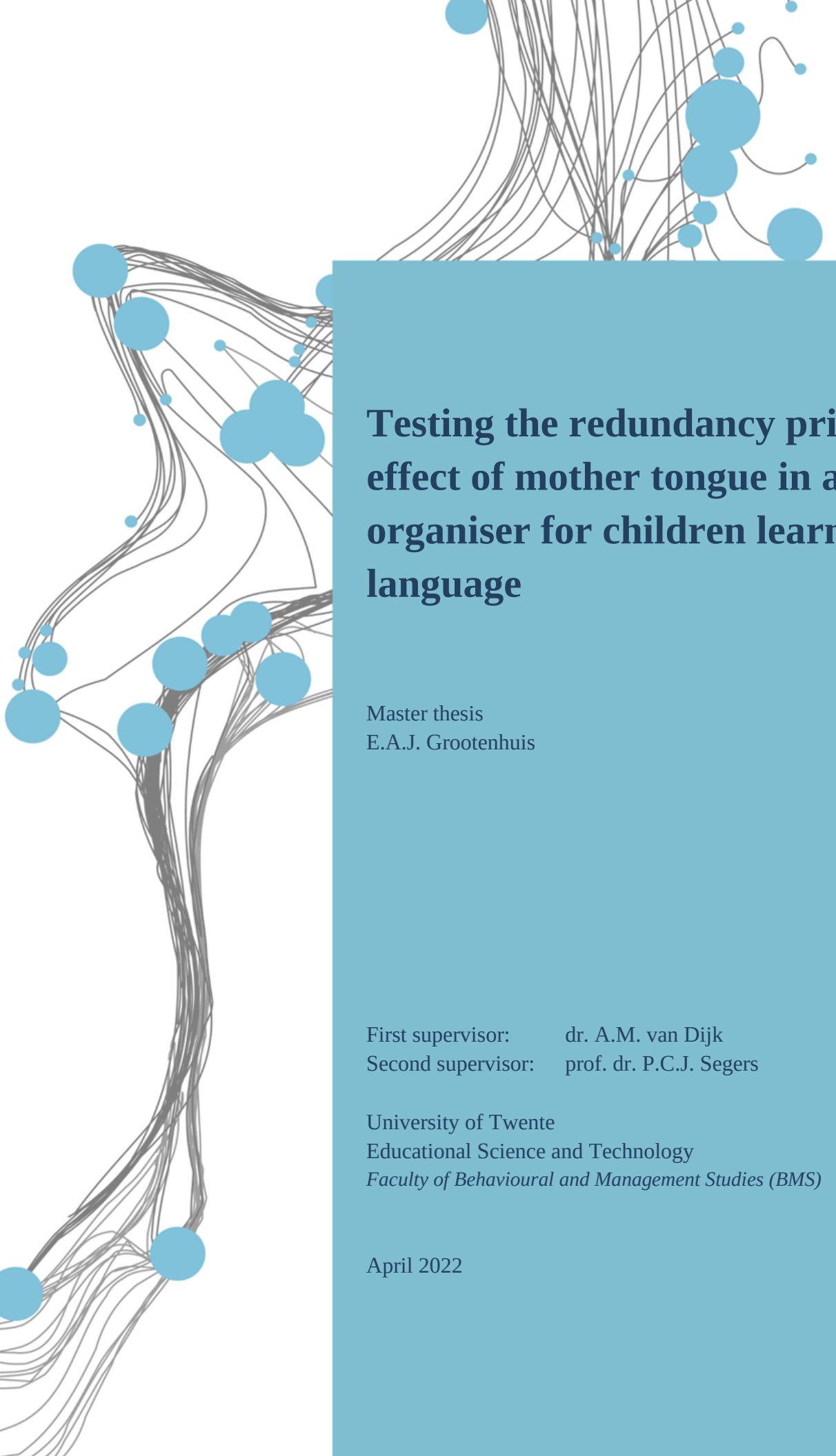

Testing the redundancy principle and effect of mother tongue in an advance organiser for children learning a second language

Master thesis

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Abstract

Learning vocabulary in a second language (L2) is essential but can be challenging, especially for newcomer children. Children need to practise with vocabulary in a way that contributes to good word retention. Digital learning environments with so-called drill exercises appear to be a good method. However, those exercises often lack a meaningful context. To offer more context to the learners an advance organiser is helpful. How information is presented (i.e., with or without on-screen text, besides images and narration) in an advance organiser has not been investigated before and previous research is divided whether on-screen text impedes or fosters learning. For L2-learning it seems that it has the potential to foster vocabulary learning. Therefore, the present study investigated the effect of redundant on-screen text on word retention. Besides, newcomers are a diverse population in terms of mother tongue and previous research showed an interdependency between mother tongue and L2-learning. That is why the present study also investigated the effect of mother tongue on the results. A digital learning environment with so-called drill exercises and an advance organiser was created and tested in a pretest-posttest-posttest design by newcomer children learning Dutch in a language class (N = 40). One group (N = 20) was provided an advance organiser with on-screen text, narration, and visual support. The other group (N = 20) was provided an advance organiser with narration and visual support. Results showed that implementing an advance organiser had a positive effect on vocabulary results on short- and long term. Besides, the advance organiser with redundant information was found to be the most effective on the long term. Indicating that not removing redundant information can be beneficial for L2-vocabulary learning. However, no effect was found for mother tongue, but future research is needed to investigate whether this finding can be supported or not.

Keywords: advance organiser, redundancy, second language learning, vocabulary, mother tongue

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Introduction

When children are going to stay and live in a new country (e.g., because they are refugees or because they are children of expat parents) it is essential to learn vocabulary in the new language soon, since vocabulary learning is an essential component of second language (e.g., L2) learning (Nation, 2001). It contributes to enhancing L2 listening, speaking, reading, and writing skills (Bossers et al., 2015; Gorjian et al., 2011). However, L2-vocabulary learning is considered to be a serious challenge for L2-learners (OECD, 2015). For example, international research shows is that for English as a second language the vocabulary level is often below the standard (Du, 2004). Regarding the situation in the Netherlands, research from the Education Council shows that the quality of Dutch as a second language (i.e., NT2) education is insufficient due to lack of expertise and the absence of proper learning material (Onderwijsraad, 2017). Not having a well-established vocabulary in the second language may result in a language delay which leads to underachievement in overall school performance (OECD, 2015), because for those children it is challenging to fully understand school instructions (Leseman, 2000; Scheele 2010). So, well-established L2-vocabulary education is needed for children who arrive in a new country (Chacón-Beltrán et al., 2010).

A meta-analysis showed that intentional vocabulary instruction is effective for L2-learning (Webb et al., 2020) this can attributed to the focused attention of the learners as argued by Schmitt (2008; 2010). One way of providing intentional instruction is learning vocabulary by means of multimedia instructions, for example via digital vocabulary games. A meta-analysis showed that integrating multimedia into vocabulary education for L2-learners had a large effect size, suggesting that incorporating multimedia is beneficial for L2-vocabulary learning (Tsai & Tsai, 2018). Incorporating multimedia in L2-vocabulary instruction can be done via so-called digital drill or tutorial exercises. The focus of such exercises is on repeated practice of words instead of working on a meaningful task (Tsai & Tsai, 2018). To optimise word learning, offering words in a meaningful context can assist learners in understanding the meaning (Kashara, 2011).

In order to offer more context to the learning environment, an advance organiser can be presented to the learner. An advance organiser introduces relevant material before the learning material is provided (Ausubel, 1968). It allows learners to activate relevant prior knowledge and therefore the integration of new information into their linguistic repertoire will become easier (e.g., Feng Teng, 2020; Plass & Jones, 2005). The effectiveness of presenting an advance organiser in L2- and vocabulary learning has been evidenced in several studies (e.g., Feng Teng, 2020; Shoari & Farrokhi, 2014). However, the current body of research is mainly focused on what type of advance organiser is effective for L2-(vocabulary)-learning (e.g., graphic organisers, captioned videos) by comparing one type of advance organiser and a control group. Research about how information is presented (e.g., visual input, narrations, and on-screen text or via visual input and narration only) in an advance organiser seems not to be conducted before. In order to create well-established digital vocabulary material, it is relevant to study how the information can be best presented since the current body of research is somewhat divided in what way information can be best presented. The main body of research states that applying redundant information (i.e., visual input, narrations and on-screen text) impedes learning (e.g. Kalyuga & Sweller, 2010). However, for L2-learning the contrary might be true, as some researchers found that not eliminating redundant information (i.e., on-screen text) enhances retention of L2-word learning (e.g., Chong Toh et al., 2010; Samur, 2012). What also might effect learning results, besides how the information is presented, is the influence of the mother tongue. Research about second language learning shows an interdependence between the mother tongue and second language (e.g., Melby-Lervåg & Lervåg, 2011; Verhoeven, 1994). As argued by researchers it is easier to learn a language close to the learners' mother tongue compared to learning a language with a greater linguistic distance (e.g., Schepens et al., 2013). Therefore, insights on the role of the mother tongue may provide implications for establishing L2-vocabulary education when designing and instructing for a diverse population.

