS teksten dan in NQS teksten.

**Conclusies:** Blinden en slechtzienden lezers profiteren van QS teksten bij het schrijven van samenvattingen. Dit suggereert dat QS *high level* tekstbegrip en recall ondersteund door de lezer met macrostructuur informatie te voorzien. Verder onderzoek met grotere hoeveelheden aan participanten is nodig om een vollediger beeld van de effecten van QS op informatie zoekgedrag bij blinde en slechtziende lezers te verkrijgen.

**Trefwoorden:** QuikScan (QS), high level tekstbegrip en recall, information zoekgedrag, low level tekstbegrip en recall, macrostructuur

## Index

1. Introduction .....	6
1.1 Reading for comprehension and recall .....	7
1.2 Searching for information.....	8
1.3 Problems/obstacles of blind and visually impaired readers during comprehension, recall and search .....	9
1.4 Why QuikScan?.....	14
1.4.1 QS and text comprehension and recall.....	14
1.4.2 QS and text search .....	15
2. Experiment 1 Writing summaries .....	16
2.1 Design.....	16
2.2 Participants .....	17
2.3 Materials .....	18
2.4 QS design of the expository texts .....	18
2.5 Analysis .....	22
2.5.1 Quality criteria for summaries .....	22
2.5.2 Coding procedure.....	24
2.5.3 Reliability coding of the summaries .....	28
2.6 Procedure .....	29
2.7 Data Analysis.....	30
2.8 Results and Discussion .....	30
3. Experiment 2 Answering low-level questions.....	33
3.1 Design.....	33
3.2 Participants .....	33
3.3 Materials .....	34
3.4 Analysis .....	34
3.4.1 Quality criteria for low level questions.....	34
3.4.2 Coding procedure for low level questions .....	35
3.4.3 Reliability of the coding procedure.....	36
3.5 Procedure .....	37
3.6 Analysis .....	37
3.7 Results and Discussion .....	38
4. Experiment 3 Searching for high-level, medium-level and low-level information .....	39
4.1 Design.....	39

4.2 Participants of the search strategy part .....	40
4.2.1 Participants of the search success part .....	40
4.3 Materials .....	41
4.4 Analysis .....	41
4.4.1 Quality criteria of the search strategies .....	41
4.4.2 Quality criteria of answering high-level, medium-level and low-level questions ...	41
4.4.3 Coding procedure of the search strategies .....	42
4.4.4 Coding procedure of the answers .....	42
4.4.5 Reliability of coding the answers .....	42
4.5 Procedure .....	43
5. Analysis .....	44
6. Results and Discussion .....	44
7. General Discussion.....	48
8. References .....	54

## 1. Introduction

Over the last decades, computers have taken on an increasingly important role in education (Gringhuis, Moonen & van Woudenberg, 2010). Not only are computers used as information and communication devices, but they are also used as a compensation device for blind and visually impaired peoples (Gringhuis et al., 2010). Special ICT devices for blind and visually impaired readers are made in order to facilitate their participation in education and society (Gringhuis et al., 2010). Nowadays, blind and visually impaired readers are supported by screen reader software that can be used on any computer, because, just as sighted readers, blind and visually impaired readers have to read and comprehend a lot of written texts in school.

Screen reader software can unburden the reading processes of blind and visually impaired readers by making it possible to read digital texts in a personalized way. Screen readers are a special kind of software that runs on the computer of the reader. When using the text-to-speech function of the screen reader, the reader can listen to a mechanical voice that is reading the text document out loud. The screen reader user can adjust the display settings such as the brightness of the display, the magnification of the display and the background colour. A device that is often used in combination with a screen reader is the refreshable braille reading line. With such a line, the user can touch-read a digital text by placing the fingers on the Braille display. Although, screen readers support blind and visually impaired readers in several ways, they merely support the technical facility of reading. They enable the user to read; they do not provide reading goals or strategies. Just like normal readers, blind and visually impaired readers probably need cognitive support in order to achieve certain reading goals.

When addressing the purpose or the goal of reading, Rouet (2006, p.93) indicates that “reading often takes place in a purposeful context, in which people engage in interactions with documents in order to satisfy a specific need or objective, for example, to locate a piece of information, to answer a question, or to perform a concrete action.” Regardless of whether the reader is sighted, blind or visually impaired, a distinction can be made between several reading goals as, for example, reading to search, reading to answer questions, reading to summarise and reading to do (O’Hara, 1996). Depending on the reading goal, the reader needs to apply different cognitive processes to achieve that goal.

This study will focus on three reading goals: 1) reading to summarize, 2) reading to answer questions and 3) reading to search with the aim of enhancing comprehension & recall.

Writing summaries and answering questions are common methods to test students' text comprehension & recall (Brown, Campione & Day, 1981).

### *1.1 Reading for comprehension and recall*

To comprehend and recall expository texts, Lorch, Lorch, Gretter and Horn (1987) argue that readers must identify the major text topics and their relations. Texts consist of different structures that the reader must recognize or develop during reading. The model of Kintsch and van Dijk (1978) gives insight into these mental processes of the reader. According to this model, the reader has to build a mental model of the text in order to comprehend and recall it. When building a mental model, the reader is going through three processes: the local/micro level processes, macro level processes and situational model processes (Kintsch & van Dijk, 1978). Together, the micro- and macrostructure form the text base or the semantic substructure that is derived directly from the text (Kintsch, 2004).

The 'microstructure' of a text consists of several propositions (words and sentences) that together form a network and represents the meaning of the text (Kintsch, 2004). During the local/micro level processes, the reader makes sense out of the different propositions and their coherence in order to obtain their meaning (Kintsch, 2004).

The 'macrostructure' is the overall organization of these propositions into higher-order units (Kintsch, 2004). The reader has to extract the text theme, in order to comprehend and recall a text. The macro level processes ensure that the reader is getting the gist of the text by organizing the important information into a coherent structure. By understanding the text as a whole the reader builds a mental representation of the text. This mental representation can be enriched by a mental representation of the situation described in the text, the situation model. In contrast to the textbase, the situation model is not a mirror of the text structure but includes the prior knowledge structure of the reader (Louwerse, 2002).

To carry out all these processes the reader has to deeply process and comprehend the text. However, comprehending and recalling a text and building a coherent mental model, poses a considerable cognitive load on the reader and may therefore not be carried out well (Rouet, Lowe & Schnotz, 2008). The reader's limited working memory capacity forces the reader to abstract the relevant information of the text and to integrate this into his mental representation of the text (Mayer, 2008). In other words, the reader must decide which information is important and which is not. As mentioned by Cerdán et al. (2008) "the

requirements may increase when students are asked not only to comprehend the ideas in the text, but also to use recall them in order to perform a specific task, such as answering questions or solving problems. ” (p.122)

### *1.2 Searching for information*

Besides the goals of reading to summarize and to answer questions, reading to search is another reading goal. This study focuses on text-based search, which implies that the reader (mainly) has to search within a text in order to find an answer. Based on the QUEST model of Graesser and Franklin (1992), Rouet (2006) identified the main processes involved in question answering when the reader answers text-based questions (see Table 1). In a text-based search task, the reader first has to identify the question category and its focus (also called question parsing). That is, the reader has to identify whether (s)he has to solve a what, why or how type of question. Next, the reader has to locate relevant information in the text. In digital texts, navigation plays an essential role and readers explore digital texts often through various navigational means (PISA, 2009). Skilled readers tend to locate relevant information more efficiently than less skilled readers, however often even skilled readers sometimes struggle in finding the key information (PISA, 2009).

Table 1  
*Information search processes*

<i>Search processes</i>	<i>Memory search</i>	<i>Text search</i>
Question parsing	Microstructure formation, categorization, identification of question focus	Microstructure formation, categorization, identification of question focus
Locating relevant information source	Selective propagation of activation (arc search)	Selection of information categories (through, e.g., meta-textual cues)
Content search	Knowledge activations, matching with questions focus	Content processing, matching with question focus
Retrieval cues	Only from prior knowledge and/or memory for text	From cues present in text integration with prior knowledge

Source: “The Skills of Document Use. From Text Comprehension to Web-Based Learning,” by F-J. Rouet, 2006, p. 99. Copyright 2006 by Lawrence Erlbaum Associations, Inc.

When reading a text to answer questions, the reader first has to select information from the text (that (s)he does not have prior knowledge) that is relevant for the task. After the



important information is found, the reader has to link it to the question (also called content search). Depending on the search task, comprehension of the text is not always necessary in order to answer a question. Some tasks merely depend on the reader's facility in locating the relevant information whereas in more complex tasks require deeper text processing such as when the reader has to compare two different texts or ideas (Rouet, 2006).

### *1.3 Problems/obstacles of blind and visually impaired readers during comprehension, recall and search*

In general, having or setting reading goals does not imply that the reader will achieve this goals. To achieve a reading goal, the reader has to go through the required reading/ cognitive processes and often needs support during these processes. Ideally, the text structure should support readers incomprehension, recall and search. Nevertheless, students frequently have to read long school texts which make it challenging for blind and visually impaired students to not only localize the desired information, but also to comprehend it. Blind and visually impaired readers can encounter several difficulties when it comes to text comprehension, recall and search of medium to long expository texts. By using text-to-speech software or a refreshable braille reading line, blind and visually impaired readers have to read in a very linear and non-selective way (Juvina & van Oostendorp, 2006). Therefore blind and visually impaired readers often have to read redundant or, for them, unimportant information, which does not only require a lot of time but also imposes more cognitive load (Juvina & van Oostendorp, 2006). Reading in an unselective way also imposes more cognitive load on them. Additionally, it can be tiring for the eyes of visually impaired readers to read long texts (Kasch, 2013). Blind and visually impaired readers often read texts several times in order to get an indication of the text content (Kasch, 2013). When reading unfamiliar texts that do not contain a preview, summary or index, blind and visually impaired readers cannot skim the text to get a quick impression of its content and structure. Repeated reading therefore, can be a way to construct a mental model of the text. Although, repeated reading is not only tiring and decrease the concentration of the reader, it can be a way of managing the amount of new information (Kasch, 2013). Depending on the reading and processing skills of the reader, the quantity of repeated reading differs. Usually, when reading a text several times, the first time is on a superficial and very quick way to merely get an impression of the theme of the text (personal communication with Anita, blind reader, April, 10<sup>th</sup> 2014). Then, after knowing what to expect, the reader can concentrate on the text content instead of its organization. Although the study of Kasch (2013) demonstrated that repeated reading is often used by blind

and visually impaired students, it cannot be generalized across all blind and visually impaired readers. However, it can be stated that blind and visually impaired readers can have difficulties during macrolevel processes (in getting the gist of texts) when not being properly informed about the text content and its structure. To get the gist of a text, readers have to filter out and connect relevant information and build a coherent model. If not being able or experiencing problems during the macrolevel processes, comprehension and recall will be negatively affected. One of the underlying reasons for time consuming and inefficient information search processes, are an (at least for the reader) unclear text structure.

Although, screen readers open new possibilities to blind and visually impaired readers, research shows that the technical facilities of screen readers, such as navigation by scrolling through pages, jumping from heading to heading and using search functions, are not enough in order to improve the text comprehension and recall and information search (Kasch, 2013).

Text signals can be an effective tool to support readers' text comprehension, recall and search (Lorch, 1989). Titles, headings, overviews, summaries, typographical cues and number signals are examples of signaling tools (Lorch, 1989). The topic sections below discuss the most pertinent types of signals. These signals are text design that accentuate certain aspects of the text content or structure, without altering the text content (Lorch, 1989). Research indicates that signals potentially facilitate cognitive processes of the reader (Lorch, 1989). By signaling relevant content information in the text and making the text structure more clear to the reader, signals can support the reader's text comprehension, recall and search (Lorch, 1989). Different kinds of signaling tools are applied to make texts more accessible to the reader (Lorch, 1989).

Table 2

*Effects of signalling devices on cognitive processes*

Type of signal	Locus of Effect				
	Attention	Reading	Comprehension	Memory	Search
Titles	—	—	Yes	Yes	—
Headings	—	—	—	Yes	Yes
Previews	Yes	—	—	Yes	—
Overviews	—	Yes	—	Yes	—
Summaries	—	—	—	Yes	—
Typography	—	—	Yes	Yes	Yes
Recall Sentences	Yes	—	—	Yes	—
Enumeration	Yes	—	—	Yes	—
Relevance Indicators	No	—	—	Yes	—
Function Indicators	Yes	—	—	Yes	—

Source: "Text Signalling Devices and Their Effects on Reading and Memory Processes," by R-F. Lorch Jr., 1989, p. 228. © 1989 Plenum Publishing Corporation

Table 2 demonstrates the influences of several signaling devices on cognitive processes such as comprehension, memory and search. Unfortunately, no research results of the effects of headings, overviews and summaries on comprehension are stated in table 2 (indicated by ‘-’).

### *Titles*

Titles inform the reader about the major topic or theme of a text (Lorch, 1989). They generally do not give any information about the text organization; they solely offer specific relevant text content (Lorch, 1989). Also, titles can provide the reader with a context. Such context information can prepare the reader for the content that lies ahead and it can activate familiar knowledge that facilitates the integration of the text content into memory (Lorch, 1989). Research of Bransford and Johnson (1972), Dooling and Mullet (1973) demonstrates that free recall of texts is better when the reader first reads the title of a text. This illustrates that titles benefit text recall by supporting the reader in organizing and integrating relevant text information (Lorch, 1989). By making specific information more visible it will also be easier for the reader to search for information. In guiding the reader’s attention, titles support the localization of relevant information (Lorch, 1989). Ultimately, text comprehension benefits from titles. Little research is done on the effects of titles on memory processes,.

To sum up, titles can direct the reader’s attention to relevant information, they can support the information search and they can activate the background knowledge of readers by giving a context and thereby enhance the readers’ text comprehension (Lorch, 1989).

### *Overviews and summaries*

Lorch (1989) makes a distinction between overviews and summaries in the sense that ‘overviews’ provide the reader in advance with topic information whereas ‘summaries’ provide the reader with content information after the main text. By conveying text content beforehand, overviews support and ease the reading processes. The reader does not have to infer the text content and its relations by himself/herself but partly obtains this from reading the overview which supports text comprehension. Additionally, Lorch (1989) states, that overviews always refer to an entire text and are intended to provide the reader with the necessary knowledge to comprehend the forthcoming text. Summaries on the other hand, often address merely one or more text topic sections (Lorch, 1989). Because summaries sometimes are written for each paragraph separately, readers get informed about the paragraph content and organization (Lorch, 1989). In sum, both, overviews and summaries

can support comprehension, recall and search of the reader, but this happens in different ways. Overviews inform the reader beforehand with an organized representation of the main text topics, whereas summaries can be consulted afterwards in order to reread the main information of a text (Lorch, 1989).

Regarding summaries and text search, Juvina and Oostendorp (2006) pointed out, that even if texts contain summaries, they do not provide the reader with enough information about the location of the information. The reader merely gets an impression of the text content but still does not know where to find specific information that is mentioned in the summary. In order to localize specific information, the reader has to remember the information while searching the text (Juvina & van Oostendorp, 2006). This imposes an additional cognitive load on the reader. Also, in the case of blind and visually impaired readers, text to speech software often does not translate text signals effectively for the reader (Juvina & van Oostendorp, 2006).

Knowing that text signals are an effective way to support readers text comprehension, recall and search, this study will focus on a new and innovative text design that incorporates several signals and aims to improve comprehension, recall and search - QuikScan.

QuikScan (QS) invented by Zhou and Farkas, is a recently developed text format that can be applied on printed and digital texts (Zhou, 2008; Zhou and Farkas, 2010). It is designed to support reading activities such as locating particular information, identifying the gist of text, and selective reading in several ways by making use of effective and well known signalling devices such as summaries and numbering (Zhou, 2008; Zhou and Farkas,2010).

Figure 1

*Impression of a QScanned text*

7} Brown and Kulik presented FBMs as engaging and provocative phenomena.

8} One reason why FBM studies are prevalent is that researchers can easily find many subjects with FBM memories of major public events.

9} In addition, psychologists who study memory have long focused on accuracy of recall.

10} Brown and Kulik suggest that FBM memory is extraordinarily powerful and unchanging, but their underlying model clearly predicts variations, partly as a result of retellings of the event.

7 Brown and Kulik's (1977) original presentation of FBM was engaging and provocative. They presented a phenomenon that all readers could readily identify in their own personal experience, yet they emphasized its unusual nature: "It is not the memory of the tragic news that invites inquiry, but the memory of one's own circumstances of first hearing the news. There is no obvious utility in such memories" (p. 74). Brown remembered being on the phone with the dean's secretary at Harvard University when he learned that Kennedy had been shot, but his personal circumstances were unrelated to the public news event. Brown and Kulik noted that "there is something strange about this recall" (p. 74), and described their research endeavor as being "on the trail of a mystery" (p. 98).

Although FBMs may be unusual, they are universally recognized. Academic psychologists know that introducing this topic to students, colleagues, or friends invariably triggers a stream of personal testimonials. The concept is so ubiquitous that Gary Larson parodied it in a cartoon with the caption "More facts of nature: All forest animals, to this very day, remember exactly where they were and what they were doing when they heard that Bambi's mother had been shot." In the cartoon, a possum was 'just getting ready to cross the interstate'. In short, Brown and Kulik identified a phenomenon that was at the same time common knowledge, compellingly curious, and lacking any scientific explanation—favourable conditions for inspiring empirical study.

8 FBMs are an especially attractive research topic for several reasons. Almost everyone is familiar with the concept and is able to produce a memory on demand, so that potential research participants are plentiful. Following an event like the 2001 attack on the World Trade Center, there is a ready pool of people who have received news of the same public trauma at about the same time. The methodology is straightforward— all that is required is a well constructed questionnaire and a willing group of respondents. The set of target events is always expanding— every new public shock or tragedy provides a unique opportunity to test existing hypotheses. In contrast, it is more challenging to conduct large-scale surveys of the "sundry private shocks in each person's life", because of the "absence of a very large population of like-minded people" (Brown & Kulik, 1977, p. 75).

