Vocabulary and Learning Styles in Dutch EFL Education:

A Study of the Relation between Visual and Non-Visual Learning Styles and the Effectivity of WRTS.

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Abstract

In recent years, various innovations have been implemented to assist second or foreign language learners with vocabulary acquisition, including CALL-based tools. As CALL-based tools are widespread, the question arises as to whether they are effective, and if so, whether they are similarly effective for students of different learning styles. The present study has investigated whether Dutch secondary school students with different learning styles (visual versus non-visual learners) benefit from using the popular CALL programme WRTS to learn new English words. Thirty-One Dutch middle school students participated in this study. They were assigned to either the experimental group or the control group. Both groups underwent pre-testing, training and post-testing and filled in a learning style questionnaire. Prior to the test, participants' learning styles were determined by means of Reid's Perceptual Learning Style Preference Questionnaire. During the pre- and post-testing, the participants were tested on their knowledge of English vocabulary via the Peabody Picture Vocabulary Test IV. During the training, participants from the experimental group took part in a 40-minute WRTS training whereas participants from the control group received 40-minute writing training. We have found that using WRTS for learning vocabulary is indeed effective. However, significant differences in learning outcomes between visual and non-visual learners were not found in both the control and experimental group. These results suggest that WRTS can be implemented in teaching EFL as an effective training tool for both visual and non-visual learners.

Keywords: Learning Styles, Vocabulary, English as a Foreign Language Education, Computer Assisted Language Learning, WRTS.

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1. Introduction

Many language acquisition professionals have attempted to create or define the most effective vocabulary training method. A concise meta-analysis of these vocabulary acquisition methods can be found in the form of Stahl and Fairbanks (1986). Even though this meta-analysis has been written quite some time ago, the tactics and methods discussed are still relevant, even for today's digital society. Stahl and Fairbanks (1986) has heightened awareness on the attention given to vocabulary acquisition in secondary foreign language education. In the current curricula in the Netherlands, some attention is given to vocabulary attainment: in the first few years of secondary education, teaching materials and course books include word lists to be studied by students. However, the vocabulary provided is thematic and does not always classify as useful. In addition, students find storing vocabulary in their long-term memory challenging. Students themselves believe that these factors attribute to their troublesome low ranges of vocabulary attainment, which can hold them back when acquiring language skills.

Concerns regarding vocabulary attainment of English as a Foreign Language (EFL) students have been present for a long time (Richards, 1976; Mobärg, 1997). These concerns arose around the same time as a change in focus of second language education from grammar and vocabulary instructions (grammar translation method) to a more communicative approach. Language skills, such as reading, writing, speaking, watching, and listening, are now seen as equally or even more valuable than grammar knowledge and vocabulary attainment. EFL education in the Netherlands is an example of an educational programme

shifting its focus from grammar and vocabulary to language skills. In this new way of teaching, grammar and vocabulary only play a supporting role.

Another shift that has occurred in education in general is the individualisation of the teaching process (Oostdam, Peetsma & Blok, 2007). Groups of students are no longer seen as merely a group, but as a composition of a multitude of individual students, each with their own needs and preferences. Modern-day education, at least in the Netherlands, is characterised by a need for customisation (*maatwerk*) of all teaching, both materials and instruction (Witte, 2008). Moreover, students and their parents have become more aware of students' needs inside and outside the classroom. With this comes an increase in studies on the characteristics and needs of students as individuals.

One of the main fields of this newly arisen research is that of the studies of Individual Differences (IDs) of language learners. IDs of second language learners are most useful to take into consideration for many aspects of language teaching. It is generally accepted that IDs are markers for success in second language learning (Dörnyei & Skehan, 2003). Most literature on IDs focuses on language aptitude and motivation. Other fields of IDs studies include learning styles and learning strategies.

Many Second Language Acquisition (SLA) researchers have become fascinated by the phenomenon of learning styles. Learning styles have been defined by Oxford (2003) as "the general approach preferred by the student when learning a subject, acquiring a language, or dealing with a difficult problem" (p. 273). Different learning styles seem to call for different

approaches to learning or teaching. This is where the teacher's task of addressing students' learning styles comes in. In theory, addressing a student's learning style should help him/her create a better understanding of what is being taught (Pashler, McDaniel, Rohrer & Bjork, 2008).

Even though learning styles are deemed meaningful and fascinating by many people in the field of EFL, there are varying interpretations of the concept of learning styles and how they should be categorised. Moreover, there is not one learning style that is categorised as 'best' or 'worst' for learning a language – the student's success depends on what is offered to the student in relation to his learning style. Yet it must be noted that learning styles only make up a small part of the larger field of IDs (Dörnyei & Skehan, 2003), which suggests that a student's overall language attainment is influenced by more than merely learning styles. Nonetheless, it is best when students' individual learning styles are addressed when learning a foreign language, for example in the choice of teaching methods and teaching tools, to best address individual students' needs. To reach this goal, lately learning styles have become part of new developments in SLA, which include learning style questionnaires and inclusion of learning style factors in the now more digitally oriented curriculum development (van Kempen, Pieters & Voogt, 2013).

The consideration of learning styles in the design of new teaching materials and methods has gone hand in hand with a rise in the digital orientation of educational programmes. Over recent years, multimedia have increasingly been used for educational

purposes. Teaching materials are accompanied by electronic learning environments and some schools no longer work with pen and paper but with tablets or laptops. This has opened a whole new world of opportunities for the language teacher. No longer do teachers have to develop all extra teaching materials that are not included in the course book themselves, they can find and share inspiration online. Moreover, online educational apps and programmes have been developed, so that the student can engage in Computer Assisted Learning (CAL). For languages specifically, there are many games and apps available that promise to teach students a language, known as Computer Assisted Language Learning (CALL) programmes (Chapelle, 2007). Now, teachers can instruct students to work at home with a CALL programme when they need extra practice in certain areas of language acquisition. Still, CALL programmes need to be applied with caution, as their effectivity has not always been proven and may vary from student to student.

Since the focus of language education has shifted from grammar and vocabulary to a communicative approach and the training of language skills, vocabulary and grammar have been given a merely supportive role. What seems to have been forgotten, however, is that vocabulary is still vital for training communicatively able students (Mobärg, 1997). In the new communicative language learning setting, students are mainly left to themselves when having to acquire vocabulary. The individual nature of present-day second language vocabulary acquisition has given rise to profit and non-profit organisations which have developed a multitude of on- and offline training tools for vocabulary acquisition, with target

audiences ranging from kindergarten and primary school to higher education. Examples of these tools include Words & Birds, which mainly targets primary school students, and Duolingo, which focuses more on adults.

A programme that is widely used at secondary schools in the Netherlands is WRTS, a multi-function vocabulary training programme with over four million users (WRTS, 2018a; WRTS, 2018b). WRTS can be used by anyone with access to the internet and has an app and a website service. Using WRTS, students can choose to study vocabulary in multiple different ways, varying in difficulty, by means of visual presentation and reproduction. Most study options are based on translations of the target word from source language to target language. As many students use this programme, it is merely assumed that WRTS is effective for acquiring vocabulary. However, it is possible that learning output varies based on students' learning styles. For example, during WRTS training, students only receive visual input. The question arises as to whether visual learners may benefit more from training with this CALL tool than non-visual learners. This study was designed to determine whether students' preferred learning styles, categorised as either visual or non-visual, influence their learning output after working with WRTS. The specific research question is as follows:

Do students' preferred learning styles influence the effectivity of WRTS vocabulary training? If so, how do visual and non-visual learning styles affect the learning outcome using WRTS?

The findings of this study will contribute to the ever-growing body of research into EFL and SLA. It is feasible that conclusions on the influence of learning styles on the success of using WRTS will provide guiding lights for teachers to design their lessons and vocabulary training programmes.

To address the research question, the learning styles of havo 4th graders were analysed by means of standardised questionnaires and the number of words acquired after having worked 40 minutes with WRTS were compared between groups of learners characterised with different learning styles. The choice to focus on havo 4th graders in this study was made because in recent studies into educational contexts and tools, focus has often been on either the lower levels (*vmbo*) or the higher levels (*vwo*) of secondary education in the Netherlands. Consequently, we know little about the needs and workings of educational tools on this group of pupils.

The structure of this thesis is as follows. Chapter 2 will present a literature review, delving into learning styles, vocabulary acquisition tools, the Dutch EFL education programme, and the instruments used for this thesis. Chapter 3 describes the method used for testing participants' learning styles and vocabulary range and the WRTS training. In chapter 4, data will be analysed and results will be provided. Chapter 5 allows for a discussion of these results, followed by a general conclusion, recommendations and suggestions for future research.

2. Literature Review

2.1 Learning Styles

Following Dörnyei and Skehan (2003) and Oxford (2003), a learning style is defined as the predisposition to deal with learning situations or to process information (Dörnyei & Skehan, 2003; Oxford, 2003). For example, one student prefers to be presented with new information auditorily, in the form of a lecture, whereas another student likes to engage in activities to learn – so he prefers learning by doing. One of the main characteristics of learning styles is that no one style is better than the other but they merely have different strengths and weaknesses (Dörnyei & Skehan, 2003). Therefore, learning styles are both so attractive to SLA researchers and so crucial to teachers – every student should receive education befitting of his learning style to come to the greatest learning output. However, with so many different visions on learning styles, and different learning style categorisations, one is at a loss for the right course of action. In the following paragraphs, four commonly used learning style measures will be discussed.