So, despite the existing body of research on second language vocabulary learning and advance organisers, research investigating the effect of an advance organiser in relation to redundancy and

considering the mother tongue of participants has both not been conducted before. Therefore, the current study aims to explore what elements of an advance organiser for a digital vocabulary learning environment can improve the learning outcomes for children learning a second language.

Theoretical framework

Second language learning

Second language learning can be defined as learning a new language after the mother tongue is already acquired (Bossers et al., 2015; Kuiken & Vermeer, 2013). Learning a second language is a dynamic and never-ending process and different for everybody (Bossers et al., 2015). Regarding the development of a second language, a distinction can be made between unguided language *acquisition* and guided language *learning*. Unguided language *acquisition* can be defined as learning a second language in a natural way, an automatic process resembling the way a child has acquired proficiency in the mother tongue (Kuiken & Vermeer, 2013; Paus & Van den Brand, 2019). Second, guided language *learning* can be defined as learning a second language by means of instruction (Kuiken & Vermeer, 2013; Paus & Van den Brand, 2019). In other words, someone is learning via explicit language instructions to master a language. In essence, second language acquisition or learning is different from foreign language learning (Ringbom & Jarvis, 2009). Whereas in the latter, the target language is not in the learners' immediate environment (e.g., Dutch primary-schoolers learning English in the Netherlands). In second language learning, the target language is directly available in the learners' immediate environment (e.g., non-Dutch primary-schoolers learning Dutch in the Netherlands).

Second language vocabulary learning and intentional instruction

When learning a second language, there are several aspects of a language that need to be trained. However vocabulary is at the heart of language learning as claimed by several researchers (e.g., Bacchini, 2019; Elgort & Nation, 2011). Vocabulary can be defined as the words and the word meanings that are available to a person for speaking and writing (Paus & Van den Brand, 2018). A distinction can be made between receptive and productive vocabulary. Receptive vocabulary can be defined as being able to

recognise the words when hearing or reading (Paus & Van den Brand, 2018; Kuiken & Vermeer, 2013). Productive vocabulary can be defined as knowing and understanding of words when hearing or reading, but also being able to use those words when speaking or writing (Kuiken & Vermeer, 2013; Paus & Van den Brand, 2018). Both receptive and productive vocabulary are considered important (Nation, 2001), but research shows that vocabulary is first learned receptively before it can be learned productively (e.g., Paribakht & Wechse, 1997; Rott 1999). One of the reasons is that productive vocabulary requires more word knowledge, as learners also need to master the spelling and/or pronunciation of the words (Nation, 2001). Therefore, scholars often state that second language vocabulary development is a complex, incremental and cumulative process and occurs over a period of time (Schmitt, 2008; Chacón-Beltrán et al., 2010). If the number of known words expands, the words can be easily categorised while meaningful relations among words are constructed (Schmitt, 2008). In other words, the more extensive the vocabulary, the easier it will become to learn novel words.

A form of teaching (L2-)vocabulary is via intentional vocabulary instruction. This is a form of guided language learning and is proven to be an effective method for L2-vocabulary learning (e.g., Elgort & Nation, 2010; Marzano, 2012; Paribakht & Wechse, 1998; Schmitt, 2010). A meta-analysis of Webb and colleagues (2020) showed similar results, but concluded that learning gains on immediate post-tests are much larger compared to delayed post-tests. They explain that these results underpin the importance of word repetition or consolidation and the complexity of L2-word learning. This can also be connected to Schmitt's (2010) argument that soon after new vocabulary is learned, forgetting occurs and that the rate of forgetting decreases by time. Therefore, it is important to consolidate the words. Schmitt (2008) argues that for novice L2-learners the focus must be on establishing a meaning-form link via explicit learning while for more advanced L2-learners a more balanced approach between explicit and implicit word learning might be necessary. Different approaches may be appropriate for different points along the incremental learning process (Schmitt, 2008).

Influence of mother tongue

Research about second language learning argue that there is an interdependence between the mother tongue and second language (e.g., Cummins, 1991; Cummins 1979; Verhoeven, 1994). Cummins (1991) explains that the interdependence is a result of the same central processing system from which both languages operate. Furthermore, research by Connor (1996) states that when more language aspects (e.g., listening or writing) of the first and second language are similar, the easier it will be to learn the second language. For example, the meta-analysis of Melby-Lervåg and Lervåg (2011) showed that the correlation between participants with an alphabetic writing system in their native language and learning another alphabetic language system was higher than in the samples where the native language was ideographic and the second language was alphabetic, because of similar language structures (Melby-Lervåg & Lervåg, 2011). Consequently, it will become more difficult to learn a second language if this language differs excessively from the mother tongue (Melby-Lervåg & Lervåg, 2011). As proposed in the meta-analysis of Melby-Lervåg and Lervåg (2011) the linguistic transfer is more common in samples if the first and second language share many cognates and are close in origin than in samples where the languages are more distant. Cognates can be defined as words that historically relate to the same word in a common ancestor language (Schepens et al., 2013). Schepens and colleagues (2013) conclude that when learning Dutch, the learning difficulty increases if there is a greater linguistic distance. For example, it is expected that it will be easier for a Dutch person to learn Spanish than for a Dutch person to learn Japanese, because Spanish and Dutch belong to the same language family, namely the Indo-European language family whereas Japanese belongs to another language family. Indo-European languages are considered a family of languages that share cognates and a common origin and it includes most languages of Europe, the Middle East and India (Melby-Lervåg & Lervåg, 2014).

Digital learning environments and exercises

Digital learning environments can offer opportunities for smart repetition algorithms and multimedia integrations, for example by establishing an algorithm that repeats mistakes and by incorporating audio-visual support (Godwin-Jones, 2017). For second language vocabulary, incorporating

digital exercises or games as a form of intentional vocabulary instruction are effective as concluded in two meta-analyses of Tsai and Tsai (2018) and Wu and Zhang (2020). Digital exercises showed larger effect sizes compared to traditional education (i.e., non-digital exercises) and enrich the learning experience as it evokes more motivation among the learners (Tobias et al., 2014; Wu & Zhang, 2020; Tsai & Tsai, 2018). Besides, Schmitt (2008; 2010) argues that intentional vocabulary learning is limited in words it can usually address due to time or curriculum constraints. However, digital exercises can be a possible solution for practising with words by offering multiple exposures to a word (Godwin-Jones, 2018). Also, a digital environment can also offer opportunities for memorization and deliberate learning and such learning can be very effective for novices learning a second language (e.g., Laufer, 2006; Elgort, 2011).

In a digital learning environment one way of practising with words in a deliberate form can be offered via so-called tutorial games or drill exercises. These exercises provide L2-learners with repeated practice of words in different vocabulary games and learners succeed in the exercises by finding the correct answer. So, there is not an overall meaningful task to work on, as opposed to task-based exercises (Tsai & Tsai, 2018). The meta-analysis conducted by Tsai & Tsai (2018) showed that drill exercises overall meet the learning purpose but lack a meaningful context and engaging situation for the L2-learners. Research from Christensen and colleagues (2007) found comparable results. That is, the drill programme was effective for learning vocabulary, however, participants in their research enjoyed an environment with more context better. Elaborating on that Folse (2004) as mentioned in Kasahara (2011) argues that word learning without context is assumed to be a boring activity for the learners. Furthermore, Kasahara (2011) adds that learning words in context can assist learners to help them in understanding meaning and establishing a form-meaning link. This than can lead to meaningful learning, which is defined by Mayer (2021) as a learning outcome that can be recognised by good transfer- and retention results and can be fostered by the cognitive engagement of the learner. So if the leaner is more cognitively engaged with the task, it is more likely that it results in meaningful learning. However, research of Van

den Broek and colleagues (2018) found that diminishing the contextual information served as a trigger for memory retrieval, which leads to long-term retention of novel L2-words. So, once learners understand a word, repetition in an uninformative context is more beneficial for word retention (Van den Broek et al., 2018). Noteworthy is that the research was focused on presenting the (un)informative sentences in the first language of the participants and presenting the target words in the second language. As suggested by Van den Broek and colleagues (2018), future research can be relevant to test the effect of context in the target language.