9 An additional reason why FBM studies are so popular is the intense, almost single-minded scientific interest in the issue of recall accuracy as opposed to other memory functions. Brown and Kulik's provocative title *Flashbulb Memories* and flowery rhetoric

**Figure 1.** Adapted from: "Improving text recall with multiple summaries," by H. van der Meij and J. van der Meij, 2012, *British Journal of Educational Psychology*, 82, p.259.

By applying the QS format to a text document, multiple summaries are placed all through the text (van der Meij, van der Meij, Farkas, 2012). In general, the first QS summary is placed at the beginning of the first page of a text document. QS summaries contain a maximum of about five sentences. Each summary summarizes one topic section of the text document. Within this study, topic sections refer to the sections of a text. The term 'topic section' is used to highlight the fact that each topic section consists of a different topic. The numbered sentences of the QS summaries inform the reader about the gist of a paragraph (van der Meij, van der Meij & Farkas, 2012). The QS summaries are placed in a grey textbox and consist of several numbered items that correspond to paragraphs in the text body. Therefore, the first sentence of the QS summaries has the number one and refers to the first paragraph in the text (standing below the QS summary) that is also numbered with digit 1. By using a bold letter type, the numbers used in the summaries as well as in the main text are more visible to the reader (Zhou & Farkas, 2010). Additionally, the numbers in the main text are preceded by

a left brace, whereas the numbers from the QS summaries are followed by a right brace (Zhou & Farkas, 2010).

#### *1.4 Why QuikScan?*

Originally QS was developed for the needs of sighted readers. It is designed to improve and support reading comprehension and recall (van der Meij, van der Meij & Farkas, 2012). Texts written in the QS format empower the reader to read in a quick and selective way, by giving the reader the chance to read one or more summaries and paragraphs (van der Meij, van der Meij, Farkas, 2012). Sighted readers can benefit from QS texts in various ways, and its effectiveness for sighted readers has been shown in several studies on text comprehension and recall (Weiss, 2012; Zhou, 2008; van der Meij, van der Meij & Farkas, 2012).

##### *1.4.1 QS and text comprehension and recall*

To improve text comprehension and recall, the QS format makes use of the following signaling tools: overviews, headings and enumeration/numbering (van der Meij, van der Meij & Farkas, 2012). QS summaries give the reader an impression of relevant text topics and their organization/sequence in the text document (van der Meij, van der Meij & Farkas, 2012). Therefore, the reader does not have to build the macrostructure on his own (Zhou, 2008; Weiss 2012). Research of Weiss (2012) demonstrated that QS texts support the macro-level processes of sighted readers by providing them with the gist of the text. This implies that QS summaries function as an organized representation of a text, which can facilitate comprehension and recall processes of the reader (van der Meij & van der Meij, 2012).

The sentence and paragraph numbers are expected to support memory for the signaled text content, by indicating the importance of this information and by informing the reader about the organization of the text content (Lorch, 1989).

The incorporation of several text signals should make QS summaries an effective means for supporting the reader in building a schema of the text and in recalling relevant information. Several studies already demonstrated the effectiveness of QS on text comprehension, recall and search by sighted readers (Zhou, 2008; van der Meij & van der Meij, 2011; Weiss, 2012). Furthermore, van der Meij, van der Meij (2011 and Weiss (2012) demonstrated that QS provides the reader with important text concepts which the reader needs in order to build the macrostructure of a text.

### *1.4.2 QS and text search*

QS texts could also be a helpful tool for question answering and searching for information. The QS summaries provide the reader with a structured overview of the text content, which makes the document more accessible to the reader. Additionally the numbered statements used in the QS summaries can facilitate the information search of the reader by providing them with information about the text organization (Lorch, 1989; Kasch, 2013).

Based on the results from several QS studies on text comprehension, recall and search of sighted readers, this study will focus on the effects of QS on text comprehension, recall and search by blind and visually impaired readers. A short pilot study of Zhou (2008) indicated that blind and visually impaired readers could also benefit from texts written in the QS design. Moreover, in 2013 study of Kasch explored the way in which the QS blind and visually impaired readers perceive the QS design and whether they thought that QS could add value to their reading processes. All participants in that study were convinced of the benefits from the QS design and mentioned that an implementation of the QS design in their schoolbooks would add big value to their reading processes (Kasch, 2013). The participants felt supported in their text search with the inclusion of QS summaries. Additionally, the QS summaries provided them with a huge amount of content and context information, which enabled them to read in a selective rather than a linear way (Kasch, 2013).

Considering these promising results the present study further investigates the contribution of QS texts for comprehension, recall and search of blind and visually impaired readers. Three experiments are conducted - due to the small number of participants in the third study, this experiment should be considered an exploration.

#### *Experiment 1: High level text recall & comprehension*

During this experiment, the participants will have read QS as well as non-QS (NQS) texts in order to summarize these (without rereading). When summarizing, the participants have to show to what extent they comprehend and recall the gist of the text. That is, their summaries should indicate the existence of a macro level text model with key concepts and their underlying relations.

Research question 1: To what extent do QuikScan texts contribute to the construction of a text model in summarization? Hypothesis: Considering the incorporation of supporting text signals

in QuikScan texts, it is expected that blind and visually impaired readers write qualitatively better summaries of QuikScan texts than of non-QS texts.

### *Experiment 2: Low level text recall & comprehension*

During the second experiment, participants will get the task to read several QS and NQS texts in order to answer detail/low-level questions. When answering the questions, the participant is not allowed to reread the text but has to free-recall the answers.

Research question 2: “To what extent do QuikScan texts influence low-level text comprehension and recall of blind and visually impaired readers?”

Hypothesis: Reflecting on research about the text-model hypothesis (van der Meij & van der Meij, 2011; Weiss, 2012), it is expected that blind and visually impaired readers do not benefit from QS texts when answering low-level questions.

### *Experiment 3: High level, medium level and low level text search*

To examine the support of QS texts on text search, the participants have to search the text for answers to different types of questions (high-, medium-, and low-level questions). This implies that the participants can make use of the QS signals during search.

Research question 3: “How well and how do QuikScan texts influence the search processes of blind and visually impaired readers?”

Hypothesis: It is expected that blind and visually impaired readers will give qualitatively as well as quantitatively better answers NQS on the low-level questions compared to the high- and medium-level questions when searching in QS texts than in NQS texts.

## **2. Experiment 1 Writing summaries**

### **2.1 Design**

In order to test the participant’s high-level text comprehension and recall, they receive the task to write a text summary after reading a text, without being able to consult the text again. “The ability to summarize information is an important study skill involving both comprehension of, and attention to, importance at the expense of trivia” (Brown and Day, 1983, p.1). Summarization tasks can measure the topic structure representation of the reader and can give an indication of the amount and kind of information the reader remembers



(Brooks, et al., 1983; Hyönä & Lorch, 2004; Lorch & Inman, 1993; Lorch et al., 2001; Sanchez et al., 2001; van der Meij, van der Meij, Farkas, 2012). By asking the participants to summarize texts, several high-level comprehension and recall processes of the participant are indirectly measured. The summarization task tests the development of a macrostructure because the reader has to make a globally coherent structure of the text, leaving out redundant information (O'Malley, 1985). When writing summaries on a free-recall basis it can be expected that the participant is called upon to remember superordinate information/global meaning of the text, which in turn relate to the macrolevel/ higher level of a text (Kintsch, Kozminsky, Streby, McKoon & Keenan 1975).

Text comprehension and recall was measured by comparing the quality of the summaries written by the participants of the QS texts with the Non-QS texts. Thus, this study investigates the effects of QS versus Non-QS texts on high-level comprehension and recall.

The general set-up of the study is shown in Table 3. As the table shows, a practice text was used at the beginning of the experiment. The practice text consisted of one page and was written in the QS format. The intention of the practice text was to make the participants familiar with the QS structure and therefore preventing that the performance of the students was negatively affected by an unknown text format, such as the QS format.

Table 3

*Overview conditions for all experiments*

Text	Participants	
	Group A	Group B
Practice text	QuikScan format	QuikScan format
1	Original format	QuikScan format
2	QuikScan format	Original format
3	Original format	QuikScan format
4	QuikScan format	Original format

## 2.2 Participants

A total of 22 blind/visually impaired students (mean age 15 years) of the Bartiméus Institute (in Zeist, The Netherlands) participated in this (and the following) experiment. The Bartiméus Institute is a school for children with special educational needs, due to visual impairments. The parents of the students were informed about the three experiments beforehand. To let the students participate in the experiments, the parents were asked for permission. On the basis of a verbal questionnaire, the students were asked about some

background information such as age, gender, visual impairment and school level (see Appendix A).

For each school level the participants were randomly assigned to one of the groups: group A and group B. In this way, each group (A and B) consisted of participants with similar school levels. The division of participants in the two groups was used throughout the entire study, in which merely the number of participants varied. In the first experiment, 13 students were in group A of whom 5 were female and 8 were male. In group B there were 9 students of whom 4 were female and 5 were male. Although the participants were divided equally into two groups (A and B) prior to the start of the experiments, the two groups ended up with unequal numbers of participants, due to illness/absence of the participants (see Table 4).

Table 4

*Number of participants subdivided in school level and groups*

School Level	Group A	Group B	Total
Havo 3/4	2	2	4
Havo 2	5	3	8
Vmbo/T3	4	3	7
Vmbo/B3	3	1	4
Total	14	9	23

## 2.3 Materials

For the main experiment, four *expository texts* that differ in content (concerning different jobs in the arts sector) were used in the experiment. The texts all came from the same book (Swinkels & Schoen, 1999) and had a similar text structure (see Appendix B for an example). In this way, the texts could be compared with each other. Additionally, these texts were chosen for this experiment in order to enhance the chances that their content was unfamiliar to the participants. By using unfamiliar topics one can minimise the possibility that prior knowledge would influence their summary writing performance. Each text was between of one and one and a half pages long with a mean <sup>1</sup>Flesch reading ease score for the QS versions

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<sup>1</sup> Flesch reading ease scores

90-100 : Very Easy

80-89 : Easy

70-79 : Fairly Easy

60-69 : Standard

50-59 : Fairly Difficult

30-49 : Difficult

0-29 : Very Confusing

of 49.75, and a mean of 46.75 for the NQS versions. Two versions of each text were used in the experiment: the original version (NQS) and the QS version. The researcher wrote the QS version of each text (see Appendix B for more information).

#### **2.4 QS design of the expository texts**

The original QS design was adapted to the needs of sighted readers. Since sighted readers read in different ways than blind and visually impaired readers, it was expected that the QS design had to be adjusted on that audience. Sighted readers can read texts in selective and non-linear ways by scanning and jumping between topic sections (Juvina & van Oostendorp, 2006). Blind and visually impaired readers, however, are more limited in their choices (Kasch, 2013). Especially blind readers are less likely to read in non-selective ways because this easily causes a loss of orientation during reading (Kasch, 2013). Based on the research of Kasch (2013) and the personal consultation of a screen reader expert (H. Snetselaar) the QS layout was adapted in the following ways:

##### *Adding an introduction*

In the adapted QS layout, a QS text document starts with a short introductory sentence to inform the reader about the text document (see Figure 2). The introduction consists of the text source, the number of pages, the number of QS summaries, and the total number of summary sentences. Research of Kasch (2013) showed that a short introduction can equip blind and visual impaired readers with pertinent prior information about the text topic, the text structure/organization and an indication of the required reading time.

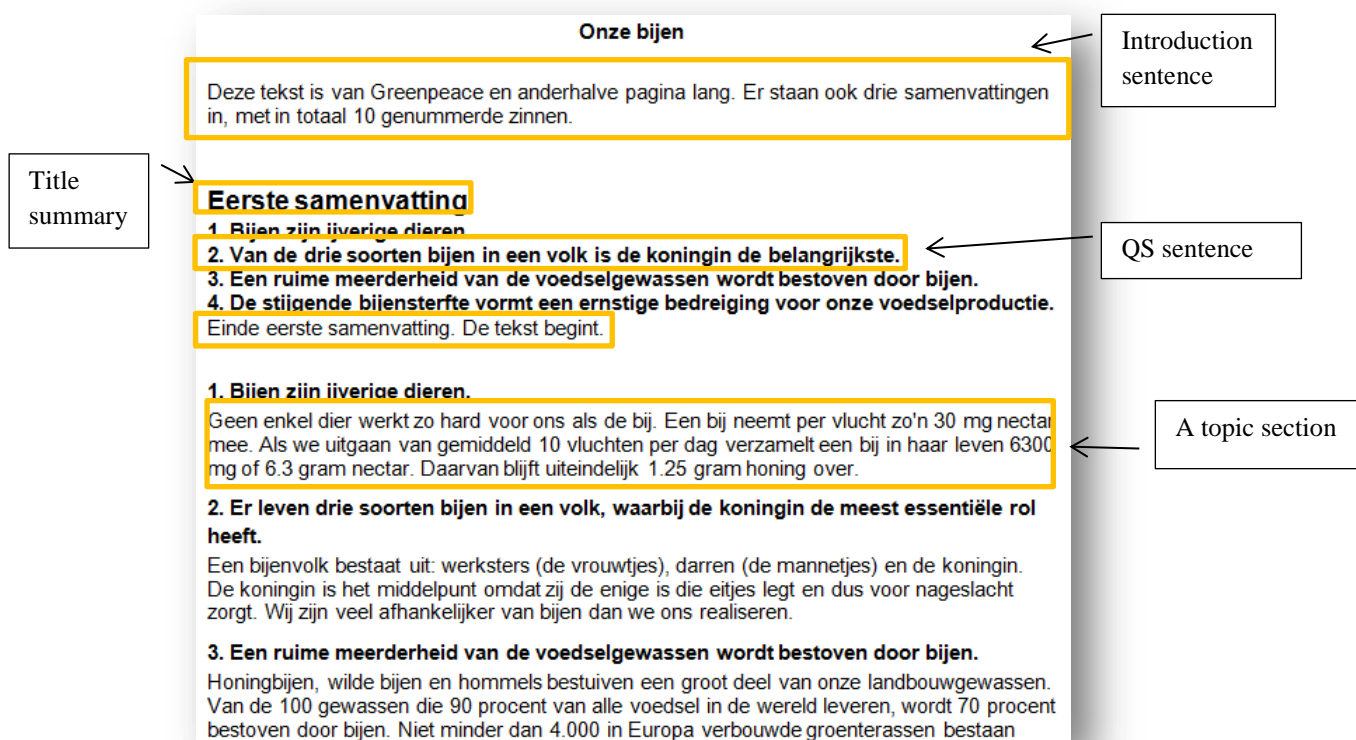


Figure 2. Greenpeace Nederland (2014) text that is QScanned with the adapted QS design for blind and visually impaired readers.

### *Beginning and end of the QS summaries*

After the introduction, the first QS summary is introduced to the reader by a short title that says 'First summary'. By numbering the summaries, the reader knows which of the multiple summaries (s)he is reading. This gives the reader a better overview during text search and can prevent the reader from losing the orientation in the text document. Below the title, the first sentence of the summary starts. After the last sentence of the QS summary, two short sentences are placed that state 'End first summary. The text begins.' By adding these sentences, the reader gains insight into the structure of the text document and knows if (s)he is reading the summary or the main body text. Additionally, the whole text document ends with the words 'The end' which implies that the reader does not have to check whether or not (s)he has read the whole document. This minimises the chances that some information especially at the end of a document remains unread.

### *QS summaries layout*

The summaries are no longer boxed, which implies that also no background colour is used. Boxed summaries can be an obstacle for blind readers that are less skilled with text-to-

speech software, (Kasch, 2013). It can be difficult to move the computer cursor into the box in order to read the text. Besides that, the box adds no value to blind readers. In contrast to blind readers, low vision readers can benefit from boxed summaries. The box can make it easier for the low vision reader to locate the summary (Kasch, 2013). Depending on the reader's preferences, a bright background colour can provide additional clarity about the position of the summary. To make the production of QS texts in this experiment more efficient and to make a comparison between the QS and NQS condition possible, all participants received texts with the same QS layout (see Figure 2).

### *Numbering system*

The target numbers in QS texts and summaries are bold but not highlighted and also not preceded by a left brace. Research of Kasch (2013) showed that blind readers often perceived braces as interrupting during the listening process. Therefore the braces were replaced by a dot followed by a white space. In addition, the target numbers in the text are always placed at the beginning of a paragraph and not anymore in between sentences within a paragraph. This adjustment is made after a personal consultation with a screen reader specialist H. Snetselaar (May 27<sup>th</sup> 2014) of the Bartiméus school in Zeist (The Netherlands). The underlying reason is of a technical nature: To enable blind and visually impaired readers to jump between the numbers of the QS summaries and the target numbers in the text, all numbers are marked as headings. However, within a screen reader program, headings always work for an entire topic section. This implies that if two target numbers are placed in one topic section, only one target number can be marked as a heading. By placing all target numbers at the beginning of each topic section, no overlap can occur.

### *Headings*

Again because of technical reasons, each topic section in the text is not only labelled with a bold number, but also with a heading. As already mentioned above in the numbering topic section, headings work for entire topic sections (in the case of screen readers). To only mark the target as heading, the number must be placed above the topic section. To avoid possible confusions for the reader by placing numbers above topic sections, the sentences of the QS summaries function as headings. Without placing the heading, the reader would first hear/read the target number and then has to navigate downwards in order to read the topic sections. When searching for information, the reader gets extra support by reading the headings of each topic section. The heading of each summary is formatted as heading 1, the

sentences of each summary are labelled as heading 2 and the heading of each paragraph (which are the same as the sentences of the QS summaries) are labelled as heading 3. This way, the participants of this study can easily jump (with their SuperNova screen reader software) from heading to heading, resulting in more efficient text search.

## 2.5 Analysis

### 2.5.1 Quality criteria for summaries

The written summaries were analysed and scored on the following categories: 1) completeness, 2) correctness, 3) coherence, 4) sequence, 5) redundancy, 6) conciseness and 7) number of words (see Appendix C for more information about the scoring procedure).