One of the scholars who has addressed learning styles is David Kolb. The learning styles model he proposed, together with Alice Kolb, has become widely accepted and his learning style inventory has been widely used (Kolb & Kolb, 2013). Kolb and Kolb (2013) described a learning style as a "dynamic state" of "preference for the four phases of the learning cycle" (p. 9). Central to this paradigm is that every individual's learning style is different. Using the Kolb Learning Style Inventory (KLSI), individuals can be grouped into

having one of nine learning styles: initiating, experiencing, imagining, acting, balancing, reflecting, deciding, thinking, and analysing. Each learning style is derived from a kite-shaped pattern that is formed by the values of the "preferences of the four learning modes" on the x and y axis (Kolb & Kolb, 2013, p. 9). The four learning modes that Kolb and Kolb describe are *concrete experience, reflective observation, abstract conceptualisation,* and *active experimentation.* Each of these learning modes is represented in one of the two dimensions of the learning style graph; the x axis ranges from active experimentation on the left to reflective observation on the right whereas the y axis ranges from abstract conceptualisation on the lower end to concrete experience on the upper end (see Figure 1).

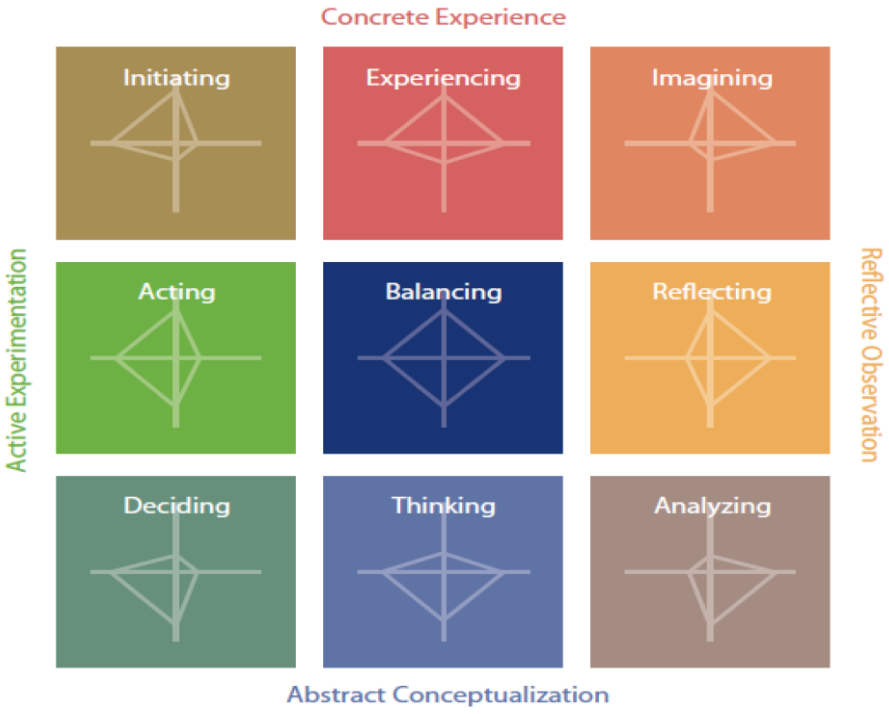

Figure 1: Kolb and Kolb's Nine Learning Styles (Kolb & Kolb, 2013)

After a person's preferences for each of the four learning modes are established, the value for each of these learning modes is resembled by a point on the axes, creating a kite-shaped pattern when connected. The balance between the major preferences and minor preferences for the learning modes, as resembled by the four points on the axes, determine the learning style, as can be seen in Figure 1.

A different approach is taken by Jan Vermunt, whose Inventory of Learning Styles (ILS) (Vermunt, 1994) has previously been used in higher education in the Netherlands (Boyle, Duffy & Dunleavy, 2003). The ILS differs from the KLSI in more than one way, but mostly the ILS defines learning styles based on processing, controlling, conceptualisation of learning and learning orientation, opposed to the four learning modes proposed by Kolb and Kolb. By using the ILS, students can be categorised into four different learning styles: meaning-directed, reproduction-directed, application-directed and undirected learning (Boyle et al., 2003). However, as Boyle, Duffy and Dunleavy applied Vermunt's ILS to British higher education in 2000, reliability concerns arose regarding the subscales of the ILS, as they were more variable for Boyle et al. (2003) than Vermunt's original figures proposed (Boyle et al., 2003, p. 287). Boyle et al. (2003) therefore recommends a reformation of the ILS to make it better suitable for diagnostic use (p. 287).

Richard Felder and Linda Silverman have received great praise for their work in the field of learning styles. Drawing from their own experience in engineering education and educational psychology, Felder and Silverman (1988) developed the understanding that

"[h]ow much a given student learns in a class is governed in part by that student's native ability and prior preparation but also by the compatibility of his or her learning style and the instructor's teaching style" (Felder & Silverman, 1988, p. 674). They identify learning style models as classifications of students' ways of processing and receiving information. To classify students' learning styles, Felder and Silverman make use of five dichotomies on the field of perception, input, organisation, processing and understanding. To determine a student's learning style, the student's learning behaviour is classified on all five fields as one type of learner out of the two choices in the dichotomy (Figure 2). The perception dichotomy includes sensory learners, who prefer "sights, sounds, and physical sensations" over the intuitive learners' "possibilities, insights, and hunches" (Felder & Silverman, 1988, p. 675). The input dichotomy distinguishes between visual learners, who prefer "pictures, diagrams, graphs, and demonstrations," and auditory learners who prefer "words and sounds" (Felder & Silverman, 1988, p. 675). The organisation dichotomy includes inductive learners, who prefer that "facts and observations are given, and underlying principles are inferred," against deductive learners, whose preference is that "principles are given, and consequences and applications are deduced" (Felder & Silverman, 1988 p. 675). The processing dichotomy distinguishes between active learners, who engage in physical activity or discussion to learn and reflective learners, who learn through introspection (Felder & Silverman, 1988, p. 675). Lastly, the understanding dichotomy differentiates between sequential and global learners; sequential learners learn "in continual steps" whereas global learners learn "in large jumps,

holistically" (Felder & Silverman, 1988, p. 675). For example, a student can be an intuitive/visual/deductive/reflective/global learner. Each unique combination of these five choices is viewed as a distinct learning style. In total, there are 32 unique learning styles to this model (Figure 2). Even though the approach to learning styles taken by Felder and Silverman (1988) is undeniably popular within the field of educational research, its learning style model is less easily implemented in smaller scale studies, due to the multitude of different learning styles that can occur within a group of students.

Preferred Learning Style	
Sensory / Intuitive	Perception
Visual / Auditory	Input
Inductive / Deductive	Organisation
Active / Reflective	Processing
Sequential / Global	Understanding

Figure 2: Felder and Silverman's five dichotomies (Felder & Silverman, 1988; Felder & Henriques, 1995).

All aforementioned learning style models have been developed for use in education in general, or even learning in general, in this nature they provide insight into the general workings of learning style models and recent developments in learning style research.

However, there are indications that learning style preferences differ between educational situations (Reid, 1987). Therefore, it would be best to assess students' learning styles using a model that has proven to be valid for application to the desired target group. In other words, to address the learning style preferences of non-native speakers of English regarding their EFL education, a learning style model must be used that was proven to be suitable for the target group.

One of the main models for mapping students' learning styles in EFL education is the Perceptual Learning Style Preference Questionnaire (PLSPQ) developed by Joy M. Reid (Reid, 1984). An example of the PLSPQ, as used for the present study, can be found in Appendix 1. This questionnaire was specifically designed to let students self-report on their preferred learning style. The model differentiates between six main styles: visual learning, auditory learning, kinaesthetic learning, tactile learning, group learning, and individual learning. The first four learning styles of Reid's model are deemed the "four basic perceptual learning channels" possessed by school children (Reid, 1987, p. 89). Students who prefer visual learning are described as benefiting from reading and studying charts, whereas auditory learners would benefit from listening to lectures and audiotapes. Kinaesthetic learners are described as needing total physical involvement in learning situations to obtain the best learning output, similarly, tactile learners benefit from hands-on learning; learning while doing (Reid, 1987, p. 89). As the PLSPQ relies on self-report, learning styles derived from the model are always *preferred* learning styles. Self-reporting would seem to leave room for

error, but Dunn (1984) verified that, even for self-reporting questionnaires, learning styles are satisfyingly correctly identified by the learners.

2.2 Vocabulary Acquisition

Words are the building blocks of a language. Without vocabulary, it is impossible to purposefully use language. Vocabulary acquisition is therefore a major field in the studies of language acquisition (Stahl & Fairbanks, 1986). More specifically, studies into the cognitive processes involved in vocabulary acquisition are of frequent occurrence (Groot, 2000). In some ways, L2 word acquisition is similar to L1 word acquisition, as not all L2 vocabulary has to be consciously and intentionally studied: exposure leads to the acquisition of most high-frequency vocabulary (Groot, 2000, p. 56). However, second language vocabulary acquisition is not identical to L1 word acquisition, as less frequently used words do not occur often enough in L2 learning materials for students to retain the words. Groot (2000) stated that, for effective language use, students should acquire at least 5.000 base words. As most of these words cannot be taught implicitly due to time and material constraints, some overt method of effective vocabulary acquisition should be implemented in EFL classrooms.