Advance organiser

An advance organiser can be defined as relevant and inclusive introductory materials introduced in advance of learning and it presents a higher level of abstraction, generality, and inclusiveness than the learning content presented afterwards (Ausubel, 1960). Important is that an advance organiser, is directing the learner's attention to a brief overview of what is important in the upcoming material (Ausubel, 1960; Mohammadi et al., 2010, Woolfolk et al., 2013). Furthermore, there are many ways of providing an advance organiser but it can serve roughly two different purposes (Woolfolk et al., 2013). First, highlighting relationships among concepts that will be presented (Woolfolk et al., 2013). This can be categorised as an expository advance organiser (Woolfolk et al., 2013). An example of an expository advance organiser can be to provide an overview of a complex text which explains the most important concepts. Second, the activation of prior knowledge to bridge the gap between known and unknown information (Mohammadi et al, 2010), this can be categorised as a comparative advance organiser (Woolfolk et al., 2013). An example of a comparative advance organiser can be to show a short clip that introduces the theme before reading a complex text. Mayer (2014) explains that the process of integrating selected material with already known information builds stronger connections and helps to coordinate the integration process of information, because it involves activation of knowledge in the long-term memory to the working memory.

In relation to language learning, presenting advance organisers are proven to be effective (e.g., Feng Teng, 2020; Mohamaddi et al., 2010; Vandergrift 2007). Vandergrift (2007) mentions that an organiser helps to build a connection between prior linguistic and content knowledge and the working memory. It allows learners to activate relevant prior knowledge and therefore the integration of new information into their linguistic repertoire will become easier. This is in line with Plass and Jones (2005) who state that learners acquire a (second) language better when they view an advance organiser before receiving further input in reading or listening activities. Also, advance organisers that are presented in visual and verbal modes are more effective than solely in verbal mode (Herron et al., 1995; Plass & Jones, 2005). More recent research has also shown positive effects of using an advance organiser and vocabulary learning. The research of Feng Teng (2020) showed better results in learning vocabulary with the advance organiser than without. This study was conducted with young Chinese pupils who are learning English as a second language and who were given an advance organiser as a short video, with highlighted captions of important words in Chinese. The research of Shoari and Farrokhi (2014) has also shown positive results regarding learning gains in vocabulary learning and the use of an advance organiser. They used a graphic organiser in the form of clusters and pictures for a group of Iranian pupils (aged eight-thirteen) who are learning English as a foreign language. According to Shoari and Farrokkhi (2014) making use of the pictures helped the pupils to have an imagination of new words and the cluster of words helped to learn words in a form that when they could not remember one word, with recalling the cluster related to that word, they recalled the missing word through the connection of the words in the cluster.

Presenting the information in an advance organiser

The current body of research used multimedia instructions in the design of the advance organiser (e.g., Feng Teng, 2020; Shoari & Farrokhi, 2014). According to the Cognitive Theory of Multimedia Learning by Mayer (2021), multimedia presentations are more likely to result in meaningful learning than single-medium presentations. This is derived from the dual channel assumption in which it is proposed that humans possess separate systems for processing visual and verbal information (Mayer & Moreno,

2002). This theory introduces two ways in which humans process non-verbal and verbal information. Words and sentences are processed and encoded in the verbal system, while images are processed and encoded in the non-verbal system. Verbal and non-verbal information are processed independently in the working memory and, therefore, the information is stored twice in the long-term memory (Clark & Paivio, 1991). Another advantage of incorporating multimedia instruction is that words and pictures can complement each other, and that human understanding is enhanced when learners are able to mentally integrate visual and verbal representations (Mayer, 2021). In relation to vocabulary learning, Moody and colleagues (2018) elaborate on the DCT and argue in a review paper that only providing verbal information may lead to shallow understanding and that visual support is essential in vocabulary instruction.

When designing a multimedia environment there are several design principles that should be considered in order to optimise the learning material (Mayer, 2021). However, in relation to second language vocabulary learning, it is particularly interesting to further investigate the redundancy principle for reducing cognitive load for the learner. The redundancy principle states that redundant material interferes with learning, and this occurs when the same information is presented in multiple forms (Mayer, 2001). In other words, people learn better from pictures and narration than from pictures, narration, and on-screen text, because written on-screen text and pictures are both processed via the visual channel. However, there are some contradictory findings in the current body of research. On the one side researchers found that elimination of the redundant information may enhance learning (e.g., Kalyuga et al., 1999; Moreno and Mayer, 2002; Leahy et al., 2003). On the other hand, two lab experiments of Mayer and Johnson (2008) showed that adding redundant text to narrated graphics resulted in improvements on retention of verbal material. They explain that in three ways. First, the on-screen information must be short, this might guide essential processing and not creating extraneous processing. Second, the on-screen text was placed near the corresponding graphic, this also intends to minimise extraneous processing and guiding the learner's attention. Third, the use of static illustrations instead of motion in animations may

be helpful for directing the learner's attention since there are no motion cues that also need attention from the learner (Mayer & Johnson, 2008). Furthermore, Mayer and Johnson (2008) mention three exceptional situations in which the redundancy principle may not apply. One of these situations is when learners must exert much greater effort to comprehend the spoken text than the on-screen text and as suggested by Mayer and Johnson (2008) this might be the case when the spoken text is not in the learner's native language. Research from Ari and colleagues (2014) also indicated that on-screen text caused better learning results, especially for complex learning material. Noteworthy is that the experiments of Mayer and Johnson (2008) and the research of Ari and colleagues (2014) were not related to second language learning. However, research from Toh and colleagues (2010) and Samur (2012) support that not eliminating redundant information enhances retention of second language word learning on short term. Toh and colleagues (2010) found that Yemeni college students who were exposed to the redundant mode in English vocabulary learning outperformed their peers in the non-redundant mode. They explained that the on-screen text helped the students to make more sense of the narration instead of causing cognitive overload. Also, the on-screen text helped to identify the complex words. The research of Samur (2012) showed equivalent results, where American students learning Turkish performed significantly better when they were exposed to redundancy mode than the students who were not exposed to redundancy. Important to consider is that for both researches the focus was not on the design of an advance organiser. Besides, the setting was based on foreign language learning instead of second language learning.

Present study

Since not removing redundant information (i.e., not removing on-screen text in combination with narration and pictures) in L2-vocabulary-learning can potentially lead to better immediate learning results for students learning a *foreign* language, this study aimed to examine if this effect will also exist for children and teenagers learning a *second* language. Also different from previous research, is that the present study will test the effect in information being presented in an advance organiser as opposed to test the effect in (digital) exercises. Considering that the mother tongue might also influence these results, it is

important to examine this effect as well. The results of the study can contribute to the current body of research about implementing an advance organiser for L2-vocabulary-learning and more specifically how information can be best presented to the learners. Therefore, the present research used a quasi-experimental pre-test-posttest-posttest research design to investigate the effect of the advance organiser, redundancy, and mother tongue. The following research questions, and hypotheses are constructed.

> ***RQ1.*** To what extent does presenting a redundant advance organiser improve the word retention for children learning a second language and to what extent are there differences if information is presented in a redundant- or non-redundant way?

Hypothesis 1. Research is to some extent inconclusive whether redundant information impedes or fosters second language learning (e.g., Mayer, 2014; Mayer & Johnson, 2008), but for this study it is expected that a positive result will be found when analysing pre- and post-tests results for participants within the redundant condition. So, the advance organiser with redundant information will have a positive influence on the learning gains. This is based on the existing body of research that showed a positive effect of implementing an advance organisers for L2-learning (e.g., Plass & Jones, 2005; Mohammadi et al., 2010; Feng Teng, 2020). In elaboration, it is also expected that when comparing the two groups, the redundant group will outperform the non-redundant group. This was already proven in some previous studies for *foreign* language learning (e.g., Toh et al., 2010).

> ***RQ2.*** To what extent does the score on word retention differ if the mother tongue of the participants belongs to the Indo-European language family versus a mother tongue in the non-Indo-European language family?

Hypothesis 2. It is expected that NT2-children with an Indo-European mother tongue will score better than NT2-children with a non-Indo-European mother tongue, because there is a stronger interdependency when comparing Dutch to another Indo-European language than comparing Dutch to a non-Indo-European language. Research shows that it will become more difficult to learn a second language if this

language differs excessively from the mother tongue (Melby-Lervåg & Lervåg, 2011). Previous research of Toh and colleagues (2010) also explained that learners were able to make more sense of the narration due to the on-screen text. Therefore it is also expected that specifically participants with an Indo-European mother tongue and in the redundant condition would score better due to a closer linguistic distance and consequently that the on-screen text was more helpful to them than for other participants, because it caused less cognitive load.