‘Completeness’ indicates whether, and to what extent, the participant mentions information from each topic section in the summary. Each topic section of a text is about a different topic, and to have a complete summary, each topic has to be mentioned in the summary. The number of topics differed across the four texts that were used. Each topic was counted and scored separately starting by the first. When scoring, it is important to not only use the QS headings of each topic section because not every participant has read a QS version of each text. If a participant mentions topic section 1 without referring to the QS heading it is still correct. In the same way, if a participant mentions topic section 1 by using the QS heading it is correct, too. The scores given for this category were either 1 point (present) or 0 points (absent). 1 point was given if the participant mentions (part of) the topic sections’ content in his/her summary. Participants do not need to summarize the entire topic to earn 1 point. If a topic section is summarized, this is sufficient. 0 points were given if no information of the topic section is found in the summary.

‘Correctness’ also refers to the topic sections and to what extent the participant was able to reproduce the content of each topic section correctly. It is about the amount of correct information a participant expresses in the summary. Possible scores for correctness were: 1 point (maximum), 0.5 points and 0 points (minimum). One point was given if the participant mentioned the gist of the topic section in his/her summary. When the participant did not summarize the theme of a topic section but merely mentioned some information of it, the participant received 0.5 points for this topic section. Zero points were given if no information of the topic section was found in the summary. Compared to the first category *completeness*, it is not about whether or not the participant mentions information of a topic section, but more

about the amount of correct information a participant summarizes. For more information see Appendix C.

‘Coherence’ is about connections between key concepts that are stated in the original text. Thus, sentences that relate through a cause and effect to each other. It indicates whether the participant can reproduce such connections in his/her summary. For each topic section these connections are written down beforehand by the researcher (see Appendix C). For each connection, the participant could score either 1 point (maximum) or 0 points (minimum). To receive 1 point, the participant had to express the connection in the summary. The connections had not to be summarized in a literal way but merely mentioned.

‘Sequence’ is related to the topic sections, too. In contrast to coherence, it is not about the topic sections’ content but the location of the topic sections in the summary. Sequence indicates whether the participant reproduces the topic sections in the same order as mentioned in the original text. When writing a summary without being able to consult the original text, the participant has to use his/her mental model of the text. This model can, obviously, be different from the original text. . Each sequence could be scored by either 1 point (maximum) or 0 points (minimum). If a participant summarized topic sections in the correct sequence (s)he got 1 point. For a text consisting of, for example, five topic sections, four sequences are possible. By summarizing topic section 1 followed by topic section 2, the participant got the sequence of the first two topic sections correct and earns 1 point. If a topic section is not summarized in the correct order, zero points are given.

By means of ‘redundancy’, the extent of redundant information that a summary contains is measured. Redundant information is unnecessary and unimportant information that will have a negative impact on a good quality summary (Brown & Day, 1983). For each redundant information a participant mentioned in his/her summary, 0 points will be scored. For each not mentioned redundant information, the participant will score 1 point. Beforehand, redundant information of each text is defined in the codebook (see Appendix C).

The ‘conciseness’ of each summary indicates whether the summaries of the participants were compact but still complete. Summaries that are longer or as long as the original text, are not qualitatively good summaries because they fail in proving the reader with a compact overview of the original text (O’Hara, 1996). The conciseness of each summary was measured by:

$$\text{conciseness} = \left(1 - \frac{\text{number of words of the participants' summary}}{\text{number of words of the original text}}\right) \times \text{score completeness}$$

At least, the number of words from each summary are counted and analyzed to get an indication of the length of the summaries.

### 2.5.2 Coding procedure

The coding procedure that is used to score the summaries, is demonstrated through an excerpt of the original photographers text written in the QS design consisting of three topic sections and an excerpt of a participants´ summary. The red rimmed sentences in the original text are ‘redundant’ information that the participants should not summarize.

#### Photographer

The following text consists of one and a half page. The text starts with a summary consisting of six numbered sentences and is followed by the main text body.

### Summary

1. **Photo’s often have high emotional significance.**
2. **Photographers work as employee or as entrepreneur.**
3. **A photographer must have great empathy.**

[...]

End of the summary. The main text starts.

1. **Photo’s often have high emotional significance.**

People often attach to certain objects. These do not necessarily have to be expensive things.

When asked what things they would take from their burning house, the first answer is often photos.

2. **Photographers work as employee or as entrepreneur.**

A photographer tries to capture the reality in an artistic way. He can do this as an employee. When working for a company or an institution he takes care of wedding photos or supplies photos for advertising. There are also photographers who make their living as an entrepreneur; they are called freelancers. Some freelancers make photos particularly to provide for their livings, just as employed photographers. There are also freelancers who in the first place, see themselves as artists. For them, photography is a form of art and making pictures is more important to them than earning money with photos.



### 3. A photographer must have great empathy.

A photographer should usually be able to empathize with others. Portrait photographers for example, only get good pictures if they hit off with the people they want to capture. It is very important that the photo models feel at ease during the shoot.

Excerpt of a participants' summary:

Topic section 1

Topic section 2

People often attach great value on their stuff, especially on photos. A photographer is someone who can capture moments on photographs. There are photographers who are employed by companies or institutions. There they take care of the pictures during weddings for example. Also, there are photographers who are self-employed. These are called freelancers. Freelancers often take pictures to earn their money, but some make pictures in first place because they see it as a kind of art. A photographer should be able to show empathy, especially a portrait photographer. It seems that they make better photos if they hit off with the person to be photographed.

Topic section 3

The summary excerpt of the participant was coded in the following way. First, the 'completeness' of the summary was examined by scoring the amount of topic sections that were summarized. Each mentioned topic section was scored with 1 point, whereas each unmentioned topic section received 0 points. Information on all three topic-sections can be found in the summary. As earlier mentioned, not the amount of information counts but whether or not (at least some) information of each topic section is summarized. In the example, each topic section is summarized and the participant receives 1 point for each mentioned topic section.

Next, the 'correctness' of each topic sections was independently scored by scoring the amount of correct information that was summarized. By mentioning words such as 'photos', 'value', 'people' and 'attach' the first topic section was completely and correctly summarized. Depending on the amount of correct information, a topic section can be scored with either 1, 0.5 or 0 points. Regarding the first topic section in the example, the participant received the maximum score of 1 point. The same procedure is used for the second and third topic section. Because the participant summarized the topic sections correctly by using words such as 'capture', 'employed', 'freelancer', 'earning money', 'kind of art', 'portrait photographers'

and ‘empathy’ (s)he received 7 point (1 point each). When scoring the ‘correctness’ of topic sections it is not about the words that are used by the participant but about their meaning. As mentioned earlier, the participants do not have to use the same words as in the original text to receive the highest point. Rather, it is about summarizing the meaning of a topic sections by using words that transfer the meaning correctly. A topic sections was scored with 0.5 points, if the participant summarized some information of the topic section correctly, but missed too much information to get a full score. Topic sections that were not or incorrectly summarized were scored with 0 points.

‘Coherence’ was scored by using the beforehand determined connections that are listed in the codebook (Appendix C) The connections relevant for this text excerpt are listed below, abbreviated as the letter ‘C’. When scoring the ‘coherence’ of the summary, the presence (scored with 1 point) or absence (scored with 0 points) of each connection was scored. For each present connection, the participant received 1 point. In the example below, the present connections, summarized by the participant, are noted behind each original connection in italics. This participant received the full score (1 point) for each connection:

Original connection as stated in the text C1: People often attach to certain objects. These do not necessarily have to be expensive things. *Expressed by the participant as: “People often attach great value on their stuff, especially on photos.”*

Original connection as stated in the text C2: A photographer tries to capture the reality in an artistic way. *Expressed by the participant as: “A photographer is someone who can capture moments on photographs.”*

Original connection as stated in the text C3: When working for a company or an institution he takes care of wedding photos or supplies photos for advertising. *Expressed by the participant as: “There are photographers who are employed by companies or institutions. There they take care of the pictures during weddings for example.”*

Original connection as stated in the text C4: Photographers who make their living as an entrepreneur; are called freelancers. *Expressed by the participant as: “Also, there are photographers who are self-employed. These are called freelancers.”*

Original connection as stated in the text C5: Some freelancers make photos particularly to provide for their livings, just as employed photographers. *Expressed by the participant as: “Freelancers often take pictures to earn their money.”*

Original connection as stated in the text C6: There are also freelancers who in the first place, see themselves as artists. For them, photography is a form of art and making pictures is more

important to them than earning money with photos. *Expressed by the participant as: [...] “but some make pictures in first place because they see it as a kind of art.”*

Original connection as stated in the text C7: A photographer should usually be able to emphasize with others. *Expressed by the participant as: “A photographer should be able to show empathy.”*

Original connection as stated in the text C8: Portrait photographers for example, only get good pictures if a they hit off with the people they want to capture. *Expressed by the participant as: [...] “especially a portrait photographer. It seems that they make better photos if they hit off with the person to be photographed.”*

‘Sequence’, was scored by comparing the order in which the text topic sections were summarized, to the order the topic sections were mentioned in the original text. The original order of the three text topic sections of the excerpt was T1 (topic section 1), T2 and then T3. For each correct transition (T1 to T2 and T2 to T3) 1 point could be achieved. The participant summarized the topic sections in the correct order and therefore received 2 points. When scoring an entire summary that was written of a text consisting of five topic sections and the participant wrote his/her summary in the order: “1, 2, 3, 5, 4”, (s)he will receive 2 points. One point for the sequence 1-2 and one point for the sequence 2-3. The remaining part of the summary is not exactly in sequence (3-5 and 5-4) and therefore no points will be awarded.

‘Redundancy’ was scored by controlling whether the summary contained any of the predetermined redundant text information. The excerpt of the original text contained two redundant information units, that were red rimmed. Each redundant information unit that is not summarized is scored with 1 point whereas each summarized redundant information unit received 0 points. The summary excerpt of the participant does not contain any of these two information units and was therefore scored with 2 points. The awarding of points when redundant information is not given results in a high score when few/no redundant information is given, which implies a high summary quality.

#### *Total score calculations:*

For each of the five categories (completeness, correctness, coherence, sequence and redundancy), the obtained scores were rescaled to a maximum of 1 point, resulting in a maximum score per text of 5.0 points. In table 5 an example is given for calculating a fictive

score of text 1. As can be seen (in Table 5), the rescaled score is obtained by dividing the obtained score by the maximum score.

Table 5

*Example score of text 1, experiment 1*

	Completeness	Correctness	Coherence	Sequence	Redundancy
Obtained score	4	3	7	2	4
Maximum score	6	6	15	5	4
Rescaled score	$4/6 = 0.67$	$3/6 = 0.50$	$7/15 = 0.47$	$2/5 = 0.40$	$4/4 = 1.00$

To calculate the total score, all the rescaled scores are added. For this example the total score is:  $0.67$  (Completeness) +  $0.50$  (Correctness) +  $0.47$  (Coherence) +  $0.40$  (Sequence) +  $1.00$  (Redundancy) =  $3.03$  (Total Score).

After rescaling the obtained scores, the sixth category ‘Conciseness’ was calculated using the following formula.

$$\text{conciseness} = \left(1 - \frac{\text{number of words of the participants' summary}}{\text{number of words of the original text}}\right) \times \text{score completeness}$$

For the above example with a summary of 70 words and a total text of 420 words, this results in a conciseness score of  $\left(1 - \frac{70}{420}\right) \times 0.67 = 0.55$ .

### 2.5.3 Reliability coding of the summaries

A codebook (see Appendix C, E and G) was made for each of the three experiments. Each codebook contained a coding schedule, the four texts that were given to the participants and an explanation of how to score. To test the quality of the codebooks, an independent assistant used the books for pilot scoring. For the first experiment, the assistant received the codebook and had to code the first ten summaries following the instructions of the codebook. Next, the scores of the assistant and that of the researcher were compared. Differences in scoring were discussed between the assistant and the researcher in order to adjust the codebook. Although differences in scoring occurred, they were due to mistakes made by the assistant or the researcher and not due unclear formulations in the codebook. Therefore, the codebook had not to be adjusted. The differences in scoring were discussed until the scoring results of the assistant and that of the researcher corresponded. Afterwards, the researcher and

the assistant scored the remaining summaries independently, while not knowing whether the summaries were written in a QS text or a NQS text. To get an indication of the scoring quality/inter-rater reliability, Cohen's kappa was calculated between the scores of the researcher and that of the assistant. A kappa score was calculated for each text independently and for the total (= all texts together) according to the following formula:

$$\kappa = \left( \frac{\text{Observed agreement} - \text{chance agreement}}{\text{Maximum score} - \text{chance agreement}} \right)$$

The total inter-rater reliability score (Cohen's kappa) for the first experiment was  $\left( \frac{2806 - 1436.5}{3018 - 1436.5} \right) = 0.87$ . The kappa's for each of the four texts individually were: text 1 = 0.84, text 2 = 0.86, text 3 = 0.89, text 4 = 0.89. These kappa's indicate that the inter-rater reliability of each text was really high which. The kappa scores were calculated before the scoring results of the assistant and that of the researcher were discussed and adjusted.

## 2.6 Procedure

The experiment took place in a classroom of the Bartiméus Institute in Zeist and was divided into several group sessions with the researcher, distributed over a period of one month. About 3 to 10 students participated in one session. During each session the participants read a text (one of the four) either written in the QS format or in the original format on the computer. Most students used the school computers but some used personal laptops. Prior to the first experiment, the participants were introduced to the QS design. The experimenter described the design in a neutral way without mentioning its name in order to prevent a placebo effect for the QS design. Additionally they received a practice text (see instruments) written in the QS design to read and were allowed to ask questions about the structure of the design. Each participant was introduced only once to the QS layout, which implies that, no practice texts were given prior to the second and third experiment.

After the introduction, the participants received the task to read a digital expository text thoroughly because of an upcoming summarization test (see Lorch et al., 2001). Through a memory stick the participants received the texts and a task description with an answer sheet on which they had to write their summaries (see Appendix D). The same procedure was applied during experiment two. It was not allowed to take notes during reading. There was no time limit set for the reading task nor the summarization task. After the participants indicated

that they were ready for the task they were not allowed to consult the text anymore. While writing the summary, the participants had to use their mental model of the text in order to summarize the text.

## 2.7 Data Analysis

An ANCOVA (ANalysis of COVariance) was used to test for the effect of the difference in the independent variable ‘format’ (QS version vs. non-QS version) on the dependent variable ‘the quality score of the summary’ controlling for the covariate ‘text number’ (text one to four) and the covariate ‘participant’. Participant is taken as covariate to control for the participant effect on reading multiple texts. In order to find possible benefits of the QS texts, the summaries were compared with respect to the above-mentioned categories.

## 2.8 Results and Discussion

This experiment examined the following research question: “To what extent do QuikScan texts contribute to the construction of a text model in summarization?” Additionally, it examined the hypothesis that blind and visually impaired readers write qualitatively better summaries of QuikScan texts than of non-QS texts was tested.

The results support the research question as well as the hypothesis. The effect of text format (QS vs. NQS) on the quality of the summary was significant,  $F(1,83) = 7.16, p = .01$ . Blind and visually impaired readers that read a text in the QS format wrote significantly better summaries ( $M = 2.82, SD = 0.13$ ) than participants that read a text in the NQS format ( $M = 2.35, SD = 0.13$ ). Additionally, blind and visually impaired readers wrote more concise summaries when summarizing QS texts ( $M = 0.55, SD = 0.03$ ) than when they summarized NQS texts ( $M = 0.44, SD = 0.03$ ).

Table 6

*Quality of summaries of QS and NQS texts*

	QuikScan		Non-QuikScan	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Completeness	.75**	.04	.58**	.04
Correctness	.45	.03	.36	.03
Coherence	.31	.03	.28	.03
Sequence	.49**	.05	.30**	.05
Redundancy	.83	.03	.83	.03
Conciseness	.55**	.03	.44**	.03
Number of words	108	8.1	97	8.0
Total	2.82**	.13	2.35**	.13

Note. \*\*  $p < 0.01$

Table 6 shows, that significant differences are found for ‘completeness’  $F(1,83) = 9.49, p = .003$ , ‘sequence’  $F(1,83) = 7.49, p = .008$ . and ‘conciseness’  $F(1,83) = 19.39, p < .001$ . This implies that summaries written of QS texts, qualitatively differed to the summaries that were written of NQS texts.

No significant effects on the quality of the summaries were found for the covariates *text number*,  $F(1, 83) = 0.03, p > .05$ , and *participant*,  $F(1, 83) = 0.72, p > .05$ . This implies that the significant difference between summaries of QS texts and NQS texts are not due to the influence of the texts or the participants but due to the effects of the QS design itself.

Therefore, the results of this experiment show that QS texts support high-level comprehension and recall of blind and visually impaired readers.

The positive effects of QS on ‘completeness’, ‘sequence’ and ‘conciseness’ can be explained by the signaling devices that are used within the QS design.

QS summaries provide the reader with structured summaries that consist of numbered sentences, which inform the reader about the organization and content of the main text. It can be assumed that comprehension and recall of the sequence of macro-level propositions is facilitated. The results showed that blind and visually impaired readers wrote more complete but also longer summaries after reading QS than NQS texts. They build in more text topics,

which resulted in more complete summaries. It can be expected that signaling text topics through QS summaries, blind and visually impaired readers get supported in discriminating superordinate information from subordinate. Kintsch and van Dijk (1983) stated that macrostructures generally are expressed through summaries whereas other signals such as titles or headings merely express major macrostructure concepts. Additionally, summaries do not only provide the reader with an overview of the macrostructure, they also make large and complex texts more accessible (Kintsch & van Dijk, 1983). When processing texts the reader has to encode the text base, consisting of the macro/high level- and micro/low level structure (Kintsch, 2004). Encoding macro-propositions out of texts asks a lot of effort of the reader because such propositions generally are not explicitly in the text (Kintsch, 2004). Generally, when encoding macro-propositions of a text, the reader has to go through three processes: selection, generalization and construction (Kintsch & van Dijk, 1984; van Dijk, (1980). During the first process 'selection', the reader has to select macro-relevant propositions of the text (van Dijk, 1980). This implies, that the reader has to discriminate macro-relevant from macro-irrelevant information. QS facilitates this process by providing the reader with high level propositions of each topic section in a text. By this, blind and visually impaired readers do not have to construct relevant, higher order propositions out of the text, but can read them in the QS summaries. By supporting the reader in managing large and complex texts, high-level text comprehension and recall will be facilitated (Kintsch & van Dijk, 1983).