2.2.1 Vocabulary Instruction

Unfortunately, vocabulary is not easily taught (Mobärg, 1997). It is difficult to decide which words students should know to prepare them best for their futures. Moreover, different students have acquired different vocabulary in the past, so it is challenging to teach vocabulary that students do not already know. In addition, it is tough to find suitable methods

that help with word retainment, as vocabulary is easily stored in the short-term memory, but less easily retained in long-term memory (Groot, 2000).

Stahl and Fairbanks provided a meta-analysis on different vocabulary instruction methods (Stahl & Fairbanks, 1986). Their aim was to report whether vocabulary instruction influenced text comprehension. They concluded that vocabulary instruction significantly affected text comprehension, and that the best instruction methods met the demands of 1) inclusion of both definitional and contextual information, 2) involvement in deeper processing, 3) multiple exposures to target vocabulary (Stahl & Fairbanks, 1986, p. 72). However, Stahl and Fairbanks (1986) also concluded that teaching vocabulary is not enough for students to form a broad enough vocabulary range. Therefore, students should work individually on acquiring as much vocabulary as possible.

Students face a major task when having to acquire vocabulary on their own. Recent communicative language teaching has become more student-focused when it comes to instructions (Richards, 2005). In addition, one of the main paradigms of communicative language teaching is that function outweighs form (Richards, 2005): creating students who can communicate in diverse situations, even if erroneous in language use, has come to outweigh creating students who are accurate in their language use. Luckily, vocabulary is still deemed an essential component of a good communicative language programme (Richards, 2005). Therefore, vocabulary lists remain included in most EFL course books, and EFL workbooks offer a multitude of vocabulary training exercises. Instructions on how to study

vocabulary, however, are rarely implemented in lessons and materials (Stahl & Fairbanks, 1986). This is peculiar, as there are many different facets to *knowing* a word (Richards, 1976) and both students and teachers would be aided by being given more tools to address the process of vocabulary acquisition. Due to the current lack of resources, students are over-burdened as they face the task of acquiring new vocabulary. In addition to acquiring the vocabulary short-term, students need guidance and help with retaining words in the long term.

2.3 CALL

The ever-growing prevalence of digital technology has given rise to many CAL and CALL programmes. CALL is seen as the field of studies on the use of computer technology for language learning (Chun, 2011). A critical note, though, is that, similarly to other educational processes and programmes, no CALL programmes are effective for all learners (Chun, 2011, p. 663). Therefore, the implementation of a CALL programme in an EFL curriculum should always be preceded with caution.

Over the last four decades, CALL has undergone incredible change. During the 1970s and 1980s, CALL was primarily used for drill and practice methods whereas in the 1980s and 1990s, communicative exercises were developed. Contemporary use of CALL is more focused on authentic discourse and individual learners (Chun, 2011, p. 664). Presently, CALL programmes are available in multitudes, giving students and teachers so many options to choose from that it is difficult to determine which programme is best to use or most effective. It also yields a high relevance for language learning in general (Chapelle, 2007). However, for

a CALL programme to be most effective for language acquisition, Chapelle (2007) offered a pair of recommendations. The first recommendation was that key linguistic characteristics must stand out and be repeated in different forms, the second that CALL users must be able to ask for help, be in control of the computer, and be able to improve their work (Chapelle, 2007, p. 101). Nowadays, new CALL programmes are continuously being invented and improved.

One of the more recent fields of CALL is Mobile Assisted Language Learning (MALL). Mobile learning is seen as the transferral from learning on computers to learning with mobile phones or smartphones. Hsu (2013) addressed students' attitudes towards MALL and found that MALL can form a potentially effective tool for language learning in general, which is deemed useful by students from different cultural backgrounds. Moreover, Miangah and Nezarat (2012) described MALL as "an ideal solution to language learning barriers in terms of time and place" (p. 309). Nonetheless, there are some disadvantages to the use of MALL, which mostly lie in the limited capabilities of some phones, costs of Internet access, and the smaller-sized screens (Miangah & Nezarat, 2012).

2.3.1 WRTS

WRTS is a previously government-subsidised online vocabulary training programme whose main target group is Dutch learners of foreign languages in secondary education. The programme is widely known among secondary school students and language teachers in the Netherlands. The programme enables students to learn vocabulary wherever they have access

to the internet on an electronic device. WRTS started out as a CALL programme, but in recent years has become a MALL programme too.

Vocabulary practice using WRTS is characterised by the students' autonomous studying. A student makes his own bilingual wordlist or imports an official wordlist from the publisher of his course book. Then the student opts for one of WRTS' eight practice assignments. All assignments are designed around the visual and/or audial representation of the source word (e.g. the Dutch word *kat*) and the student's ability to type in the correct target word (e.g. the English word cat).

The practice assignments are divided into two groups: easy and difficult. The five easy assignments are *puzzle*, *spelling*, *dictation*, *multiple choice*, and *consonants*. In *puzzle* mode the letters of the target word are mixed, and the student has to form the correct translation from the letters given. In *spelling* mode, the target word appears briefly after which the student must type in the correct translation of the source word. *Dictation* mode entails the audial verbalisation of the source word after which the student must type in the target word. In the *multiple choice* mode, the students are visually provided with one source word and four possible target words. The student must choose the correct target word matching the source word given. In the *consonant* exercise, students only see the consonants of the target word and must fill in the vowels.

The difficult assignments in WRTS are firstly *in mind*, where the student sees the source word and must mentally envision the correct target word. Afterwards, the student sees

the correct answer and taps whether he had answered correctly in mind. This exercise is perceived as difficult, as this is the first exercise where there is no hint given about the target word. However, spelling does not play a role here, and the learning success is largely based on the student's correctness when answering, therefore, *in mind* is perceived as the easiest of the difficult assignments. The second difficult assignment is *first letter*, where the student only sees the first letter of the target word and must complete it. The third and last difficult assignment is the *test*. In this assignment, the student is presented with the source word and must type in the correct target word. For all assignments, both difficult and easy, students are graded on a scale of 1-10. When a student has answered all items correctly, a 10 is given and the student is presumed to have acquired all the vocabulary trained (WRTS, 2018b).

2.4 Dutch EFL Education

In the Netherlands, most students are enrolled in primary education from ages 4-12. After eight years of primary education (*basisschool*), students enrol in different types of secondary education (*middelbare school*) based on their primary school teacher's recommendation. Generally, there are three types of secondary education: 1) preparatory vocational secondary education (*vmbo*), which is four years in duration, 2) senior general secondary education (*havo*), which lasts five years, and 3) university preparatory education (*vwo*), which is six years in duration. Students are subjected to national examinations at the end of their final year of secondary education. Upon passing these exams, students can continue their studies. A *vmbo* diploma gives access to vocational training (*mbo*) schools, a

havo diploma serves as access to both higher professional education (*hbo*) and vocational training (*mbo*). Students who graduate *vwo* can access all types of vocational training and higher education, including university research-oriented education (*universiteit*) (Nuffic, 2018a; Nuffic, 2018b).

English as a foreign language (EFL) education in the Netherlands is one of the key courses (*kernvakken*) students follow during their 4-6 years of secondary education. In other words, English is seen as one of the three most essential courses, together with mathematics and Dutch. On average, students follow classes for English for approximately 150 minutes a week, 40 weeks a year. At most secondary schools, teachers and students use course books during English classes as a guideline for studying grammar and vocabulary and language skills (reading, writing, watching, listening, speaking). Some of the most popular course books include *Stepping Stones* (published by Wolters-Noordhoff), *New Interface* (published by Thieme Meulenhoff) and *Of Course!* (published by Malmberg). During the first few years of secondary education, students mostly engage in grammar and vocabulary training and building up language skills. In later years, focus shifts completely to language skills: reading, writing, speaking, and listening.

Students' progress is most often measured using summative tests. To make sure students at different schools for the same educational level progress similarly, language teachers in the Netherlands make use of the CEFR (Common European Framework of Reference) proficiency levels. At the end of each year of secondary education, students must

meet certain CEFR levels, which rise in difficulty each year. In this way, students work towards their final examinations, which, too, are based on CEFR proficiency levels. For havo education in the Netherlands, students must score B2 level on reading, and B1 level on speaking, watching and listening, and writing at the end of their final year (Europees Referentiekader Talen, 2018). For more information on the CEFR levels, see Council of Europe (2001).

Vocabulary training plays a supportive role in English classes during students' secondary education. Bilingual wordlists are provided in most course books, and students are expected to memorise vocabulary for both small tests, the so called *schriftelijke overhoringen*, and bigger tests on complete chapters of the course book material, the so called *proefwerken* or *repetities*. Many teachers find it remarkable that students seem to easily forget studied vocabulary during the interval between a small test and a big test. This is supported by Groot (2000), which states that "[i]t is common knowledge that high ability learners in these age groups [middle school students] possess an admirable memorising capacity. This enabled the subjects to achieve extremely high scores on the immediate tests. The associations, however, are not firmly established and two weeks later most of them are beyond recall" (p. 72). Apparently, current tactics used for vocabulary acquisition are not as effective as they should be; students will only benefit from studying vocabulary in the long haul when they retain the words in their long-term memory.