Context of the study

The context of the current study is based on a NT2-programme *Horen, Zien en Schrijven* (translated into 'To hear, to see and to write') intended for children aged six to twelve years who are just learning Dutch. So, the target group of the programme are newcomer-children in the Netherlands. This entails a diverse group of learners. For example, asylum seekers, children from expat parents or children who are coming to the Netherlands for family reunification. The programme is a product of Bazalt, a Dutch educational publisher. The material consists of thirty-two workbooks, compact-discs and a digital platform that focus on vocabulary development, word-formation, and sentence-formation. The learning materials are divided in different themes (e.g., 'school,' 'health') and different levels (i.e., level one is the easiest level, level four is for more advanced learners). Children are supposed to practise with the workbooks and the compact discs first before they start working with the digital platform. Currently Bazalt is at the verge of revising and optimising the whole programme. Concerning the digital platform, they expressed a wish to offer more context to the learners and to connect the workbooks more to the online learning platform in a way that is beneficial for the learning outcomes.

Method

Participants

In total 40 (20 female, 20 male) NT2-children completed the study. The average age of the participants was 13.3 years old (*SD* = 2.8, range 8-17 years*)*. The division of non-Indo-European and Indo-European was consequently 60% (*N* = 24) and 40% (*N* = 16). All participants were enrolled in a so-called language class. These classes are specifically for newcomers where the focus is on learning Dutch more explicitly and intensively compared to a regular class. More specifically, the participants of this study are children from the age of eight who are joining Dutch primary or secondary education. The participants have at least three months experience in learning NT2 and maximum one school year. Since the participants are minors, the parents and/or caregivers gave their consent to participate in this study.

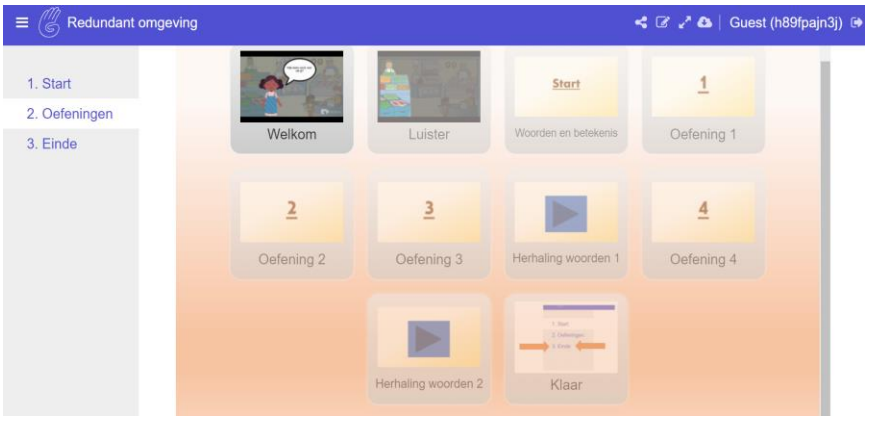
In total, three language classes of two different language schools participated in this study. One group was a class in primary education and two groups were classes in secondary education. All participants already made use of the method of Bazalt. Beforehand, the participants were randomly assigned to one of the two conditions: 1) the group with the redundant advance organiser and 2) the group with the non-redundant advance organiser. Afterwards, one participant was excluded from the dataset because the participant did not participate in the second post-test.

Instruments

Learning environment. A digital learning environment for both conditions was designed where the elements of the experiment were incorporated. Participants were able to access the website via a specific link. On the page named '*Start'* participants were able to fill in the pre-test. On the page named '*Oefeningen' (*exercises, see for an example figure 1) the participants were presented with the advance organiser and the exercises. On the last page named '*Einde' (*end*)* participants were able to fill in the first post-test. The second post-test was not incorporated into the learning environments.

Figure 1.

Example of the 'Oefeningen'-page in the redundant learning environment.



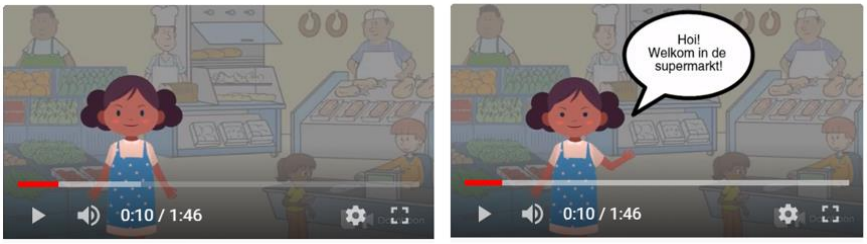
Advance organiser. In order to activate prior knowledge and to introduce the theme to the participants an advance organiser was implemented. This consisted of two short clips: a comparative advance organiser and an expository advance organiser. When the participant entered the '*Oefeningen'*-page and clicked on the highlighted picture, the clip with the first part of the advance organiser started automatically. After watching the first part and re-entering the page, the other picture was automatically highlighted. When the participant clicked on the new highlighted picture, the second part started.

The comparative advance organiser involved storytelling. This entailed a short clip (1 minute 46 seconds) introducing the supermarket theme, because as suggested by the NT2-specialist it must be clear from the start what the central theme of the clip is (Personal communication, October 26, 2021). There were two main elements: a general introduction about the theme and an introduction to a subtheme. Within each element there was an introductory sentence and a question that the participants can answer for themselves. An example of the introductory sentence was 'Hi and welcome to the supermarket!' and an example of the subsequent think-question was 'Look around, what do you see?' (See appendix D for an overview of all the elements). For the redundant group, the sentences are read aloud in Dutch and there was on-screen text available. The on-screen text was simultaneously available with the spoken text and

the on-screen text disappeared automatically when the spoken text was finished. Also, only one sentence was shown at a time. For the non-redundant group, there was no on-screen text visible (see for an example figure 2).

Figure 2.

Screenshots of the first part of the advance organiser for both conditions

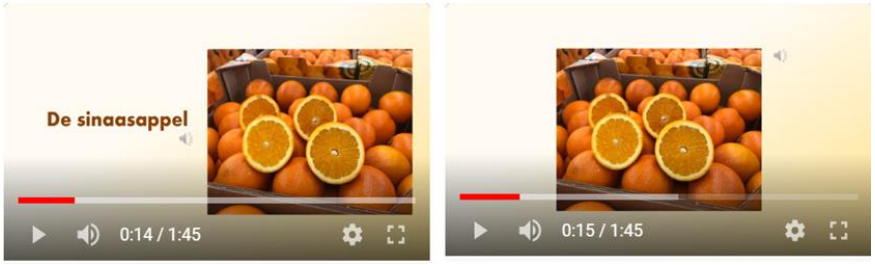


Note. The left picture is an example of the non-redundant advance organiser, right is an example of the redundant advance organiser.

Second, the expository advance organiser. This advance organiser was also presented as a short clip (1 minute, 45 seconds). It involved presenting new information, the Dutch target words, while connecting this information to the first advance organiser. This was done by structuring the new target words to an introduced sub-element as introduced in the first clip (e.g., showing the cartoon of 'the bakery' again and then presenting the Dutch target words connected to the theme). The target words were presented with a picture and spoken text (and for the redundant condition, the on-screen text was available as well).

Figure 3.

Screenshots of the second part of the advance organiser



Note. The left picture is an example of the non-redundant advance organiser, right is an example of the redundant advance organiser.

Words and exercise. In total nine words were selected for this study. These words were connected to the theme 'Supermarket' (Appendix C). The words were selected from the Digiwak 2.0 wordlist for newcomers and from the regular wordlist. Digiwak provides an online overview of words that children must at least know and master during primary education (Kuiken et al., n.d.) The selected words were also checked and approved by the NT2-specialists (personal communication, January 24, 2022).

Although a new digital learning environment was created for this research, the exercises are based on the Bazalt programme. Before the exercises started, the words, the pronunciation, and meanings were first demonstrated in a clip. After this clip, the participants did six different vocabulary exercises. In four exercises the nine words were all practiced at the same time in the other two exercises the words were divided among two exercises.

Vocabulary tests. The goal of the vocabulary tests was to measure whether participants had knowledge of the target words by means of a multiple-choice test. Two versions of the test were developed that measured all nine target words in a pre- and a post-test. The first and second post-test used the same items. The only difference in the post-tests was the order in which the vocabulary questions were presented. Both tests started with some general demographic questions (e.g., gender, age, and mother tongue) and after this, the vocabulary test started. No indication if an answer was answered wrong or correctly was given to the participants. The tests differed from each other to some extent.