Signaling devices that are used in QS texts, such as headings, numbering and summaries can also support high level comprehension and recall in clarifying text structures in which readers often encounter difficulties, especially when reading unfamiliar texts (Kintsch, 2004). The significant difference between QS and NQS texts regarding *sequence* indicates that informing blind and visually impaired readers about the text structure can affect their mental representation of the text.

QS texts provide the reader with concise summaries, which support the reader building concise mental representations of the texts. As a result, the reader is able to comprehend and recall high-level information in a concise way.

In sum it can be concluded, that reading QS texts support high-level comprehension and recall of blind and visually impaired readers by supporting the construction of a mental representation of the text in several ways.



### **3. Experiment 2 Answering low-level questions**

#### **3.1 Design**

In this second experiment it is examined to what extent QS texts influence low-level text comprehension and recall of blind and visually impaired readers. To measure the participants' low-level comprehension and recall they first had to read an expository text of approximately two pages and then had to answer detail questions on a computer screen (Rouet & Schnotz, 2008). As in the experiment of Cerdán et al. (2008) low-level questions required the reader to remember specific information in one summary/paragraph to answer the question. To find the answers of low-level questions, the reader has to search and locate specific detail information. No or few inferences are necessary to extract the answer of low-level questions because they are literally stated in the text.

When answering the questions, the participants were not allowed to reread or use the text. The participants had to participate in two conditions: 1) read an expository text written in the QS design and answer low-level questions, 2) read a NQS text and answer low-level questions.

When answering low-level/detail questions, the participants' comprehension and recall of subordinate text information is tested. Kintsch et al. (1975) already demonstrated that low-level information is less likely to be comprehended and recalled than high-level information because it is presented on a lower hierarchical rank within the text. Lorch (1989) demonstrated similar results in the case of different text signals and their effects of comprehension and recall. As already mentioned earlier, QS implements different signals, which are supposed to signal main ideas/superordinate information to the reader. By providing the reader a global and coherent overview of the text structure and content, it can be supposed that QS 'distracts' the reader's attention from detail information/subordination information.

#### **3.2 Participants**

The same participants as in the first experiment participated in this experiment, excluding participants that were sick or absent. A total of 21 students (mean age 15 years) participated in this experiment. In group A there were 13 students of whom 6 were female and 7 were male. In group B there were 8 students of whom 4 were female and 4 were male. Because of illness not all signed up students could participate in this experiment, which resulted in unequal numbers of participants in the two groups.

### 3.3 Materials

Like in experiment 1, four in subject matter differing expository texts, (Swinkels & Schoen, 1999) were used in this study and for each text a QS version was constructed next to the original version. Again, the texts were about jobs in the art sector (see Appendix B for more information). Each text consisted of approximately one page with a mean <sup>2</sup>Flesch reading ease score for the QS versions of 38.9 and 34.8 for the NQS versions (see Appendix B for more information). As in experiment 1, two versions of each text were used in the experiment: the original version (NQS) and the QS version that was written by the researcher. The participants had to answer seven low-level questions for each text (see Appendix F).

### 3.4 Analysis

#### 3.4.1 Quality criteria for low level questions

The answers of the participants were coded on the basis of a codebook by the means of five categories: 1) keywords, 2) synonyms of 3) descriptions 4) correct answer and 5) no answer (see Appendix E). In order to get the highest points for an answer, a participant had to use ‘keywords’. ‘Keywords’ are the words that were literally used in the original text. Each answer can contain a variable amount of ‘keywords’. These ‘keywords’/norm answers were predetermined by the researcher and recorded in the codebook. In some cases the participant does not know the exact words and therefore will use a synonym of that keyword. ‘Synonyms’ are words that have the same meaning as the keyword. Example: ‘supply’ was scored as a synonym for ‘provide with’. If the participant neither can remember a keyword nor a synonym he can describe the word. An answer will be scored as a ‘description’ when the participant is using several words (without using the keyword or a synonym) in order to describe the keyword. Example: ‘not really good’ was scored as a description of ‘unhappy’. Answers were scored as correct if the question was answered with a keyword and/or a synonym and / or a description.

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<sup>2</sup> Flesch reading ease scores

90-100 : Very Easy

80-89 : Easy

70-79 : Fairly Easy

60-69 : Standard

50-59 : Fairly Difficult

30-49 : Difficult

0-29 : Very Confusing

### 3.4.2 Coding procedure for low level questions

Prior to the experiment, norm answers for each question were noted in the codebook. Next to the norm answers, key words were noted for each norm answer. These keywords were important words that a participant had to use in his/her answer to gain the full score of 3 points. The answers of the participants were compared with the given norm answers, by scoring for the five categories. The five categories were scored as followed: For each question, the number of keywords, synonyms, descriptions, correct answers and missing answers were counted. For each keyword (that was noted in the codebook) a participant has given in his/her answer, 3 points are scored. If a synonym of a keyword is given, 2 points are scored. A description of the keyword resulted in 1 point. Answers were scored as correct, if keywords and/or synonyms and/or descriptions were used. The amount of each correct answer was counted. No answers were scored with 0 points.

Seven low-level questions were asked for each text. To demonstrate the coding procedure for this experiment, four answers of the first text (regarding the visual artist) will be scored and explained:

Question 1: Which jobs are covered by the profession of visual artist?

Norm answer consisting of keywords: 1) sculptor, 2) set designer, 3) potter, 4) furniture designer, 5) painter

Answer of the participant: sculptor and painter

Score: The answer is scored as correct and two keywords were scored resulting in 6 points.

Questions 2: Which artists are famous for their impressionist art?

Norm answer consisting of keywords: 1) Monet, 2) Rodin

Answer of the participant: Dorin and the painter Rodin

Score: The answer 'Rodin' is scored as correct and one keyword was scored resulting in 3 points. The answer 'Dorin' was incorrect, resulting in 0 points.

Question 3: Which artists are famous of their expressionist art?

Norm answer consisting of keywords: 1) van Gogh, 2) Mondriaan

Answer of the participant: Vincent van Gogh

Score: The answer was scored as correct and one keyword was scored, resulting in 3 points.

Question 4: In what way can PR managers or gallery owners support artists?

Norm answer consisting of keywords: They can help selling art. They can advertise their work and show their art in crowded galleries. Keywords/concepts: 1) bring on the man, 2) advertise, 3) putting up

Answer of the participant: For example, by advertising their art or by exhibiting their art in galleries.

Score: The answer is scored as correct and one keyword (advertising), as well as one synonym (exhibit) is scored.

#### *Total score calculations*

Although seven questions had to be answered for each text, the total amount of keywords in the answers among the four texts differed. Therefore, in order to compare the four texts, the scores of all participants for each text were rescaled. The maximum score was set at 1.0 point.

Example for calculating the total score: In Table 7 a fictive score for text 1 is given along with the maximum score. In text 1, there are 21 keywords, thus a participant can obtain a maximum score of 21 times 3 equals 63 points. In this example the participant had given 11 keywords (each worth 3 points), 2 synonyms (each worth 2 points) and 5 descriptions (each worth 1 point). The total score of this participant is 33 (Keywords) + 4 (Synonyms) + 5 (Descriptions) = 42 points. To rescale this score to a maximum of 1.0 point, the following formula is used: score participant / maximum score text. A participant with a score of 42 for text one will have a rescaled score of  $42/63 = 0.67$ .

Table 7

#### *Example score of text 1 consisting of 21 keywords, experiment 2*

	Keywords	Synonyms	Descriptions	No Answer
Obtained score	$11 * 3 = 33$	$2 * 2 = 4$	$5 * 1 = 5$	$3 * 0 = 0$
Maximum score	$21 * 3 = 63$	$0 * 2 = 0$	$0 * 1 = 0$	$0 * 0 = 0$

### **3.4.3 Reliability of the coding procedure**

The codebook for this experiment (see Appendix C, E and G) contained a coding schedule, the four texts that were given to the participants, the norm answers of each question and an explanation of how to score the answers. To test the quality of this codebook, an

independent assistant used the codebook for pilot scoring. The assistant applied the same procedure as in the first experiment. The assistant scored the first ten questions following the instructions of the codebook. After comparing the scores of the assistant and with that of the researcher, differences in scoring were discussed in order to adjust the codebook. The codebook had not to be adjusted. The differences in scoring were discussed until the scoring results of the assistant and that of the researcher corresponded. Afterwards, the remaining questions were scored by the researcher and the assistant independently. To get an indication of the scoring quality/inter-rater reliability, Cohen's kappa was calculated between the scores of the researcher and that of the assistant. A kappa score was calculated of each for the four texts and of the total (= all texts together). The total inter-rater reliability score (Cohen's kappa) for this experiment was 0.94. The kappa's for each of the four texts individually were: text 1 = 0.96, text 2 = 0.91, text 3 = 0.93, text 4 = 0.95. These kappa's indicate that the inter-rater reliability of each text was really high. The kappa scores were calculated before the scoring results of the assistant and that of the researcher were discussed and adjusted.

### **3.5 Procedure**

The participants received the instruction to read the digital expository texts ( four in total but one text at a time) thoroughly and trying to remember all the information, especially details and facts, because of an upcoming free-recall test consisting of seven low-level questions. Prior to the experiment, the participants got informed that the upcoming test would consist of seven detail questions. By informing the participants on the question type (low-level) that they will have to answer, it can be prevented that they will not focus on detail information under the assumption that it is not important. They were allowed to read the text as often and as long as desired. No time limit was set for the task. Additionally, it was not allowed to take notes during reading. While answering the questions, the participants were not allowed to consult the text and therefore had to use their mental model of the text in order to answer the questions. For each text, the participants received all the seven questions at once in a Word document. The participants could decide in which order they will answer the questions. See Appendix F for an example of the texts and low-level questions.

### **3.6 Analysis**

An ANCOVA was used to test for the effect of the differences in the independent variables 'format' (QS version vs. non-QS version) and on the dependent variables 'total

score of the test/questions', controlling for the covariate 'text number' (text one to four) and participant.

### 3.7 Results and Discussion

The results support the hypothesis that QS texts do not support blind and visually impaired readers in answering low-level questions.

The covariate, text number, was significantly related to the test score:  $F(1,80) = 4.72$ ,  $p = .03$ . The second covariate, participant, was not significantly related to the test score, text number:  $F(1,80) = 0.21$ ,  $p = .65$ . The significance of the covariate *text number* implies that it is likely that the chances of finding significant effects are an underestimation. Therefore the found non-significant effect of text format on the search success is probably lower than the true effect.

The effect of text format (QS vs. NQS) on the test score was not significant,  $F(1,80) = 0.94$ ,  $p = .34$ . Participants that read a text written in the QS format did not answer the questions better ( $M = 0.28$ ,  $SD = 0.02$ ) than participants that read a text written in the NQS format ( $M = 0.25$ ,  $SD = 0.02$ ). Additionally, there was no significant effect on the number of correct answered questions:  $F(1,80) = 0.00$ ,  $p = .96$  between QS texts ( $M=0.81$ ,  $SD = 0.03$ ) and NQS texts ( $M =0.81$ ,  $SD = 0.03$ ).

This implies answers of low-level questions do not differ between QS texts and NQS texts.

Table 8

#### *Results of low-level questions*

	Five categories											
	Keywords		Synonyms		Descriptions		Correct answers		No answers		Total	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
QS	.20	.02	.09	.01	.07	.01	.81	.03	.12	.03	.28	.02
NQS	.16	.02	.10	.01	.06	.01	.81	.03	.16	.03	.25	.02

*Note:* no significant effects where found

Table 8 shows that the participants used more keywords and descriptions after reading QS texts. The participant not only answered more low-level questions after reading QS texts, they gave more correct answers. Although the participants were beforehand informed that they had to answer low-level questions and therefore had to remember detail information, no

significant difference was found between QS and NQS texts. Several reasons could lead to this result, such as the small number of participants in this study. Significant differences are more likely shown in larger numbers of participants. Another option is that the texts and/or the questions were too difficult for the participants through which no QS effect could be observed. Alternatively, the texts in this experiment could be too short to show a significant effect of QS.

In sum, low-level comprehension and recall of blind and visually impaired readers are not supported by QS texts.

## **4. Experiment 3 Searching for high-level, medium-level and low-level information**

### **4.1 Design**

This experiments focused on how well and how QS texts influence the search process of blind and visually impaired readers. Therefore the experiment was conducted in two steps: First, the search processes within QS texts were examined for two participants. Second, the search success of several blind and visually impaired readers were examined by asking them to search the answers of high-level, medium-level and low-level questions. Compared to the first two experiments, this experiment is incomplete because of missing data. Although the number of participants does not differ much to that of experiment 1 and 2, not all participants completed the experiment. Not all participants have read all four expository texts which implies, that merely tentative conclusions of this experiment can be drawn. Similar to the first two experiments, the participants had to take part in four different conditions, reading four different expository texts of which two were written in the QS format and two were not (see Appendix G) and searching for answers. In order to answer high-level questions the reader has to process several text units/superordinate information and integrate them into a coherent text model through making inferences. Thus, to answer high-level question, the reader has to read, search and integrate several paragraphs, often spread throughout the whole text document (Cerdán et al., 2008). Such a search pattern is called the *review and integrate search pattern* and it is said that it promotes not only deeper comprehension but also the identification of important ideas within the text (Rouet, Vidal-Abarca, Bert-Erboul and Millogo, 2001). Medium level questions, based on the question classifications of Goldman and Durán (1988) are similar to high-level questions, except for the amount of text the reader

has to review and integrate in order to find the answer. To answer medium-level questions, the reader does not have to review the whole text but merely one paragraph. When answering low-level questions on the other hand, the reader merely has to locate subordinate/detail information and extract it by either direct copying or writing it over by making inferences. (Cerdán et al., 2008). Therefore this type of search pattern is called the localization and memorization search pattern (Rouet, Vidal-Abarca, Bert-Erboul and Millogo, 2001).

Another difference compared to experiment 1 and 2 was that, inspired by Cerdán et al. (2008), no initial reading of the text took place in this experiment. “Therefore, information search processes to answer the questions could be studied more precisely, without the influence of the prior comprehension of the text” (Cerdán et al., 2008, p. 138).

## **4.2 Participants of the search strategy part**

Two students participated in this first part of the experiment. Both were students from the Bartiméus Institute in Zeist and they also participated in the second part of this experiment. Participant 1 was a 16 years old, visually impaired student of the vmbo/B3 school level. Participant 2 was a 16 years old, blind student of the havo 4 school level. These two participants were chosen because of their differences in school level (vmbo/B3 lowest and havo 4 highest school level within this study) as well as visual impairment (blind and visually impaired). When being observed during the experiment, a lot of students tend to be stressed which can negatively affect their performances. These two participants appeared to be less affected (than other students) by the experimental stress which made them more suitable in participating in this part of the study.

### **4.2.1 Participants of the search success part**

A total of 18 students (mean age 16 years) participated in this second part of the experiment. In group A there were 12 students of whom 5 were female and 7 were male. In group B there were 6 students of whom 3 were female and 3 were male. The same participants as in the first two experiments participated in this experiment, excluding sick or absent participants. Although the participants were divided equally into two groups (A and B) prior to the start of the experiments, the two groups ended up with unequal numbers of participants, due to illness/absence of the participants.



### 4.3 Materials

Four in subject matter differing expository texts (obtained from the Greenpeace Nederland website) were used in this experiment and for each text a QS version was constructed besides to the original version (see Appendix G for more information). All the texts consisted of two to three pages and had about the same number of words and paragraphs (the mean <sup>3</sup>Flesch reading ease score of the QS versions was 43.15 and 42.75 for the NQS versions). Due to the length of the texts, each text contained three QS summaries instead of one such as in experiment 1 and 2. The three QS summaries, consist of four or less sentences, which make them more manageable for the reader. The two participants who also participated in the first part of this experiment (regarding the search strategy) read the same texts as well as the same amount of texts. During the first part of this experiment, participant 1 (visually impaired, vmbo/B3) read a QS version of text 4 whereas participant 2 (blind, havo 4) read a NQS version of text 1.

For each text, ten questions were made by the researcher in which a difference can be made between three different types of questions: high-level (HLQ), medium-level (MLQ) and low-level questions (LLQ). Based on the experiment of Cerdán et al. (2008) the participants had to answer more low-level questions than medium- and high-level question.

### 4.4 Analysis

#### 4.4.1 Quality criteria of the search strategies

No predetermined quality criteria were used to analyse the search strategies of the two participants. This part of the study was set up to get insights into their using strategies, therefore both students were one by one observed by the researcher. During the observation, the researcher noted how they were searching the text and answering the answers.

#### 4.4.2 Quality criteria of answering high-level, medium-level and low-level questions

The same quality criteria (keywords synonyms, descriptions, correct answers and no answers), were used as in experiment 2 (see 3.4.1 for more information about these criteria).

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<sup>3</sup> Flesch reading ease scores

90-100 : Very Easy

80-89 : Easy

70-79 : Fairly Easy

60-69 : Standard

50-59 : Fairly Difficult

30-49 : Difficult

0-29 : Very Confusing

#### **4.4.3 Coding procedure of the search strategies**

The recorded reading strategies of the two participants were compared to each other by the researcher.

#### **4.4.4 Coding procedure of the answers**

The same coding procedure was applied as in experiment two. Prior to the experiment, norm answers for each question were noted in the codebook. Next to the norm answers, key words were noted for each norm answer. These keywords were important words that a participant had to use in his/her answer to gain the full score of 3 points. The answers of the participants were compared with the given norm answers, by scoring for the five categories. The five categories were scored as followed: For each question, the number of keywords, synonyms, descriptions, correct answers and missing answers were counted. For each keyword (that was noted in the codebook) a participant has given in his/her answer, 3 points are scored. If a synonym of a keyword is given, 2 points are scored. A description of the keyword resulted in 1 point. Answers were scored as correct, if keywords and/or synonyms and/or descriptions were used. The amount of each correct answer was counted. No answers were scored with 0 points.