2.5 PPVT-IV

One of the standardised tests used to measure the vocabulary range of native English speakers, aged between 2 and 99, is the Peabody Picture Vocabulary Test (PPVT) (Dunn & Dunn, 2007a). This test was designed by Dunn and Dunn to "assess the listening comprehension for spoken words in Standard English" (Biloh, 2008). Participants in a PPVT hear a word and are requested to indicate which picture, out of four options, corresponds with that word. The test is suitable for both native speakers of English and non-native speakers of English. Participants' results can be compared to the performance of native speakers in a specified reference population (Dunn, Dunn, Bulheller & Häcker, 1965). As the PPVT is a norm referenced test it is an especially insightful tool for comparing Dutch EFL students' performances to those of native speaker students. The PPVT, originally published in 1959, has been updated roughly every 20 years, which has ensured that the vocabulary used in the test remains relevant and suited for present-day learners. Moreover, recurrent problems and validity issues have been solved over the past years (Biloh, 2008). The most recent version is the PPVT-IV (fourth version of the PPVT). All in all, the PPVT-IV is a valid and reliable testing instrument regarding vocabulary attainment of non-native speakers of English.

3. Method

To find out whether WRTS vocabulary training is effective to different degrees for havo 4th graders with different preferred learning styles, an experimental study has been conducted. Two groups of Dutch havo 4th graders (an experimental group vs. a control group) have been subjected to 1) a survey on learning styles, 2) the PPVT-IV, which functioned as a pre-test, 3) a 40-minute WRTS training on verifiably unknown vocabulary from the PPVT-IV in the experimental group and a 40-minute writing training in the control group, 4) the PPVT-IV, functioning as a post-test. In this manner, data has been obtained on the participants' preferred learning styles and their vocabulary scores before and after the training session. This allowed for assessment of the effect of WRTS on the vocabulary attainment of participants with different learning styles, compared to participants who did not work with WRTS. The analysis of learning styles focused on preferences for either visual or non-visual (kinaesthetic, tactile, auditory) learning styles, as the vocabulary training programme WRTS' functions mainly addresses learners who prefer visual representation of target vocabulary. It was hypothesised that WRTS training would be more effective for participants with visual learning styles compared to participants with non-visual learning styles, as WRTS' training options mainly address visual learners.

3.1 Participants

A total of 37 Dutch havo 4th grade students of EFL participated in the present study. Of these 37 students, six were excluded because they missed the post-testing session. All 31 participants were enrolled at the same school for secondary education in the Netherlands.

Moreover, all participants were selected from two groups of havo 4th graders (higher general secondary education, year four out of five). I had been the English teacher of 21 of the participants for approximately six months before the first testing took place. The other eleven participants' English classes were being taught by a colleague. Background information on the 31 participants can be found in Table 1.

Group	Age[1]	N	Gender	
			Male	Female
Control group	15y	3	2	1
	16y	8	2	6
	17y	5	1	4
Subtotal		*16*	*5*	*11*
Experimental group	15y	4	1	3
	16y	8	6	2
	17y	3	2	1
Subtotal		*15*	*9*	*6*
Total		31	14	17

Table 1: Age and gender of participants who completed both the pre- and post-test.

3.2 PLSPQ

To determine the participants' preferred learning styles, Reid's Perceptual Learning Style Preference Questionnaire (Reid, 1984; Appendix 1) was administered to the participants. The PLSPQ has been successfully used for self-testing of learning styles for non-native speakers of English before (Chen, 2009; Reid, 1987; Vaseghi, Ramezani & Gholami,

[1] Age in years at PPVT-IV pretest

2012; Wintergerst, DeCapua & Verna, 2002). A week before the pretesting took place, the participants were given paper copies of the PLSPQ to fill in during class hours. Before filling in the questionnaire, the participants were informed, in Dutch, on how to fill it in. Moreover, the participants were given the option to let the teacher translate the questions for them, so they would not have any difficulties understanding the statements. Three participants needed a translation of one of the questions, one participant needed a translation of three questions. All other participants filled in the questionnaire without problems.

3.4 Training

3.4.1 The experimental group: WRTS training

Based on the PPVT-IV pretest and the PLSPQ, participants were assigned to either the control or experimental group, in such a way that both groups were roughly equal in learning styles and in English vocabulary attainment. The experimental group continued to receive WRTS-training on the vocabulary that was proven to be lesser known by the participants. To determine which vocabulary was relatively unknown to the participants and needed to be included in the wordlist, scores from the PPVT-IV pretest were gathered and a quotum was set at 60% correctness. All words from set 1-15 that were known by less than 60% of the respondents to that set were included in the wordlist. Words from sets 16 and up were disregarded as the number of participants that continued to those sets was unrepresentative of the sample. In total, 36 words were included in the WRTS training (for wordlist, see Appendix 4).

Twelve days after the PPVT-IV pretest, participants of the experimental group were sent to a computer-room, in which they received written instructions for the experimental WRTS-training (for instructions, see Appendix 5). I was present during this training as the participants' teacher and coordinator of the experiment. Instructions were provided orally to those participants who had difficulty understanding the training. After checking for comprehension of the instructions, participants started the WRTS-training. Participants were told that they had to work with the wordlist provided, using the CALL programme WRTS, but that they could choose for themselves how they wanted to train the words from the wordlist. This training lasted for 40 minutes. No problems occurred during the experiment. Participants who could not attend the WRTS-training were redistributed to the control group. After 40 minutes, participants were instructed to stop the training and turn off the computers they were working with. During the testing, I walked around the room, checking participants' screens to make sure that all participants were engaged in WRTS training as they should be. For an impression of WRTS' online training environment, see Appendix 6.

3.4.2 The control group: Writing training

Whilst the experimental group underwent computer WRTS training, the control group was given a different assignment, not related to the tested vocabulary. Students were given computer access and written instructions on a writing assignment. Students had to write the opening paragraph of a grimmification of a fairy tale of their choice. The assignment did not include any of the words tested in the PPVT-IV. In this manner, both control and

experimental group were actively engaged in learning activities, but the control group's activity was unlikely to influence testing scores.

3.3 PPVT-IV tests

The participants' baseline knowledge of English vocabulary was measured using the PPPVT-IV. In short, during a PPVT-IV test, participants are presented with four pictures and one spoken word. The participant has to identify which picture resembles the meaning of the word. The experimenter marks the participant's answers on a score sheet on which all words are grouped into sets of twelve. The participant's number of errors per set may not exceed seven in order to be allowed to go to the next set. When a participant makes eight or more mistakes in a set, the test ends.

PPVT-IV pre- and posttest were administered by a total of four different experimenters. All experimenters were teachers of English for the higher levels of havo and vwo. The pretest was administered by two experimenters, including myself. The posttest was administered by three experimenters, including myself. The extra experimenters were recruited at the same school where the testing took place and where the participants were enrolled in higher secondary education. All recruited experimenters were compensated by the school for the time invested in administering pre- and posttests.

3.3.1 PPVT-IV pretest

For this research, all participants were subjected to the PPVT-IV on the same day. Testing took place in an empty classroom, with proper lighting that allowed good visibility of the projection of the pictures on a whiteboard. Each participant was assigned a time-slot and tested individually. Each participant was greeted at the door of the classroom in a friendly

way and then directed to his or her seating place, 2,5 metres from the projection on the whiteboard. The experimenter explained the process of the PPVT-IV to the participant, following a step-by-step guide that can be found in Appendix 3. Moreover, the experimenter also checked if the information that had been filled in on the score sheet beforehand was correct. To control the participant's understanding of these instructions, two test-items were administered. Then, the starting time was written down on the score sheet and the test started. All participants responded correctly to these test-items.

Administering the PPVT-IV calls for creating a base-set. When administering the PPVT-IV to native speakers, experimenters pick the starting set based on the participant's age. After determining the starting set, testing must begin by establishing a base-set. A base-set can be described as a set with one or zero errors. When the participant makes more than one error in the starting set, the experimenter must go back a set and administer that set until a baseline or base-set is established. When the participant scores a base-set on the starting set, that set is taken as the baseline or base-set, even if the participant also scores one or zero errors in subsequent sets.

For non-native speakers of English, a starting set cannot be established beforehand, because for this group of people, English vocabulary attainment does not correlate with age. For the present research, this meant that the starting set must always be set one. However, for the present study, individual pretesting did not start at set one but set seven. In the following subparagraph (3.3.2: PPVT pretest subtest 1-6), I would like to motivate this choice.

For this test, a PowerPoint with integrated audio files of the spoken words was used. The participant was shown a picture and heard the corresponding word from the audio file, after which the participant told the experimenter the number of the picture they thought

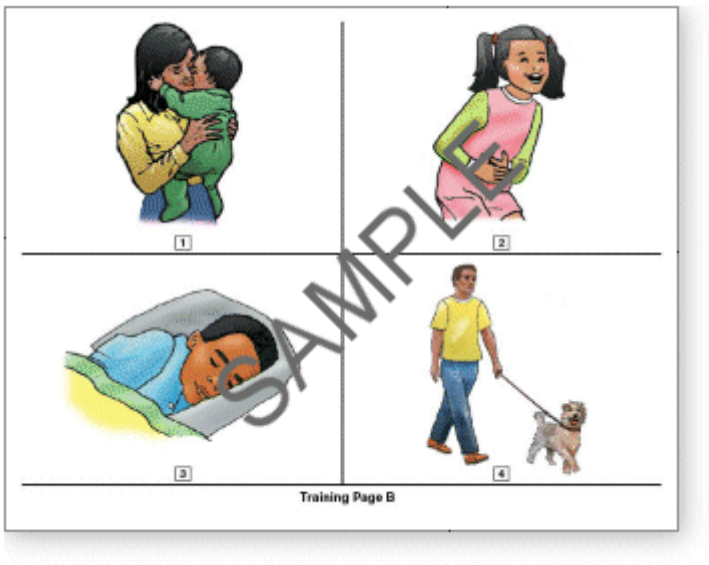

Figure 3: PPVT Sample test item (Dunn & Dunn, 2007c)

corresponded with the spoken word. The experimenter then circled this number on the score sheet. The correct answers were marked dark grey on the score sheet. If the answer given was incorrect, *e* for error was circled. Then the experimenter continued to the next slide and the process was repeated. For an impression of the administration of the PPVT-IV, see Figure 3 above, which shows a sample test item as it would be shown to a participant.