In the pre-test twelve items were incorporated that measured vocabulary knowledge. Besides the nine target words in the pre-test, three other easy Dutch words were incorporated to motivate the learner to proceed with the test as the nine target words might had a discouraging effect if a participant did not know many of them (personal communication NT2-specialist, January 24, 2022). These easy questions were shown after two or three questions with target words, in order to give the participant confidence to proceed with the test. In the post-test eighteen items were incorporated, where the target words were measured on two different elements (i.e., selecting the correct spelling of the word and meaning).

In the pre-test the target words were only measured once, six answer options were incorporated to reduce guessing effects (Elgort, 2013). One of the options was an in-doubt-emoticon, indicating that the participant does not know the answer. Two distractors were context-related, one distractor was not context-related, but had approximately the same length as the target word and the last distractor was spelled the wrong way (Appendix A). To measure vocabulary knowledge more extensively in the post-test (Appendix B), the target words were measured for finding the correct spelling of the word (i.e., selecting the correct spelling of a pictured word) and meaning (i.e., selecting the correct word corresponding to the picture). Since the words were measured twice, only four answer options were included. The distractors consisted for finding the correct meaning consisted of 1) a word in the same context and also a target word 2) a word in the same context, but not a target word and 3) a non-context related target word. The distractors for spelling consisted of 1) a word where vowels were changed or replaced by other vowels, 2) a word with a wrong consonant and 3) a word with incorrect vowels and consonants.

A final difference between the pre- and post-test was an additional question that was used in the pre-test to measure students' prior knowledge of the theme. Participants were asked to indicate in a yes- or no-question whether they have been in a supermarket before.

Procedure

The data collection of this study was fully conducted in an online environment. After a short classroom instruction by the researcher, the participants were able to start independently on the digital environment. In the classroom instructions, it was explicitly made clear that in the pre-test the participants were allowed to use the in-doubt-emoticon instead of guessing the right word. Besides in the instructions, it was made clear that the pre-test was not named as a 'test,' but as the first exercise. This was done in order to limit the test anxiety. Also, part of the classroom instruction was the division of the participants among the two conditions. This was done as equally as possible by splitting the class by half (e.g., the left

side of the classroom used the link that was first on the class board and the right side used the second link). First, they filled in the pre-test for approximately five minutes. Participants were not able to skip items. When the test was completed, the participants saw instructions to proceed with the other exercises. So, the participants moved to the advance organiser and the exercises. The exercises were presented in a fixed order and the participants were not able to skip exercises. This phase lasted for approximately 30 minutes. Lastly, the participants filled in the post-test immediately after completing the exercises, the duration was approximately 10 minutes. Again, this was being explained to the participants as the final exercise instead of a test. During this whole time (i.e., pre-test, experiment, and immediate post-test), the researcher was available in the classroom to help with possible technical difficulties and questions of the participants. Approximately five to seven days after the first post-test, the second post-test was conducted. Ideally, all groups would have done the second post-test on day seven, however, this was not possible due to the different classroom schedules. For the second post-test another link was distributed via the teacher among the participants. Due to the absence of the researcher during the second post-test, the researcher instructed the teacher on the day of the experiment and afterwards again via email.

Analytical approach and data analysis

In order to answer the different research questions, the data obtained from the different tests were moved from Qualtrics to IBM SPSS Statistics version 28 (IBM Corporation, 2021). Before proceeding with the analyses, new variables were created. Scores on the pre- and post-tests were calculated as follows: one point for a correct answer and zero points for an incorrect answer. For the post-test, that consisted of eighteen vocabulary items, the total score was divided by two to construct a mean score. Also, a new variable for post-test score was created. The new variable entailed the average score on the first and second post-test. Since there were nine target words in total, the participants were able to score nine points on all tests. After inspecting the results of the pre-test, it was decided to exclude another participant because the participant scored a full score on the pre-test. The score on prior knowledge was measured as follows: one point if the participant indicated that s/he has been in the supermarket before

and zero points if it was indicated that s/he has not been in the supermarket before. Results showed that all participants have been in the supermarket before.

The descriptive statistic showed for example a wide range for age. So, a Pearson's chi-square test of contingencies was conducted to assess whether there are differences between the groups that needed to be considered for further analyses. To assess the influence of the redundant condition, two different aspects were taken into account. First, the influence of condition within the group to assess whether there was a learning effect visible within the condition. Although the research question is specifically constructed for the redundant condition, differences within the group were also analysed for the non-redundant group since this might help to understand differences between the groups better. It was preferred to use a repeated measures ANOVA. However, the assumptions for normality were moderately to severely violated for each condition when assessing pre- and post-tests scores according to the Shapiro-Wilk test. As suggested by Allen and Bennett (2012) the Friedman ANOVA and follow-up pairwise Wilcoxon Signed Rank comparisons served as the alternative. After establishing the learning effect within the condition, differences between the conditions were analysed. Again, the assumption for normality were not met. So instead of using an independent samples *t*-test, the Mann-Whitney *U* test was being used. Second, to assess the influence of mother tongue (i.e., Indo-European and non-Indo-European) Mann-Whitney *U* tests were used to compare the differences of the group. Lastly, to further analyse the relationship between mother tongue and condition, results of four groups of participants (i.e., Indo-European + redundant; Indo-European + non-redundant; non-Indo-European + redundant and non-Indo-European + non-redundant) were compared with a Kruskall-Wallis ANOVA due to violations of the normality assumption.

Results

Demographic information and assessing its influence on condition and sub-group

Table 1 shows a summary of the demographic information in the two different conditions and its sub-groups. The first Pearson's chi-square test of contingencies (with $\alpha = .05$) found a non-significant result for age and condition (χ^2 (1) = 9.77, p = .461) and gender and condition (χ^2 (1) = 1.60, p = .206). Another Pearson's chi-square test of contingencies (with $\alpha = .05$) showed also non-significant relations between mother tongue and age (χ^2 (1) = 11,29, p = .335*)* and mother tongue and gender (χ^2 (1) = 1.67, p = .197).

Table 1

Distribution of demographics among condition and subgroups

Condition	Subgroup	Age *M (SD)*	Man (freq)	Female (freq)
Redundant (N = 20)	Indo-European	12.50 (.89)	2	6
	Non-Indo-European,	13.92 (.79)	6	6
	Total	13.21 (.84)	8	12
Non-redundant (N = 20)	Indo-European	12.13 (1.26)	4	4
	Non-Indo-European	13.83 (.65)	8	4
	Total	12.98 (.96)	12	8

Effect of condition on word retention within the group

To assess the influence of each condition (i.e., redundant and non-redundant) on the scores for the immediate post-test, the delayed post-test and the average score on the post-test, two Friedman ANOVA

and follow-up pairwise Wilcoxon Signed Rank comparisons were conducted. See Table 2 for a summary of the means and standard deviations for the different conditions.

The first Friedman ANOVA indicated that within the redundant group, the scores of the immediate, delayed and the average score on the post-test differed significantly when comparing these results with the pre-test results, $\chi^2_f = 45.28$ (corrected for ties), $df = 3$, $N = 20$, $p = <.001$. Follow-up pairwise comparisons with the Wilcoxon Signed Rank test and a Bonferroni adjusted α of .017 indicated that all comparisons (i.e., pre-test + immediate post-test; pre-test + delayed post-test and pre-test + average score on post-test) were statistically significant, with all large effect sizes as suggested by Cohen (1988), with *r* scores of respectively .90, .88 and .87.

The second Friedman ANOVA indicated that within the non-redundant group, the scores of the immediate, delayed and the average score on the post-test differed significantly when comparing these results with the pre-test results, $\chi^2_f = 45.49$ (corrected for ties), $df = 3$, $N = 20$, $p = <.001$. Follow-up pairwise comparisons with the Wilcoxon Signed Rank test and a Bonferroni adjusted α of .017 indicated that all comparisons (i.e., pre-test + immediate post-test; pre-test + delayed post-test and pre-test + average score on post-test) were statistically significant, with all large effect sizes as suggested by Cohen (1988), with *r* scores of respectively .88, .86 and .87.

Effect of condition on word retention between the groups

To test the effect of condition, the following two groups of participants were compared: 1) all participants in the redundant group (i.e., with an Indo-European and a non-Indo-European mother tongue) and 2) all participants in the non-redundant group (i.e., with an Indo-European and non-Indo-European mother tongue). Three Mann-Whiney *U* tests were conducted.

The first Mann-Whitney *U* test indicated that the score on the immediate post-test for participants in the redundant condition ($MR = 21.65$, $N = 20$) did not significantly differ from the pre-test scores in the

non-redundant condition (*MR* = 19.35, *N* = 20), *U* = 177, *z* = -.632 (corrected for ties), *p* = .527, two-tailed.