#### **4.4.5 Reliability of coding the answers**

The codebook for this experiment (see Appendix G) contained a coding schedule, the four texts that were given to the participants, the norm answers of each question and an explanation of how to score the answers. To test the quality of this codebook, an independent assistant used the codebook for pilot scoring. The assistant applied the same procedure as in the first two experiments. The assistant scored the first ten questions following the instructions of the codebook. After comparing the scores of the assistant and that of the researcher, differences in scoring were discussed in order to adjust the codebook. The codebook had not to be adjusted. The differences in scoring were discussed until the scoring results of the assistant and that of the researcher corresponded. Afterwards, the remaining questions were scored by the researcher and the assistant independently. To get an indication of the scoring quality/inter-rater reliability, Cohen's kappa was calculated between the scores of the researcher and that of the assistant. A kappa score was calculated of each of the four texts and of the total (= all texts together). The total inter-rater reliability score (Cohen's kappa) for this experiment was 0.95. The kappa's for each of the four texts individually were: text 1 = 0.95, text 2 = 0.91, text 3 = 0.96, text 4 = 0.96. These kappa's indicate that the inter-

rater reliability of each text was really high which. The kappa scores were calculated before the scoring results of the assistant and that of the researcher were discussed and adjusted.

### *Total score calculation*

Although ten questions had to be answered for each text, the total amount of keywords in the answers among the four texts differed. Therefore, in order to compare the four texts, the scores of all participants for each text were rescaled. The maximum score was set at 1.0 point. The total score is calculated in the same way as in experiment 2. Example: In Table 9 a fictive score for text 1 is given along with the maximum score. In text 1, there are 21 keywords, thus a participant can obtain a maximum score of 21 times 3 equals 63 points. In this example the participant had given 11 keywords (each worth 3 points), 2 synonyms (each worth 2 points) and 5 descriptions (each worth 1 point). The total score of this participant is 33 (Keywords) + 4 (Synonyms) + 5 (Descriptions) = 42 points. To rescale this score to a maximum of 1.0 point, the following formula is used: score participant / maximum score text. A participant with a score of 42 for text one will have a rescaled score of  $42/63 = 0.67$ .

Table 9

### *Example score of text 1 consisting of 21 keywords, experiment 3*

	Keywords	Synonyms	Descriptions	No Answer
Obtained score	$11 * 3 = 33$	$2 * 2 = 4$	$5 * 1 = 5$	$3 * 0 = 0$
Maximum score	$21 * 3 = 63$	$0 * 2 = 0$	$0 * 1 = 0$	$0 * 0 = 0$

## **4.5 Procedure**

For both parts of this study, the same procedure is applied. The participants first got the task to read the ten questions of the first text in order to answer them. The questions had to be read first to ensure that the participants got an indication for what information they were looking for. No time limit was set for this experiment. When finished reading, the participants were allowed to search the texts. The participants received the texts and questions through a memory stick. During the search, they had two Word documents opened at the same time and had to switch between the two documents. Thus, they had to use the texts in order to answer the question. When searching the texts, the participants could choose their own way in which they answered the questions. This implies that they could choose the order in which they were answering the questions and the way in which they were reading the texts. Additionally, the

participants were not informed about the different question types they were answering. See Appendix H for examples of high-level, medium-level and low-level questions.

## 5. Analysis

An MANCOVA was used to test for the effect of the differences in the independent variables ‘format’ (QS version vs. non-QS version) and ‘question type’ (high-level, medium-level and low-level questions) and on the dependent variables ‘total score of the answer’, controlling for the covariates ‘text number’ (text one to four) and participant.

## 6. Results and Discussion

The results indicate that different search strategies are applied by blind and visually impaired readers, when searching in texts. Additionally, the results tentatively indicate that QS texts do not influence the search success of blind and visually impaired readers, when searching answers for high-level, medium-level and low-level questions. support the hypothesis that QS texts do not support blind and visually impaired readers in answering low-level questions.

Participant 1<sup>4</sup> first reads all the questions by using the magnification function of the computer and then started searching by reading the first out of three QS summaries. When finding an answer for the first questions, in the first QS summary, he started reading the part of the main body belonging to this part of the summary in order to find more information. After answering the first question, he again read the second question and started searching in the QS summaries. When reading the summaries, he read each numbered sentence. If he thought that no important information could be found in the first summary, he jumped straight to the second summary. If he thought to find the answer in the summary, he jumped to the topic section to read it completely. When finding the answer of the question he switched to the second Word document (containing the questions) to answer the question. While answering, he often switched back to the text document to read back the sentence(s) that contained the answer. He answered all the questions in sequence by first reading the QS summaries and then, if expecting to find an answer, reading the main body of the text belonging to this summary. In general, he answered the question quite quick without having read the entire text completely.

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<sup>4</sup> Both, participant 1 and 2 are referred to as ‘he’, independently their real sex.

*Illustration of the strategy participant 1 applied*

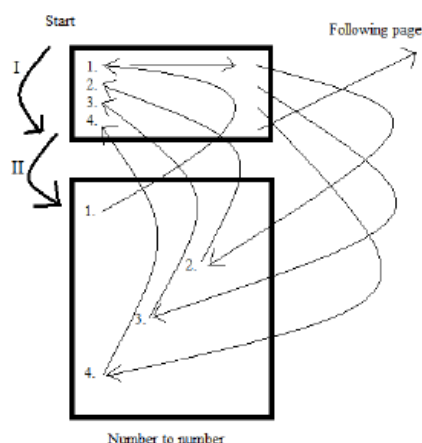


Figure 3. Source: “QuikScan and reading strategies,” by A. Lohuis, 2013, *University of Twente*, p.21.

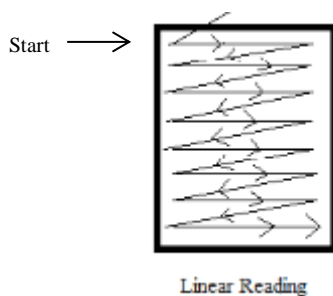
Participant 2 applied a quite different strategy when reading a NQS text. After reading the ten questions thoroughly, he started reading the text, sentence for sentence. He started reading at the beginning of the document and read the entire text in a linear way. He never jumped from section to section or left out a sentence. When he came across relevant information during reading, he switched back to the Word document with the questions, to look for the matching question and answered the question. The questions, therefore were not answered in the sequence they were given in the Word document. Whenever he came across information that he thought, could be an answer for one the read questions, he switched back to the questions. Sometimes, he could remember which question asked what, but most of the time he had to quickly reread all the questions to decide where to put the found information. In general, it took him much more time to search for the answers compared to participant 1. He often had to reread the questions, because he did not answered them in the given sequence.

When comparing the two participants of this experiment it is important to note that participant 2 was reading and searching in a NQS text by using a braille reading line. As stated in the introduction of this study, using a braille reading line almost forces blind and visually impaired readers to read in a linear way. The combination of NQS and braille reading line explains why the participant did not applied a more effective and faster search strategy. The design of a NQS text does provide any information of the text structure and content which makes it more difficult for blind and visually impaired readers to recognize topic sections. Participant 1 however, used the magnification faction when searching in a QS text. Compared to participant 2, he therefore was able to navigate within the text document by

scrolling through the pages. Furthermore, the search of participant 2 got supported by the QS design, which provided him with an overview of the text structure and content. The QS text enabled him to jump from topic section to topic section.

In sum, tentative conclusions can be drawn that QS texts support visually impaired readers in searching texts in an effective way.

*Illustration of the strategy, participant 2 applied*



**Figure 4.** Adapted from: “QuikScan and reading strategies,” by A. Lohuis, 2013, *University of Twente*, p.18.

When looking at the second part of this experiment, regarding the search success results, no significant effects on high-level, medium-level and low-level questions were found. However, a significant difference on ‘synonyms’ is found when searching in QS texts.

The effect of text format (QS vs. NQS) on the test score was, when controlling for the covariates, not significant,  $F(1,59) = 0.00$ ,  $p = .98$ . Participants that read a text written in the QS format did not answer the questions better ( $M = .24$ ,  $SD = 0.02$ ) than participants that read a text written in the NQS format ( $M = .24$ ,  $SD = 0.02$ ). When comparing HLQ, MLQ and LLQ (Figure 5), in general participants answered LLQ ( $M = .37$ ,  $SD = .02$ ) better than MLQ ( $M = .21$ ,  $SD = .03$ ) and HLQ ( $M = .14$ ,  $SD = .01$ ). The results indicate a tentative significance when comparing HLQ, MLQ and LLQ’s  $F(2,58) = 2.52$ ,  $p = 0.09$ . The two covariates, *text number*  $F(1, 59) = 0.69$ ,  $p = .41$  and *participant*  $F(1, 59) = 1.77$ ,  $p = .19$ . were not significantly related to the test scores.

Table 10 shows the results when comparing QS vs. NQS text. Figure 5 shows, that the effect of text format (QS vs. NQS) was tentative significant on synonyms,  $F(1,57) = 5.88$ ,  $p = .02$  and nearly significant on *description*,  $F(1,57) = 3.92$ ,  $p = .052$ . Table 11 shows, that when searching in QS texts. The participants used significantly more synonyms ( $M = .06$ ,  $SD = .01$ ) than NQS ( $M = .04$ ,  $SD = .01$ ).

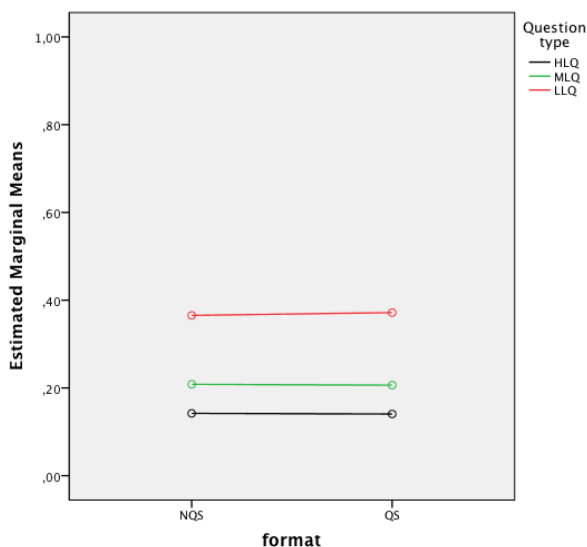


Figure 5. visualizes that in general, more low-level questions (red line) were answered, than medium-level and high-level questions.

Table 10

Results for QS as well as NQS texts (HLQ, MLQ and LLQ)

	Five categories										Total	
	Keywords		Synonyms		Descriptions		Correct answers		No answers			
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
<b>QS</b>												
HLQ	.08	.02	.05	.01	.09	.01	.91	.04	.08	.04	.14	.02
MLQ	.13	.04	.07	.02	.09	.02	.99	.04	.14	.06	.21	.04
LLQ	.28	.03	.07	.01	.12	.01	.90	.02	.10	.04	.37	.03
<b>NQS</b>												
HLQ	.08	.02	.05	.01	.09	.01	.90	.04	.07	.04	.14	.02
MLQ	.17	.03	.02	.02	.09	.02	.90	.04	.10	.06	.21	.04
LLQ	.31	.03	.03	.01	.11	.01	.89	.02	.10	.03	.37	.03

Table 11

Results for QS as well as NQS texts

	Five categories										Total	
	Keywords		Synonyms		Descriptions		Correct answers		No answers			
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
<b>QS</b>	.23	.03	.06*	.01	.11	.01	.92	.02	.10	.03	.33	.03
<b>NQS</b>	.26	.03	.04*	.01	.10	.01	.89	.02	.11	.03	.32	.03

Table 10 shows that, when comparing the search success of blind and visually impaired readers, no large differences can be found between QS and NQS texts. It also shows that when comparing the five categories, keywords were more often used when searching for medium-level and low-level question within both QS and NQS texts.

Although, tentative significant differences between NQS and QS texts are found it is still expected that QS texts do facilitate the search of low-level information.

When looking at the results of experiment three, there is a significant difference for the use of synonyms ( $p=0.02$ ) but no significant difference for descriptions ( $p=0.25$ ) on low-level and medium-level questions. Additionally, when searching in QS texts, the questions were answered more often correct. The use of synonyms and descriptions instead of keywords implies, that the reader interpreted the information by organizing it into a coherent structure (Mayer, 2008). By recalling keywords it is not clear whether the reader has understood and integrated the information correctly. However, by transforming a keyword into a synonym or by being able to describe the meaning of a keyword, the reader clearly shows that (s)he has organized and integrated the new information.

In sum, it can be tentatively concluded that QS texts support the use of synonyms when searching and answering questions. No clear significant effects of QS on the search of high-level, medium-level and low-level questions by blind and visually impaired readers is found.

## 7. General Discussion

In sum, this study confirmed that QS supports high-level comprehension and recall but no low-level comprehension by blind and visually impaired readers. Tentative support is found for the facilitation of information search for low-, medium- and high- level questions.

### *7.1 The role of QS in writing summaries by blind and visually impaired readers*

The first experiment examined to what extent QS texts influence high-level comprehension and recall processes of blind and visually impaired readers. The results confirm that QS texts support high-level comprehension and recall. Blind and visually impaired readers wrote more complete and concise summaries. Furthermore their summaries were in line with the topic section sequence of the original texts. This implies that QS texts



support several high-level comprehension and recall processes for blind and visually impaired readers.

QS texts signal text topics to the reader by applying, structured and numbered summaries and headings. The effectiveness of text signals that are used in QS texts is also indicated by Hyöna and Lorch (2004) who stated that, by signaling new topics to the reader (s)he does not have to construct the text structure on his/her own. Also, headings are said to be effective signals that facilitate text comprehension and recall for those text topics (Hyöna & Lorch, 2004).

Complementary to the findings of this research, Lorch (1989) found the effects of headings and overviews/summaries on comprehension and recall (Table 2). Note though, that no difference was made between high-level and low-level comprehension and recall, the table indicates general effects. Table 2 demonstrates that little research is done regarding a combination of different signalling devices such as the effects of headings, previews, overviews and summaries. By incorporating several different signalling devices, QS can provide more insight in the effects of signal on comprehension and recall. In comparison to table 2, this experiment found similar positive effects of headings, previews, overviews and summaries on recall. Additionally, these results are in line with other QS research about comprehension and recall (Weiss, 2012; van der Meij, van der Meij, 2012).

### *7.2 The role of QS in answering low level questions by blind and visually impaired readers*

In the second experiment the effect of QS texts on low-level comprehension and recall is tested. The results did support the hypothesis that QS does not support low-level comprehension and recall of blind and visually impaired readers. Possible explanations for this result could be found when referring to the results of the first experiment of this study and other studies regarding QS (van der Meij, van der Meij, 2012; Weiss, 2012). All these studies demonstrated positive effects of QS on high-level or macrostructure processes. When providing readers with structured, high-level summaries it can be expected that merely comprehension and recall of high level propositions gets facilitated in which no effects of QS on low-level propositions are found. As Kintsch and Kozminsky (1975) already stated, readers experience difficulties in comprehending and recalling unfamiliar information because of lacking memory references. When reading QS summaries, the reader gets merely informed about the gist of each topic section and not the detail information. By not informing the reader about detail information it can be expected that these information will be perceived as unfamiliar and new to the reader. Compared to high-level information with which the reader

is made familiar through the QS summaries, new, low-level information is less likely to be processed and stored into memory (Kintsch & Kozminsky, 1975). Moreover, it can be expected that readers are not able to derive detail information of a text, when being provided with gist information. Additionally, the results that QS does not support low-level comprehension and recall could be caused by a bottom effect. If the low-level questions, the participants had to answer were too difficult for them, this could reflect in the research results by low test scores.

Concerning the research method of experiment 2, the question could be asked whether the way of measuring the effects of QS on low-level questions was suitable enough to, indeed, test low-level comprehension and recall. As stated in research of Pazzaglia (2008) free recall tests usually measure comprehension and recall of high-level information and are less sensitive to low-level information.

In sum, further research with the focus of the effects of QS texts on low-level comprehension and recall by blind and visually impaired readers, is needed in order to find proper explanations for these outcomes.

### *7.3 The role of QS in searching strategy and searching success for high level, medium level and low level information by blind and visually impaired readers*

Tentative conclusions that QS enables visually impaired readers to apply effective search strategies can be drawn. The results are in line with research of van der Meij and van der Meij (2012), and Lohuis (2013) who defined several reading strategies that can be used when reading QS texts. The two different strategies that were applied by the two participants are also found in the study of Lohuis (2013). The strategies of participant 1, who has read a QS was called 'processing all QS summaries first' or 'number to number strategy' in which the reader first processes the QS summaries before reading the main bodies (van der Meij & van der Meij, 2012; Lohuis, 2013). The strategy of participant 2 who has read a NQS version of a text was called 'linear reading' or 'reading from start to finish' in which the reader processes the text in a linear way without jumping between QS summaries or numbers (Lohuis, 2013, van der Meij & van der Meij, 2012). Although, Lohuis (2013) states, that the 'linear reading strategy' and the 'number to number strategy' are two of the most used processing strategies when reading QS texts, it is important to mention that here participants were sighted readers. Therefore it is interesting to note that the visually impaired participant applied a reading strategy, that is also applied by sighted readers. More research is needed to

get a better impression of the search strategies of blind and visually impaired readers, when searching in QS texts.

Depending on the reading context, the linear strategy often can be unnecessary when being able to scan a long text by quickly reading the QS summaries. Although, within a school context it might not always be desirable that students quickly scan texts without reading it completely. To gain more insight into the effects of QS on answering different types of questions and the underlying reasons for applying reading strategies by blind and visually impaired readers, further research is needed.

Regarding the search success of blind and visually impaired readers, no clear significant effects for the support of QS texts are found. However, tentative support is found for the search of low-level questions in QS texts. Moreover, significant effects for the use of synonyms are found. This implies that QS supports blind and visually impaired readers comprehension and recall. The fact, that the participants used synonyms instead of keywords, implies that they have understood the text well enough to express themselves in their own words. In general, blind and visually impaired readers found more answers for low-level questions. Additionally, it is important to mention that this experiment was incomplete conducted due to the amount of missing data, which makes it more difficult to find effects. Further research is needed to investigate the effect of QS texts on the search success of blind and visually impaired readers.