After administering a set (12 words with 48 corresponding pictures) the experimenter counted the number of errors. When 8 or more errors occurred in 1 set, the testing was terminated. When the participant scored 7 errors or less, the experimenter continued to the next set. The PPVT-IV has a total of 19 sets that could be administered. When the ceiling set (a set with

eight or more errors) was reached, the experimenter wrote down the ending time and her experimenter abbreviation, so the test could be traced back to a specific experimenter. The participant was thanked for his participation and the next participant was called in.

Sometimes, a participant would not know which picture corresponded with the spoken word. These participants then gave the answer "I don't know" or (in Dutch) "*Ik weet het niet.*" The protocol states that these answers are marked as an error for which the experimenter also had to write down *DK*, next to the *e* for error, so that in analysis it would be clear which type of error was made.

3.3.2 PPVT-IV pretest subtest 1-6

The PPVT-IV pretest did not start at set 1 but at set 7. Due to limited resources of experimenters and time, the individual process had to be shortened. After discussing with several EFL professionals, it was decided that testing could start at set 7. The reason for this was that these professionals deemed it highly unlikely that participants would make multiple errors in the vocabulary of set 1-6, based on their knowledge of these participants' previous English education. Because of this, set 1-6 were tested in a different way. That is, the pictures and words of set 1 to 6 were printed and given to the participants shortly after the pretest. Participants received plenary instructions, similar to the instructions for the pretest, on how to fill in the document before filling it in during class, where they could ask questions if anything was unclear. An experimenter was present during the administering of sets 1-6 to make sure tests were filled in individually.

3.3.3 PPVT-IV posttest

The posttest was conducted similarly to the PPVT-IV pretest and took place three days after the WRTS training, 15 days after the PPVT-IV pretest. For conciseness, I will merely point out the differences between the pre- and posttest. Firstly, participants were asked if they remembered what they had to do, instead of starting with an explanation. Participants who claimed they did not remember were then instructed. All participants were subjected to the test-items to check whether they remembered how to respond on the test. Secondly, during posttesting, testing began at set 1 as there were more experimenters available to administer the untimed tests. Otherwise, no differences in methodology of pre- and posttesting occurred.

4. Analysis and Results

Before testing started, participants' demographics were registered, and participants received a number by which their test results could be anonymised.

4.1 PLSPQ

Participants' learning styles were determined using the PLSPQ (Appendix 1) and accompanying score guide (Appendix 2). Each statement (out of a total of 30) in the PLSP questionnaire corresponds with a certain learning style (visual, tactile, auditory, group, kinaesthetic, individual). Participants scored each question in one of the following boxes: 1) strongly agree, 2) agree, 3) undecided, 4) disagree, 5) strongly disagree. These scores were then transformed to numbers for the analysis: 5 points: strongly agree, 4 points: agree, 3 points: undecided, 2 points: disagree, 1 point: strongly disagree. By filling in these numerical

scores on the score sheet for each question, a total for each learning style could be calculated. Values ranged from 0-50, as there were five questions per learning style and the end total for each learning style was multiplied by 2. Based on the PLSPQ, major learning style preferences were indicated at scores above 38. Minor learning style preferences, which were left out of the analysis for the present study, were indicated for scores between 25 and 37. Scores below 24 were categorised as negligible. Each of the participants could be categorised as having a major preference for either visual or non-visual learning.

The participants were grouped according to their major learning style preferences. These preferences were categorised as either visual or non-visual as visual learners were expected to benefit most from WRTS training opposed to non-visual learners due to WRTS' learning options. The non-visual learning style preference included major preferences for auditory, tactile and kinaesthetic learning. The visual learning style preference only included major preferences for visual learning. Scores for individual and group learning styles were disregarded, as they would be present in most learners and were not of particular interest for research into an individual CALL method. Sometimes, a participant was found to have multiple major learning styles. For these participants, the highest score was used to indicate the participant's representative learning style. Occasionally, participants would obtain similar scores for both visual and non-visual learning styles. In these cases, the participant was categorised to be a visual learner. Distribution of participants with visual and non-visual learning styles over the control and experimental group can be found in Table 2.

	Control group	Experimental group	Total
Visual	9	5	14
Non-visual	7	10	17
Total	16	15	31

Table 2: Distribution of learning styles over control and experimental group

4.2 PPVT-IV

Participants' raw scores on the PPVT-IV for both pretest and posttest were calculated using the calculation tool provided with the PPVT-IV (Dunn & Dunn, 2007b). To calculate raw scores, the total number of errors made by the participant up until the ceiling set (the last set administered) was subtracted from the item number of the last item administered (the last item in the ceiling set). For example: a participant reached item 144 (set 12) and made a total of 21 errors in sets 1-12, his raw score would be 144 - 21 = 123. Raw scores were then transformed to WBQ (*WoordBegripsQuotiënt,* word comprehension quotient) scores, using the conversion table provided with the PPVT-IV test. WBQ scores, which are norm-referenced scores, were determined by a combination of age at testing in years and months, and raw test scores. Raw and WBQ scores were calculated for both pretesting and posttesting.

4.3 SPSS analysis

The analysis was conducted using a mixed design repeated measures ANOVA using SPSS IBM (version 25).[2] The between-subject independent variables were identified as

[2] Tests were conducted to check whether our data met the assumptions of repeated-measures ANOVA, i.e. normal distribution and equality of error variances. Because our independent

learning style (visual and non-visual learning styles) and group (experimental and control group) whereas testing phase (pre-test and post-test) acted as the within-subject independent variable. Participants' WBQ scores (Table 3), derived from the PPVT-IV pre- and posttesting were categorised as the dependent variable. For the present study, effects are reported as significant at $p < .05$.

	group	learning style	mean	standard deviation	N
pretest	experimental	non-visual	94.4	18.55	10
		visual	82.4	5.46	5
		total	90.4	16.25	15
	control	non-visual	96.6	12.31	7
		visual	92.1	17.97	9
		total	94.1	15.43	16
	total	non-visual	95.3	15.87	17
		visual	88.6	15.20	14
		total	92.3	15.68	31
posttest	experimental	non-visual	104.6	11.05	10
		visual	93.0	11.20	5
		total	100.7	12.10	15
	control	non-visual	98.0	13.88	7
		visual	92.7	14.05	9
		total	95.0	13.78	16
	total	non-visual	101.9	12.33	17
		visual	92.8	12.66	14
		total	97.8	13.10	31

variables only had two levels, sphericity can be assumed. Normal distribution was confirmed for the pre- and posttest data using the Shapiro-Wilk test. Levene's test of equality of error variances showed no significant deviation from error variance between groups.

Table 3: WBQ scores for PPVT-IV pre- and posttesting

The analysis showed a main effect of testing phase on the test scores ($F(1, 27) = 11.55$, $p < .05$). Planned comparisons revealed that WBQ scores on posttesting were significantly higher than on pretesting, $F(1, 27) = 11.55$, $p < .05$ (Figure 3). This indicates that, generally, participants improved their scores on posttesting compared to pretesting.

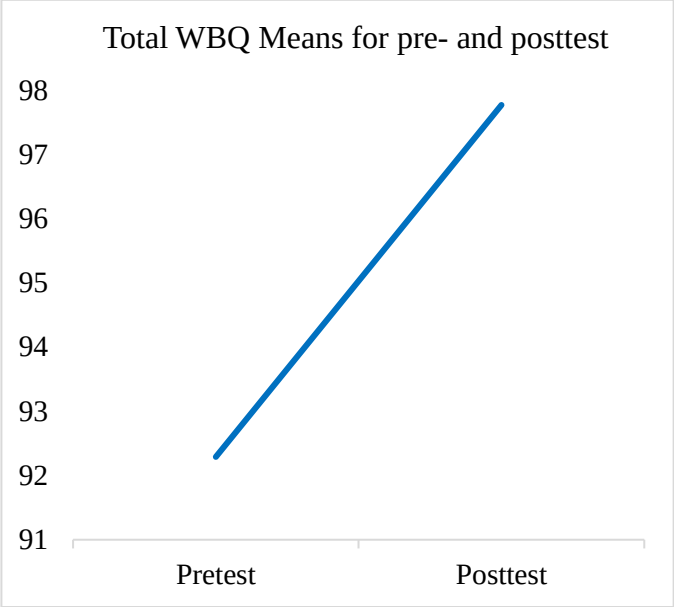

Figure 3: Effect of testing phase on mean WBQ scores

In addition, a significant interaction effect between testing phase and group was found ($F(1, 27) = .005$, $p < .05$). This indicates that testing phase had a different effect depending on which group (experimental/control group) was tested (Figure 4). Planned comparisons revealed that participants in the experimental group and the control group did not behave exactly alike at posttesting, compared to pretesting, $F(1, 27) = 7.88$, $p < .05$. To break down this interaction, post-hoc tests were performed comparing the control group's pre- and posttesting scores and the experimental group's pre- and posttesting scores. These revealed

that the experimental group significantly increased mean WBQ scores between pretesting and posttesting with $F(1, 13) = 17.57$, $p < .05$, whereas the control group's mean WBQ scores did not increase significantly ($F(1, 14) = .19$, $p > .05$). This indicates that the WRTS training has affected WBQ means, independent of other factors.