The second Mann-Whitney *U* test indicated that the score on delayed post-test for participants in the redundant condition (*Mean Rank* = 24.63, *N* = 20) did significantly differ from the pre-test scores in the non-redundant condition (*Mean Rank* = 16.38, *N* = 20), *U* = 117.5, *z* = -.2.29 (corrected for ties), *p* = .022 two-tailed. This effect can be described as medium (*r* = .36) according to Cohen (1988).

The last Mann-Whitney *U* test indicated that the average score on the post-tests for participants in the redundant condition (*Mean Rank* = 24.18, *N* = 20) did significantly differ from the pre-test scores in the non-redundant condition (*Mean Rank* = 16.38, *N* = 20), *U* = 126.5, *z* = -2 (corrected for ties), *p* = .045, two-tailed. This effect can be described as medium (*r* = .32) according to Cohen (1988).

Table 2

Means and standard deviations for condition on pre- and post-test scores

Variable	**Redundant condition**	**Non-Redundant condition**	
	M (SD), *p*-value within condition	*M (SD)*, *p*-value within condition	*p*-value between conditions
Score pre-test	3.65 (1.55)	3.55 (1.90)	.650
Average score post-test	7.55 (.89) <.001	7.12 (.80) <.001	.045
Immediate post-test	7.73 (1.12) <.001	7.43 (1.50) <.001	.527
Delayed post-test**	7.34 (.90) <.001	6.90 (.80) <.001	.022

Note. Scores value from 1-9, with higher scores indicating a higher word knowledge *N* = 20. Tested with α .05. ** The delayed post-test was conducted five to seven days after the experiment

Effect of mother tongue

To test the effect of mother tongue, the following two groups were compared with three Mann-Whitney *U* tests: 1) participants with an Indo-European mother tongue in the redundant and non-redundant condition and 2) participants with a non-Indo-European mother tongue in the redundant and non-redundant condition. None of the tests showed a significant result (See Table 3 for a summary of the results). So, the score on the pre-test did not differ for participants with an Indo-European mother tongue and participants with a non-Indo-European mother tongue (U = 183.5, z = -.454 (corrected for ties), p = .659, two-tailed. Consequently, no differences were found for the immediate post-test (U = 140.5, z = -1.44 (corrected for ties), p = .157, two-tailed), the delayed post-test test (U = 156.0, z = -1.02 (corrected for ties), p = .331, two-tailed), and the average score on the post-tests (U = 176.50, z = -.43 (corrected for ties), p = .672, two-tailed.

Table 3

Means and standard deviations for mother tongue on pre- and post-test scores

Variable	**Indo-European**	**Non-Indo-European**	
	M (SD)	*M (SD)*	*p*-value
Score pre-test	3.50 (2.00)	3.75 (1.90)	.659
Average score post-test	7.34 (.99)	7.34 (.81)	.672
Immediate post-test	7.75 (1.63)	7.49 (1.07)	.157
Delayed post-test**	7.34 (1.06)	7.22 (.86)	.331

Note. Scores value from 1-9, with higher scores indicating a higher word knowledge N = 20. Tested with α .05. ** The delayed post-test was conducted five to seven days after the experiment

Effect of mother tongue and condition

A Kruskal-Wallis ANOVA indicated that there were no significant differences found between the scores on the pre-test and post-tests for participants with 1) an Indo-European mother tongue and in the redundant conditions, 2) an Indo-European mother tongue and in the non-redundant condition 3) a non-Indo-European mother tongue and in the redundant condition and 4) a non-Indo-European mother tongue and in the non-redundant condition. For example, when comparing the average score on the post-test, the analysis showed the following results: H (corrected for ties) = 4.22, df = 3, N = 40, p = .234. Table 4 shows a summary of means and standard deviations on the average score of the post-test (see Appendix E for tables with means and standard deviations for the other test results).

Table 4

Means and standard deviation on average score of post-test for condition and mother tongue

Mother tongue **Condition**	**Indo-European *M* *(SD), N***	**Non-Indo-European *M* *(SD), N***	**Total *M* *(SD), N***
Redundant	7.63 (.29) *N* = 8	7.50 (.28) *N* = 12	7.55 (.20) *N* = 20
Non-Redundant	7.06 (.45) *N* = 8	7.19 (.17) *N* = 12	7.14 (.19) *N* = 20
Total	7.34 (.27) *N* = 16	7.34 (.16) *N* = 24	

Note. Scores value from 1-9, with higher scores indicating a higher word knowledge

Discussion and conclusion

The aim of this study was to provide insight in how to optimise digital learning environments for children learning NT2-vocabulary by implementing an advance organiser and assessing the effect of redundancy (i.e., offering information via speech, text, and pictures versus offering information via speech and pictures) and also exploring the possible effect of the mother tongue on the learning results. The results first showed that providing an advance organiser with redundant information does significantly improve the vocabulary learning results within the condition. In addition, when analysing the two distinct groups, the results indicated that the participants in the redundant group scored significantly higher on the average score on the post-test and on the long term than the participants in the group where there was not on-screen text available. Second, the study investigated the effect of mother tongue on the learning results, but the results did not found an effect for mother tongue.

Effect of the advance organiser and condition

Using an advance organiser as a form of L2-vocabulary-instruction has proven to be effective according to previous research (e.g., Feng Teng, 2020 Mohammadi et al., 2010; Shoari & Farrokhi, 2014). The findings of the present research are in line with this, since learners in both conditions (i.e., redundant and non-redundant) score significantly better when comparing the results of the pre- and post-vocabulary tests within each condition. As opposed to previous research that tested solely the immediate effect of an advance organiser in L2-learning (e.g., Feng Teng, 2020; Shoari & Farrokhi, 2014) or solely the delayed effect (Mohammadi et al., 2010), the present study showed positive the effects of the advancer organiser immediately and after a longer term. In addition, previous research was more focused on providing an organiser for plenary classroom instructions, without using multimedia instructions incorporated in a digital word-practise environment (e.g., Mohammadi et al., 2010; Shoari & Farrokhi, 2014). The results of the present study confirmed to the small body of current research (e.g., Feng Teng,

2020) that implementing an organiser in a digital environment, where young L2-learners work independently on so-called drill-exercises is effective as well.

Besides looking into the results within the condition, there was also a comparison made between the conditions, because the current body of research is divided. The main body of research shows that eliminating redundant information enhances learning (e.g., Kalyuga et al., 1999; Leahy et al., 2003 Moreno and Mayer, 2002). However, a small body of research found that the opposite, not eliminating redundant information, can be helpful for specifically L2-vocabulary-learning. Implementing on-screen text helped learners to make more sense of the information presented in the second language (e.g., Samur, 2012; Toh et al., 2010). The results of the present study were mostly in line with the findings of research in L2-learning and redundancy (e.g., Samur, 2012). As expected, the results of the present research showed a positive effect of not eliminating redundant (i.e., on-screen text) on the average score of both post-tests and the delayed post-test. Different from previous research is that the focus was on *foreign* language learning, where the group of participants was quite homogenous in terms of mother tongue. The present student indicated that redundancy can foster learning effects for primary and secondary pupils in the context of *second* language learning. However, these results should be interpreted with some caution, since the effect was not found for the immediate results. Even though the results of the immediate vocabulary test indicated a higher score for the redundant group, the effect was not statistically significant. This might be explained by a biased result in both conditions due to a combination of the testing time and recency effects. That is the effect when most information is best remembered at the end of a learning period (Polyn & Kahana, 2008). In the present research, the first post-test was immediately after finishing the last vocabulary exercise. Also, the last exercise included a repetition of five of the nine target words. To reduce the recency effect a distractor exercise or element can be helpful (Polyn & Kahana, 2008). So, instead of directly proceeding with the post-test, implementing another exercise that did not include any of the nine target words might have been helpful to prevent the effect of recency to some degree.

Effect of mother tongue

Research showed that the mother tongue participants influence L2-learning (Melby-Lervåg & Lervåg, 2014). Also, when there is a longer linguistic distance between the first and second language, it is expected that learning the L2 will be more difficult (Schepens et al., 2013). Therefore, it was expected that learners with an Indo-European mother tongue outperformed the learners with a non-Indo-European mother tongue. Besides this overall effect of comparing the two groups, it was also expected that this result would have been visible when condition was taken into account as well. Previous research of Toh and colleagues (2010) explained that learners were able to make more sense of the narration due to the on-screen text. Therefore, it was expected that specifically participants with an Indo-European mother tongue and in the redundant condition would score better.