Interestingly when looking at the Flesch-Reading scores of QS and NQS texts (Appendix B), QS texts mostly score higher than NQS texts. High Flesch- Reading scores imply more reading ease. This could imply, that blind and visually impaired, but also sighted readers could benefit from the ease of QS texts.

### **Limitations of this study**

A clear and in all experiments recurrent limitation is the small number of participants. This often makes it difficult to find significant differences. Another point regarding the participants of this study is that for almost all of the participants, the texts appeared to be too difficult. Prior to the conduction of the experiments, a pilot study was conducted to test some texts and questions on three participants of an average school level. Additionally, the teachers

of the participants were consulted on the text difficulties. Apparently the three average participants deviated too much from participants attending lower school levels. By adapting the materials more precisely to the skills and needs, better results could be yielded. When conducting the experiments, several participants participated at the same time in the same room. Occasional discussions between the participants interrupted the concentration of other participants in the room and therefore it is recommended to carry out the experiments in one on one sessions.

Regarding QS texts it is unclear whether the design will be adapted in schoolbooks of blind and visually impaired readers. If further research on QS by blind and visually readers also confirms, that this target group benefits when it comes to text comprehension and recall, it is important to think about possible implementations of the QS layout. However, the implementation of the QS layout implies time consuming and customized text production.

If the aim of QS is to obtain qualitatively as well as quantitatively better school results of blind and visually impaired students regarding comprehension, recall and search, it could be helpful to educate and train students as well as teachers in the use of QS. Especially blind readers that are used to read texts in a linear way have to be trained in how to use the screen reader more efficient when reading QS texts. Education of several reading strategies could support text comprehension, recall and search of blind and visually impaired students. Although, the search strategies of only two student were implemented in this research, it stroked the researcher that students used different ways of reading QS texts in which some were not efficient. By educating students and teachers, they could benefit more from the advantages that QS has to offer.

Reading processes have a direct implication for the design of efficient school materials (van den Broek, 2008). Therefore it is necessary to adapt school texts as well as possible to the processes and needs of blind and visually impaired readers. For blind and visually impaired students, applying QS on school texts could unburden their cognitive processes during comprehension, recall and text search and add more value to their comprehension and reading processes.

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## Appendix A: Demographics

### Demographics

	Mean	SD	Minimum	Maximum
<b>Age</b>	15.3	1.1	13	18
	Frequency ( <i>N</i> = 23)	Percentage (%)		
<b>Gender</b>				
Male	13	56.5		
Female	10	43.5		
<b>Visual Impairment</b>				
Blind	10	43.5		
Partially sighted	13	56.5		
<b>Reading method</b>				
Magnification	9	39.1		
Braille reader	4	17.4		
Magnification + Braille	2	8.7		
Magnification + Braille +	2	8.7		
Magnification + Listening	2	8.7		
Braille + Listening	3	13.0		
Other	1	4.3		

## Appendix B: Statistical information texts

### Experiment 1 Writing summaries

Text number	Text format	Text topic	Pages	Words	Flesch reading ease
1	QS	Photographer	1 ½	619	48.7
1	NQS	Photographer	1	442	48.7
2	QS	Fashion designer	1 ½	574	47
2	NQS	Fashion designer	1	409	43.8
3	QS	Writer	1 ½	634	52.1
3	NQS	Writer	1	507	51.3
4	QS	Actor	1	462	51.2
4	NQS	Actor	1 ½	335	43.2
Mean			1 ¼	497.75	48.3

**Experiment 2 Answering low level questions**

Text number	Text format	Text topic	Pages	Words	Flesch reading ease
1	QS	Visual artist	1 ¼	506	43.3
1	NQS	Visual artist	1	355	37.7
2	QS	Interior designer	1 ½	566	33.8
2	NQS	Interior designer	1	435	30.6
3	QS	Museum employee	1 ¼	560	40.1
3	NQS	Museum employee	1	427	35.6
4	QS	Comedian	1 ¼	504	38.2
4	NQS	Comedian	1	369	35.3
Mean			1.15	465	36.8

**Experiment 3 Searching answers for high-, medium-, and low level questions**

Text number	Text format	Text topic	Pages	Words	Flesch reading ease
1	QS	Living oceans	3	1370	45.2
1	NQS	Living oceans	1 ½	979	46.5
2	QS	Clean energy	3	1283	45
2	NQS	Clean energy	1 ½	924	42.8
3	QS	Strong forests	3	1155	42.6
3	NQS	Strong forests	1 ¼	834	44.9
4	QS	Our bees	2 ½	1098	39.8
4	NQS	Our bees	1 ½	810	36.8
Mean			2.15	1057	43.0

To get an indication of the meaning of the Flesch- Reading ease scores, scores between 60-70, can be easily understood by 8<sup>th</sup> and 9<sup>th</sup> graders, whereas scores between 0 and 30 are easily understood by college graduates (Readability formulas, 2014).

## Appendix C: Codebook and coding schema for the summaries

Based on research of Lorch et. al (2001) and the correction prescription HAVO 2012.

Text	Participants	
	Group A	Group B
Practice text	QS Youtube	QS Youtube
1	NQS photographer	QS photographer
2	QS fashion designer	NQS fashion designer
3	NQS writer	QS writer
4	QS actor	NQS actor

The quality of the summaries is analyzed on the basis of six categories: 1) completeness, 2) correctness, 3) coherence, 4) sequence, 5) conciseness and 6) amount of words.

### *1. Completeness: Are all text topics mentioned?*

Completeness indicates whether, and to what extent, the participant mentions information from each text topic section in the summary. Each topic section of a text is about a different topic, and to have a complete summary, each topic has to be mentioned in the summary. The number of topics differs across the four texts that were used:

Text 1 (photographer) has 6 text topics indicated as T1, T2, T3, T4, T5 and T6 in the scoring schema.

Text 2 (fashion designer) has 5 text topics indicated as T1, T2, T3, T4 and T5 in the scoring schema.

Text 3 (writer) has 5 text topics indicated as T1, T2, T3, T4 and T5 in the scoring schema.

Text 4 (actor) has 5 text topics indicated as T1, T2, T3, T4 and T5 in the scoring schema.

#### *Scoring:*

When scoring, it is important to not only use the QS headings of each topic because not every participant has read a QS version of each text. If a participant mentions topic 1 without using a QS heading it must still be scored as correct/present. In the same way, if a participant mentions topic 1 by using the QS heading it is correct, too.

**A)** Each mentioned topic can get a maximum score of 1 point. A topic will be scored as present (1 point) under the following conditions:

-part of the text topic is mentioned in the text

-the text topic does not has to be mentioned completely

**B)** Each not mentioned topic can get a minimum score of 0 points. A topic will be scored as absent if no single information of the text topic is mentioned in the summary.

Example of an answer that has to be scored with 1 point:

A text topic section in the original text states: “A photographer tries to capture the reality in an artistic way. He can do this as an employee. Working for a company or an institution he takes care for example for the photos of a wedding or supplies photo’s for advertising. There are also photographers who make their living as an entrepreneur; they are called freelancers. Some freelancers make photos particularly to provide for their livelihood, just as employed photographers. There are also photographers who in the first place, see themselves as artists. For them, photography is a form of art and making pictures is more important to them than earning money with photos.”

Answer of a participant who received 1 point for the summarization of this topic section: “A photographer is somebody who can capture events well in photos. There are photographers who are employed by companies or institutions. There they take care of pictures of weddings for example. There are also photographers that are entrepreneurs. These are called freelancers.”

*Explanation of the example:* This participant got 1 point for this topic because (s)he summarized several information bits of this topic. As can be seen in the example, it is not necessary to summarize the topic literally to get 1 point for *completeness*.

## **2. Correctness: Is the gist of each text topic mentioned correctly?**

Correctness refers to the text topic sections and to what extend the participant was able to reproduce the content of each topic section correctly. In the coding schema, correctness is referred to as the T1, T2, T3 etcetera such as in the first category *completeness*.

*Scoring:*

- A)** For each correct summarized topic, the participant will score 1 point. This implies, that the gist of the topic section is completely and correct summarized.
- B)** Each partly correct summarized topic gist will get the score 0.5 points. With partly it is meant that the participant has succeeded in summarizing some parts of the topics gist.
- C)** Each incorrect or not summarized topic gist’s, will get a score of 0 points.

Example

A text topic section in the original text states: “If a photographer works as a freelancers it is of greatest importance that he gets enough orders. Most freelancers use a portfolio of

*their best work to convince potential clients of their qualities. Photographers can also see their work as making art. Their main goal is to convey ideas and emotions through their photos. Unfortunately, often artistic photographers cannot live from their photos.*”

Answer of a participant who received 0.5 from the original 1.0 point: “*Freelancers often make photos to earn money, some of them make photos in the first place because they see it as a form of art.*”

*Explanation:* The participant did not summarize the topic completely.

Answer of a participant who received 1 point: “*Freelancers want to bring in as much orders as possible. To convince potential clients, they show their best photographs. Photographers that make photo’s as an art often cannot live of it.*”

*Explanation:* The participant summarized each important aspect of the text topic.

Answer of a participant who received 0 points: “*Artistic photographers cannot live from their photos.*”

*Explanation:* Although the participant summarizes some information of the topic, it is too little information of the topic to receive 0.5 points.

### 3. Coherence

Coherence is about connections between key concepts that are stated in the original text. These are sentences that relate through a cause and effect or other content relation to each other. Coherence indicates whether the participant can reproduce such connections in his/her summary. For each text, the connections are written down beforehand by the experimenter. Each connection is indicated by the letter *C* with C1 for the first connection etcetera.

*Scoring:*

**A)** Each connection, the participant summarizes correctly, (s)he receives 1 point. To receive the maximum score of 1 point it is not necessary to literally summarize the connections but to grasp the meaning of the connection.

**B)** Each wrong or missing connections receives 0 points.

All connections of each text are listed below.

Example of an answer that has to be scored with 1 point:

Connection as stated in text 3 C1: For example, think of the most widely read book in the world, the Bible.

Answer of a participant: “*Think of the most read book in the world, the Bible.*”

Text 1 (photographer):

- C1: People often attach to certain objects. These do not necessarily have to be expensive things.
- C2: A photographer tries to capture the reality in an artistic way.
- C3: When working for a company or an institution he takes care of wedding photos or supplies photos for advertising.
- C4: Photographers who make their living as an entrepreneur; are called freelancers.
- C5: Some freelancers make photos particularly to provide for their livings, just as employed photographers.
- C6: There are also freelancers who in the first place, see themselves as artists. For them, photography is a form of art and making pictures is more important to them than earning money with photos.
- C7: A photographer should usually be able to emphasize with others.
- C8: Portrait photographers for example, only get good pictures if a they hit off with the people they want to capture.
- C9: When working as a freelancer it is important to get enough orders.
- C10: Most freelancers make a portfolio of their best photos to convince possible clients about their talent.
- C11: Often, artistic photographers cannot live of their photos.
- C12: When there were only black and white photos, photographers developed the photos themselves in the doka/ darkroom.
- C13: Photographers rely on professional laboratories to develop color photos.
- C14: After the discovery of photography by the Frenchman Joseph Niepce, photography has spread quickly around the world.
- C15: In the Netherlands, Mr. Kiek one of the first Dutch photographers of whom we owe the expression 'een kiekje nemen', created awareness of photography.
- C16: The last couple of years photographers have been less positive in the news.

Text 2 (fashion designer):

- C1: One of the most famous fashion designers is Coco Chanel.
- C2: One of her famous designs was a little black dress.
- C3: Especially her perfumes, specifically the perfume 'Chanel no. 5' have contributed to her fame.
- C4: Chanel named her perfume after her lucky number.
- C5: 'Chanel no.5' still is the most sold perfume.
- C6: Gianni Versace became instantly famous after been murdered.
- C7: There are only a few copies of 'haute couture' clothes.
- C8: 'Haute couture' is referred to as the big fashion.
- C9: The 'prêt-a-porter' collection is referred to as small fashion.
- C10: Ready-made clothing is not custom made fashion.
- C11: Fashion designing is a form of art.
- C12: When designing fashion, a thorough knowledge of the human body is necessary.
- C13: One of the central tasks of the fashion designer is making a creative concept.
- C14: Usually the designer first chooses the type of clothing that he wants to make. Then he will think about the fabric and the colors of the clothes.
- C16: After that, the fashion designer will pass on making sketches.
- C17: Once the sketches have their final form, they are developed by a pattern maker or by specially developed software.

C18: A model maker then uses the selected fabric the final garment.

Text 3 (writer):

C1: For example, think of the most widely read book in the world, the Bible.

C2: Think of the blind Greek poet Homer in the "Iliad" and "Odyssey".

C3: The profession of writer actually has two sides.

C4: First there is the text writer or copywriter who can for instance write commercial texts.

C5: But a copywriter can also deal with texts as the instructions for medications or complicated equipment.

C6: A journalist is a copywriter, too.

C7: On the other hand, there is a writer in the sense of a writer of prose or poetry who publishes stories, poems, novels, short stories and so on.

C8: A literary writer distinguishes itself by its particular verbal expression.

C9: Especially poets verbal talent to grasp hard to express emotions in words.

C10: Nowadays it is necessary that a literary writer makes him becomes known to a wide audience.

C11: Another way that writers like to use to attract attention, is arguing with others.

C12: Almost all literary writers publish their work through a publisher.

C13: Such a publisher is involved in the overall development of the book.

C14: Great publishing companies use designers, illustrators and editors for this process.

C15: Whilst at small publishing companies sometimes performed by only one person.

C16: In average a writer receives about ten percent of the gross selling price per sold book. It is therefore not easy for a writer to earn his living through his work.

Text 4 (actor):

C1: Acting is a profession where you can literally go in 'to' sometimes

C2: 'Method actors' are actors who, often for several months, completely empathize with the experiences of their characters.

C3: Such experiences may end less well for the actor.

C4: An actor can play a role in a film, a soap opera, an advertisement or a play.

C5: A 'performance actor' is an actor who is hired to make an animated figure move as natural as possible.

C6: An actor has to ensure that his public is going through and experiences the same emotions as he is.

C7: To get the audience in the right frame of mind, the actor spoken and gesture must be credible.

C8: Furthermore, an actor has to evoke emotions in himself to display feelings of his character in a convincing way.

C9: Whether someone has empathy or not is a matter of predisposition.

C10: Other capabilities of an actor are good to learn, such as the development of insight into their own dramatic expression, different acting techniques and memory techniques to memorize texts.

C11: In many cases an actor carry out prior research to understand the perception of his character.

C12: In the investigation, he will use written sources, such as biographies, or filming. A method actor will want to fieldwork.

C13: Only with repeated practice he develops his character into a character with personality and unique characteristics.

#### ***4. Sequence***

Sequence is related to the text topics, too. In contrast to the third category coherence, it is not about the topics content but the location of the topics in the summary. Sequence indicated whether the participant reproduces the topic sections in the same order as mentioned in the original text.

*Scoring:*

In the scoring schema, each sequence is indicated with the letter S. Depending on the text (one to four) the number of sequences differ:

Text 1 (photographer): S1-> S2; S2->S3; S3->S4; S4->S5; S5->S6= maximum points to earn 5

Text 2 (fashion designer): S1-> S2; S2->S3; S3->S4; S4->S5= maximum points to earn 4

Text 3 (writer): S1-> S2; S2->S3; S3->S4; S4->S5= maximum points to earn 4

Text 4 (actor): S1-> S2; S2->S3; S3->S4; S4->S5= maximum points to earn 4

**A)** Each correct sequence is scored with 1 point. By summarizing topic section 1 followed by topic section 2, the participant got the sequence of the first two topic sections correct.

Example: Text 2 has 5 topic sections: S1, S2, S3, S4 and S5. If a participant writes his/her summary in the order: S1, S2, S3, S5, S4 (s)he will receive 2 points because of S1->S2 and S2->S3. S3->S4 and S4->S5 are missing.

**B)** Each missing or incorrect sequence is scored with 0 points.

#### ***5. Redundancy***

The extent of redundant information that a summary contains is measured with this category. Beforehand, redundant information of each text is defined and listed below, indicated with the letter R.

*Scoring:*

**A)** Each redundant information part that is mentioned in a summary is scored with 0 point.

**B)** Each not mentioned redundant information is scored with 1 points.

Text 1 (photographer):

R1: When asked what things they would take from a burning house, photos is often the first response.

R2: Very important is that the photographer make models feel at their ease.

R3: They could sometimes lock up for hours.



R4: Photographers were blamed for the death of Princess Diana. An exhibition in the Groninger Museum of the American photographer Andres Serrano caused a stir because of his explicitly erotic photos.

Text 2 (fashion designer):

R1: Although the dress was black, it was for the first time, not designed for a funeral.

R2: And indeed she had luck.

R3: Most people know Paco Rabanne more likely of his perfumes and aftershaves than his fashion designs.

R4: Most people, when thinking about the profession of fashion designer, that they design exclusive fashion for wealthy individuals.

R5: Since the target group who can afford haute couture is relatively small, most couturiers not earn their money by haute couture.

R6: A fashion designer distinguishes from other artists because his designs are made to be worn by people.

R7: After the garment is fitted to a model, the designer can still make some changes.

R8: Om van een schets naar een kledingstuk te komen zijn nog andere mensen nodig.

Text 3 (writer):

R1: There are lots of sayings about books that people may or may not characterize truthful. For example, a person can 'zijn boekje te buiten gaan, or be an open book. A phrase that is not about people but especially about the influence of books is that "the pen is sharper than the sword." This statement is a grain of truth.

R2: That fame also can have a negative side proves Salman Rushdie. His book 'The Satanic Verses' was banned by the Iranian Ayatollah Khomeini and he was declared an outlaw. He had to hide in fear and uncertainty for many.

R3: Stephen King has, for instance, specializes in horror stories. Annie M. G. Schmidt was very good at coming up with children's stories. Some writers are well known for their huge production. Such as Heinz G. Konsalik who wrote over 200 books.

R4: Shakespeare is known for playing around with words and phrases. Through his extensive vocabulary, there are some doubts whether his work is written by a single person.

R5: Willem Frederik Hermans was known be at loggerheads with everybody. Clinch Ronald Giphart knows the ropes in this area, too.