The effect and interaction found indicate that apart from all participants improving between pre- and posttesting, as an effect of age or test familiarity, WRTS training helped the participants in the experimental group to significantly improve their scores on the posttesting session. When analysing experimental and control groups' pre- and posttest scores, training provably relatively unknown vocabulary with WRTS does seem to have a significant effect, independent from visual/non-visual learning styles.

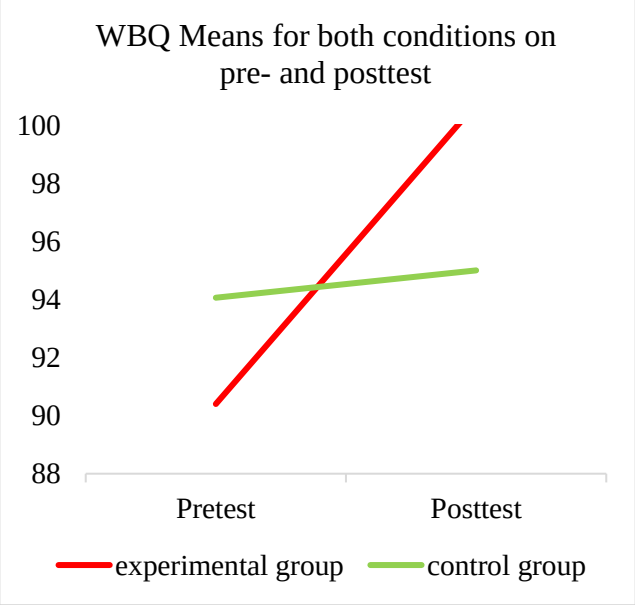

Figure 4: Interaction between pre- and posttest scores for both conditions

Contrary to the hypothesis made earlier, the interaction between testing phase, learning style and group was not significant ($F(1,27) = .04$ with $p > .05$). This meant that participants

with non-visual learning styles from the experimental condition did not significantly outperform their control group non-visual peers, nor did the two visual learning style groups. Overall, learning styles (visual or non-visual) did not significantly influence the effectivity of WRTS training; our hypothesis can thus be rejected.

5. Discussion and conclusion

5.1 Discussion

Our results point towards a significant effect of WRTS training on mean PPVT-IV test scores when referenced to a norm-based age group. For the tested circumstances, training target vocabulary with WRTS shows to be effective for memorising target vocabulary until at least three days after the training. Effectiveness of WRTS might correlate with students' generally positive attitude towards learning with apps and computer programmes (Cornelissen & Groenendijk, 2015). In general, the recommendation can be made not to discourage the use of WRTS for training vocabulary, as its effect is proven to be positive.

However, further research is needed to shed light on long term learning effects of the use of WRTS. As pointed out by Groot (2000), "[p]resentation in bilingual word lists seems an attractive shortcut [for studying vocabulary] because it takes less time than contextual presentation and yields excellent short-term results. Long term retention, however, is often disappointing" (p. 56). Moreover, it is possible that not all participants in the experimental condition profited from the WRTS training, as we analysed the data at the group level. In addition, no significant effect of learning style on test scores was found. Students with visual learning styles did not benefit significantly more from WRTS training than students with non-visual learning styles, contra our prediction. This result might be related to the fact that the participants were free to choose their preferred learning method in WRTS. Possibly, participants' learning styles influenced their choices of training method. This could mean that,

even though training with WRTS always relies on visual input, some training methods are more demanding in terms of visual learning than others. This could indicate that even though no significant effect of learning styles on test scores was found for WRTS training in general, results might still be significant when training modes are addressed separately.

5.2 Limitations

5.2.1 Validity

It is possible that internal validity may have been compromised in this research because participant selection occurred partly based on availability – even though groups were statistically matched based on PPVT-IV pretest scores and learning styles. In relation to external validity, caution is advised when generalising results to the general population, as the present study included a mere small number of participants, who were additionally taken from a small demographic area.

Face validity and construct validity, on the other hand, are higher because referenced, standardised tests were used to measure variables. Both the PLSPQ and the PPVT-IV are especially befitting for the presently explored situations. Moreover, these tests have each been previously successfully used in several different studies of similar design (Chen, 2009; Hargrave & Sénéchal, 2000; Reid, 1987; Vaseghi et al., 2012; Wintergerst, et al., 2002). However, in another study, doubts arose about the construct validity of the PLSPQ (Wintergerst et al., 2002). Therefore, results should not remain self-standing but call for retesting with re-evaluation of presently used instruments.

5.2.2 Reliability

Apart from the limited scope of the study due to the small sample size, the present study does not pose many threats to reliability. Instruments used were standardised and did not leave room for discussion of terminology or procedure. Testing was not interfered, and data were processed and analysed according to standard procedures. However, test-retest reliability remains to be proven by replication of the present research.

The use of a control group added greatly to the reliability of the present study, even though it thinned out the experimental group. The control group allowed for results to be interpreted carefully, as some of the effects found (e.g. the effect of testing phase on mean scores) were present in both the experimental and the control group. These results were most likely not the effect of WRTS training, as the control group did not receive any.

5.3 Suggestions for future research

Firstly, the current study has looked into the relation between learning styles and vocabulary acquisition. However, the present learning style indication was made based on general language learning style preferences using the PLSPQ. Possibly, learning style preferences differ between learning tasks, which could mean that students' learning style preferences for studying vocabulary might be different from their general language learning style preferences. At this point in time, learning style models based on specific language learning tasks are not available. However, future research could explore the possibilities for such instruments.

In future research, replicating the present study is desirable to find out whether results are reliable in successive measurements. At a retest, the participants' choices for the different exercises of WRTS should be controlled for, as the specifics of the different WRTS exercises might have influence on learning style effects. Moreover, for retesting, a Solomon four group design with a larger sample size could be considered, as this would more effectively and reliably report results and effects for the present research question. A Solomon four group design controls for testing effects, as two extra groups of participants are added, one of which takes part in the experiment and posttesting and one that only takes part in posttesting.

In addition, a retest could give a more reliable insight into the effectivity of WRTS in general, from which a more definitive recommendation in relation to the programme's uses for educational purposes could be formed. As the PLSPQ does not appear to be totally without flaws, future research into the effect of learning styles on educational instruments could measure learning styles using multiple different learning style questionnaires and could for example include the Learning Style Indicator (Wintergerst & DeCapua, 1999). Wintergerst and DeCapua's Learning Style Indicator is an individually administered learning style questionnaire based on Reid's PLSPQ. It differs from the PLSPQ in multiple ways. Firstly, some validity and reliability concerns that arose regarding the PLSPQ have been addressed in the Learning Style Indicator (DeCapua & Wintergerst, 2005). Secondly, the Learning Style Indicator portrays a participant's preferences based on three learning styles in contrast to the four major learning style preferences in the PLSPQ and the Group versus

Individual factor tested in the PLSPQ. The preferences measured with the Learning Style Indicator include Project Orientation, which applies to students who like to learn in hands-on situations, Group Activity Orientation, which characterises students who learn best when working together, and Individual Activity Orientation, which applies to students who learn best individually (DeCapua & Wintergerst, 2005).

5.4 Conclusion

To conclude, our results indicate that, under our testing circumstances, training with WRTS is effective, regardless of visual or non-visual preferred learning styles. This suggests that WRTS can be a useful tool and that preferred learning styles do not necessarily have to be taken into consideration with regards to the effectiveness of WRTS. Recommendations that can be deducted from the results are that educational professionals could encourage the use of WRTS for training vocabulary by using bilingual wordlists. However, our results should be interpreted with caution as the present study was conducted with only 31 participants, divided into two groups, the control (N=16) and experimental groups (N=15). Further research is needed to verify the results from the present study and come to more definite conclusions on learning style influence on effectivity of vocabulary training instruments.

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Appendix 1: PLSPQ

Perceptual Learning Style Preference Questionnaire

Directions:

People learn in many different ways. For example, some people learn primarily with their eyes (visual learners) or with their ears (auditory learners); some people prefer to learn by experience and /or by "hands-on" tasks (kinaesthetic or tactile learners); some people learn better when they work alone while others prefer to learn in groups.

This questionnaire has been designed to help you identify the way(s) you learn best – the way(s) you prefer to learn.

Decide whether you agree or disagree with each statement. And then indicate whether you:

Strongly Agree (SA)
Agree (A)
Undecided (U)
Disagree (D)
Strongly Disagree (SD)

Please respond to each statement quickly, without too much thought. Try not to change your responses after you choose them. Please answer all the questions.

PERCEPTUAL LEARNING STYLE PREFERENCE QUESTIONNAIRE

	SA	A	U	D	SD
1. When the teacher tells me the instructions I understand better.					
2. I prefer to learn by doing something in class.					
3. I get more work done when I work with others.					
4. I learn more when I study with a group.					
5. In class, I learn best when I work with others.					
6. I learn better by reading what the teacher writes on the chalkboard.					
7. When someone tells me how to do something in class, I learn it better.					
8. When I do things in class, I learn better.					
9. I remember things I have heard in class better than things I have read.					
10. When I read instructions, I remember them better.					
11. I learn more when I can make a model of something.					
12. I understand better when I read instructions.					
13. When I study alone, I remember things better.					
14. I learn more when I make something for a class project.					
15. I enjoy learning in class by doing experiments.					
16. I learn better when I make drawings as I study.					
17. I learn better in class when the teacher gives a lecture.					