However, no effects of mother tongue were found when comparing the two groups in general nor effects were found when taking into account condition as well. This might be explained by the research design choice in this study to classify the mother tongues of the participants as either Indo-European or non-Indo-European. In other words, in the present research the differences among the mother tongue of participants nor the language distance to Dutch was not taken into consideration. This might have led to biased results. The Indo-European language family consists of many different sub-language families (Melby-Lervåg & Lervåg, 2014) and these languages all have a different language distance to Dutch. Therefore, another classification of mother tongue in the present research might have led to other results. For future research specifically investigating the effect of redundancy and the influence of the mother tongue, it might be interesting to classify mother tongue otherwise while keeping into account the language distance to the target language.

Limitations and future research

Some of the results of the present research were in line with the expectations, however there are some limitations of the present study that should be considered when reading the conclusions. Based on these limitations some possible directions for further research are suggested.

Noteworthy in the present study is that the initial target population was NT2-children from the age of eight and who were joining primary education. However, due to internal COVID-regulations and protocols at primary schools it was not possible for a lot of the initially contacted schools to attend this study. Consequently, a secondary school with newcomer-classes was contacted. Eventually two secondary newcomers classes and solely one primary newcomer class participated in this study. Although all participants were learning Dutch for more than three months, the age of the participants was higher than the average age of children in primary education. A limitation might have been, that the target words were selected from lists for primary education and not secondary education. Hence, this might have led to some words being easier to learn than first expected, because the prior knowledge of the participants regarding the target words may differ. To illustrate, the word 'banknote' (i.e., '*bankbiljet'* in Dutch) may be completely new for an 8-year-old whereas the word is already known in the mother tongue for a 15-year-old. And as research shows, the process of relabelling of already known words is one of the main procedures for second language learners and more adult L2-learners often rely on their pre-existing semantic system (Jiang, 2004). Since there is a variety among the participants and the relatively small sample size, it might be interesting for future research to conduct a similar study with a learning environment for either participants in primary- or secondary education with target words that suit their educational level and prior knowledge. Besides, it is also desirable to recruit more participants to enlarge the external validity and to make the results more generalisable.

In the present study, the focus of the vocabulary test was on the retention of words. Conclusion about meaningful learning as described by Mayer (2021) can not be drawn, since transfer was not measured. In the post-tests this has led to measuring the words only on receptively for word form

recognition and the sub-aspect spelling (i.e., were participants able to select the right spelling of the word) and word meaning (i.e., were participants able to select the right meaning of the word corresponding to the picture that was shown). The present study left out word use (e.g., where, when and how can you use the word). In order to measure word knowledge correctly it is desirable to measure all aspects and corresponding sub-aspects (Nation, 2011). Due to limited time constraints, it was not possible to incorporate all aspects and therefore word knowledge should be interpreted with some caution in the current study. Hence, for future research it is desirable to create an environment where all aspects can be practised and consequently tested in order to draw more firm conclusions about the improvement of word knowledge.

In the pre-test, the focus was on measuring prior knowledge of the target words instead of measuring the general ability of the Dutch language. Due to limited time constraints, it was not possible to measure both and as previous research of Leeuwestein and colleagues (2020) showed, measuring the target words served as appropriate way to draw conclusions about the (target) word retention for a diverse group of participants. However, for future research it is desirable to have knowledge of the Dutch language ability of the participants. For example, by collecting this information via the teacher or to incorporate this in the pre-test as well. The reason for this is that when incorporating this as a variable, more firm conclusions can be drawn since differences in language abilities might cause other results (Webb, 2020). Mayer (2014) highlights that individual differences are an important consideration in the instructional design of instruction, because what low-knowledge learners help might hinder more advanced learners. This is also in line with Schmitt's argument (2008) that vocabulary education should be adapted to the proficiency level of the learner.

Implications for theory and practice

Despite the limitations of the current study, the present research showed that implementing an advance organiser with (and without) redundant information had a positive impact on the learning gains.

This can be useful for educational designers and NT2-teachers in primary and secondary education who already use digital drill-and-practice word games without a meaningful context. Designers or teachers can think of creating an advance organiser for the learners to obtain better learning results. Especially since there is a need for newcomers to practise with Dutch vocabulary as soon as possible to not fall behind their Dutch peers. When implementing an advance organiser, it can be helpful to show information via on-screen text, speech, and visual support. Although no immediate effects were found, the group that was offered the information in this way did outperform the other group on average and on the delayed post-test.

Regarding the scientific impact of the study, this was the first study that investigated the effect of redundancy in an advance organiser for second language learning and thereby combining theoretical insights from vocabulary-, multimedia- and second language learning. Previous studies have investigated the effect of an advance organiser in second language learning (e.g., Mohamaddi et al., 2010) but not for a more specific online setting with drill exercises. Previous studies already showed that leaving out redundant information is beneficial for second language learners (e.g., Toh et al., 2010; Samur, 2012), but this seems to be the first study investigating the effect of redundancy in a newcomers' class where learners do not share the same mother tongue and more specifically, this seems to be the first study investigating the effect of redundancy in an advance organiser for second language learners.

Conclusion

The present study has provided support that the implementation of a redundant advance organiser is beneficial for digital word learning, where learners work independently on so-called drill-exercises. This beneficial effect was found immediately after practise, but also a few days later. The results of the redundant advance organiser were on average higher than the results in the non-redundant advance organiser. Implicating that NT2-learners benefit from the information in the advance organiser that is presented via speech, on-screen text, and pictures/animations. However, this benefit was only found a few

days after practise and on the average score, so no immediate effects were found. This might be attributed to recency effects. Also, no effect was found for mother tongue or for mother tongue and condition. This could be interpreted as that mother tongue has no influence on the results. However, future research focusing more on language distance is needed to investigate whether this finding can be supported or not.

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Appendices

Appendix A– Vocabulary test 1: pre-test

The pre-test was provided in Dutch, therefore the questions are presented in Dutch.

General introduction / algemene introductie

Welkom! Je gaat zo een oefening doen.

Eerst geef je antwoord op een paar vragen. Dan zie je 13 foto's. Geef aan of jij het Nederlandse woord kent of niet kent.

General demographic information/ Algemene informatie

1. Ik ben een...
- Jongen
- Meisje

2. Hoe oud ben jij (open question)

3. Welke taal spreek je thuis?

- Arabisch
- Turks
- Dari
- Tigrinya
- Kurdisch,
- Pools
- Belarussisch
- Bulgaars
- Roemeens
- Engels
- Pashtu
- Mandarijn
- Amhaars
- Hindi
- Berber
- Punjabi
- Hebreeuws
- Een andere taal (> follow up question: welke taal spreek je thuis?)

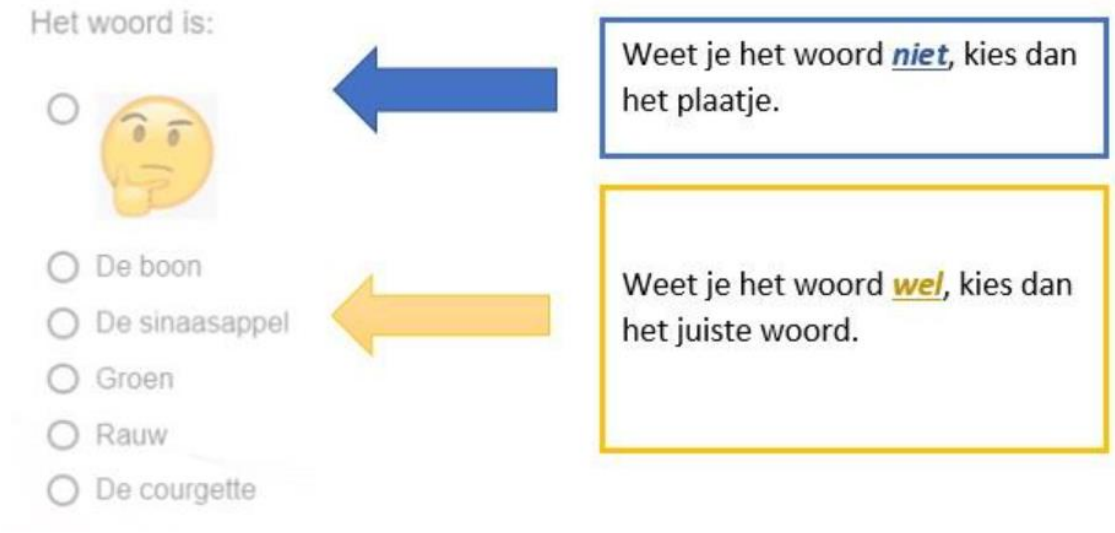
Prior knowledge/ voorkennis

4. Ga jij wel eens naar de supermarket? (+ showing pictures of a supermarket)

- Ja
- Nee

Vocabulary knowledge introduction – introductie over woordkennis

Uitleg: Je ziet zo een plaatje. Kies het goede Nederlandse woord.