Text 4 (actor):

R1: The English actor and comedian John Cleese, needed psychiatric help to get out of the role of a hotel owner 'Basil Fawlty' (from the series 'Fawlty Towers') in which he was stuck.

R2: The number of roles is endless.

R3: Gollum from the movie "The Lord of the Rings" was played by such an actor.

## 6. Conciseness

The ‘conciseness’ of each summary indicates whether the summaries of the participants contain the gist of the text without redundant information. Summaries that are longer or as long as the original text, are not qualitatively good summaries because they fail in proving the reader with a compact overview of the original text (O’Hara, 1996). The conciseness of each summary was measured by:

$$\text{conciseness} = \left(1 - \frac{\text{number of words of the participants' summary}}{\text{number of words of the original text}}\right) \times \text{score completeness}$$

## 7. Words

The amount of words of each summary has to be counted.

### *Appendix D: Example text experiment 1 and task description (in Dutch)*

Task description:

Schrijven van een samenvatting

Wat is jouw voor en achternaam?:

Schrijf in je eigen woorden een zo volledig mogelijke samenvatting van de pas gelezen tekst. Er staat geen tijdslimiet voor het schrijven van de samenvatting.

Text 1:

#### **Fotograaf**

De onderstaande tekst is anderhalve pagina lang. Eerst volgt een samenvatting van de tekst bestaande uit 6 genummerde zinnen. Daarna begint de tekst.

## Samenvatting

1. Foto's hebben vaak een grote emotionele betekenis.
2. Fotografen werken in loondienst of als freelancer.
3. Een fotograaf moet beschikken over een goed inlevingsvermogen.
4. Voor een fotograaf is of het binnenhalen van opdrachten of het maken van kunstige foto's de belangrijkste taak.
5. Veel fotografen maken gebruik van professionele ontwikkel-laboratoria.
6. Waar vroeger vooral het positieve aanzien van de fotografie naar voren kwam, komt nu ook de negatieve kant meer in beeld.

Einde samenvatting. De tekst begint.

### 1. Foto's hebben vaak een grote emotionele betekenis.

Mensen hechten vaak aan bepaalde objecten. Dat hoeft lang niet altijd om dure dingen te gaan. Op de vraag welke dingen men zou meenemen uit een brandend huis is het eerste antwoord vaak foto's.

### 2. Fotografen werken in loondienst of als freelancer.

Een fotograaf probeert de realiteit vast te leggen in een kunstzinnige vorm. Dit kan hij in loondienst doen. Bij een bedrijf of instelling verzorgt hij dan bijvoorbeeld de reportage van een trouwerij of hij levert de foto's voor de reclame. Er zijn ook fotografen die hun geld verdienen als zelfstandig ondernemer; zij worden freelancers genoemd. Sommige freelancers maken, net zoals de fotografen in loondienst, vooral foto's om in hun levensonderhoud te voorzien. Maar er zijn ook freelancers die zichzelf op de eerste plaats zien als kunstenaars. Voor hen is de fotografie een vorm van kunst en het maken van foto's is belangrijker dan het verdienen van geld met de foto's.

### 3. Een fotograaf moet beschikken over een goed inlevingsvermogen.

Een fotograaf moet zich meestal goed kunnen verplaatsen in anderen. Portretfotografen krijgen bijvoorbeeld alleen dan goede foto's als er een klik ontstaat met de mensen die ze op de gevoelige plaat willen vastleggen. Heel belangrijk daarbij is dat de fotograaf de modellen op hun gemak stelt.

### 4. Voor een fotograaf is of het binnenhalen van opdrachten of het maken van kunstige foto's de belangrijkste taak.

Als een fotograaf als freelancer werkt is het van het grootste belang dat hij genoeg opdrachten binnen haalt. De meeste freelancers maken gebruik van een portfolio van hun beste werk om eventuele opdrachtgevers te overtuigen van hun kwaliteiten. Fotografen kunnen hun werk echter ook op de eerste plaats zien als het maken van kunst. Hun belangrijkste doel is het om ideeën en emoties over te brengen door middel van hun foto's. Helaas is het vaak zo dat de meer artistieke fotografen niet van hun foto's kunnen leven.

### 5. Veel fotografen maken gebruik van professionele ontwikkel-laboratoria

Toen er nog uitsluitend zwart-wit foto's bestonden, deden veel fotografen al het ontwikkelwerk zelf. Ze konden zich dan soms uren opsluiten in hun doka (de donkere kamer). Tegenwoordig wordt dat werk vaak uitbesteed. Vooral bij kleurenfoto's zien we dat de fotograaf een beroep doet op professionele laboratoria.

## 6. Waar vroeger vooral het positieve aanzien van de fotografie naar voren kwam, komt nu ook de negatieve kant meer in beeld.

Na de ontdekking van de fotografie door de Fransman Joseph Niepce, verspreidde deze zich al heel snel over de hele wereld. In ons land zorgde vooral meneer Kiek, één van de eerste Nederlandse fotografen, voor bekendheid van de fotografie. Aan deze fotograaf danken we ook de uitdrukking ‘een kiekje maken’. Fotograferen is nog steeds een geweldig populaire hobby in Nederland. Fotografen zijn de laatste jaren bij tijd en wijle echter ook minder positief in het nieuws. Zo werd de schuld van de dood van prinses Diana in de schoenen geschoven van de haar achtervolgende paparazzi. En een expositie in het Groninger Museum van de Amerikaanse fotograaf Andres Serrano deed veel stof opwaaien vanwege de expliciet erotische foto’s.

Het einde.

### *Appendix E: Codebook experiment 2 answering low level questions*

Text	Participants	
	Group A	Group B
Practice text	QS YouTube	QS YouTube
1	NQS visual artist	QS visual artist
2	QS interior architect	NQS interior architect
3	NQS museum employee	QS museum employee
4	QS comedian	NQS comedian

Seven questions were asked about each text. The norm answer of each questions were noted beforehand in this codebook. Besides the norm answers, the amount of points the participants could get was determined. During scoring a distinction must be made between keywords, synonyms, descriptions and no answers. Although different scored were awarded for keywords, synonyms and descriptions, all three options were scored as ‘correct answer’.

‘Keywords’ are the words that were literally used in the original text. Each answer can contain a variable amount of ‘keywords’. ‘Synonyms’ are words that have the same meaning as the keyword. Example: ‘supply’ was scored as a synonym for ‘provide with’. An answer will be scored as a ‘descriptions’ when the participant is using several words (without using the keyword or a synonym) in order to describe the keyword. Example: ‘not really good’ was scored as a description of ‘unhappy’.

#### *Scoring:*

The to be obtained points depend on the amount of keywords of a norm answers. Keywords, are important concepts of the answer that need to be mentioned by the participant to receive points.

The five categories were scored as followed: For each question, the amount of keywords, synonyms, descriptions, correct answers and missing answers must be counted and filled in in the coding schema:

- A) For each keyword that a participant has given in his/her answer, 3 points are awarded.
- B) For each synonym 2 points are awarded.
- C) A description of the keyword results in 1 point
- D) Keywords (A), synonyms (B) and descriptions (C) count as correct answer. Each question that is answered with one or more of these categories has to be scored as a correct answer. The amount of correct answered questions must be counted.
- E) Missing answers are scored with 0 points.

### *Appendix F: Example text and questions experiment 2*

Example text:

#### **Binnenhuisarchitect**

De onderstaande tekst is net iets langer dan één pagina. Eerst volgt een samenvatting van de tekst bestaande uit 4 genummerde zinnen. Daarna begint de tekst.

#### **Samenvatting**

- 1. Nederlanders hechten steeds meer waarde aan de inrichting van hun woning.**
- 2. Een binnenhuisarchitect moet vernieuwend zijn.**
- 3. Een binnenhuisarchitect moet bij zijn werkzaamheden rekening houden met beperkingen zoals ruimte.**
- 4. Bij de realisatie van het ontwerp door woninginrichtingbedrijven en soms ook aannemers is de binnenhuisarchitect de projectmanager.**

Einde samenvatting. Nu begint de tekst.

#### **1. Nederlanders hechten steeds meer waarde aan de inrichting van hun woning.**

De waarde die door Nederlanders aan het interieur van hun woning wordt gehecht, lijkt de laatste jaren steeds groter te worden. Dit is alleen al te zien aan de relatief grote hoeveelheid televisieprogramma's die over dit onderwerp worden uitgezonden. Ging het aanvankelijk nog uitsluitend om programma's waarin de 'doe-het-zelf'-klus voorop stond, tegenwoordig bestaan er speciale programma's die helemaal gaan over binnenhuis-architectuur. In een van de eerste programma's, TV Woonmagazine, verzorgde binnenhuisarchitect Jan des Bouvrie de favoriete 'metamorfose'. Het ging daarin om een gedaanteverwisseling van keuken, badkamer, slaapkamer of woonkamer. De mensen die niet waren ingelicht over de keuzes van Jan des Bouvrie werden (hopelijk positief) verrast met een totaal nieuwe inrichting van hun leefruimte.

#### **2. Een binnenhuisarchitect moet vernieuwend zijn**

Een binnenhuisarchitect moet in de eerste plaats vernieuwende ideeën kunnen verkopen. Hij moet over de vaardigheid beschikken om een oudbakken interieur om te toveren in een frisse en vaak moderne leefomgeving. Daarvoor moet hij of zij uitstekend op de hoogte zijn van de nieuwste trends en mogelijkheden op interieurgebied. Ruimtelijk inzicht en een goede

kennis van de modernste stoffen en materialen voor de inrichting van een huis zijn ook onontbeerlijk.

### **3. Een binnenhuisarchitect moet bij zijn werkzaamheden rekening houden met beperkingen zoals ruimte.**

Om een project te laten slagen moet de binnenhuisarchitect in staat zijn een ontwerp te realiseren dat tegemoet komt aan de wensen en financiële mogelijkheden van de klant, en dat voldoet aan technische beperkingen. De binnenhuisarchitect begint meestal de ruimte(s) te bekijken en voert dan een gesprek met de klant om te bepalen wat hij wil en niet wil en hij vraagt de klant naar diens financiële mogelijkheden. Als de opdracht binnen is, begint de binnenhuisarchitect de leefruimtes op te meten die moeten worden ingericht. De klant heeft immers niets aan een kast, die niet in de ruimte past. Daarna maakt hij voorlopige schetsen, waarbij natuurlijk rekening wordt gehouden met bouwvoorschriften en technische mogelijkheden. Anders dan in de 'metamorfose' van Jan des Bouvrie volgt dan vaak een nieuw overleg met de klant dat kan leiden tot aanpassingen in de schetsen. Een relatief nieuwe ontwikkeling is de trend dat binnenhuisarchitecten elementen uit het interieur zelf ontwerpen, zoals vazen en lampen, maar ook huishoudelijke apparatuur. Een goed voorbeeld hiervan is de Italiaanse ontwerpstudio Alessi, die een tijdje geleden een ware rage ontketende met haar karakteristieke 'ronde' design.

### **4. Bij de realisatie van het ontwerp door woninginrichtingbedrijven en soms ook aannemers is de binnenhuisarchitect de projectmanager.**

De binnenhuisarchitect beschikt vaak over een groot netwerk van leveranciers van meubelen, bouwspullen, vloeren en dergelijke. Die schakelt hij in zodra hij een opdracht van de klant heeft verworven. Bij ingrijpende vernieuwingen waarbij ruimtes verbouwd moeten worden werkt de binnenhuisarchitect samen met een aannemer. De binnenhuisarchitect heeft dan de rol van manager. Hij moet ervoor zorgen dat het project netjes en op tijd wordt afgerond.

Het einde.

Questions and answers:

Wat is jouw voor en achternaam?:

Er volgen 7 vragen over de tekst die jij net hebt gelezen. Probeer de vragen zo goed en volledig mogelijk te beantwoorden. Voor het beantwoorden van de vragen staat geen tijdslimiet.

Antwoorden scoren van tekst 2 binnenhuisarchitect:

Vraag 1: Wat houdt de metamorfose van Jan des Bouvrie in? **12 punten (want 4 termen)**

Antwoord: Bij de metamorfose gaat het om een **gedaanteverwisseling** van keuken, badkamer, slaapkamer of woonkamer. De mensen die niet waren ingelicht over de keuzes van Jan des Bouvrie werden (hopelijk positief) **verrast** met een totaal **nieuwe inrichting** van hun **leefruimte**.

Samenvatting 1: Sectie 1

De vier kernwoorden uit deze antwoord zijn: 1)gedaanteverwisseling, 2)verrast/verassing, 3)nieuwe inrichting, 4)leefruimte.

Vraag 2: Welke rol heeft een binnenhuisarchitect bij de realisatie van zijn ontwerp door bedrijven of aannemers? **3 punten**

Antwoord: manager/projectmanager

Samenvatting 1: Sectie 4

Vraag 3: Wat is een nieuwe trend bij binnenhuisarchitecten? **12 punten**

Antwoord: trend dat binnenhuisarchitecten elementen uit het interieur zelf ontwerpen, zoals vazen en lampen, maar ook huishoudelijke apparatuur.

Samenvatting 1: Sectie 3

Kernwoorden=1) elementen uit het interieur zelf ontworpen, 2)vazen, 3)lampen, 4)huishoudelijke apparatuur

Vraag 4: Welke rol spelen leveranciers voor de binnenhuisarchitect? **12 punten**

Antwoord: Leveranciers verzorgen binnenhuisarchitect met meubelen, bouwspullen, vloeren en dergelijke.

Samenvatting 1: Sectie 4

Kernwoorden= 1) verzorgen met 2)meubelen, 3)bouwspullen, 4) vloeren

Vraag 5: Hoezo spreken televisie programma's die gaan over binnenhuis architectuur steeds meer mensen aan? **9 punten**

Antwoord: De waarde die door Nederlanders aan het interieur van hun woning wordt gehecht, lijkt de laatste jaren steeds groter te worden. Dit is alleen al te zien aan de relatief grote hoeveelheid televisieprogramma's die over dit onderwerp worden uitgezonden. Ging het aanvankelijk nog uitsluitend om programma's waarin de 'doe-het-zelf'-klus voorop stond, tegenwoordig bestaan er speciale programma's die helemaal gaan over binnenhuis-architectuur.

Samenvatting 1: Sectie 1

Kernwoorden= 1)waarde hechten, 2)doe het zelf klus, 3)speciale programma's

Vraag 6: Wat maakt je tot en goede binnenhuisarchitect? **18 punten**

Antwoord: Het kunnen verkopen van vernieuwende ideeën, op de hoogte zijn van de nieuwste trends en mogelijkheden op interieurgebied. Ruimtelijk inzicht en een goede kennis van de modernste stoffen en materialen voor de inrichting van een huis zijn ook onontbeerlijk.

Samenvatting 1: Sectie 2

Kernwoorden= 1) verkopen, 2) vernieuwende ideeën, 3)op de hoogte zijn, 4) ruimtelijk inzicht, 5) goede kennis, 6) modernste stoffen/materialen

Vraag 7: Wat voor stappen doorloopt een binnenhuisarchitect als hij met een project bezig? **18 punten**

Antwoord: De binnenhuisarchitect bekijkt eerst de ruimtes en voert gesprekken met de klant. Tijdens de gesprekken worden de wensen en financiële mogelijkheden van de klant besproken. Vervolgens worden de ruimtes op gemeten en worden voorlopige schetsen gemaakt die de klant gaat bekijken.

Als deze stappen zijn genomen kan worden begonnen.

Samenvatting 1: Sectie 2

Kernwoorden= 1)ruimte bekijken, 2)gesprekken voeren met de klant, 3)wensen, 4) financiële mogelijkheden, 5) opmeten ruimtes, 6) voorlopige schetsen

### *Appendix G: Codebook experiment 3 searching answers*

Text	Participants	
	Group A	Group B
Practice text	QS YouTube	QS YouTube
1	NQS living oceans	QS living oceans
2	QS clean energy	NQS clean energy
3	NQS strong forests	QS strong forests
4	QS our bees	NQS our bees

The scoring method in this last experiment is alike of that in experiment 2 (see Appendix E). This time, ten questions about each text were asked. Additionally different types of questions were asked: high-level, medium-level and low-level questions. When scoring, no distinction must be made between the different question types. Thus, the same scoring procedure must be applied. Again, the norm answer of each question was noted beforehand in this codebook. Besides the norm answers, the amount of points the participants could get for each question was determined. During scoring, again a distinction must be made between keywords, synonyms, descriptions, correct answers and no answers, see Appendix E for the definition of the five categories..

#### *Scoring:*

The to be obtained points depend on the amount of keywords of a norm answer. Keywords, are important concepts of the answer that need to be mentioned by the participant to receive points.

The five categories were scored as followed: For each question, the amount of keywords, synonyms, descriptions, and missing answers must be counted and filled in in the coding schema:

- A)** For each keyword that a participant has given in his/her answer, 3 points are awarded.
- B)** For each synonym 2 points are awarded.
- C)** A description of the keyword results in 1 point
- D)** Keywords (A), synonyms (B) and descriptions (C) count as correct answer. Each question that is answered with one or more of these categories has to be scored as a correct answer. The amount of correct answered questions must be counted.
- E)** No answers result in 0 points

### *Appendix H: Example text and questions for experiment 3*

Example text:

#### **Onze bijen**

Deze tekst is van Greenpeace en anderhalve pagina lang. Er staan ook drie samenvattingen in, met in totaal 10 genummerde zinnen.



## Eerste samenvatting

1. Bijen zijn ijverige dieren.
  2. Van de drie soorten bijen in een volk is de koningin de belangrijkste.
  3. Een ruime meerderheid van de voedselgewassen wordt bestoven door bijen.
  4. De stijgende bijensterfte vormt een ernstige bedreiging voor onze voedselproductie.
- Einde eerste samenvatting. De tekst begint.

### 1. Bijen zijn ijverige dieren.

Geen enkel dier werkt zo hard voor ons als de bij. Een bij neemt per vlucht zo'n 30 mg nectar mee. Als we uitgaan van gemiddeld 10 vluchten per dag verzamelt een bij in haar leven 6300 mg of 6.3 gram nectar. Daarvan blijft uiteindelijk 1.25 gram honing over.