	SA	A	U	D	SD
18. When I work alone, I learn better.					
19. I understand things better in class when I participate in role-playing.					
20. I learn better in class when I listen to someone.					
21. I enjoy working on an assignment with two or three classmates.					
22. When I build something, I remember what I have learned better.					
23. I prefer to study with others.					
24. I learn better by reading than by listening to someone.					
25. I enjoy making something for a class project.					
26. I learn best in class when I can participate in related activities.					
27. In class, I work better when I work alone.					
28. I prefer working on projects by myself.					
29. I learn more by reading textbooks than by listening to lectures.					
30. I prefer to work by myself.					

Appendix 2: PLSPQ scoring guide

SCORING SHEET

VISUAL	TACTILE
6 - _____	11 - _____
10 - _____	14 - _____
12 - _____	16 - _____
24 - _____	22 - _____
29 - _____	25 - _____
Total_____ x 2 = _____(Score)	Total_____ x 2 = _____(Score)
AUDITORY	GROUP
1 - _____	3 - _____
7 - _____	4 - _____
9 - _____	5 - _____
17 - _____	21 - _____
20 - _____	23 - _____
Total_____ x 2 = _____(Score)	Total_____ x 2 = _____(Score)
KINAESTHETIC	INDIVIDUAL
2 - _____	13 - _____
8 - _____	18 - _____
15 - _____	27 - _____
19 - _____	28 - _____
26 - _____	30 - _____
Total_____ x 2 = _____(Score)	Total_____ x 2 = _____(Score)

Major Learning Style Preference	38-50
Minor Learning Style Preference	25-37
Negligible	0-24

Appendix 3: PPVT-IV instructions

PPVT INSTRUCTIE

- De PPVT-4 is een niet-tijdsgebonden, individuele toets. Dat wil zeggen dat de leerlingen alle tijd moeten krijgen om te antwoorden.
- De PPVT moet plaatsvinden is een rustige ruimte zonder afleidingen. Let erop dat er voldoende licht is maar dat het licht het zien van de diavoorstelling niet belemmerd.
- Heeft de leerling na 10 seconden niet geantwoord, spoor hem/haar dan aan om een antwoord te geven.
- Probeer ervoor te zorgen dat de leerling het scoreformulier niet ziet.

Stap 1:

Verwelkom de leerling en wijs hem zijn zitplek.

Stap 2:

Vertel de leerling (in het Nederlands) dat hij steeds 4 plaatjes te zien krijgt en 1 woord te horen krijgt. De leerling moet vervolgens het nummer van het bijbehorende plaatje opnoemen (dit mag zowel in het Nederlands als in het Engels) of anderszins aangeven welk plaatje bij het woord hoort. Als de leerling het niet weet, mag hij dat zeggen. Er volgen eerst 2 voorbeelden voordat de echte test begint. Vertel de leerling dat de totale test zo'n 10 minuten zal duren.

Stap 3:

Controleer samen met de leerling of de informatie over de leerling op het scoreformulier correct is.

Stap 4:

Start met de voorbeelditems 1A (bij een fout in 1A, herhalen met 1B) en 2. Hiervoor is geen audiofragment – Lees zelf voor "dog" en "chair." Begin pas met de test als de leerling snapt hoe hij/zij het correcte item moet aanduiden.

Schrijf de starttijd op het scoreblad.

Stap 5:

Start met de test. Begin bij set 4. Indien de leerling meer dan 1 fout maakt in set 4, geef dan ook set 3 (na de base set kan verder gegaan worden met set 5). Laat steeds maar 1 dia zien bij elk gesproken woord. Indien de leerling na 10 seconden nog niet geantwoord heeft mag hem de volgende vraag gesteld worden: "Welk nummer is [woord]"/"What number is [word]" – let hierbij wel op geen lidwoorden te gebruiken! Indien de leerling daarom vraagt of indien jij als examinator dat nodig acht mag je het gesproken woord nogmaals laten horen.

Tijdens het afnemen van de toets omcirkel je als examinator steeds het door de leerling gekozen antwoord. Het vakje van het juiste antwoord is grijs gekleurd. Geeft de leerling een

ander antwoord dan het juiste, kruis dan ook het vakje met E (error) aan. Geeft de leerling aan het antwoord niet te weten, zet dan in de kantlijn achter E DK (voor don't know).

Stap 6:

Als de leerling 8 of meer fouten heeft gemaakt in een set eindigt de test. Geef de leerling wel altijd de HELE set, ook als hij/zij al 8 fouten gemaakt heeft maar nog niet de hele set is afgenomen.

Schrijf de eindtijd op het scoreblad.

Vul je afkorting in bij de vakjes tester. De overige lege vlakken worden later bij de analyse verwerkt.

Appendix 4: WRTS wordlist

English	Dutch	% correct in PPVT-IV pretest
branch	tak	59%
plumber	loodgieter	59%
chimney	schoorsteen	54%
vine	wijnstok	54%
inflated	opgeblazen	54%
primate	primaat	53%
pentagon	*vijfhoek*	*52%*
squash	pompoen	49%
boulder	kei/rotsblok	49%
fragile	kwetsbaar	49%
hazardous	*gevaarlijk*	*48%*
vest	gilet	47%
hatchet	bijl	43%
aquatic	aquatisch	42%
sedan	sedan	40%
buckle	gesp	38%
perpendicular	loodrecht	37%
carpenter	timmerman	36%
valve	ventiel	33%
cerebral	hersen-	33%
syringe	spuit	33%
links	schakels	32%
garment	kledingstuk	31%
submerging	dompelen	30%
beverage	drank	27%
polluting	vervuilend	27%
appliance	toestel	26%
cornea	hoornvlies	26%
peninsula	schiereiland	26%
hydrant	brandkraan	24%
mammal	zoogdier	24%
tusk	slagtand	19%
poultry	pluimvee	19%
wrench	moersleutel	16%

feline	katachtig	8%
rodent	knaagdier	5%

Appendix 5: Instructions experiment

Start de computer op.

Stap 1:

Log in op WRTS (www.wrts.nl), mocht je nog geen account hebben, maak dan een account aan.

Dit mag ook m.b.v. facebook of Instagram.

Stap 2:

Ga naar http://wrts.nl/l-schreurs.

Stap 3:

Oefen met de lijst “English H4B 05-06-2018”

Je mag zelf weten hoe je oefent en welk soort opdrachten je daarbij gebruikt. Je moet alleen wel het programma WRTS én deze lijst gebruiken.

Stap 4:

Wanneer de docent het einde van de les aangeeft log je uit op WRTS en sluit je de computer af.

Appendix 6: WRTS impression

Figure 1: The wordlist as uploaded on WRTS.

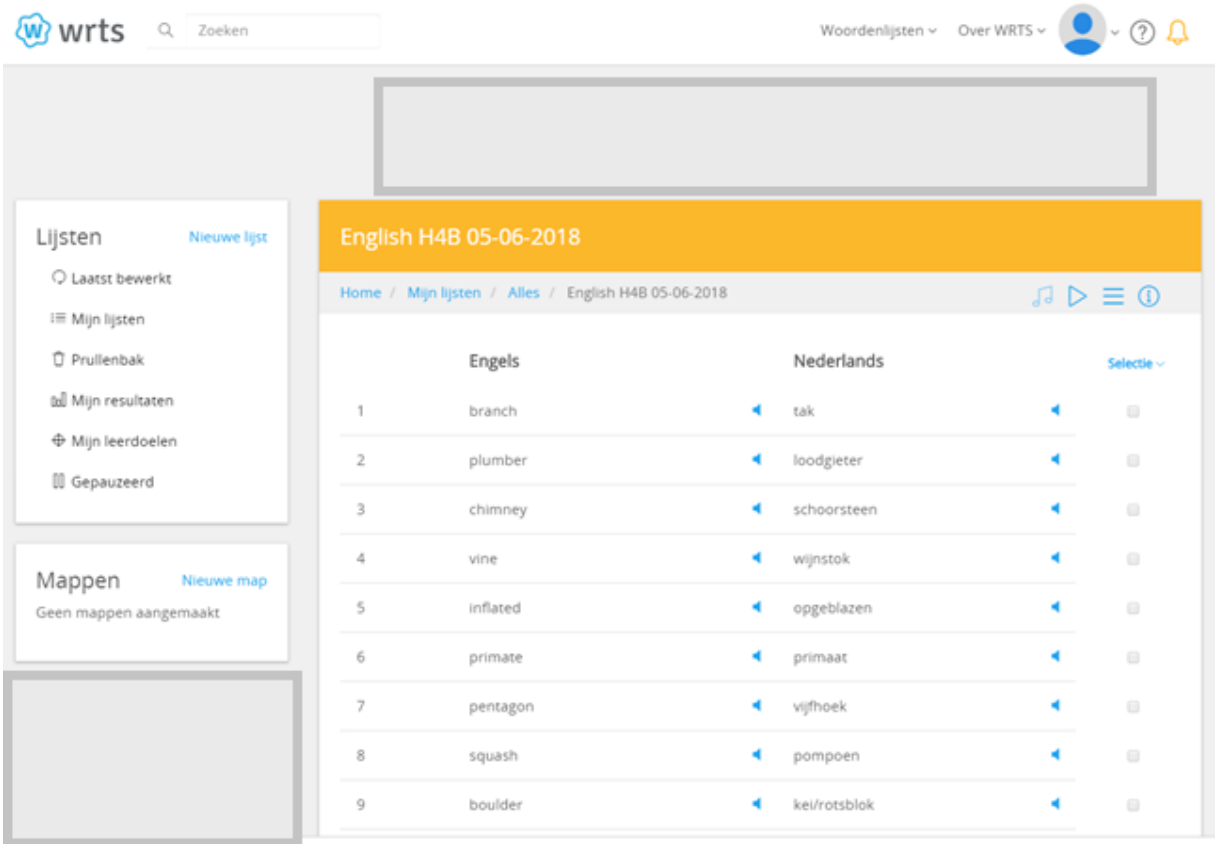

Figure 2: The menu in which the trainings' settings can be adapted to the student's needs.