Vocabulary knowledge / woordkennis

5. (showing picture of beans) Het woord is :

- Boom
- In-doubt-emoticon
- Boon
- Sinaasappel
- Groen
- Rauw

6. (showing picture of bread crumbs) Het woord is:

- Stokbrood
- Kruimels
- In-doubt-emoticon
- Koek
- Bankbiljet
- Kreemals

7. (showing picture of a banknote) Het woord is:
- Benkbiljat
- Bankbiljet
- In-doubt-emoticon
- Prijskaartje
- In de rij staan
- Pinpas

8. (showing picture of an apple) Het woord is:
- Zak
- Appel
- Vlees
- Tas
- In-doubt-emoticon

9. (showing picture of a chicken leg) Het woord is:
- Stokbrood
- Kippenpoot
- In-doubt-emoticon
- Rauw
- Slager
- Koppenpoot

10. (showing picture of a pricetag) Het woord is:
- In-doubt-emoticon
- Prijskaartje
- Uithangbord
- Bankbiljet
- Stokbrood
- Prijspaartje

11. (Showing picture of a bag) Het woord is:
- Tas
- Kar
- In-doubt-emoticon
- Appel
- Peer

12. (showing picture of raw meat) Het woord is:
- In-doubt-emoticon
- Koud
- Rauw
- Kippenpoot
- Kruimels
- Rauv

13. (showing a picture of standing in line at the register): de woorden zijn
- In de rij staan
- Omhoog kijken
- In-doubt-emoticon
- Prijskaartje
- Lopen
- Im de rij staam

14. (showing a picture of bananas). The word is
- In-doubt-emoticon
- Tas
- Prijskaartje
- Banaan
- Appel

15. (showing picture of oranges) The word is

- Citroen
- Sinaasappel
- Mango
- In-doubt-emoticon
- Stokbrood
- Sineesappel

16. (showing picture of a baguette) The word is:
- Cucumber
- Stokrood
- In-doubt-emoticon
- Kruimels
- Sinaasappel
- Stokbraat

< the end/instructions to proceed - einde + instructies om naar de volgende pagina te gaan >

Goed gedaan. Ga door naar 2. Oefeningen

Appendix B – Vocabulary test 2 – post-test

The post-test was provided in Dutch, therefore the questions are presented in Dutch. This post-test was conducted twice. Once directly after the experiment and once several days after the experiment. The items and answer options for both tests were the same. However, small differences can be found in the introduction, ending and the sequence of the presented words. The basis of this appendix is the first post-test.

General introduction / algemene introductie
Bijna klaar!

Goed gewerkt. Nu nog de laatste paar vragen.

***Uitleg*:** Kies het goede Nederlandse woord.

General information/ Algemene informatie

1. Ik ben een...
- Jongen
- Meisje

2. Hoe oud ben jij (open question)

3. Welke taal spreek je thuis?

- Arabisch
- Turks
- Dari
- Tigrinya
- Kurdisch,
- Pools
- Belarussisch
- Bulgaars
- Roemeens
- Engels
- Pashtu
- Mandarijn
- Amhaars
- Hindi
- Berber
- Punjabi
- Hebreeuws

- Spanish
- Een andere taal (> follow up question: welke taal spreek je thuis?)

Word form recognition / woord vorm herkenning (spelling)

4. (picture of crumbs) Het woord is
- De kruimels
- De kriumels
- De kraimals
- De kruinels

5. (picture of beans) Het woord is
- De doon
- De boon
- De been
- De doom

6. (picture of banknote) het woord is
- Het dankbiliet
- Het dankbiljit
- Het bankbiljet
- Het bankbiljit

7. (picture of chicken leg) het woord is:
- De koppenpoot
- De kappenpood
- De kippenpood
- De kippenpoot

8. (picture of pricetag) het woord is:
- Het prijskaartje
- Het prijskuurtje
- Het preeskeerte
- Het prijspaartje

9. (picture of raw meat) het woord is
- Ruaw
- Rauw
- Raav
- Rauv

10. (picture of standing in line) de woorden zijn
- In de rij steen
- An de rij steen

- Im de rij staam
- In de rij staan

11. (picture of orange) het woord is
- De sinaaseppal
- De sinuuseppel
- Sinaasappel
- De sinaasabbel

12. (picture of baguette) het woord is
- het stokbraat
- het stocbbrood
- het stakbrood
- het stokbrood

Word meaning / woord betekenis

13. (picture of standing in line) de woorden zijn
- In de rij staan
- Lopen
- Het prijskaartje
- Het bankbiljet

14. (picture of raw meat) het woord is
- De kippenpoot
- Koud
- Rauw
- De kruimels

15. (picture of baguette) het woord is:
- De sinaasappel
- Het stokbrood
- Het deeg
- De kruimels

16. (picture of orange) het woord is:
- De boon
- Het stokbrood
- De sinaasappel
- De citroen

17. (picture of banknote) het woord is
- In de rij staan
- Het bankbiljet

- De pinpas
- Het prijskaartje

18. (picture of beans) het woord is
- De sinaasappel
- Rauw
- De boon
- Groen

19. (picture of crumbs) het woord is
- De kruimels
- Het stokbrood
- De koek
- Het bankbiljet

20. (picture of chicken leg) het woord is
- De kippenpoot
- Het stokbrood
- Rauw
- De slager

21. (picture of price tag) het woord is
- Het geld
- Het bankbiljet
- Het stokbrood
- Het prijskaartje

< The end/ het einde >

Appendix C – Target word selection

Subtheme	***Word in English***	***Word in Dutch and as used in the environment***	***Where the word can be found in Digiwak***
Vegetables and fruit	The orange	De sinaasappel	List for newcomers, first and second grade
	The bean	De boon	Regular list, second grade
Bakery	The baguette	Het stokbrood	List for newcomers, first and second grade
	The crumbs	De kruimels	List for newcomers, first and second grade
Butchery	The chicken leg	De kippenpoot	Regular list, first grade
	Raw	Rauw	Regular list, third grade
Cash register	Stand in line	In de rij staan	List for newcomers, kindergarten + first, second
	The banknote	Het bankbiljet	List for newcomers, first to sixth grade
	The pricetag	Het prijskaartje	List for newcomers, fifth and sixth grade

Appendix D – Explanations of the elements of the narrative advance organiser

Element	**Content**
General introduction - supermarket	English: Hi and welcome to the supermarket! Look around, what do you see? *Dutch:* *Hoi en welkom in de supermarkt!* *Kijk eens rond, wat zie jij?*
Vegetables and fruit	English: Here you can buy vegetables and fruit. Do you prefer to eat vegetables or fruit? *Dutch:* *Bij mij koop je groente en fruit. Eet jij liever groente of eet jij liever fruit?*
Bakery	English: Here you can buy bread. Do you like bread as well? *Dutch:* *Bij mij koop je het brood. Vind jij het brood ook lekker?*
Butchery	English: Here you can buy meat. Do you sometimes eat meat? *Dutch:* *Bij mij koop je het vlees. Eet jij wel eens vlees?*
Register	English: Here you can pay for groceries. Do you see the girl take the money from the wallet? *Dutch:* *Bij mij kun je de boodschappen betalen. Zie je dat het meisje het geld uit de portemonnee pakt?*

Appendix E – Means and standard deviations for effect of condition and mother tongue

Table 5

Means and standard deviation on pre-test score for condition and mother tongue

Mother tongue Condition	Indo-European *M (SD), N*	Non-Indo-European *M (SD), N*
Redundant	3.75 (1.67) *N* = 8	3.75 (1.54) *N* = 12
Non-Redundant	3.26 (2.31) *N* = 8	3.75 (1.67) *N* = 12

Note. Scores value from 1-9, with higher scores indicating a higher word knowledge

Table 6

Means and standard deviation on immediate post-test score for condition and mother tongue

Mother tongue Condition	Indo-European *M (SD), N*	Non-Indo-European *M (SD), N*
Redundant	8.06 (.94) *N* = 8	7.50 (1.21) *N* = 12
Non-Redundant	7.44 (2.15) *N* = 8	7.42 (.97) *N* = 12

Note. Scores value from 1-9, with higher scores indicating a higher word knowledge

Table 7

Means and standard deviation on delayed post-test score for condition and mother tongue

Mother tongue	Indo-European *M (SD), N*	Non-Indo-European *M (SD), N*

Condition		
Redundant	7.19 (1.00) *N* = 8	7.50 (.85) *N* = 12
Non-Redundant	6.69 (.80) *N* = 8	7.00 (.81) *N* = 12

Note. Scores value from 1-9, with higher scores indicating a higher word knowledge