### 2. Er leven drie soorten bijen in een volk, waarbij de koningin de meest essentiële rol heeft.

Een bijenvolk bestaat uit: werksters (de vrouwtjes), darren (de mannetjes) en de koningin. De koningin is het middelpunt omdat zij de enige is die eitjes legt en dus voor nageslacht zorgt. Wij zijn veel afhankelijker van bijen dan we ons realiseren.

### 3. Een ruime meerderheid van de voedselgewassen wordt bestoven door bijen.

Honingbijen, wilde bijen en hommels bestuiven een groot deel van onze landbouwgewassen. Van de 100 gewassen die 90 procent van alle voedsel in de wereld leveren, wordt 70 procent bestoven door bijen. Niet minder dan 4.000 in Europa verbouwde groenterassen bestaan puur bij de gratie van deze harde werkers. Zonder de bij zou de voedselvoorziening voor de mens en talloze dieren in gevaar komen. Diertjes om zuinig op te zijn, is daarom het devies.

### 4. De stijgende bijensterfte vormt een ernstige bedreiging voor onze voedselproductie.

Toch sterven de laatste jaren meer en meer bijen. Imkers uit Europa en Noord-Amerika melden al sinds eind jaren negentig ongewoon hoge sterftecijfers van hun bijenvolken. Nederland spant daarbij de kroon. Jaarlijks overleeft 20 tot 25% van al onze bijenvolken de winter niet. In sommige regio's sterft zelfs ruim de helft van de bijen. Als we nu niet de overstap maken naar gezonde, ecologische landbouw zonder gif, dan kan dit het sterftecijfer in rap tempo stijgen en onze voedselproductie ernstig in gevaar komen. Ecologische landbouw is dus geen luxe, maar absolute noodzaak.

## Tweede samenvatting

5. De variëteit aan gewassen neemt af waardoor het dieet van de bij eenzijdiger wordt.
  6. Parasieten verzwakken de bijen en maken ze gevoeliger voor bestrijdingsmiddelen.
  7. Bestrijdingsmiddelen doden de bijen of leiden tot ernstige bijwerkingen.
- Einde tweede samenvatting. De tekst gaat verder.

Ons landbouwlandschap wordt steeds monotoner. Onaangetaste ecosystemen zijn nauwelijks meer te vinden. Er is steeds minder variëteit in gewassen, bloemen en planten op het land.

### 5. De variëteit aan gewassen neemt af waardoor het dieet van de bij eenzijdiger wordt.

Voor een uitgebalanceerd bijendieet is een variëteit in bloemen en bloeiende gewassen cruciaal. Helaas verwacht de International Union for the Conservation of Nature (kortweg de IUCN) dat in de komende decennia nog eens 20.000 bloeiende plantensoorten zullen verdwijnen.

In tegenstelling tot de honingbij die door mensen wordt gehouden, hebben wilde bijen ook een ongestoorde omgeving nodig om hun nesten te bouwen. Dit soort veilige plekken wordt steeds zeldzamer.

### **6. Parasieten verzwakken de bijen en maken ze gevoeliger voor bestrijdingsmiddelen.**

Parasieten als de varroamijt maken wereldwijd bijenvolken ziek. De mijt nestelt zich in de kasten en parasiteert op bijen al vanaf dat ze larf zijn. De bijen raken daardoor niet alleen verzwakt maar worden vaak tegelijk besmet met virussen en bacteriën die desastreus kunnen zijn. Verzwakte bijen zijn extra gevoelig voor schadelijke pesticiden, en andersom: bestrijdingsmiddelen verzwakken de weerstand van bijen waardoor ze meer last krijgen van parasieten en ziektes.

### **7. Bestrijdingsmiddelen doden de bijen of leiden tot ernstige bijwerkingen.**

In de landbouw, maar ook in parken, op schoolpleinen, en (achter)tuinen gebruiken mensen al jaren enorme hoeveelheden giftige bestrijdingsmiddelen om onkruid en plaaginsecten te bestrijden. Vooral bestrijdingsmiddelen zoals imidacloprid, thiamethoxam, clothianidine, fipronil, chlorpyrifos, cypermethrin en deltamethrin zijn extreem giftig maar erg populair onder boeren en tuinders. Deze middelen zijn 'systemisch', dat wil zeggen dat ze zich door de hele plant verspreiden. Bijen kunnen het gif dus via het stuifmeel binnenkrijgen, maar ook via de nectar of druppeltjes sap die aan de plant hangen. Afhankelijk van de pesticide en de dosis, sterven de bijen onmiddellijk of krijgen ze last van bijwerkingen. Denk dan bijvoorbeeld aan het verlies van oriëntatie-vermogen waardoor bijen hun korf niet terug kunnen vinden, het vergeten van de geuren van bloemen en het niet meer herkennen van hun eigen nest. Op de lange termijn zijn deze bijwerkingen dodelijk.

## **Derde samenvatting**

**8. Om bijensterfte tegen te gaan is een meer gevarieerde flora nodig en moeten er minder bestrijdingsmiddelen gebruikt worden.**

**9. Greenpeace heeft een agenda met vier actiepunten ter bescherming van bestuivers.**

**10. Iedereen kan in actie komen door de Greenpeace petitie te tekenen.**

Einde samenvatting. De tekst gaat verder.

Bloeiende bloemen en planten zijn van levensbelang voor bijen. Daarom moeten we maatregelen nemen om nog intacte ecosystemen te beschermen. Daarnaast moeten we het aantal planten- en bloemensoorten op landbouwgrond vergroten door bijvoorbeeld stroken wilde bloemen rondom akkers aan te leggen.

**8. Om bijensterfte tegen te gaan is een meer gevarieerde flora nodig en moeten er minder bestrijdingsmiddelen gebruikt worden.**

Om te overleven moeten bestuivers zoals wilde bijen voldoende gevarieerd voedsel kunnen vinden, en hebben ze ruimte nodig om nesten te kunnen bouwen. Ook moet een landbouw zonder bestrijdingsmiddelen, en met meer afwisseling in gewassen, de norm worden.

**9. Greenpeace heeft een agenda met vier actiepunten ter bescherming van bestuivers.**

Greenpeace wil:

Ten eerste: Een Europees verbod op bestrijdingsmiddelen die schadelijk zijn voor bijen. Mocht Europa hierin falen, dan moet Nederland deze maatregel in eigen land nemen.

Ten tweede: EU-lidstaten moeten nationale actieplannen aannemen voor de bescherming van bestuivers met specifieke aandacht voor de bevordering van duurzame landbouw.

Ten derde: Behoud van natuurlijke leefomgevingen van bestuivers, en meer biodiversiteit in agrarische gebieden. Dat wil zeggen meer leefruimte en voedsel voor bijen in en om akkers en weiden.

Ten vierde: Meer financiering voor onderzoek naar de toepassing van ecologische landbouwmethoden, zowel via het Europese Gemeenschappelijke Landbouw Beleid (GLB), als via het Europese financieringsprogramma voor onderzoek Horizon 2020.

We roepen staatssecretaris Dijkema en de Europese leiders op om een verbod in te stellen op alle bestrijdingsmiddelen die gevaarlijk zijn voor de bijen, en om zich in te zetten voor een gezonde ecologische landbouw.

### 10. Iedereen kan in actie komen door de Greenpeace petitie te tekenen.

Om meer druk uit te oefenen, willen we in Europa minstens 1 miljoen getekende petitieën verzamelen. Onderteken de petitie en help mee de bijen te redden!

Einde tekst.

Example questions with answers:

Antwoorden scoren tekst 4 onze bijen

- High level questions

Vraag 1 Wat zijn de belangrijkste redenen voor de bijensterfte? **27 punten**

Antwoord: Ons landschap wordt steeds monotoner. Onaangetaste ecosystemen zijn nauwelijks meer te vinden. Er is steeds minder variëteit in gewassen, bloemen en planten op het land. Voor een uitgebalanceerd bijendieet is een variëteit in bloemen en bloeiende gewassen cruciaal. Helaas verwacht de International Union for the Conservation of Nature (kortweg de IUCN) dat in de komende decennia nog eens 20.000 bloeiende plantensoorten zullen verdwijnen.

In tegenstelling tot de honingbij die door mensen wordt gehouden, hebben wilde bijen ook een ongestoorde omgeving nodig om hun nesten te bouwen. Dit soort veilige plekken wordt steeds zeldzamer. Parasieten als de varroamijt maken wereldwijd bijenvolken ziek. De mijt nestelt zich in de kasten en parasiteert op bijen al vanaf dat ze larf zijn. De bijen raken daardoor niet alleen verzwakt maar worden vaak tegelijk besmet met virussen en bacteriën die desastreus kunnen zijn. Verzwakte bijen zijn extra gevoelig voor schadelijke pesticiden, en andersom: bestrijdingsmiddelen verzwakken de weerstand van bijen waardoor ze meer last krijgen van parasieten en ziektes. In de landbouw, maar ook in parken, op schoolpleinen, en (achter)tuinen gebruiken mensen al jaren enorme hoeveelheden giftige bestrijdingsmiddelen om onkruid en plaaginsecten te bestrijden. Vooral bestrijdingsmiddelen zoals imidacloprid, thiamethoxam, clothianidine, fipronil, chlorpyrifos, cypermethrin en deltamethrin zijn extreem giftig maar erg populair onder boeren en tuinders. Deze middelen zijn 'systemisch', dat wil zeggen dat ze zich door de hele plant verspreiden. Bijen kunnen het gif dus via het stuifmeel binnenkrijgen, maar ook via de nectar of druppeltjes sap die aan de plant hangen. Afhankelijk van de pesticide en de dosis, sterven de bijen onmiddellijk of krijgen ze last van bijwerkingen. Denk dan bijvoorbeeld aan het verlies van oriëntatievermogen waardoor bijen hun korf niet terug kunnen vinden, het vergeten van de geuren van bloemen en het niet meer herkennen van hun eigen nest. Op de lange termijn zijn deze bijwerkingen dodelijk. Om te overleven moeten bestuivers zoals wilde bijen voldoende gevarieerd voedsel kunnen vinden, en hebben ze ruimte nodig om nesten te kunnen bouwen. Ook moet een landbouw zonder bestrijdingsmiddelen, en met meer afwisseling in gewassen, de norm worden.

Samenvatting 2: Sectie 5, 6, 7 & Samenvatting 3: Sectie 8

Kernwoorden: 1) monotoon, 2) Landbouwschap, 3) plantensoorten verdwijnen, 4) weinig ongestoord, 5) omgeving, 6) parasieten, 7) gif, 8) bestrijdingsmiddelen, 9) pesticide

- Medium level questions

Vraag 2 Wat is het verschil tussen het effect van een parasiet en een bestrijdingsmiddel op een bij? **21 punten**

Antwoord: Parasieten als de varroamijt maken wereldwijd bijenvolken ziek. De mijt nestelt zich in de kasten en parasiteert op bijen al vanaf dat ze larf zijn. De bijen raken daardoor niet alleen verzwakt maar worden vaak tegelijk besmet met virussen en bacteriën die desastreus kunnen zijn. Verzwakte bijen zijn extra gevoelig voor schadelijke pesticiden, en andersom: bestrijdingsmiddelen verzwakken de weerstand van bijen waardoor ze meer last krijgen van parasieten en ziektes. In de landbouw, maar ook in parken, op schoolpleinen, en (achter)tuinen gebruiken mensen al jaren enorme hoeveelheden giftige bestrijdingsmiddelen om onkruid en plaaginsecten te bestrijden. Vooral bestrijdingsmiddelen zoals imidacloprid, thiamethoxam, clothianidine, fipronil, chlorpyrifos, cypermethrin en deltamethrin zijn extreem giftig maar erg populair onder boeren en tuinders. Deze middelen zijn 'systemisch', dat wil zeggen dat ze zich door de hele plant verspreiden. Bijen kunnen het gif dus via het stuifmeel binnenkrijgen, maar ook via de nectar of druppeltjes sap die aan de plant hangen. Afhankelijk van de pesticide en de dosis, sterven de bijen onmiddellijk of krijgen ze last van bijwerkingen. Denk dan bijvoorbeeld aan het verlies van oriëntatie-vermogen waardoor bijen hun korf niet terug kunnen vinden, het vergeten van de geuren van bloemen en het niet meer herkennen van hun eigen nest. Op de lange termijn zijn deze bijwerkingen dodelijk.

Samenvatting 2: Secties 6, 7

Kernwoorden: 1) verzwakken, 2) ziek, 3) gevoelig, 4) weerstand, 5) bijwerking, 6) oriëntatie-vermogen, 7) dodelijk

- Low level questions

Vraag 3 Waardoor zijn parasieten gevaarlijk voor de bij? **12 punten**

Antwoord: Parasieten als de varroamijt maken wereldwijd bijenvolken ziek. De mijt nestelt zich in de kasten en parasiteert op bijen al vanaf dat zij een larf zijn. De bijen raken daardoor niet alleen verzwakt maar worden vaak tegelijk besmet met virussen en bacteriën die desastreus kunnen zijn. Verzwakte bijen zijn extra gevoelig voor schadelijke pesticiden, en andersom: bestrijdingsmiddelen verzwakken de weerstand van bijen waardoor ze meer last krijgen van parasieten en ziektes.

Samenvatting 2: Sectie 6

Kernwoorden: 1) ziek, 2) verzwakt, 3) besmet, 4) gevoelig

- High level question

Vraag 4 Hoe kan landbouwgrond bijvriendelijker gemaakt worden? **21 punten**

Antwoord: Om te overleven moeten bestuivers zoals wilde bijen voldoende gevarieerd voedsel kunnen vinden, en hebben ze ruimte nodig om nesten te kunnen bouwen. Ook moet een landbouw zonder bestrijdingsmiddelen, en met meer afwisseling in gewassen, de norm worden. Behoud van natuurlijke leefomgevingen van bestuivers, en meer biodiversiteit in agrarische gebieden. Dat wil zeggen meer leefruimte en voedsel voor bijen in en om akkers en weiden. Meer financiering voor onderzoek naar de toepassing van ecologische landbouwmethoden, zowel via het Europese Gemeenschappelijke Landbouw Beleid (GLB), als via het Europese financieringsprogramma voor onderzoek Horizon 2020. Als we nu niet de overstap maken naar gezonde, ecologische landbouw zonder gif, dan kan dit het sterftcijfer in rap tempo stijgen en onze voedselproductie ernstig in gevaar komen. Ecologische landbouw is dus geen luxe, maar absolute noodzaak. Bloeiende bloemen en planten zijn van levensbelang voor bijen. Daarom moeten we maatregelen nemen om nog intacte ecosystemen te beschermen. Daarnaast moeten we het aantal planten- en bloemensoorten op landbouwgrond vergroten door bijvoorbeeld stroken wilde bloemen rondom akkers aan te leggen.

Samenvatting 1: Sectie 4 & Samenvatting 3: Sectie 8, 9

Kernwoorden: 1) zonder bestrijdingsmiddelen, 2) afwisseling gewassen, 3) leefruimte, 4) voedsel, 5) akkers, 6) weiden, 7) ecologisch

- Low level questions

Vraag 5 Wat zijn de doelen van Greenpeace? **33 punten**

Antwoord: Zij noemen vier doelen zoals een Europees verbod op bestrijdingsmiddelen, het invoeren van nationale actieplannen, het creëren van meer leefruimte en voedsel voor de bijen en meer financiering voor onderzoek naar en toepassing van ecologische landbouwmethodes.

Samenvatting 3: Sectie 9

Kernwoorden: 1) Europees, 2) verbod, 3) bestrijdingsmiddelen, 4) nationale, 5) actieplannen, 6) leefruimte, 7) voedsel, 8) financiering, 9) onderzoek, 10) ecologisch, 11) landbouwmethodes

Vraag 6 Wat wordt bedoeld met een monotone landbouwlandschap? **12 punten**

Antwoord: Er is steeds minder variëteit in gewassen, bloemen en planten op het land. En onaangetaste ecosystemen zijn nauwelijks meer te vinden.

Samenvatting 2: (Sectie 5)

Kernwoorden: 1) minder, 2) variëteit, 3) bloemen, 4) planten

Vraag 7 Wat maakt een systemisch bestrijdingsmiddel zo gevaarlijk voor de bij? **30 punten**

Antwoord: Deze middelen zijn 'systemisch', dat wil zeggen dat ze zich door de hele plant verspreiden. Bijen kunnen het gif dus via het stuifmeel binnenkrijgen, maar ook via de nectar of druppeltjes sap die aan de plant hangen. Afhankelijk van de pesticide en de dosis, sterven de bijen onmiddellijk of krijgen ze last van bijwerkingen. Denk dan bijvoorbeeld aan het verlies van oriëntatie-vermogen waardoor bijen hun korf niet terug kunnen vinden, het vergeten van de geuren van bloemen en het niet meer herkennen van hun eigen nest. Op de lange termijn zijn deze bijwerkingen dodelijk.

Samenvatting 2: Sectie 7

Kernwoorden: 1) verspreiden, 2) stuifmeel, 3) nectar, 4) druppels, 5) sterven, 6) bijwerkingen, 7) verlies oriëntatie vermogen, 8) vergeten geuren, 9) niet herkennen nest, 10) dodelijk

Vraag 8 Hoeveel bloemensoorten worden door de IUCN verwacht in de komende decennia te verdwijnen? **3 punten**

Antwoord: Helaas verwacht de IUCN (International Union for the Conservation of Nature) dat in de komende decennia nog eens 20.000 bloeiende plantensoorten verdwijnen.

Samenvatting 2: Sectie 5

Vraag 9 Hoeveel bijen sterven er jaarlijks in een winter in Nederland? **6 punten**

Antwoord: 20 tot 25% van alle bijenvolken. In sommige regio's zelfs ruim de helft.

Samenvatting 1: Sectie 4

Kernwoorden: 1) 20, 2) 25%

Vraag 10 Welke bijen zitten er in een bijenvolk? **15 punten**

Antwoord: werksters (de vrouwtjes), darren (de mannetjes) en de koningin.

Samenvatting 1: Sectie 2

Kernwoorden: 1) werksters, 2) vrouwtjes, 3) darren, 4) mannetjes, 5) koningin