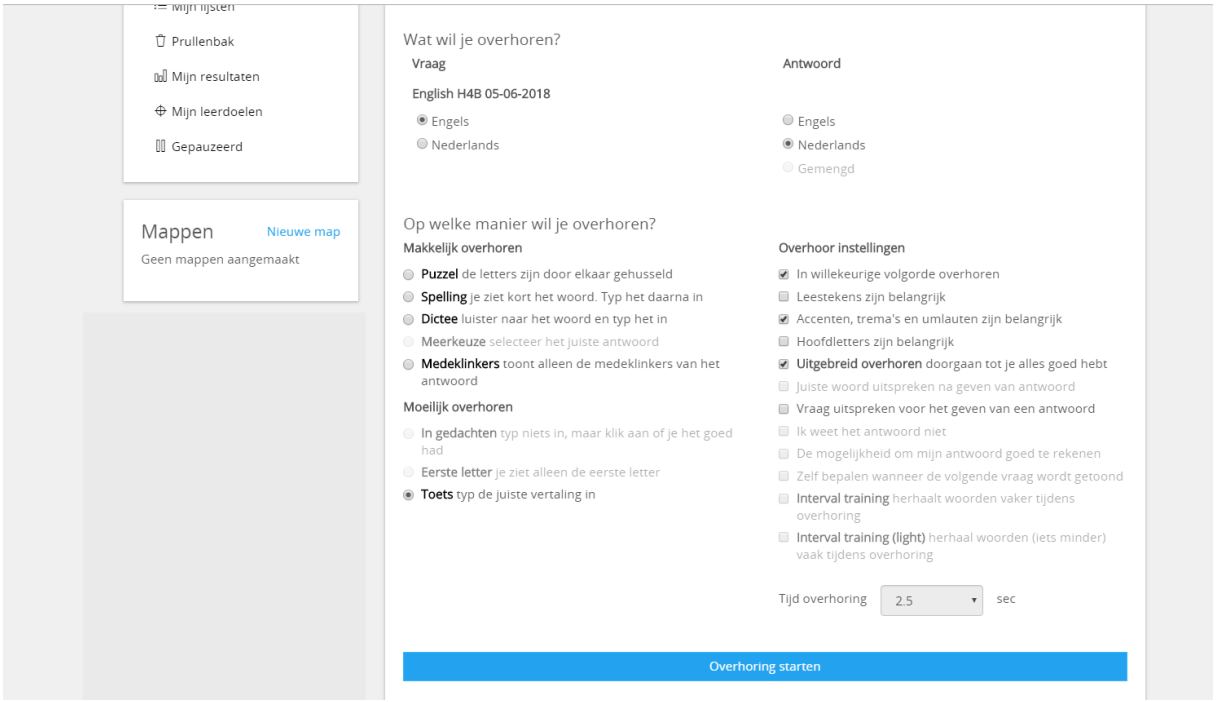

Figure 3: Training with mixed letters.

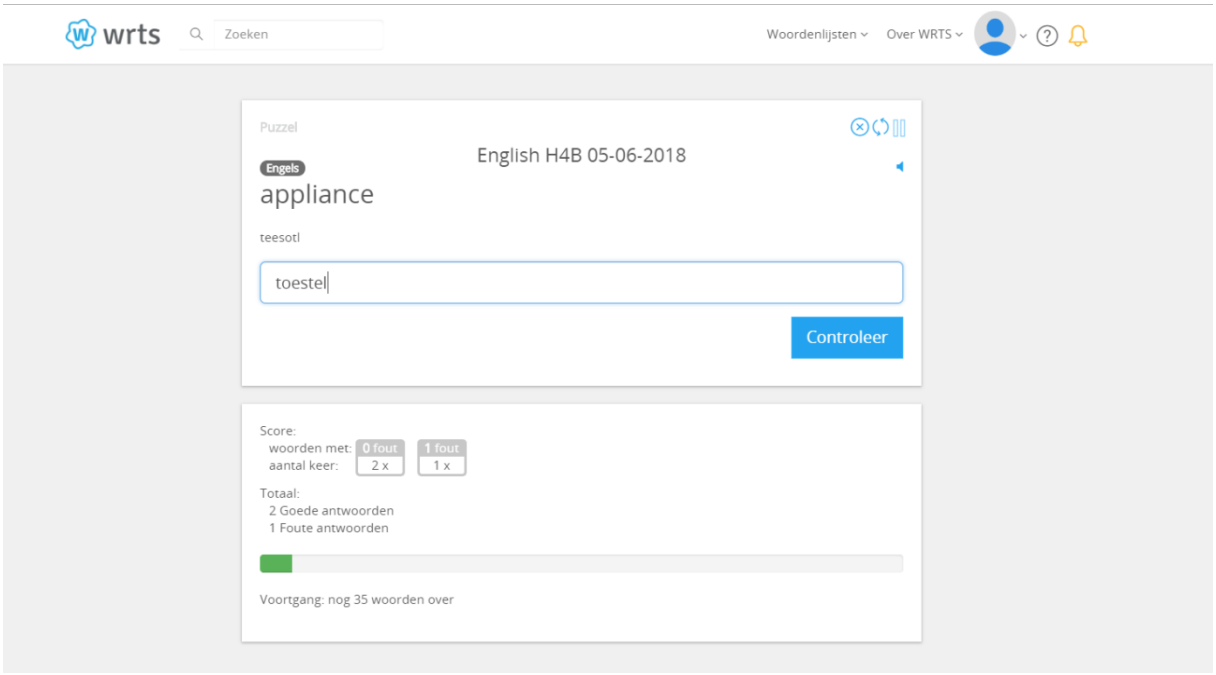

Figure 4: Training with consonants only.

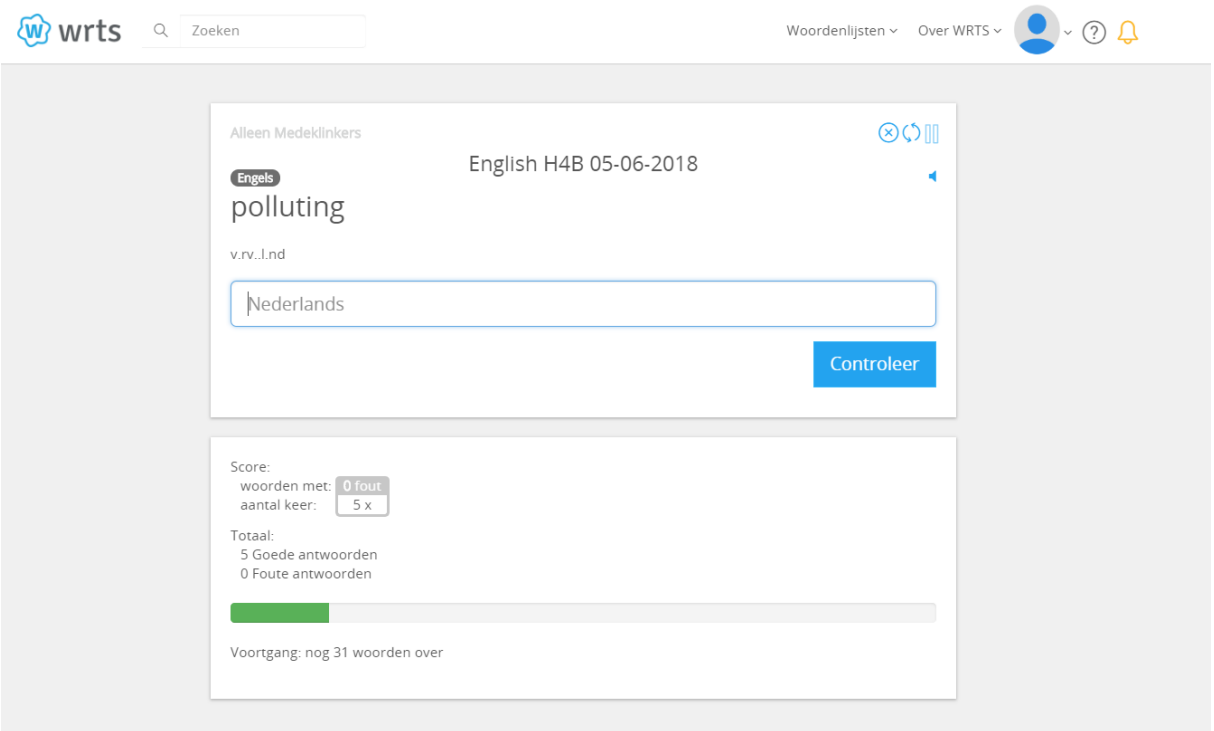

Figure 5: Training results in a grade out of 10, complete with overview of correct/incorrect answers, date, time, etc.

Figure 6: Example of a wrong answer during the training.